Developing Confident Computational Thinking through Teacher Twinning Online

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ABSTRACT

In view of the current focus on computational thinking in schools, professional development is needed so that teachers can help students acquire the requisite skills. Enhancing teachers’ confidence is one important aspect. This article describes a project which offers teachers a playful, supportive introduction to computer programming, using the language Scratch. The project, CTwins (“Coding Twins” or “Computational Thinking wins”), entails teachers working in pairs called ‘twins’ to produce an artefact, by communicating and reflecting in an online environment. The theoretical framework uses research on pair programming and working in online communities. An evaluative action research approach in two cycles was undertaken, the first being a pilot. For each cycle, teachers completed surveys to measure confidence pre- and post-participation, posted to the online environment, and participated in a focus group. The article then outlines implementation of the CTwins strategy, presents the findings – teachers’ confidence showed gains overall— and discusses possibilities for future work.

KEYWORDS

Blended Learning, Community of Practice, Confidence, Cooperative Learning, Online Community, Professional Development, Programming in Pairs, Scratch

INTRODUCTION

Attention is currently focused on the development of computational thinking (Wing, 2006), not only through Computer Science or Computing courses, but across the whole of the school curriculum. This means that there is a need for innovative professional development, so that teachers can identify computational thinking elements in their subject areas and help their students to acquire the requisite skills. The authors believe that such development should begin by promoting teachers’ confidence, so that they may embark on further professional development.

The CTwins (“Coding Twins” or “Computational Thinking wins”) project set out to address this need by offering a playful and supportive introduction to computer programming, using the “jigsaw” block-based language Scratch. The aim was to equip teachers with the confidence and skills to develop computational thinking through learning to programme in pairs called “twins.” It was intended that the twins would be geographically and educationally-culturally distant from one another by pairing

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teachers from different countries (in this case Northern Ireland and the Republic of Ireland). After meeting at a launch event to establish relationships and trust, each pair was asked to produce a creative artefact, such as an artwork or a subject-specific game, taking turns at contributing to the final product. During this process they were required to communicate and reflect in an online community, thus ensuring that the processes involved in programming in pairs were recorded. Finally, the artefacts were displayed and the experiences discussed at an exhibition.

In this paper, the theoretical framework underpinning the study is described. The design and implementation of the CTwins strategy are then outlined in some detail, emphasising aspects that the authors deem to be innovative. The research undertaken with regard to change in the participants’ confidence is presented, and possibilities for further work in a wider European context are discussed.

**Aim of the Study**

The CTwins project, funded by Google as part of its CS4HS (Computer Science for High School – cs4hs.com) initiative, had the following goals:

- a. To develop new practical exercises in computational thinking for the professional development of teachers;
- b. To improve confidence in teachers using these exercises with support;
- c. To create and disseminate this model of peer – and mentor – support for teachers, packaged in a toolkit for use by other providers of professional development;
- d. To build lasting professional relationships between teachers from Northern Ireland and the Republic of Ireland.

The first three goals refer to the development of a suitable package for dissemination. As part of this, it was important to determine if the suggested model did indeed have the capacity to increase the confidence and skills of participating teachers; goal (b) refers specifically to the development of confidence. The present paper focuses on the study designed to address this aspect. Hence, the chief aim of the study is:

- To determine if participation in CTwins increased the confidence of participating teachers, especially with regard to using computers to address computational thinking among their students.

Subsidiary aims are:

- To investigate the teachers’ enjoyment of the CTwins process;
- To investigate the effects on the teachers of working with colleagues from an education system other than their own.

**THEORETICAL FRAMEWORK**

The CTwins strategy was built around four concepts: computational thinking, cooperative programming, working in an online community, and encountering an education system other than one’s own. They are discussed in turn, with most attention being paid to the first two because of their particular relevance to this paper.

**Computational Thinking**

Computational thinking has been an area of interest in school education since the publication in 2006 of Jeanette Wing’s seminal paper, in which she asserted that it is a fundamental skill for everyone, not just for computer scientists (Wing, 2006). However, researchers vary in their views on what exactly
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