

Leaving Certificate Computer Science

Bulletin 4, December 2021



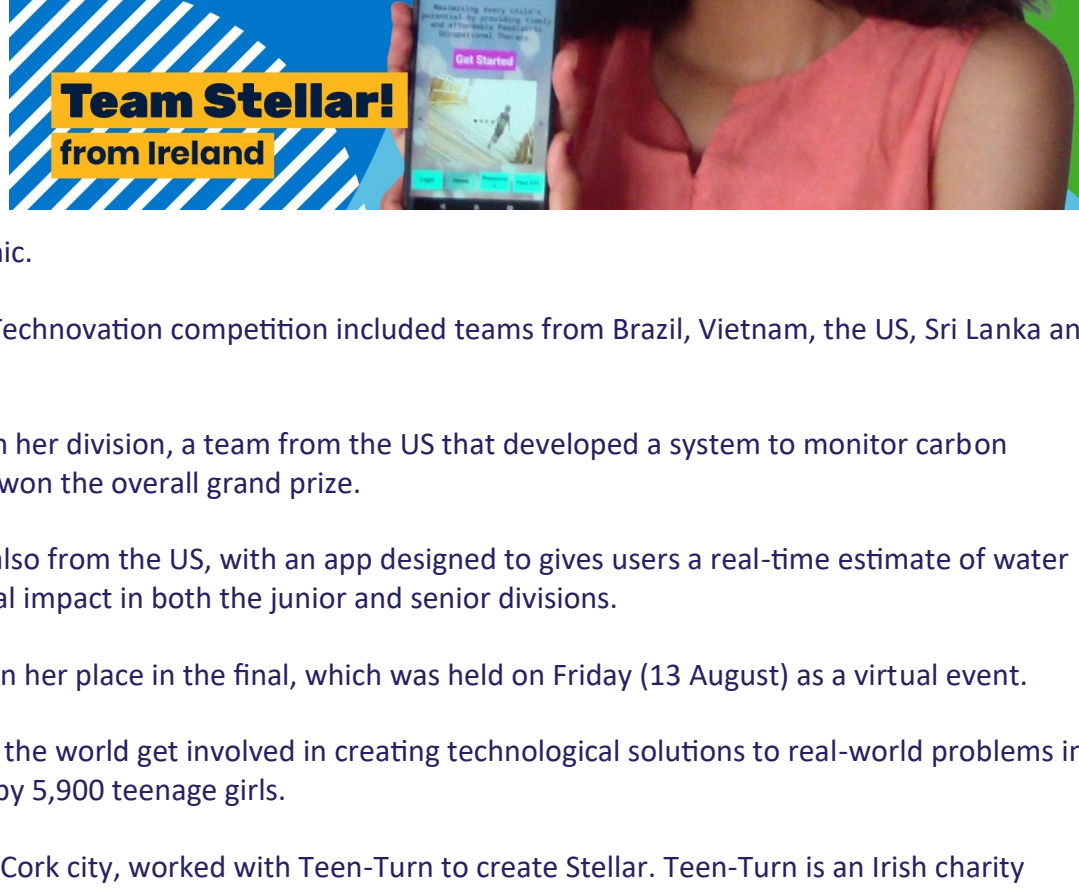
Cork teen scoops tech prize for her app at global Technovation competition

13-year-old student Saanvi Kaushik won the Technovation competition's technology prize for her occupational therapy app Stellar.

A Cork teenager who developed an app to help patients access occupational therapy services has been recognised for her innovative technology at the Technovation World Summit 2021.

Saanvi Kaushik beat out teams from around the world to be selected as one of six junior finalists in the annual competition organised by educational nonprofit Technovation, which aims to encourage girls interested in technology and problem solving.

The 13-year-old secondary school student developed an app called Stellar to help children access occupational therapy services on a remote basis. She was inspired by her mother, who works as an occupational therapist, after seeing how hard she worked to deliver care to patients during the pandemic.



Kaushik's fellow finalists in the junior division of the Technovation competition included teams from Brazil, Vietnam, the US, Sri Lanka and Spain.

While the Cork teen received the technology award in her division, a team from the US that developed a system to monitor carbon dioxide levels and ventilation quality inside buildings won the overall grand prize.

The grand prize winner from the senior division was also from the US, with an app designed to give users a real-time estimate of water quality in households. There were also prizes for social impact in both the junior and senior divisions.

Kaushik beat off competition from 60 countries to gain her place in the final, which was held on Friday (13 August) as a virtual event.

The competition organisation saw girls from all over the world get involved in creating technological solutions to real-world problems in their communities. Around 1,700 apps were created by 5,900 teenage girls.

Kaushik, who attends Christ King secondary school in Cork city, worked with Teen-Turn to create Stellar. Teen-Turn is an Irish charity organisation that works with young women and girls from underrepresented areas to help them get involved in STEM.

She said she was delighted to make the finals and that her app's success made her "ambitious for the future".

This is not the first time an Irish team has seen success at the Technovation World Summit. Last year, Margaret Akano, Rachael Akano and Joy Njoku from Drogheda, Co Louth, took the grand prize in the senior division for their app to help families affected by dementia.

This article by Blathnaid O'Dea first appeared *siliconpublic.com*.

Challenges and Opportunities

Danny Murray's article in the last Bulletin started off talking about the well-known 'Hello World' as a student's first simple programming attempt. In many languages it takes just one line of code.

This made me think back to having written a pilot program in 1971 to display text on what were originally called visual display terminals or units. Very complicated, it involved writing a large amount of code and understanding the meaning and purpose of very many more lines of background code. The content wasn't 'Hello World' as universal text messaging was then just a pipe-dream.

This was a preparatory step in writing the first Irish real-time screen-based system. Arguably Aer Lingus was ahead with its reservation system but I believe it was written on the other side of the Atlantic and it was far from a solo effort. In deference to some eminent Irish industry and academic computing trailblazers before me, I was only one of many pioneers. I was just fortunate to be in the right place at the right time and to be given the challenge and the opportunity.

Computers have been used in Ireland commercially and industrially from the dawn of the 1960s, though it was the 1970s before peripherals bore even a slight resemblance to present times. My own background is that after starting programming in 1968 on paper tape, I joined computer manufacturer ICL, now Fujitsu. This provided an upgrade to the only other media for communicating with a computer at that time, punched cards. Our backing storage consisted of large reels of magnetic tape (10.5" diameter), manually loaded by an operator for each application.

In 1971 we advanced to three state-of-the-art magnetic disks – each of them holding 8 Megabytes of data! Our single processor had 32K of RAM and could only run 4 programs at the one time. No PCs, no internet, no remote data communications – just primitive no-graphics "dumb" terminals with a keyboard attached to a bulky screen. No possibility of Googling or appealing on social media for help with any problems.

Despite the limitations, our systems still controlled all the accounting, purchasing and manufacturing information for an advanced factory in Belfast employing nearly two thousand people. The systems ran 24 hours per day and if they crashed, as Chief Programmer I was sometimes rung up in the middle of the night to do an urgent fix. At least there were no hackers in those days!

What has this to do with LCSS? Well, there is not a direct link though I would have loved to have had the opportunity to study LCSS at school or to teach it during my early career as a teacher. As a convert to Computing, I only switched to industry because the prospect of an LCSS equivalent was not even a faint speck on the horizon at that time.

My experience above should also give an appreciation of the amazing advances over the past 50 years and the power that any student or teacher now has at their finger-tips. Compare 32 KB RAM and 8 MB storage with the Giga capacities of even a cheap smartphone. And you wouldn't think of trying to run an entire factory on one small phone!

This year the LCSS paved the way with the first ever computer-based element in a Leaving Cert final exam. Innovative for a nation-wide State exam but again I was fortunate to have been involved in a forerunner. By 1975 I had moved to GMTI to set up the first computing course in what were then the Regional Technical Colleges. Unique at the time, the Programming subject was based entirely on continuous assessment, with 80% of it being on-line. We had to overcome reservations from the national awarding body about the viability of live tests but in 2016 it was a useful precedent to quote in early high-level discussions between the NCCA and LERO about the formation of the LCSS.

As well as education, the Computing/IT job scene has of course changed dramatically in the last 50 years. In the early days the main entry points for any computing job were as a computer operator or a programmer. There are now numerous pathways including: further education and training, apprenticeships, third level and even opportunities for young entrepreneurs thanks to initiatives like the BT Young Scientist and Technology Exhibition. The range of IT job openings is exciting, ever-increasing, and change in the workplace has been accelerated by Covid 19.

The EU is embarking on a Digital Decade and has a target to move from the current 2.8 million ICT specialists to 20 million by 2030. An additional objective is to encourage more women to take up these jobs. Being classed as an ICT specialist does not mean that you spend most of your day on technical work. In the 1970's, developing new software usually meant writing most if not all from scratch. Skill is still needed but low code building block advances have removed a lot of drudgery while still retaining the excitement and satisfaction for the developer.

Having a degree or higher qualification is a good starting point but currently one third of EU ICT specialists did not go to third level. Many would have accumulated part-time qualifications along the way and this will be an increasing trend. Also as Monica Ward said in the last Bulletin, being good at Maths, although always useful, is by no means essential for many roles.

Ireland is one of the foremost digital countries but to maintain its position we need a lot more people with IT skills as well as a digitally literate population. Many countries are planning to make Informatics a compulsory school subject on a par with language and mathematics.

A recent report maintained that "any company is now a technology company". Whether or not you wish to make a career in Computing/IT, one thing is certain, doing LCSS will not be wasted in virtually any future job.

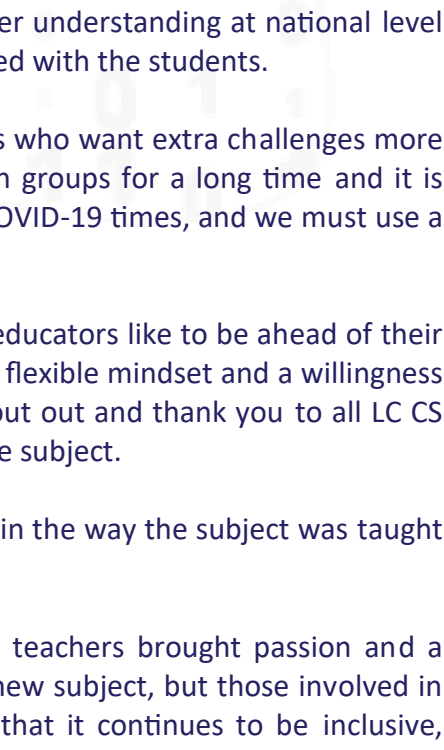
Ted Parslow is Chairperson of the Third Level Computing Forum and a member of the Technology Skills 2022 Steering Group

LCSS class of 2021 - what do they think?

The first LC CS students studied the subject from September 2018 to June 2020. Their teachers were new to the subject and there were many unknowns. The feedback from the teachers and students to-date has been positive. So what about the second group of students (September 2019 - June 2021) to study LCSS? Did the same enthusiasm and positive feedback continue for this group? What was their experience of studying the subject? To find out, Monica Ward, the Irish Universities Association (IUA) domain expert to the Department of Education and Skills for the Leaving Certificate Computer Science implementation group (that's a mouthful), spoke to two students currently studying computing at Dublin City University. She asked them for their thoughts on the subject - let's see what they have to say.

School Experience

It is always good to give a bit of context and the contributors are Robert Maloney and Carlos Conde. Robert studied in Lucan CBS and is currently studying Computing for Business in DCU. His school was a boys only school and has around 600 pupils in total. There were two computer science classes and each had 20 students. Carlos studied in Le Chéile secondary school, a mixed school of approximately 1,000 students. There were 20 students in the LCSS class and most of them took LCSS at higher level. There were more female than male students in his class and it is great to see the ethos of a subject for all students happening on the ground. Carlos is a Computer Science student in DCU. Both schools were in their second year of teaching the subject.

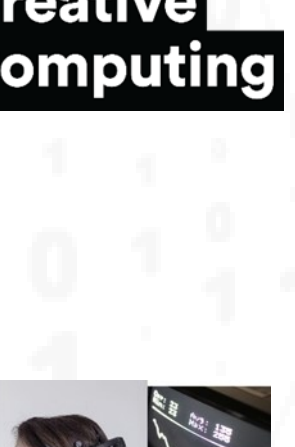


Carlos Conde

Each school had a slightly different approach to teaching the subject. In one school (Le Chéile), all the LC CS classes were in the computer room. The students did not really take notes and this helped with their learning as they were more focussed on active learning. It was different from other subjects in this regard - in a good way. In the other school (Lucan CBS), there was a mix of classes, with some in the classroom and some in the lab (particularly for project work in 6th year).

Room to improve

We usually start off with the positives, so this time for a bit of variety, let's look at the non-positives (or the 'room to improve' items). One thing that the students mentioned was that there was maybe too much micro:bit. While they used it for their final project, they said it would have been good to include other elements (e.g. more Scratch and python). Another comment on the micro:bit was that it was fairly simple, and easy to learn the basics - although this is not necessarily a bad thing.



Robert Maloney

Students like to look at past papers to get a sense of what types of questions they will be asked (their teachers also like to see them as well). However, LCSS students only had one year's papers to review and this added to their uncertainty about what their exam paper would look like. A final comment on the coursework project (worth 30%) was that it was very rushed in the end. This may have been compounded by COVID related matters and the newness of the subject, but it is a valid observation from the students.

There were also general comments on the usual downsides of doing group work, particularly the 'free riders' who do not contribute to work and rely on others to carry them.

Positives

We would like our students to be reflective learners, so it's only fitting that we are reflective educators ourselves (time constraints notwithstanding of course). Reflecting on what the students have said, those of us involved in the LC CS rollout should take on-board their feedback. Perhaps as our teachers become more comfortable with the subject and we get a better understanding at national level what we can include when teaching the subject we will be able to expand the tools and languages covered with the students.

In Robert's case, the teacher was "really passionate" and "very knowledgeable". He knew about hardware, had prior experience and was very comfortable teaching the subject. He was happy to answer any question coming in computing in general, including cryptocurrency.

The hardware/ theory aspect was good as it gives the students an insight into how computers work. The students enjoyed the final project, despite the time pressures "rushed but fun".

Advice to Others

Carlos and Robert had some good advice for others. They would recommend the subject to other students. They noted that it doesn't do a lot of work so it does not suit some. In general, the theory was "ok/interesting", and some students "weren't too keen on coding". Only a few of the students went on to study computing at third level, but most got something out of it. For teachers, they would recommend that they bring passion to the subject and note that "it's nice to see the teacher learning in parallel with the students". Going back to the micro:bit, they suggest "maybe cut down a bit of the micro:bit, maybe touch on Arduino and Raspberry Pi". They would also like to cover databases a bit more.

For those that do go on to study computing (in whatever flavour), Robert and Carlos reported that it was helpful for them. Carlos said it helped with python, all the programming-related modules, computer systems, computing topics like logic gates, and maths. He is able to help his peers and this is beneficial for him as well. Following the old adage, "to teach is to learn twice" (a la "explain to a duck"). Robert said it was helpful for his IT hardware module and it will be useful his programming module in semester two.

Reflections

We would like our students to be reflective learners, so it's only fitting that we are reflective educators ourselves (time constraints notwithstanding of course). Reflecting on what the students have said, those of us involved in the LC CS rollout should take on-board their feedback. Perhaps as our teachers become more comfortable with the subject and we get a better understanding at national level what we can include when teaching the subject we will be able to expand the tools and languages covered with the students.

With regards to the micro:bit, it would be good to stretch students a little bit more, to give the students who want extra challenges more opportunities to expand their knowledge. Educators have been dealing with the issue of free riders in groups for a long time and it is something that we have to be vigilant about to the challenge and excitement of teaching this new, interesting, creative subject.

Both students mentioned the passion and enthusiasm of their teachers. It was obvious to the students in the subject was taught and how they added in their own input and this improved the students' enjoyment of the module.

In summary, it is reassuring to know that the students enjoyed studying the module and that their teachers brought passion and a willingness to learn to their teaching of the module. We will always have challenges when teaching a new subject, but those involved in the LC CS rollout will continue to strive to ensure that all students have access to the subject and that it continues to be inclusive, educational and enjoyable.

Creative Computing in IADT

"Creative computing?? I didn't know computing could be creative!!"

I don't know how many times people have said this to me. I'm here to tell you Computing is Creative!!

The B.Sc. in Creative Computing (<https://iadt.ie/courses/creative-computing/>) in Dun Laoghaire Institute of Art, Design and Technology (IADT) is as creative as you get. It is a great blend of creativity and computer science. This degree gives you the opportunity to explore your technical and creative skills to generate amazing ideas and projects. The opportunities are endless as you work with technologists, psychologists, artists, designers and film makers while still pursuing your passion in computing. To give you a taste of what to expect in IADT we offer free computer camps (early June) and also TV Placement.

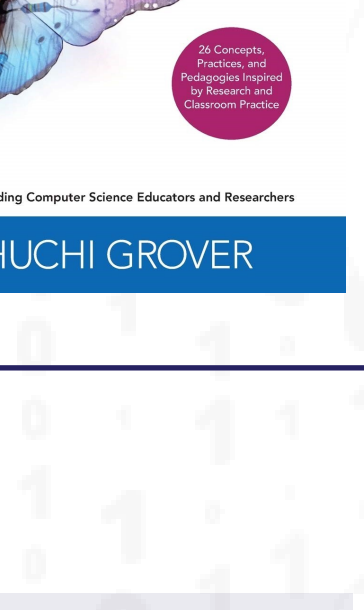


Creative Computing Summer Camps

In June 2022 IADT will run three free summer camps:

- Creative Computing for All
- Young Women in Computing – Focusing on Projects that Matter to Girls
- Games Development

You'll have the opportunity to work on topics that matter to you while creating games, generating art with code, programming robotic balls and experiencing virtual reality (VR) in our VR lab. You will meet IADT computing students who will be very happy to help and provide you with advice. And in case that's not enough you will come home with lots of goodies and have the opportunity to win fantastic prizes every day.



Check out what past participants said about the camp....

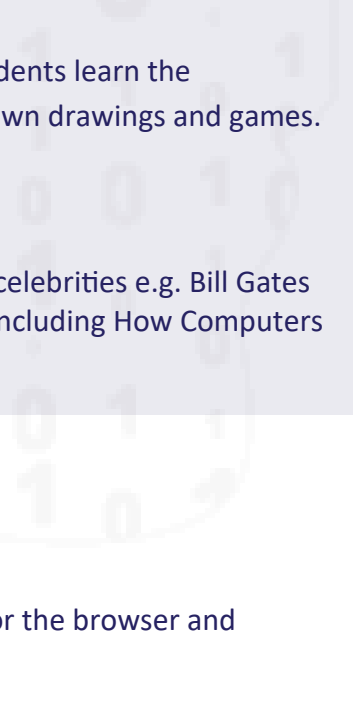
"I just want to say thank you for doing this for people like me. I had a lot of fun and I learnt new useful skills. Enjoy your summer!!"

"I think it was really amazing, the lecturers were really helpful and the whole experience was just positive overall. It was interesting to also see what the student done for their projects in their course."

"IT WAS THE BEST THING EVER THANK U SO MUCH!!"

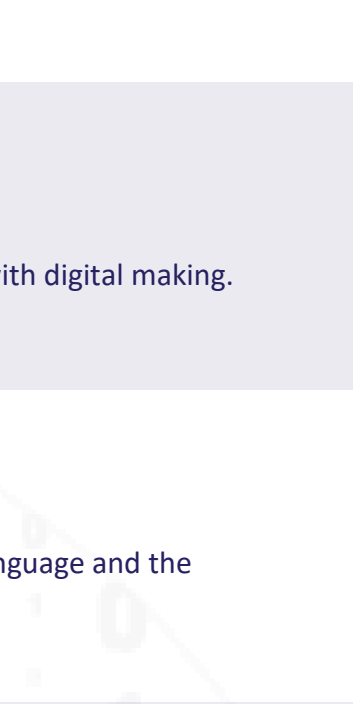
TY Placement

If you are in Transition Year you can spend a week in IADT experiencing college life by studying on our first year programme. I have had TY students tell me that IADT is the place for them after spending the week hanging out with our first years. Simply contact us at the email below (note due to covid there are some restrictions at the moment).



Careers

I know you will also be thinking about what to do after school and college. Our creative computing programme will provide you with the skills to become a web designer, web developer, mobile app designer, mobile app developer, user experience designer, game developer, product manager, database administrator & systems administrator. Our past students work in companies such as SAP, Workday, Verizon Connect, Google, Vodafone, IBM, Accenture, Microsoft and Eir.



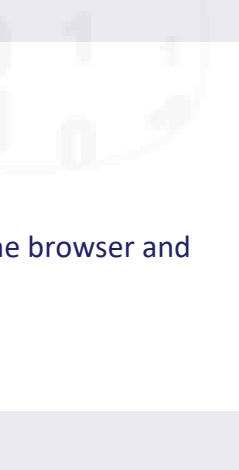
Booking Summer Camps and TY Placement

Booking for the summer camps will be available from end of April onwards.

Please do contact me at creative.computing@iadt.ie and I will put you on our mailing list so you will be the first to know when the booking system goes live.

I look forward to welcoming you to IADT.

Anne Wright – Lecturer - B.Sc. in Creative Computing – DL836



Dr Shuchi Grover

Transition year students to learn how computers think

Katherine Donnelly

TRANSITION year pupils are getting classes on the artificial neural networks that allow computer programmes to recognise hidden patterns in data and then solve problems.

Machine learning (ML) and artificial intelligence (AI) are the technologies that are giving the world self-driving cars, manufacturing robots and a myriad of other automated wonders.

Now, almost 10,000 fourth year students have signed up to learn how humans teach computers to think.

What started earlier this year as a pilot project involving 50 schools, with about 3,000 students participating, has grown rapidly to more than 100 schools this term.

"We didn't expect such a big uptake," said TU Dublin computing lecturer Dr Keith Quille, one of the drivers behind the Computer Science Inclusive Learning Environment (CSILINC) initiative.

While initially aimed at transition year students, some schools are also introducing younger students to the programme.

CSILINC has its roots in a schools' outreach programme to raise awareness about computer science, particularly among students in disadvantaged areas, which was led by Dr Quille, a former second level teacher.

Collaborators
With computer science now a Leaving Cert subject, Dr Quille and his fellow outreach volunteers in TU Dublin decided

to develop an introductory course for younger students. It has benefited from academic and industry collaborators in Microsoft, CodeClub Ireland, Mayohead University, the European Space Education Research Office (ESERO), UCD ML Labs, global tech giant Huawei and Science Foundation Ireland.

CSILINC is free to use and mobile-friendly, so schools do not need a fully equipped computer lab to use the platform.

The AI and machine learning module was developed over the summer by PhD student Joyce Mahon, working in UCD ML Labs with industry partner Huawei.

While it serves as a taster for students thinking about taking computer science for the Leaving Cert, it also gives useful and practical knowledge of how machine learning and AI is used in the tools and apps they interact with every day.

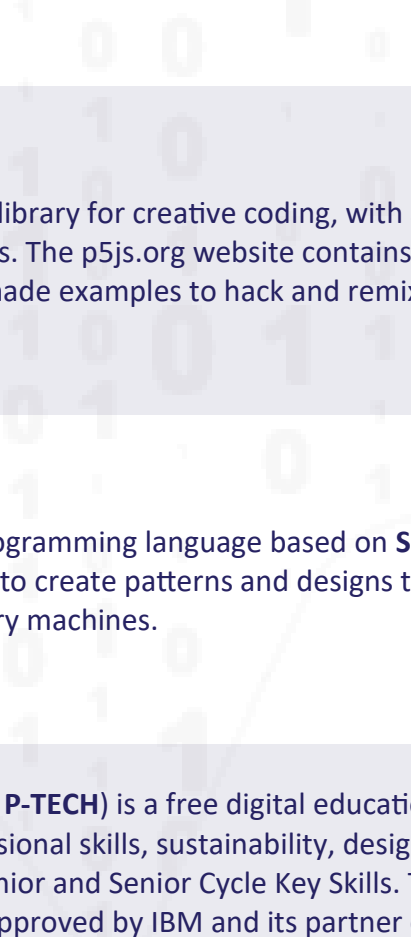
As a former teacher, Ms Mahon knew how to pitch the idea. "Any maths you would need would be covered in lower secondary. In my own mind I was thinking, would a first year or second year student be able to use it?" she said.

They also sought out someone to narrate the lessons in language that students were sure to understand. That's how sixth year student Amy McMahon, a pupil at Coláiste Bhaile Chláir, Clongoway, Co Galway, found herself taking on the role of educator.

Her mother, Mary, spotted an ad and showed it to Ms McMahon, who was studying computer science for the Leaving Cert. "I was looking for something to do over the summer holidays anyway. I'm interested in computer science. It is my favourite subject," she said.

Ms McMahon spent the summer working with the UCD research team. "When they were making a PowerPoint presentation, I was able to see what level it was at and to make sure it was OK for students," she said. "I also helped to source materials and recorded voiceovers."

The course also emphasises the important roles of ethics and bias in AI. Ms Mahon said: "AI is only as good as humans who programme it; it requires critical thinking."



Joyce Mahon with transition year student Jack O'Connor

This article originally appeared in The Herald newspaper on 13/12/2021

From the PDST

Leaving Cert Computer Science teachers had the pleasure of the virtual company of learning scientist and Computer Science educationalist, Dr Shuchi Grover, when she recently presented a webinar for Phase 1, 2 and 3 teachers. The title of the informative and energetic webinar was **Teaching CS & Programming: Goals & Pedagogies for Deeper Computational Learning, Engagement, & Equity**.

Shuchi is recognised worldwide as a leading scientist and researcher in the field, and has worked, *inter alia*, in Harvard and Stanford University.

This webinar was the sixth in our series for Leaving Cert Computer Science teachers. It is notable that the first one featured Sue Sentence of the Raspberry Pi Foundation. Shuchi has collaborated with Sue on projects in Computer Science education, and share an interest in inclusive pedagogies for teaching Computer Science, and of female uptake in the subject.

The webinar was very well received by Computer Science teachers on the night and can be viewed on www.cses.ie. There is a clear alignment with aims of the Leaving Cert Computer Science specification in much of her research. Consider some of the themes of her published papers, such as:

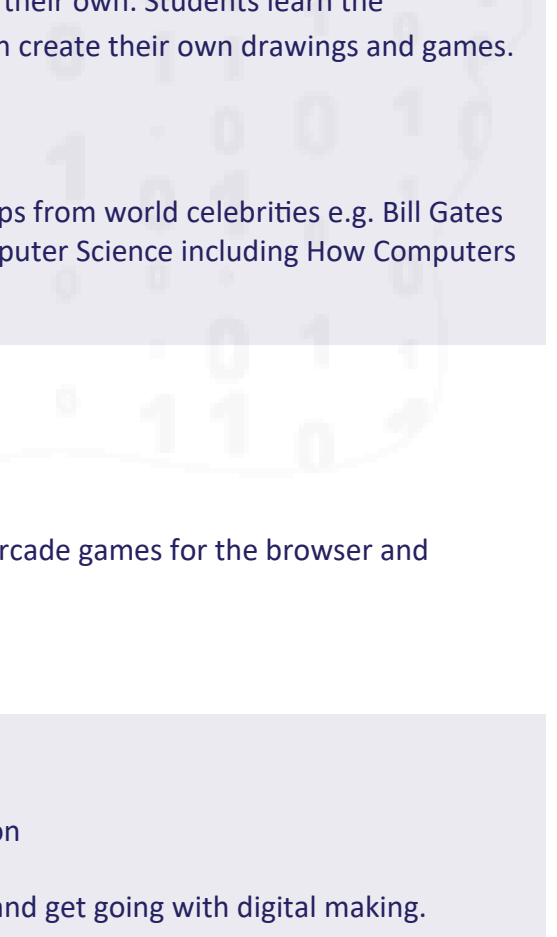
"Computational Thinking – A Competency whose Time has come"

"Open-ended programming"

"Designing an Assessment for Introductory Programming Concepts"

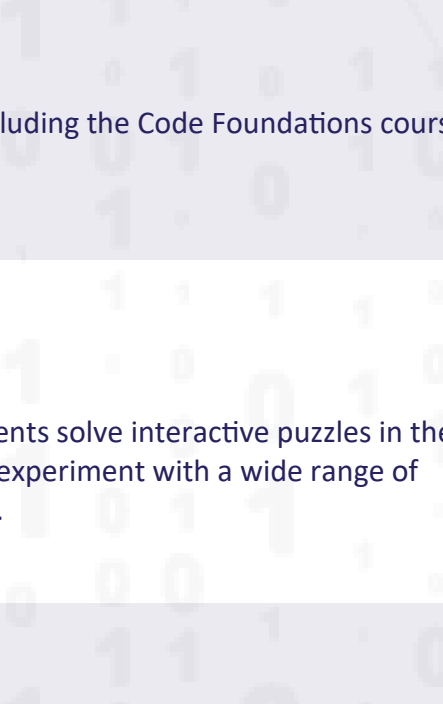
"Collaborative, Computational Problem-Solving Processes"

We are looking forward to collaborating with Shuchi in the future, and will benefit from her extensive research in the meantime. Many of her publications and other insights can be found at www.shuchigrover.com.



Dr Shuchi Grover









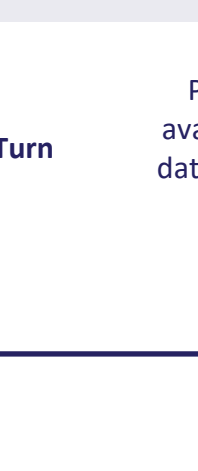


COMPUTER SCIENCE IN K-12
An A to Z handbook on teaching programming



Contributed by Leading European Science Educators and Researchers

EDITED BY SHUCHI GROVER

Useful websites for TY students to get started with coding

TITLE	DESCRIPTION
 Code.org	https://studio.code.org/s/express-2019 A great option for students who wish to start programming on their own. Students learn the fundamentals of programming with drag & drop blocks and can create their own drawings and games. https://www.code.org/educate/resources/videos A library of engaging resources including inspirational video clips from world celebrities e.g. Bill Gates and Barack Obama. There are also videos on principles of Computer Science including How Computers Work and How the Internet works.
 Microsoft MakeCode Arcade	https://arcade.makecode.com/ MakeCode Arcade is a block-based code editor to build retro arcade games for the browser and handheld consoles.
 Raspberry Pi	https://projects.raspberrypi.org/en/projects/software =python Some great projects that will help students start writing code and get going with digital making.
 Khan Academy	https://www.khanacademy.org/computing/computer-programming An interactive website where students can learn how to use the JavaScript language and the ProcessingJS library to create fun drawings and animations.
 Codecademy	https://www.codecademy.com/catalog/subject/all A range of online web development and programming courses including the Code Foundations course and the Computer Science course.
 Swift Playgrounds	https://www.apple.com/ie/swift/playgrounds/ An app that makes it fun to learn and experiment with code. Students solve interactive puzzles in the guided 'Learn to Code' lessons to master the basics of coding, or experiment with a wide range of challenges that let them explore many unique coding experiences.
 MIT App Inventor	http://appinventor.mit.edu/ An intuitive, block-based visual programming environment that allows everyone - especially young people - to build fully functional apps for smartphones and tablets. Seeks to move people from technology consumers to become technology creators.
 Sonic Pi	Sonic Pi is a code-based music creation and performance tool. The software contains useful tutorials and references for getting started with resources for teachers available at www.sonic-pi.net
 p5.js	p5.js is a web-based JavaScript library for creative coding, with a focus on making code accessible to artists, designers, and beginners. The p5.js.org website contains a detailed reference tool, guided learning resources and ready-made examples to hack and remix.
 TurtleStitch	TurtleStitch is a block-based programming language based on Snap! that allows users to both use and learn programming techniques to create patterns and designs that can then be stitched onto fabric using programmable embroidery machines.
 IBM SkillsBuild	IBM SkillsBuild (formerly Open P-TECH) is a free digital education platform from IBM with digital learning courses such as professional skills, sustainability, design thinking, AI and Cybersecurity—all designed for and mapped to Junior and Senior Cycle Key Skills. Teacher resources are included and students can earn credentials approved by IBM and its partner organisations.

UPCOMING EVENTS AND COMPETITIONS

EVENT/COMPETITION	ENTRY DATE	URL	ABOUT
ACM SIGCSE	Various dates	https://sigcse.org/sigcse/events/	The SIGCSE organisation provides a forum for educators to discuss issues related to the development, implementation, and/or evaluation of computing programs, curricula, and courses, as well as syllabi, laboratories, and other elements of teaching and pedagogy.
Computer Science Apprenticeships	Ongoing	https://apprenticeship.ie/career-seekers/get-started/learn-more/ict/software-developer-associate https://www.ecollege.ie/course/	Apprenticeships and college courses in the area of ICT, Computer Programming, and Data Science:
Formula Females	All year round	https://www.formulafemale.org/	The Go Girls Karting initiative is designed to give young females an insight into the world of Motorsport, whether it's competing as a driver or undertaking a career through STEM.
Teen Turn	Programmes available throughout the year	https://teen-turn.com/	Using Motorsports as a platform to teach STEM education provides a new way of thinking for students who need something different in order to learn. Teen-Turn aims to provide teen girls the opportunity to gain hands-on STEM experience so that they can visualize themselves in those kinds of careers and therefore make third level course choices accordingly.

UPCOMING CONFERENCES

CONFERENCE	DATE	URL	ABOUT
CEISCon 2022	05/03/2022	https://www.ceis.ie	The Computers in Education Society of Ireland's annual conference takes place online on Saturday 5th March. This year's theme is 'Reimagining—Learning after the pandemic experience'.