



A computational thinking module for secondary students and pre-service teachers using Bebras-style tasks

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ABSTRACT

We have developed a Transition Year (TY) computational thinking module (for 15-16 year olds) based on Bebras tasks that was delivered online by teachers at 240 schools in Ireland during 2021-2022. To serve primary and secondary pre-service teachers, we have started developing a 24-hour module based on this TY module. We are co-creating the module with education experts and CS academics working collaboratively. The education experts consist of academics and pre-service teachers from both primary and secondary teaching departments at our institution.

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1 BACKGROUND

Computational thinking (CT) has recently become available to secondary school students in Ireland with the introduction of computer science as a Leaving Certificate subject (17-19 year olds). Our two SFI (Science Foundation Ireland) Discover Programme projects have allowed us to introduce computational thinking (CT) resources to 400 schools throughout Ireland. Our interactions with 540 teachers in Ireland have shown that there is significant interest by pre-service and in-service teachers in obtaining basic CT skills. This is true for secondary school teachers across the full range of STEM subjects. Also, it is true for primary school teachers of all age groups, who see problem-solving as a skill that they need to integrate into many parts of their teaching. In addition, the NCCA (National Council for Curriculum and Assessment) has proposed CT for inclusion in its recent draft primary curricula [1, 2]. We have developed a Transition Year (TY) computational thinking module (for 15-16 year olds) based on Bebras tasks that was delivered online by teachers at 240 schools in Ireland during 2021-2022 (<http://csinc.ie/Home/CSLINC>). CT is not taught currently to many pre-service teachers in Ireland. To serve primary and secondary pre-service teachers, we have started developing a 24-hour (5 ECTS credit) module based on this TY module.

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2 CT MODULE FOR TY STUDENTS

Our TY module adapts Bebras-style tasks [3] to teach CT concepts. The Bebras Challenge is run in Ireland by the Irish Computer Society. UK teachers have for years used CT resources from Computing at School/Barefoot Computing, the National Centre for Computing Education, BBC BiteSize, and others. However, we feel there would be interest in a CT module that uses a uniform set of examples that makes it easier to distinguish the different CT concepts. High-quality internationally recognised CT Bebras tasks (puzzles) have been carefully developed over the past 14 years by an international team of 100+ established CS educators. These tasks have proven to be remarkably inclusive, across gender and culture. We believe they can be used to engage computer science novices of all ages with CT. The TY module consists of lessons covering eight CT concepts, most closely aligned to the six CT concepts/skills proposed by Computing at School [4] and CS Unplugged [5]. The concepts are (in order of increasing sophistication with which they are treated in the module): decomposition, pattern recognition, representation, abstraction, algorithms, evaluation, logic, generalisation. Each lesson consists of a presentation, a video voice-over, explanations of how particular Bebras tasks illustrate various aspects of that CT concept (see poster for examples), and teacher notes.

3 PRE-SERVICE TEACHER CO-CREATION

The pre-service teacher module extends the TY module with supervised laboratory work on Bebras-style task preparation and extension activities, and project work developing an original Bebras-style task. The pre-service teacher module is being developed during monthly co-creation workshops through January 2023. We will deliver the module to two cohorts of pre-service teachers during 2023 (February and September) with analysis of feedback and revision of the material between deliveries.

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