Chapter 7
Education With Passion:
Computing as a Means for Addressing the Challenges of All

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ABSTRACT

The fourth UNESCO goal for sustainable development addresses issues related to quality education for all. A worldwide effort strives to introduce computing from early studies. In this chapter, the authors will share and analyze approaches for embedding computational thinking (CT) in STEAM teaching, approaches drawn upon their experience as computing subject experts spanning their teaching careers. They will share experiences and best practices on the impact of CT on 1) Creativity supporting all the educational activities; 2) Challenges for educators and their students, with a particular emphasis on how to deliver an inclusive and accessible education addressing the expectation of all the students in the same class from the gifted one to those requiring a special education; 3) Convenience and how computing and CT promote special abilities within STEAM; 4) Custom and ethical principles supporting the teaching and learning process of all; and 5) Citizenship with an emphasis on digital citizenship and wisdom on how CT and computing can be taught, learned, and applied for the social good.

INTRODUCTION AND BACKGROUND

The primary issue for this chapter is in what resources exist and how they can contribute to academic enrichment practices for fostering development of Computational Thinking (CT) in students so that they can excel in (hopefully) all Science, Technology, Engineering, Arts and Mathematics (STEAM) education and, in general, in education. More fundamentally, can educators be empowered with best practices and materials so as to impart CT to their students, regardless of the subject area? For example, students who only learn how to follow instructions (as in a program), may become proficient in following instructions, but probably not gain proficiency in solving the underlying problems independently. In such a restricted environment, they gain only the capabilities of a (non-thinking) computer, not of the computer programmer, or more generally of the creators of all STEAM solutions. Is this what students are looking for or do they prefer to look for other ways to express their creativity? Can this be considered quality education?

One of UNESCO's sustainability goals is quality education for all (UNESCO, 2017), (Owens, 2017). The paramount importance of education is clearly stated by researchers (Howells, 2018a). Quality education allows for "an integrated approach" with mutual sustainment involving different activities pursuing different goals. This international effort for quality education is comprehensive, incorporating the dissemination of computing knowledge to all citizens, involving all educators, using all levels of education, extending into all types of educational systems, and considering all stages of life, have all been indicated to be pursued from early development (Cutts et al., 2018) and has been the focus of the Computer Science education community during its entire existence.

Some notable examples around the world in this direction are the following:

1. Computing At School (CAS), (Crick, 2011), (Anonymized, 2015) which was, is and will be the driving force of the National Curriculum in England and Scotland.
2. Computer Science Teachers Association (CSTA) which released a framework (CSTA, 2016) and a Standard, both for students (CSTA, 2016) and teachers (CSTA, 2020), covering Computer Science (CS) education from kindergarten through 12th grade, which drives the effort in the USA.
3. Code.org (Franke & Osborne, 2015) with an incisive action to have everyone learn CS, working with educational departments across the USA and around the world with initiatives covering Europe (Sirocchi et al., 2022) and Italy (Corradini & Nardelli, 2021), and the United Kingdom.
4. CSforAll (Santo et al., 2018), a movement dedicated to bringing high quality Computer Science to all school students in order to prepare them for college.
5. Informatics for All (M. E. Caspersen et al., 2018) coalitions supported by the ACM Europe Council, Informatics Europe, and the Council of European Professional Informatics Societies (CEPIS) aims at introducing Informatics as a fundamental discipline for all learners.
6. The Consortium for Computing Sciences in Colleges (CCSC) promotes CS in two and four years Colleges and Universities in the USA and represents the glue between K-12 school and higher education.
7. Additional leading educational organizations like OECD (Howells, 2018), (OECD learning, 2030) and ACM, and more specifically SIGCSE.

A focus on competencies is driving the effort in new curricula development and comparison on 21st-century competencies, and skills (Binkley et al., 2014), such as Computational Thinking (CT), play a key role (Wing, 2020) despite a debate (Denning, 2017) lasting more than 80 years (Tedre & Denning,

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