## Thesis Abstract

Inexperienced and young learners typically have difficulties with respect to the programming experiences and activities. These difficulties are mainly because of their lack of syntactic knowledge, conceptual knowledge and strategic knowledge. Considering the complexity of introductory programming for the learners, visual programming has become more and more popular. In particular, block-based programming have emerged as an area of active research.

Block-based programming environments have become the standard medium of instruction in the design of introductory programming courses for young learners. As a result, they are employed by researchers and educators to enable the learners to learn programming and author computer programs. In addition to these programming environments, an interesting and motivating context is needed to encourage young learners to start with programming activities. Scientific works emphasize that tangible interactive objects benefit learning, specially for young learners. Moreover, countless block-based programming environments have been employed together with these objects in order to improve the learners' emotional engagement, attitudes, and their computer programming performance. Nevertheless, we have lack of investigation on the impacts of new and powerful technologies (which provide possibilities to tightly connect computer science to reality and introduce the future) on young learners' programming skills and attitudes. My research is aimed at better understanding of how the use of block-based programming together with state-of-the-art smart technologies can leverage young learners' interest in programming, and support the acquisition of programming skills.

This thesis explores educational block-based programming environments in the context of smart objects and environments to achieve two main objectives. First, exposing young learners to programming activities to help them to realize that computer programming can be presented in a way which is not necessarily difficult to understand. Second, utilizing the results of these programming activities to effectively develop the learners' basic programming skills and engage them in future learning computer programming.

The exposure of young learners to programming activities focuses on presenting an educational block-based programming tool that brings together the hot topic of smart environments and the visual programming paradigm. In order to illustrate the effectiveness of our approach, it is employed to design one-day non-formal programming training sessions in the context of smart homes. Furthermore, to offer insights into the impacts of embedding the construction of smart objects in context of smart environments, longer period (2- to 4-day) of training sessions are conducted. Each training session is divided into two parts: (i) introduction to basic programming concepts, and (ii) implementation of these concepts on tangible objects and construction of a smart object in the context of smart homes. This helps us to explore the learners' programming performance and their attitudes towards programming over time. In this respect, programming tasks can be more diverse and complicated for both groups of learners (with and without prior programming experience), and both genders (boys and girls). In this phase, we focus more to find out the learners' trajectories of (i) attitudes towards programming (in terms of confidence, interest, and enjoyment), (ii) acquisition of programming skills, and (iii) programming experience (in terms of ease-of-use, ease-of-learning, usefulness and satisfaction), using the block-based programming environment and smart tangible objects.