

Leaving Certificate Computer Science Teachers' CPD Programme

Interim Report – October 2019

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Acronyms and Abbreviations List

ALT	Applied Learning Task
CAP	Curriculum & Assessment Policy Unit
CBE	Computer Based Exam
CESI	Computers in Education Society of Ireland
CPD	Continuing Professional Development
CS	Computer Science
CT	Computational Thinking
DEIS	Delivering Equality of Opportunity in Schools
DES	Department of Education and Skills
Epi*STEM	The National Centre for Excellence in STEM Education
IT	Information Technology
LCCS	Leaving Certificate Computer Science
Lero	Irish software research centre
NCCA	National Council for Curriculum and Assessment
PDST	Professional Development Service for Teachers
SFI	Science Foundation Ireland
STEM	Science, Technology, Engineering and Mathematics
TES	Teacher Education Section

Acknowledgement

The writers of this report would like to express their appreciation to the teachers and staff at the 40 Phase 1 schools and to the PDST team for their valuable input.

Section 1 – Introduction

Following consultation with key stakeholders and the completion of a scoping exercise into the provision of Computer Science in upper second-level education internationally¹ the Department of Education and Skills (DES) initiated the development of a Computer Science Leaving Certificate subject in 2017. As part of this development, the National Council for Curriculum and Assessment (NCCA) convened a Leaving Certificate Computer Science development group. Based on the NCCA's partnership model of curriculum development, this development group consisted of representatives from the various educational stakeholders as well as business and industry representatives (see Appendix 1 for development group details and Appendix 2 for specification details).

As a result of the work of the development group, delivery of the new subject commenced in September 2018. The first phase of its introduction involved a selected group of 40 schools. In addition to considering the teachers' previous skills and knowledge in the area of CS, schools were also selected on the basis of other criteria to ensure that they were geographically dispersed across the country and represented the range of post-primary schools in Ireland including rural and urban, single-sex and mixed, large, medium and small schools as well as the different types of post-primary schools (Community Schools, Community Colleges, Voluntary Secondary Schools, Comprehensive schools and ETB Schools). See Appendix 3, 4 and 5 for the school selection criteria, a list of the Phase 1 schools and their geographical spread.

As part of the Phase 1 roll-out of the subject, teachers from the schools embarked on a CPD programme which commenced in the spring of 2018. Provided by the Professional Development Service for Teachers (PDST), the programme aimed to support the teachers' professional development throughout the introduction of the subject into schools. An SFI Discover funded research project was established to track the development of the teachers' progress during the first two years of the subject roll-out.

A Leaving Certificate Computer Science Steering Group was established in DES to oversee the introduction of the subject to schools. A sub-group of the Steering Group was formed to assist in, and have oversight of, this research study. The sub-group comprises of representatives from DES (TES, CAP, Inspectorate), Lero, and the PDST and meetings take place approximately every three months.

This interim report outlines the research conducted into the first year of the programme which involved an analysis of the online collaboration platform (Slack) used as part of the delivery of the CPD and the analysis of the responses to a teacher questionnaire distributed to all participating teachers. The next stage of research will involve visits to a sample of participating schools to explore how the subject is being implemented at a school level and how the teachers are progressing in their professional development.

¹ https://www.ncca.ie/media/2605/computer_science_report_sc.pdf

Section 2 – Overview of the CPD framework

The PDST's programme for the participating teachers consisted of a number of components as shown in Figure 1 below and for logical reasons, teachers were divided into two cohorts for some of these activities. Underpinned by a strong social constructivist orientation to learning with a goal of establishing communities of learners, the CPD framework provided opportunities for teachers to interact and collaborate in both formal and informal ways. National workshops and fundamental skills development workshops provided opportunities for teachers to interact face-to-face at key times during the year. In addition, utilising technology-enhanced strategies, informal engagement was encouraged through the use of an online platform (Slack) and the participants also had access to online MOOC courses. Regional cluster meetings were established to encourage teachers to collaborate at a local level and share experiences and practice.

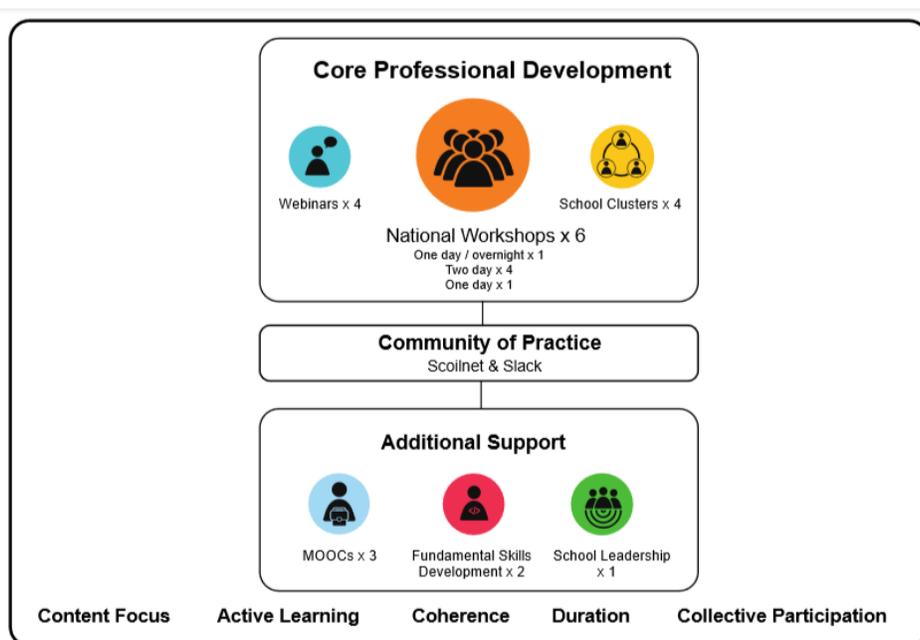


Figure 1 - CPD Framework²

In brief, the key elements of the CPD framework included:

- **National workshops:** These are two-day residential workshops which address pedagogy and curricular content. In the first year, three national workshops were delivered and a further two workshops are planned for the 2019/20 academic year starting with National Workshop #4 in September 2019.
- **Fundamental Skills Development:** Two three-day residential workshops to address programming skills have been included in the CPD programme. The first camp introduced teachers to Python and the second introduced HTML, CSS and JavaScript. Teachers were involved in many hands-on exercises during the camps and were provided with detailed manuals as support material³.

² <https://www.scoilnet.ie/uploads/resources/26525/26261.pdf>

³ <https://www.compsci.ie/cpd/>

- **Webinars:** Two webinars have taken place to date. The first, titled 'Perspectives of Teaching Programming for Leaving Certificate Computer Science', was presented by Dr Sue Sentence and the second titled 'LCCS from Inception to Implementation' involved a panel of representatives from the LCCS Development Group. Both webinars were two hours in duration and took place in the evening. Further webinars are scheduled to take place during 2019/2020.
- **MOOC Recommendations:** Optional online MOOCs were offered to the teachers during the first year of the CPD programme, details of which are outlined in Appendix 6.
- **Regional Cluster Meetings:** Six regional clusters have been set up for teachers to share their thoughts and build up a community of practice. Details of schools by cluster are available in Appendix 7. Two rounds of cluster meetings have already taken place and additional events are planned for 2019/2020.
- **Slack Platform:** In addition to all the face-to-face opportunities mentioned above, Slack has also been introduced to assist with the development of a community of practice. It is a closed online communications platform for the participating teachers to seek help, answer requests and share resources and it is facilitated by the PDST.

Teachers also have access to the CompSci.ie and CESI-CS⁴ platforms for additional resources.

An overview of all CPD activities to date is outlined below.

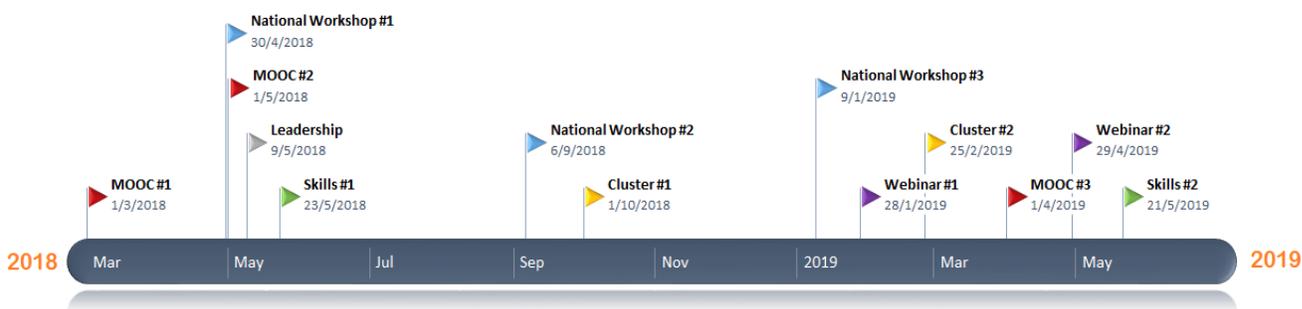


Figure 2 - CPD activities to date

Additional details on these activities are available in Appendix 8. This research team has attended a number of events to meet the teachers, communicate plans and obtain consent for research purposes.

⁴ Available via CompSci.ie

Section 3 – Aim of the study

This is an SFI Discover funded research project which aims to explore the development of the teachers' Pedagogical Content Knowledge (PCK) and to examine the role of the CPD infrastructure in contributing to the development of their knowledge and skills.

Working in conjunction with PDST, the study aims to explore how the teachers' CS knowledge and skills are developing during the first two years of the implementation of Computer Science. The research study does not aim to evaluate the CPD provision but rather aims to document the teachers' journey and examine how the professional development framework outlined above contributes to the development of their capacity to teach the new subject. Through this exploration, the study aims to inform future developments in the area of Computer Science education in schools and teacher CPD provision in general.

While the overall research question examines the way teachers, who have participated in the CPD programme, developed their expertise in the teaching of CS, for the purposes of this interim report, a number of sub-research questions are addressed. These include:

1. How were teachers using the online Slack Platform as part of the CPD provision?
2. What is the profile of the participating schools and teachers?
3. How is the subject being rolled out in the participating schools, looking specifically at timetabling, student uptake?
4. What aspects of the CPD provision did the teachers participate in?
5. What are the teachers' initial experiences of the different elements of the CPD framework?
6. According to the teachers' self-reports, to what extent are teachers developing their:
 - a. CS knowledge
 - b. Specification knowledge
 - c. Pedagogical expertise in teaching the subject

A timeline of this study is outlined below.

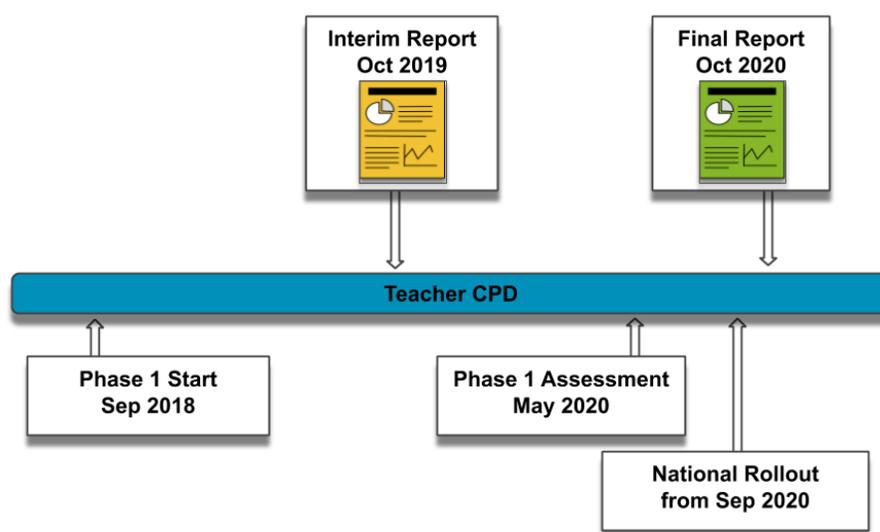


Figure 3 - Timeline of study

Section 4 – Methodology

The research adopted a mixed-method approach conducted in two phases.

Phase 1, which is reported in this document, involved the analysis on the teachers' use of the online platform (Slack) and an analysis of the data from a questionnaire distributed to all teachers towards the end of the first year of the CPD programme.

- In relation to the use of the Slack platform, 43 Slack users (40 of the phase 1 teachers and 3 PDST staff members) consented to their data being exported from the platform to undergo analysis. Python scripts were used to extract this data set which consisted of 2038 posts across 7 Slack channels.
- A mixed-method questionnaire informed by the Slack data analysis was developed and distributed at the May 2019 national workshops and responses were received from 29 of the phase 1 teachers.

Phase 2 of the research will involve visits to a sample of participating schools to interview teachers, students, principals and guidance counsellors to explore how the subject is being implemented at a school level and how the teachers are progressing in their professional development.

The research was approved by the University's research ethics committee following an assessment in 2019.

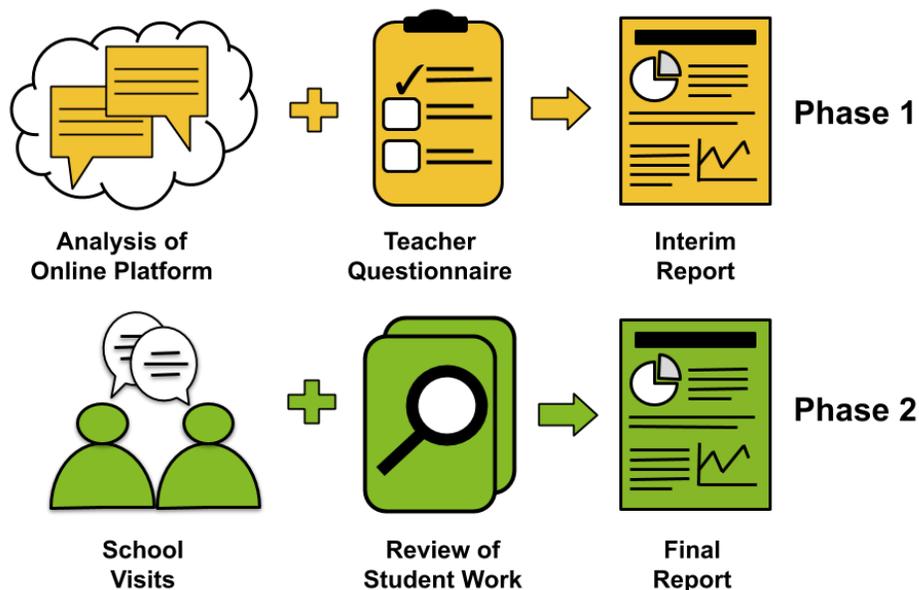


Figure 4 - Multi-phased approach to this study

Section 5 – Findings to date

This section outlines the findings of the research study to date. The first section outlines the findings from the analysis of the Slack platform data and then following this, the data from the teacher questionnaires is presented.

Slack⁵

Slack is a virtual workplace that facilitates collaboration through the provision of channels which allow team members to interact and contribute to projects. Amongst its many features, it provides site administrators with access to usage data which records the activity by the users of the system. This includes what the users accessed while using the platform and if they contributed to discussion fora or uploaded material to the various channels. There is hence a number of potential uses of the Slack platform, including sharing resources and as a site for professional interaction and discussion.

The analysis of the data from the Slack site involved the downloading of the user data and the categorisation of this data under a number of themes. This involved a review of the nature of the posts in the channels established. Of the seven channels established the 'General' channel was the most active channel and the 'Resources' channel was next indicating a high level of resource sharing amongst the participants (see Figure 5 below for the number of posts per channel).

Channel	Created	Last active	# Posts
General	Nov 17, 2017	May 29, 2019	910
PDST CPD Events	Apr 17, 2018	May 29, 2019	348
Resources	May 4, 2018	May 29, 2019	387
ALT3	Nov 5, 2018	May 30, 2019	127
Comp Thinking	Dec 10, 2018	Apr 2, 2019	129
ALT2	Mar 6, 2019	May 1, 2019	82
Assessment Theory	May 24, 2019	May 24, 2019	55
Total			2038

Figure 5 - Slack activity by channel

After analysis of the number of posts per channel, the number of posts by user was also examined to identify the level of activity of the community of users. There was quite a significant difference in the usage of the system amongst the cohort. For example, the top five users generated 59% of the posts and two of these were part of the PDST team. The bottom 10 users generated 1% and could, therefore, be classified as 'lurkers'.

⁵ <https://slack.com/intl/en-ie/>

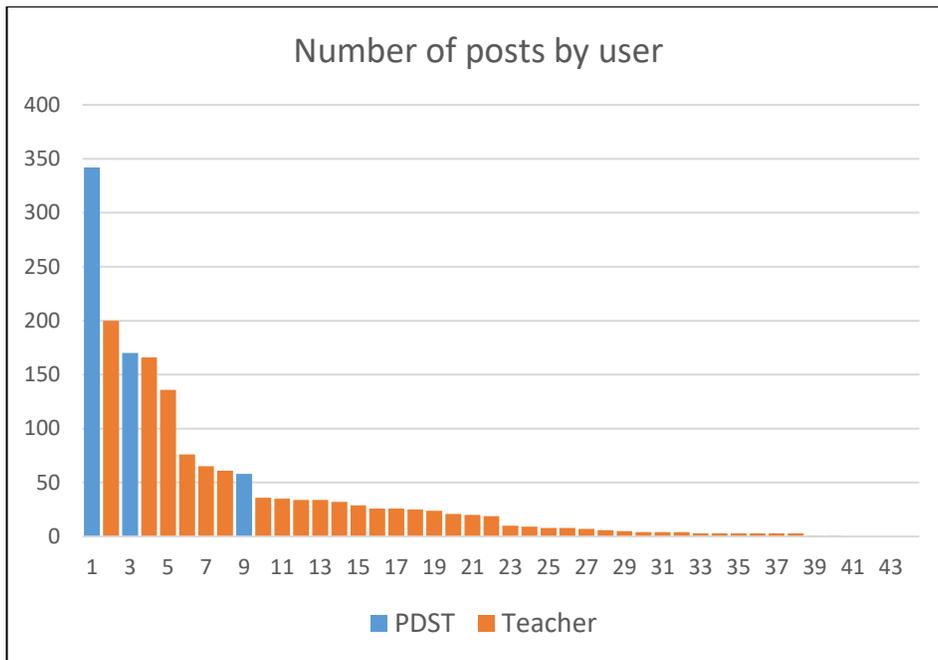


Figure 6 - Slack posts by user

In order to explore the nature of the contributions to the channels, the size of the posts was also examined to identify the extent to which the contributions were short responses or longer more discursive contributions. In this analysis it emerged that the majority of posts were short contributions (see Figure 7 below), again indicating the resource-sharing nature of the platform rather than as a forum to discuss professional issues in depth.

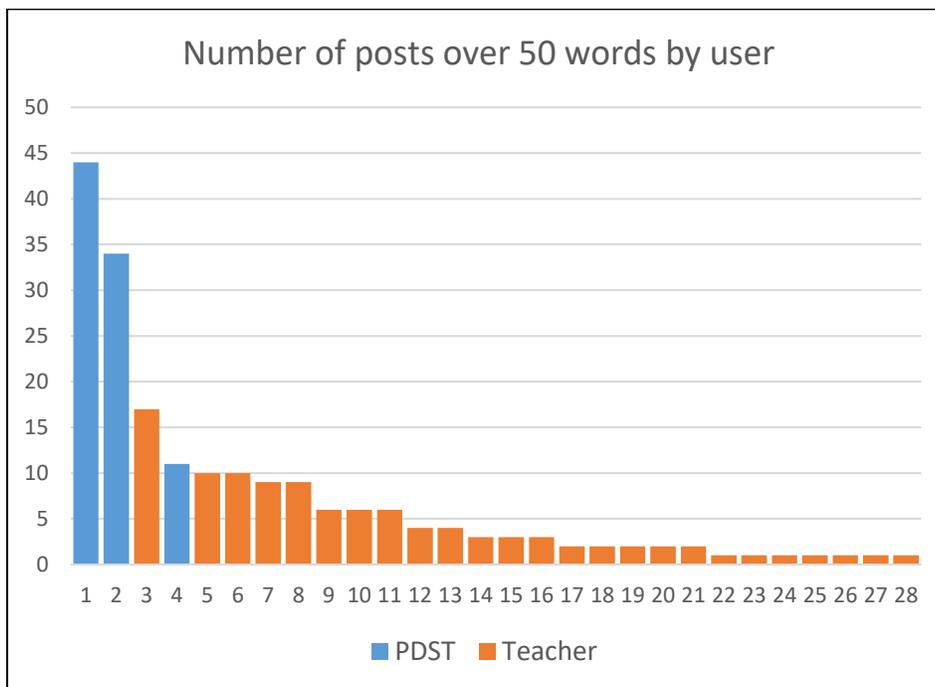


Figure 7 - Slack 50+ word posts by user

As an example of the nature of its use, the analysis of the Computational Thinking (CT) channel data highlighted that the level of participant interaction in the discussion channel on the Slack platform did not reflect the level of interaction one would expect from a group of this size. As Figure 8 below shows, the number of posts per user in the CT channel indicates that most participants joined the channel to observe the contributions but not to add responding posts themselves.

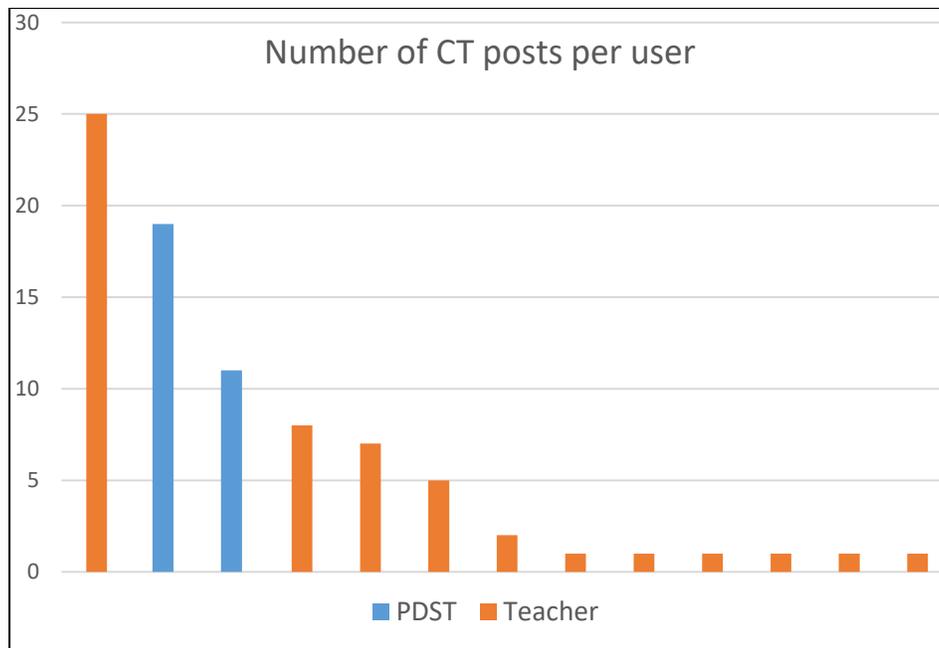


Figure 8 - Slack CT posts by user

This analysis highlighted two key issues. Firstly, when analysing the overall level of usage of the system it emerged that the use of the platform varied significantly across the users. In general, while there were a small number of more active users (as measured by contributions to the discussion in the various channels), the majority of the teachers used the platform to view and access resources uploaded. In addition, within the channels, there were few examples of more in-depth discussions of issues which indicate that this platform is used primarily as a resource sharing site rather than a teacher engagement platform.

Teacher Questionnaire

The questionnaire was completed by 29 of the phase 1 teachers on conclusion of Year 1 of the CPD, representing a response rate of 65%. The initial analysis of the data aimed to identify whether the responses represented the larger cohort of teachers participating in the study as reflected in the school demographics. This proved to be the case as the schools that the responding teachers came from represented the diverse range of schools in the sector, were geographically dispersed in both rural and urban settings, had a mix of both mixed and single-sex and varied in school size (see Figures 9, 10, 11 below) and 11 of the teachers were from DEIS schools.

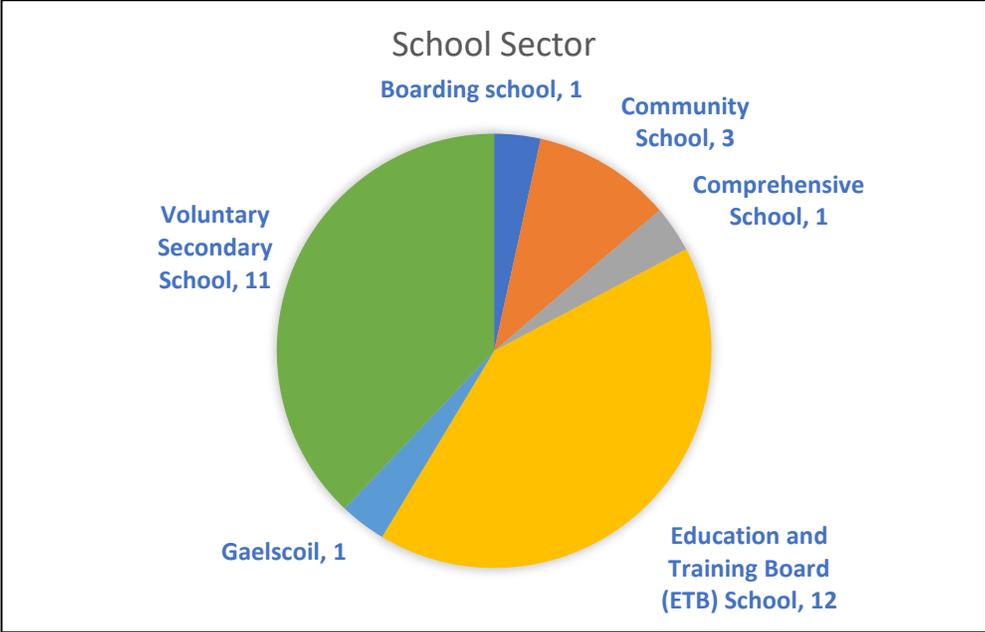


Figure 9 - Schools by sector

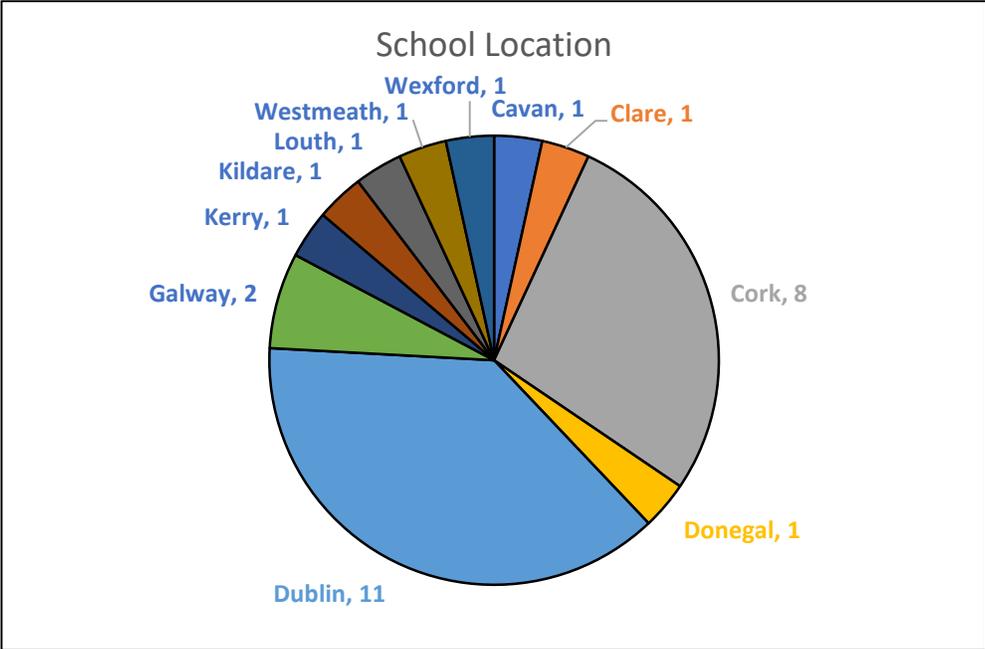


Figure 10 - Schools by location

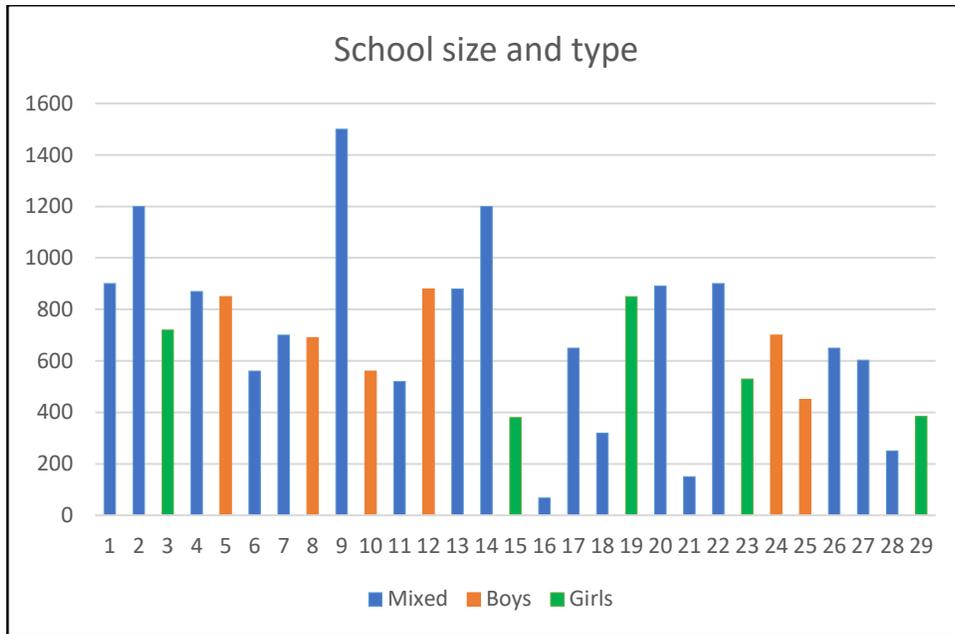


Figure 11 - Schools by size and type

The survey also sought information in relation to whether the schools were already providing Junior Cycle short courses in this area which may indicate an established interest. A number of schools reported offering the Junior Cycle short course in Coding (31%) and the short course in Digital Media (21%) (see Figure 12).

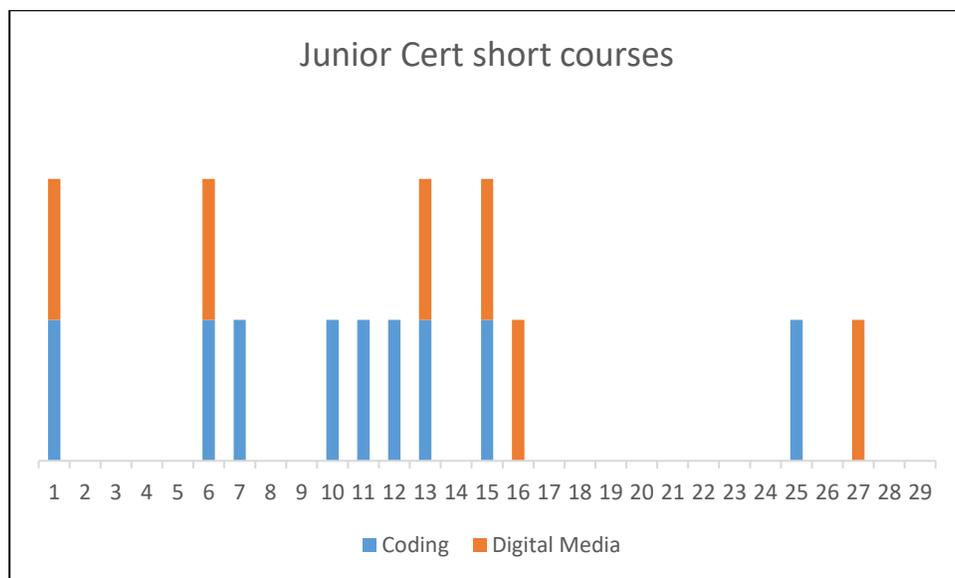


Figure 12 - Schools offering JC Coding / Digital Media

Teachers' Experience

The second part of the teachers' survey sought information on the teachers' background. This section of the survey examined the teachers' previous experience of the number of years teaching in general and the number of years teaching in their current school. Responses to this question indicate that 50% of teachers who responded to the questionnaire have more than 10 years of teaching experience and that only 17% have less than 5 years of teaching experience (see Figure 13).

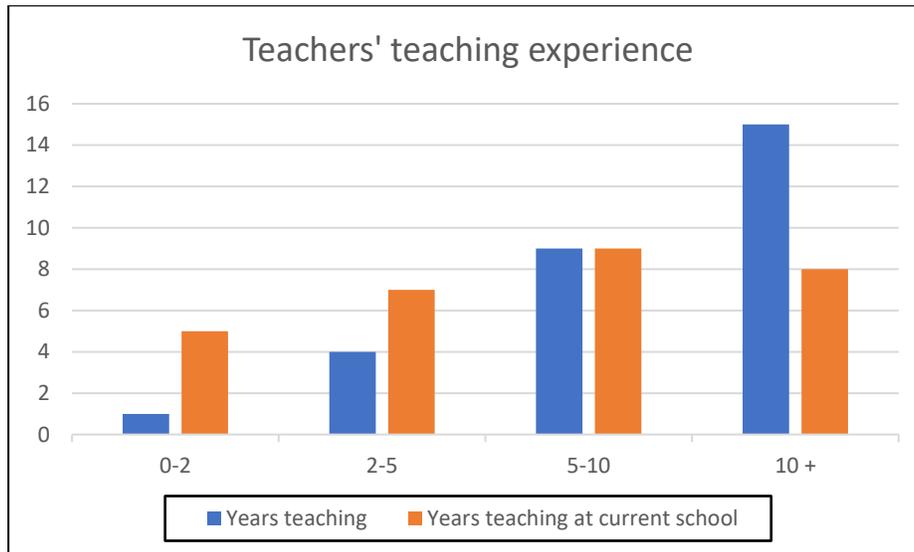


Figure 13 - Teachers' teaching experience

Of this cohort, 38% of participating teachers are female. Participating teachers previous experience varied. Some teachers had taught IT related subjects in school, some had provided IT support in schools and some had worked in industry (see Figure 14).

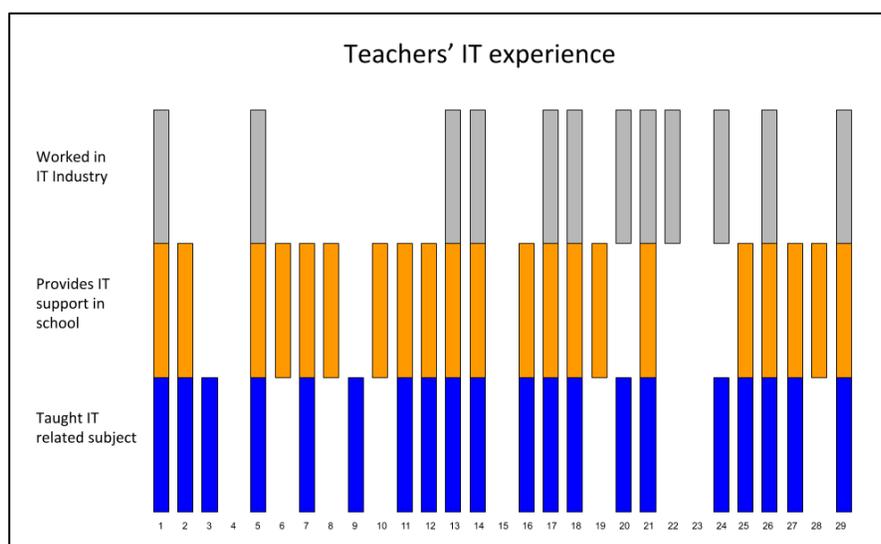


Figure 14 - Teachers' IT experience

Students and timetables

It was reported by the teachers that CS was available as an option to all students and 79% of the teachers reported teaching one class group in their school (21% of teachers taught two groups). In terms of the sex of students undertaking the subject, while 38% of the teachers teaching the subject were female, only 22% of the overall population of the students were female. In mixed schools, this Figure was lower with only 16% of the students female (see Figure 15 below where the yellow dot highlights mixed schools). Indeed, in some cases, class groups had only one or two females in a class of over 20 students. In relation to the timetabling of the subject in the school, the questionnaire sought the number of single and double class periods used in its delivery. The responses indicated that 9 teachers reported that the school did not timetable double class periods for the subject and in the other schools there were a number of combinations of single and double classes used.

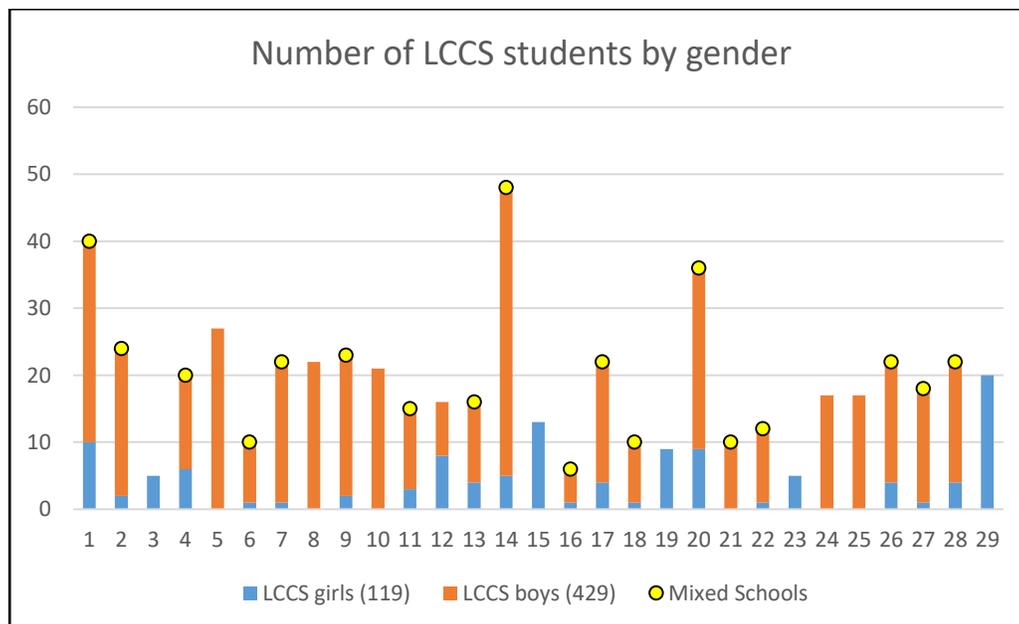


Figure 15 - Students by school and gender

CPD activities

The questionnaire also sought information on the teachers' participation in the various elements of the CPD framework. Overall participation in the range of activities was very high with national workshops being the most attended of the range of activities (see Figure 16).

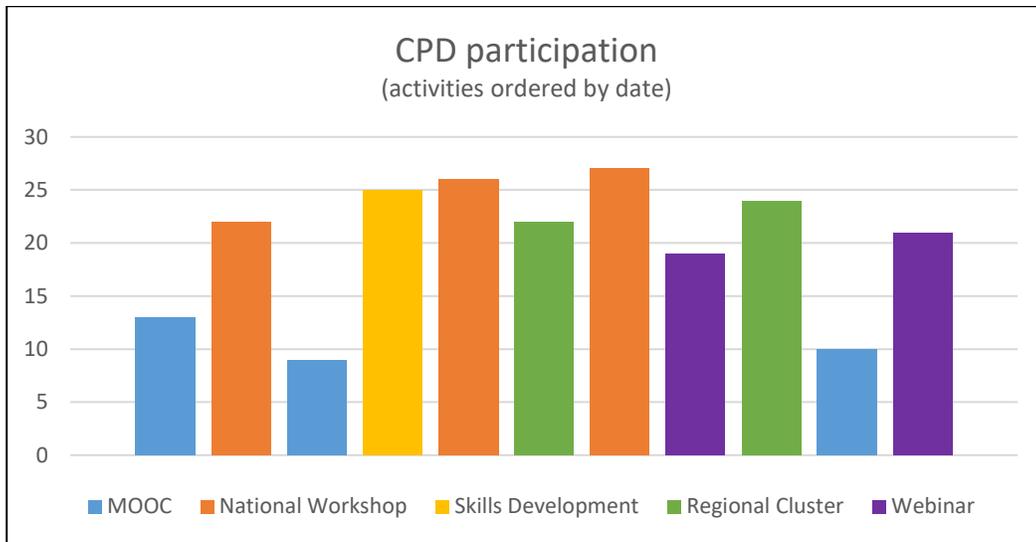


Figure 16 - CPD participation

When asked to rank the value of these experiences more face-to-face engagement appeared to be preferred with the national workshops and skills development workshops being ranked the highest (see Figure 17).

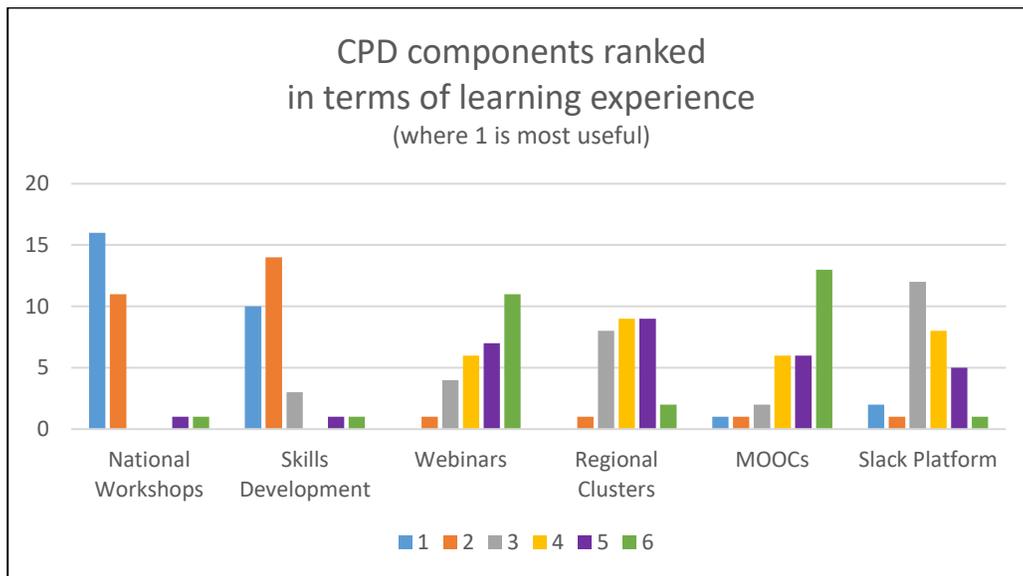


Figure 17 - CPD components ranked

In line with the analysis of the Slack data, that indicated that the majority of teachers used the platform to access resources, the teachers also reported that they primarily used the platform to view and access material (see Figure 18)

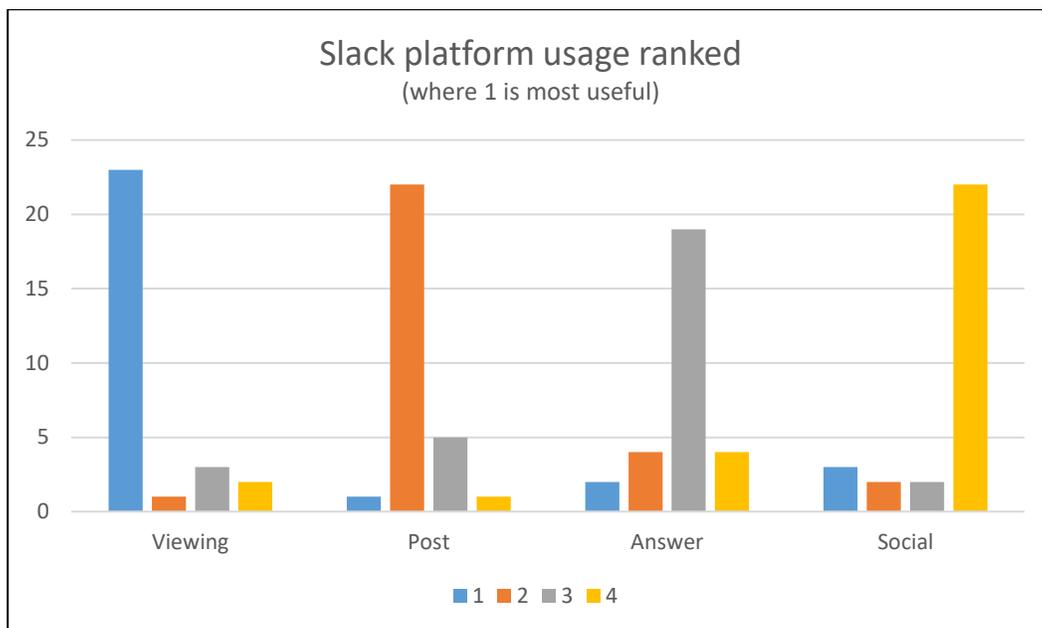


Figure 18 - Slack platform usage ranked

The final part of the questionnaire provided a number of open-ended questions seeking the teachers' views on the extent to which they felt their skills and knowledge were developing and the challenges and successes they were experiencing at that point.

These responses indicated that the teachers appeared satisfied with the development of their CS content knowledge and also felt that their knowledge of the subject specification was developing. While they also mentioned that their pedagogical skills were developing, this was not as prominent as the other areas (CS and subject specification knowledge). See a sample of teachers' responses below:

To what extent are you developing your content knowledge and skills?

- *"Very much so: the workshops on Python, html etc. are very useful and the books we get are great"*
- *"Great help on slack and national workshops so I feel I have improved over the past year"*

To what extent are you developing your pedagogical content knowledge and skills?

- *"Well. I would like to learn some more unplugged activities to break the monotony of my classes"*
- *"My pedagogical [skills] are developing from a less developed base as I am new to teaching in the classroom. I have set up and taught for years [elsewhere], but I find it very different in the second-level classroom"*
- *"Unsure of this as I haven't spent much time on thinking which pedagogical strategy I am implementing and I am powering through the content. I will focus on this more during the summer in my preparation for next year"*

To what extent are you developing your knowledge of the specification?

- *“As I become more familiar with the course specification I find my confidence in teaching is improving”*
- *“it is a challenge to know how deep to go into each LO [learning outcome] in order to cover it in sufficient details for their assessment”*
- *“gradually but clarity will come from exams”*
- *“I have a good sense of what the overall aim of it [the specification] is. However, I don’t often find it particularly helpful when it comes to the classroom”*

Questions related to successes, challenges and additional supports back up this pattern. When asked what were their most significant successes, the teachers highlighted their success in completing ALTs and student progress in coding, followed by student engagement and student progress in general/non-coding. For example, they noted *“Three ALTs done to date”, “The ALT projects were successful in that they engaged the students and developed good teamwork skills”* and *“Most students seem to show a good understanding of coding structure and how to do basic principles.”*

When asked what their major challenges were, the teachers tended to emphasise pedagogical difficulties. For example, they mentioned challenges *“Enable students to follow tasks and new concepts”, “finding right level to pitch it at”, the “pace of subject”* and *“giving appropriate homework”*.

In addition, when asked what additional supports they required, their responses again suggested that classroom pedagogy was their biggest challenge. This was reflected in calls for more teaching and assessment resources.

It must be noted however that while the questionnaire specifically sought the teachers’ challenges and future needs, the teachers were on the whole very positive and praised the quality of the professional development they received from the PDST.

Section 6 – Summary of key issues emerging from the data to date

While this phase of the research only analysed the teachers' use of the Slack platform and captured the teachers' perceptions through a single questionnaire, there are a number of issues that have emerged at this point in the research.

Firstly, 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 researched, designed, developed and delivered by the PDST team and the motivation and dedication of the teachers.

Returning to the key sub-questions outlined in the methodology section, in summary, the study has found that:

- The Slack platform was used primarily as a resource sharing site rather than a forum for professional dialogue and engagement.
- The participating schools reflected the overall range of schools in Ireland. In relation to female participation, while there were 38% female teachers in the sample of teachers that responded to the questionnaire, only 22% of the students were female.
- Schools approached the timetabling of the subject differently with some schools offering a mix of double class periods and single periods whereas others timetabled the subject as single lessons. This may hinder project-based approaches to learning the subject.
- While teachers participated in all aspects of the CPD provision, the national workshops and the skills development workshops were the most frequently attended CPD elements. The teachers also reported that these elements were the most useful elements of the CPD provision.
- A year into its implementation it is evident that the teachers' knowledge of CS content, the subject specifications and their pedagogical skills are developing. However, the teachers' comments in the questionnaire suggest that their pedagogical skills perhaps lag behind the other areas of skills and knowledge. Given the complexity of developing one's PCK in this area, this is perhaps not surprising. The second year will likely see further development and maturation of these pedagogical skills, which could be facilitated and developed through appropriate sharing of practice and reflection.

Phase 2 of the study will involve visits to a sample of schools to explore how the subject is being implemented 'on the ground' and will hopefully examine the development of the teachers' pedagogical skills further.

In addition to this, there are a number of other issues that have emerged in this phase of the study that will be explored further in phase 2, these include:

- The criteria used by teachers to define success and student learning in the subject.
- The extent to which student engagement with the subject is different from other subjects. Does it demand more of student time and effort than other subjects? Are there threshold concepts that are emerging from practice that can inform future practices?
- The development of teachers' communities of practice and in particular how they are sustained.

Appendices

Appendix 1: LCCS Development Group

Role	Name
Chair	Oliver McGarr
Association of Community & Comprehensive Schools	Paul Behan
Association of Secondary Teachers Ireland	Geraldine O'Brien
Association of Secondary Teachers Ireland	Mark Walshe
Computers in Education Society of Ireland	John Hegarty
Co-opted	Cornelia Connolly
Co-opted	Padraig Cunningham
Co-opted	Kevin Marshall
Department of Education & Skills	Tony Weir
Education & Training Boards Ireland	Stephen Gallagher
Irish Business Employers Confederation	Claire Conneely
Irish Universities Association	Monica Ward
Joint Managerial Body	Alan Kinsella
National Parents Council Post Primary	Geoffrey Browne
Quality & Qualifications Ireland	Joe English
State Examinations Commission	Hugh McManus
Teachers' Union of Ireland	Aengus Byrne
Teachers' Union of Ireland	Ciaran Callaghan

Appendix 2: LCCS Specification

The Leaving Certificate Computer Science specification⁶ was designed for all students and involves 180 hours of class contact time. It assumes no prior knowledge of Computer Science and aims to develop and foster the learner’s creativity and problem solving, along with their ability to work both independently and collaboratively.

The LCCS is made up of 3 strands which are interwoven and can be completed in any order. Strand 3 is made up of 4 Applied Learning Tasks (ALTs) which the students work in teams to complete over the two years. They each result in the creation of a real/virtual computational artefact which should be relevant to the students, their peers and their community or to society in general.

Strand 1: Practices and principles	Strand 2: Core concepts	Strand 3: Computer science in practice
<ul style="list-style-type: none">▶ Computers and society▶ Computational thinking▶ Design and development	<ul style="list-style-type: none">▶ Abstraction▶ Algorithms▶ Computer systems▶ Data▶ Evaluation/Testing	<ul style="list-style-type: none">▶ Applied learning task 1<ul style="list-style-type: none">- Interactive information systems▶ Applied learning task 2 - Analytics▶ Applied learning task 3<ul style="list-style-type: none">- Modelling and simulation▶ Applied learning task 4<ul style="list-style-type: none">- Embedded systems

Figure 19 - Structure of Leaving Certificate Computer Science

There are two assessment components, an end-of-course computer-based examination (CBE) which will constitute 70% of the student’s total grade and an individual project completed in school which will constitute the remaining 30%. Although there is no restriction on the choice of programming languages used for the Applied Learning Tasks, Python and JavaScript will be the languages used for both the coursework assessment and CBE. This will be reviewed on an ongoing basis.

Preparation for the practical exam is not applicable to this study.

⁶ <https://curriculumonline.ie/Senior-cycle/Senior-Cycle-Subjects/Computer-Science>

Appendix 3: Phase 1 school selection criteria

In November 2017, schools were invited to apply to participate in the phase 1 programme based on the following criteria⁷:

- Support from the Board of Management and senior leadership within the school, in consultation with the school community, for offering the subject;
- A willingness to offer Computer Science as a Leaving Certificate subject on the timetable from September 2018;
- The school was able to identify a teacher (or teachers) with relevant experience and/or qualifications who are willing to teach Computer Science and participate in professional development within school time;
- Consideration of a requirement for teachers to participate in some professional development in their own time;
- Identification of a viable number of students interested in studying Computer Science as a Leaving Certificate subject.

⁷ <https://www.education.ie/en/Schools-Colleges/Information/Curriculum-and-Syllabus/Senior-Cycle-/leaving-certificate-computer-science-faq-s.pdf>

Appendix 4: Phase 1 schools

	Name	Address
1	Abbey Vocational School	The Glebe, Donegal Town, Co. Donegal
2	Adamstown Community College	Station Rd, Adamstown, Co. Dublin
3	Breifne College	Cootehill Rd, Cavan, Co. Cavan
4	Bush Post Primary	Riverstown, Dundalk, Co. Louth
5	Carrigaline Community School	Waterpark, Carrigaline, Co. Cork
6	Castleblayney College	Dublin Road, Castleblayney, Co. Monaghan
7	Christ King Girls Secondary School	Half Moon Lane, South Douglas Road, Cork
8	Clongowes Wood College	Clane, Co. Kildare
9	Coláiste an Chraoibhin	Duntaheen Road, Fermoy, Co. Cork
10	Coláiste Bríde	New Road, Clondalkin, Dublin 22
11	Coláiste Chiaráin	Croom, Co. Limerick
12	Coláiste Choilm	Ballincollig, Co. Cork
13	Coláiste Mhuire	Mullingar, Co. Westmeath
14	Coláiste na Ríochta	Listowel, Co. Kerry
15	Colaiste Phadraig	Roselawn, Lucan, Co. Dublin
16	Coláiste Pobail Setanta	Phibblestown, Clonee, Dublin 15
17	Creagh College	Carnew Road, Gorey, Co. Wexford
18	Dominican College Sion Hill	Sion Hill, Blackrock, Co Dublin
19	Ennistymon Vocational School	Ennistymon, Ennis, Co. Clare
20	Gaelcholaiste Mhuire AG	An Mhainistir Thuaidh, Corcaigh
21	Le Chéile Secondary School	Hollystown Road, Tyrellstown, Dublin 15
22	Loreto College	Swords, Co. Dublin
23	Luttrellstown Community College	Porterstown road, Clonsilla, Dublin 15
24	Mayfield Community School	Old Youghal Road, Mayfield, Cork
25	Moate Community School	Church Street, Moate, Co. Westmeath
26	Mount Sion CBS	Barrack Street, Waterford
27	Mount Temple Comprehensive	Malahide Road, Dublin 3
28	Presentation Secondary school	Clonmel, Co. Tipperary
29	Rice College	Castlebar Road, Westport, Co. Mayo
30	Sacred Heart Secondary School	Convent of Mercy, Clonakilty, Co. Cork
31	St Aidan's Comprehensive School	Cootehill, Co. Cavan
32	St Brigids Mercy Secondary School	Convent Of Mercy, Tuam, Co. Galway
33	St Eunan's College	Letterkenny, Co. Donegal
34	St Finian's Community College	Swords, Co. Dublin
35	St Joseph's Secondary School	Convent Lane, Rush, Co. Dublin
36	St Mary's CBS	Millpark Road, Enniscorthy, Co. Wexford
37	St Vincent's Secondary School	Seatown Place, Dundalk, Co. Louth
38	Stratford College	1 Zion Road, Rathgar, Dublin 6
39	Synge St CBS	Synge St., Dublin 8
40	Terenure College	Templeogue Road, Terenure, Dublin 6W

Appendix 5: Geographical spread of Phase 1 schools



Figure 20 - Map of phase 1 schools⁸

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<https://www.google.com/maps/d/viewer?mid=1-oKzmF9wF78Hv4DjpTPuQ57V2MLZVu0m&ll=53.43630870063433%2C-7.175965896874914&z=7>

Appendix 6: MOOC recommendations to teachers

Date	Recommendations
March 2018	Computational Thinking for Educators (Google) Introduction to Computer Science (Harvard) Introduction to Python: Absolute beginner (Microsoft)
May 2018	Micro:bit videos for ALT4 (NCCA) Raspberry Pi and Python (Raspberry Pi Foundation and Google) Introduction to Python: Fundamentals (Microsoft)
April 2019	Developing SQL Databases (Microsoft) JavaScript introduction (W3C) HTML5 and CSS Fundamentals (W3C)

Appendix 7: Regional Clusters



Red Cluster - Monaghan Education Centre

- Abbey Vocational School Donegal Town
- Breifne College
- St Vincent's Secondary School
- Bush Post Primary School
- Castleblayney College
- St Eunan's College
- St Aidan's Comprehensive School



Green Cluster - Dublin West Education Centre

- Adamstown Community College
- Coláiste Mhuire
- Le Chéile Secondary School
- Coláiste Bríde
- Coláiste Pobail Setanta College
- Coláiste Phádraig



Orange Cluster - Drumcondra Education Centre

- Synge Street CBS
- Mount Temple Comprehensive School
- St Joseph's Secondary School
- Loreto College
- Dominican College Sion Hill
- St Finian's Community College



Purple Cluster - Cork Education Centre

- Mayfield Community School
- Christ King Girls School
- Colaiste Choilm
- Sacred Heart Secondary School Clonakilty
- Coláiste an Chraoibhin
- Carrigaline Community School
- Mount Sion CBS Secondary School
- Gaelcholáiste Mhuire
- Presentation Secondary School



Yellow Cluster - Galway Education Centre

- Colaiste Chiarain
- Moate Community School
- Rice College
- Coláiste na Ríochta
- St Brigids School
- Ennistymon Vocational School



Navy Cluster - Dublin West Education Centre

- Luttrellstown Community College
- Creagh College
- Stratford College
- Terenure College
- Clongowes Wood College
- St Marys CBS



Figure 21 - Map of regional clusters⁹

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<https://www.google.com/maps/d/viewer?mid=10cwKQBaqvMQN12lqzfi7PrjwOWuHNeB&ll=53.32171795079704%2C-7.801870799999961&z=7>

Appendix 8: CPD activities to date

Start Date	End Date	Duration	Event	LCCS Teachers
March 2018	N/A	N/A	MOOC Resources #1	All
30-Apr-18	01-May-18	2 days	National Workshop #1	All
May 2018	N/A	N/A	MOOC Resources #2	All
09-May-18	09-May-18	1 day	Leadership Support	(Principals)
23-May-18	25-May-18	3 days	Skills Dev #1 (Python)	Cohort 1
28-May-18	30-May-18	3 days	Skills Dev #1 (Python)	Cohort 2
06-Sep-18	07-Sep-18	2 days	National Workshop #2	Cohort 1
10-Sep-18	11-Sep-18	2 days	National Workshop #2	Cohort 2
01-Oct-18	11-Oct-18	2 hours	Regional Clusters #1	All
09-Jan-19	10-Jan-19	2 days	National Workshop #3	Cohort 1
16-Jan-19	17-Jan-19	2 days	National Workshop #3	Cohort 2
28-Jan-19	28-Jan-19	2 hours	Webinar #1 (Dr Sue Sentence)	All
25-Feb-19	07-Mar-19	2 hours	Regional Clusters #2	All
April 2019	N/A	N/A	MOOC Resources #3	All
29-Apr-19	29-Apr-19	2 hours	Webinar #2 (LCCS Dev Group Panel)	All
21-May-19	23-May-19	3 days	Skills Dev #2 (HTML, CSS, JavaScript)	Cohort 1
27-May-19	29-May-19	3 days	Skills Dev #2 (HTML, CSS, JavaScript, DBs)	Cohort 2