032
An Autodidactic Programming Curriculum Application for Early Education: Pilot Studies and Improvement Suggestions

C. Florou[1]
PhD Candidate at Department of Computer Engineering and Communications
University of Thessaly
Volos, Greece
chflorou@inf.uth.gr

A. Bagiati
Postdoctoral Associate within the MIT-SUTD Collaboration
Massachusetts Institute of Technology
Cambridge, MA, USA
abagiati@mit.edu

I. Kosmopoulou
Instructor - 2nd Institute of Vocational Training of Larissa
Larissa, Greece
iokosmop@gmail.com

E. Houstis
Professor at Department of Computer Engineering and Communications
University of Thessaly
Volos, Greece
enh@inf.uth.gr

Conference Topic: Curriculum Development
Keywords: self-teaching programming curriculum, self-assessment rubrics, problem-solving, early education

Informal learning is a research area not fully explored yet [1], but interest in out of classroom learning methods and settings is currently increasing [2], [3]. In parallel to that, the advent of Internet, which allows for a plethora of educational content to be widely shared, seems to be promoting self-directed learning for all ages. Furthermore the rapid technological advancement makes obvious the need to identify opportune times and methods for technology and computer education, starting probably from the very early ages [3] and [4].

[1] C. Florou, chflorou@inf.uth.gr

This paper presents improvement suggestions after children and teachers piloted a self-teaching programming using an interactive application developed by our research group. The application presents a curriculum that introduces fundamental programming concepts and algorithmic thinking to early elementary school students. The teaching approach is based on parallel use of the self-teaching application, and use of the "Scratch" platform that allows for interaction and experimentation with fundamental but also more advanced programming concepts [5]. The application is interactive, and in parallel with teaching, offers the students developmentally appropriate rubrics for self-assessment [6].

The curriculum proposed, consists of 10 educational modules that address fundamental programming concepts, namely the concepts of algorithmic thinking, well-structured problem solving, assignment of variables, creating of logic diagrams, use of sequential, conditional and repeated instructions, testing and debugging. Every educational module consists of an audiovisual introduction to a game scenario and the Scratch modules the children will need to use, one step-by step solution to the problem, and introduction to a similar game scenario that addresses the same programming concepts as the initial scenario, a self-assessment rubric for the child to use, that again uses developmentally appropriate form of questions and visual elements and requires Yes/No answers.

The application was initially developed and piloted as an afterschool activity by 12 3rd graders in an elementary school in Greece [2]. Following that, two 3rd grade teachers also implemented the application in class during regular class hours. ■

REFERENCES

[1] Willoughby, T. and Wood, E. (2008), Informal learning with technologies: opportunities and challenges – Introduction, In T. Willoughby & E.Wood (Eds.), *Children's learning in a digital world*, Malden, MA: Blackwell Pub.

[2] Bagiati, A., Florou C., Kosmopoulou I. and Houstis, E. (2011), Third Graders Experience on Using an Autodidactic Programming Software: A Phenomenological Perspective, Proceedings of 2011 ASEE Annual Conference & Exposition, Vancouver, B.C. Canada.

[3] Bagiati, A., Yoon Yoon, S., Evangelou, D., Ngambeki, I. (2010), Engineering Curricula in Early Education: Describing the Landscape of Open Resources, Early Childhood Research & Practice, Vol. 12(2).

[4] Bagiati, A. and Evangelou, D. (2009), An examination of web-based P-12 engineering curricula: Issues of pedagogical and engineering content fidelity, Proceedings of the Research in Engineering Education Symposium, Palm Cove, QLD.

[5] Resnick, M., Maloney, J., Monroy-Hernandez, A., Rusk, N., Eastmond, E., Brennan, K., Millner, A., Rosenbaum, E., Silver, J., Silverman, B. and Kafai, Y. (2009), Scratch: Programming for all, *Communications of the ACM*, Vol. 52(11), pp.60-67.

[6] Mitchell, A. (2006), Introduction to rubrics: An assessment tool to save grading time, convey effective feedback and promote student learning, *Journal of College Student Development*, Vol. 47(3), pp. 352-356.