Chapter 20
Fielduino (Digital Farming): Design of an Open Agricultural Platform

Christoforos Karachristos
Hellenic Open University, Greece

Ioannis Chantzis
Public Institute of Vocational Training in Messolonghi, Greece

Aggeliki Grivopoulou
School of Second Chance in Messolonghi, Greece

Theodora Kouvara
Hellenic Open University, Greece

ABSTRACT

The 21st-century challenges have established changes in education's prospects. In this vein, the current action-research followed the three steps (planning, implementation, evaluation) of an interdisciplinary project which explores the pedagogical impact of its application in the field of STEM education. The three stages of the project are an overview of an internet-of-things platform called Fielduino – Digital Farming. This platform constitutes a prototype for a do-it-yourself (DIY) construction and maintenance of a system which is capable of applying new technologies. The research was conducted in a provincial Institute of Vocational Education. The participants were a group of five trainees. The research tool employed was participatory observation. The research results highlighted that the current project positively influenced computational thinking, soft skills development, and the trainees' engagement with STEM education.

INTRODUCTION

Many global scientific 21st-century challenges such as climate change, farming, health and declining energy need a cooperative and international scientific approach to manage the complexity of their emergence (Kelley & Knowles, 2016). Under these new circumstances, the adoption of modern technologies was deemed an imperative need. As an example, in the field of farming, the idea of advanced technologies

DOI: 10.4018/978-1-7998-6717-3.ch020

was introduced in the World Summit on Information Society in 2003. E-agriculture aims to facilitate the farmers' efforts in the production via the capabilities which the communication technologies (ICT) insert (Wenjun & Jinsong, 2007).

As the financial crisis has hit Greece, the consequences moved the Greek economy into a period of a prolonged recession. In this vein, many scientists highlighted the crucial role of technology innovations in Greece's efforts to recover from the crisis and enhance the economy again (Giotopoulos, Kontolaimou, Korra & Tsakanikas, 2017). According to Greece's VNR (2018) (Voluntary National Review), Greece has to adopt economic policies which contribute to achieving sustainable, economic development. The main goals of the country have to be oriented toward fostering economy, improving the business environment, supporting innovation and farming, tourism and infrastructure.

Furthermore, the new challenges have established changes in the prospects of education which have been configured by the priorities set up by the 21st-century. Researchers and educators have already incorporated new approaches which are focused on promoting students' skills through an interdisciplinary process based on the effort of handling the 21st-century issues (McCright, O' shea, Sweeder, Urquhart & Zeleke, 2013). These new approaches provide teaching as a strategy which is orientated to facilitate students in solving real problems based on the fields of science, technology, engineering and mathematics (STEM education). The STEM education contains educational activities across all grade levels (Gonzalez & Kuenzi, 2012). These activities promote the critical and computational thinking, communication and collaboration skills via a holistic approach of knowledge in the disciplines of STEM education (Achzab, Budiyanto & Budianto, 2018).

However, according to Kelley & Knowles (2016), for many years, STEM education was focused mainly on science and mathematics as separate eras and less on technology and engineering. Moreover, according to Swaid (2015), the efforts which have been made to introduce Computational thinking scenarios to students of STEM education are few. Also, there is more emphasis on learning outcomes than emotional ones (collaboration and communication skills, empathy, learning engagement) (Admawati, Jumadi, & Nursyahidah, 2018; Kelley & Knowles, 2016).

Based on the above issues, the current action research followed the 3 steps (planning, implementation, evaluation) of an interdisciplinary project which explores the pedagogical impact of its implementation in the field of STEM education. Moreover, based on the philosophy of STEM education, the purpose of the project was based on a real problem which trainees have to deal with by using their knowledge in practice.

The project was assigned and developed as a semester project by the trainees of the speciality "Computer Technician" in the context of the fourth-semester course named "Interdisciplinary Project". The purpose of the project was to enable farmers involved in agricultural work, to develop a system through which they can monitor remotely via the internet and throughout the day, various environmental and non-environmental rates that are important for their cultivation and are related to rate measurements by sensors. Furthermore, as the principles of STEM education govern the project, its objectives had a pedagogical orientation, too. The goals of the current project were:

- to foster Student Self-Efficacy in Computational Thinking as a means of problem-solving and penetration to advanced issues of computing science as well as the use of their critical thinking and creativity,
- to engage trainees with modern educational models based on the STEM approach (Science, Technology, Engineering, Mathematics),