Title: An Exploratory Case Study of Aspects of the Leaving Certificate Computer Science Draft Specification

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Relevant key words: Bridge21 Learning Model; Constructivist; Computer Science; Second Level; Key Skills; Teamwork; Technology-Mediated Learning; Non-Formal Learning; Assessment.

Summary:

To facilitate the new Leaving Certificate (LC) Computer Science (CS) specification, while cognisant of the associated teaching and learning challenges, there is a requirement for an evidence-based learning model encouraging team-work and self-motivation. Bridge21 is a constructivist model of 21st Century teaching and learning. It is a candidate pedagogical model for the CS classroom because it advocates a collaborative, project-based, hands-on approach to teaching and learning.

The approach of the Bridge21 learning model (2018)[1] is based on the World Scout Movement. It is team-based which facilitates project-based learning. Mediated through technology it provides a pragmatic constructivist pedagogical model of learning. Central to this learning model is the shift in ownership in the classroom – from teacher to learner.

The purpose of this research was to examine through an exploratory, mixed methods case study, the implementation of teaching and learning of aspects of this CS syllabus in the classroom using the Bridge21 Learning Model and the Bridge21 Activity Model for lesson plans.

[1] John Lawlor, Claire Conneely, Elizabeth Oldham, Kevin Marshall & Brendan Tangney (2018): Bridge21: teamwork, technology and learning. A pragmatic model for effective twenty-first-century team-based learning, Technology, Pedagogy and Education, DOI: 10.1080/1475939X.2017.1405066

Twenty-two Transition Year (4th Year) participants, aged 15-16 years from an urban, second-level, mixed gender, fee-paying school worked on three group-based computing projects. The research intervention was explored over the course of the school academic year, 2017-2018.

Qualitative and quantitative data was collected from students, the researcher, co-teachers and external reviewers. Qualitative field instruments included a group-based online 'Design Process Log' and individual online student reflection diaries using OneNote. Quantitative field instruments included an online student questionnaire (administered repeatedly at key milestones using a Likert scale), researcher observation sheets of student engagement with Learning Outcomes and Senior Cycle Key Skills (per class), external reviewer's group assessment sheets and co-teacher's observation sheets. Observation sheets were rated on a scale of 1-4 based on the four level descriptors of achievement described in the Junior Cycle Coding Short Course: Guidelines for the Classroom Based Assessment.[2]

This measurement of 21st Century Key Skills aligns with the PhD research currently being done by Michelle O'Kelly who is exploring a three-step process of Key Skills assessment:

1. During curriculum planning, teachers decide on the Key Skill that is in focus and use Davies (2011)[3] Triangulation of Evidence of Student Learning Framework to analyse and code the elements.
2. During curriculum planning, teachers design or use suitably demanding assessment tasks.
3. To support teachers' evidence collection of skills, an assessment rubric for each of the Key Skills is provided. The rubric takes each skill and its elements and maps them onto the 4 point grading scale that is used for Classroom Based Assessment at Junior Cycle.

There were a number of methodological limitations to this research. Challenges included: the dual role of teacher/researcher in the classroom; students not always having time to write their reflection diaries at the end of class; the observation sheets for the external reviewers and co-teachers were difficult to construct and interpret; and the researcher's bias for this study was for a positive outcome.

The findings in this research show that the Bridge21 constructivist 21st century teaching and learning model provided an effective way for students to learn about CS and that the classroom social learning environment encouraged group-work, self-motivation and hands-on, project-based learning activities. This process of engagement led to the students being able to develop core 21st century skills including problem solving, creative thinking and collaboration, while individual self-motivation and personal effectiveness contributed positively to group work. However, the research also highlights the need for teacher professional development in constructivist teaching skills. These findings merit further CSE research of 21st century key skills and CS at second level as there is little research in this area of the field at present.

[2] https://www.curriculumonline.ie/getmedia/45111bec-3ea6-4dae-b68d-a7d8f0baa954/CODING_AssessmentGuidelines_Feb2017.pdf

[3] https://assessmentmethods.weebly.com/before-teaching.html