Computational thinking: an experience of 4 years in primary teacher training in Coimbra-Portugal

Computer Science is important to industry, it is important intellectually, it teaches problem solving skills, and it leads to multiple career paths. There can be no doubt that computer science is enabling a new world of discovery and progress across all of the sciences and a growing number of humanities fields.[1] Unfortunately, there are a significant lack of consistency in computer science teacher certification standards in the United States and other countries worldwide. [1]

The teaching of ICT in schools has come in for much criticism. The question of what children should be learning in ICT lessons is one that increasingly preoccupies teachers and educators.

This is a huge discussion in UK, USA and in some other countries. For example, in UK there has been a flurry of activity to introduce programming to children at an early age: ex. Code Club, NESTA (UK).

A primary teacher training in Portugal is done at Colleges of Education. However, these schools do not prepare future teachers to teach the young starting age 8 develop the interactive contents, developing logical problem solving. For this reason, we started 4 years at the College of Education Polytechnic Institute of Coimbra a training program on ICT for 1st year student teachers, using Scratch.

Over this time, we have followed their progress and see there are much to fix, especially in the development of the concept of computational thinking: in [4] the authors define computational thinking as "the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent". As [3] we believe that programming with Scratch provides a context and set of opportunities for contributing to the active conversations about computational thinking. However, in the training of young school teachers, whose overwhelming majority are women, which should be the enthusiasts who begin programming with the young students with at least 8 years old, there must be a reflection on:

- Are we clear about what is wrong with computer science and ICT in schools now ?

- More importantly, are we all clear about exactly what we want learners to be able to achieve as a result of studying computer science? [2]

[1] Computer science teacher preparation is critical, Judith Gal-Ezer, Chris Stephenson, March 2010, Inroads , Volume 1 Issue 1, Publisher: ACM.

[2] Kiss Goodbye to ICT (or KISS hello to Computer Science?), http://ioelondonblog.wordpress.com/2012/10/31/kiss-goodbye-to-ict-or-kiss-hello-to-computer-science/

[3] New frameworks for studying and assessing the development of computational thinking, Karen Brennan (kbrennan@media.mit.edu) and Mitchel Resnick (mres@media.mit.edu), MIT Media Lab, 2012, paper presented at annual American Educational Research Association meeting, Vancouver, BC, Canada.

[4] Cuny, J., Snyder, L., & Wing, J.M. (2010). Demystifying computational thinking for non- computer scientists. Unpublished manuscript in progress, referenced in http://www.cs.cmu.edu/~CompThink/resources/TheLinkWing.pdf