

SYNTAX CIRCUITRY: A MOBILE GAME FOR PRACTICING PROGRAMMING LANGUAGE SYNTAX

W. A. Shellington¹, M. A. E. Rizvi^{2*}, T. O. Humphries¹, R. Morsi¹

1) Norfolk State University, Norfolk, VA, USA; 2) School of Science and Technology, Nazarbayev University, Astana, Kazakhstan;
*mona.rizvi@nu.edu.kz

Introduction. According to the U.S. Bureau of Labor Statistics [1], computer science professions are among the fastest growing occupations in the U.S., and computer science occupations will add more than half a million new jobs in the next ten years. A similar need for computer professionals is expected in Kazakhstan. Simultaneously, universities in the U.S. and worldwide are seeing poor retention rates in computer science, a major reason being that students often view the early courses in the subject as uninteresting and dull [2]. Game-based learning is one of many techniques proposed to address this issue [2,3,4,5]. We have developed a mobile game that provides an engaging way for students to practice (not learn) the basic syntax of C, C++ and Java (since these languages share the same syntax for basic constructs like declarations, selection and iteration). Learning programming language syntax is a tedious process. Practicing by programming is, of course, ideal, but we believe that a game which is fun to play in their spare time will help students get used to distinguishing correct syntactical constructs quickly.

Methodology. The game, *Syntax Circuitry*, has been developed for the Android platform. The game has three categories of syntax (declaration, selection, and iteration) with three levels of difficulty in each category. The game-play is as follows: bubbles containing small snippets of code float down the screen. Those which contain incorrect syntax must be popped with a slicing motion, similar to that used in the well-known *Fruit Ninja* game, while bubbles with correct syntax must be allowed to reach the bottom of the screen. There are also plain red and green bubbles to add more challenge and interest to the game; the red bubbles must be popped.

Results. The game is currently being evaluated by a population of first-year computer science students at Norfolk State University. The evaluation methodology consists of pre- and post-tests, the collection of usage and play data from within the game, and surveys about the usability and enjoyment factors of the game. Preliminary data shows that students enjoy the game, and that a modest improvement in the students' abilities to identify correct and incorrect syntax is achieved after just a week's play.

References.

1. U.S. Department of Labor, *Bureau of Labor Statistics Occupational Outlook Handbook*, 2014
<http://www.bls.gov/ooh/>
2. Ana Paula L. Ambrosio and Fabio M. Costa, "Evaluating the Impact of PBL and Tablet PCs in an Algorithms and Computer Programming Course," in SIGCSE '10 Proceedings of the 41st ACM Technical Symposium on Computer Science Education, Milwaukee, 2010, pp. 495-499.
3. Nickolas Falkner, Raja Sooriamurthi, and Zbigniew Michalewicz, 'Puzzle-Based Learning for Engineering and Computer Science,' *Computer*, vol. PP, no. 99, pp. 20-28, January 2010.
4. Amruth N. Kumar and Aravind K. Krishna, "A Problem Generator to Learn Expression Evaluation in CS I, And its Effectiveness," *Journal of Computing Sciences in Colleges*, vol. 16, no. 4, pp. 34-43, 2001.
5. Kathryn E. Merrick, "An Empirical Evaluation of Puzzle-Based Learning as an Interest Approach for Teaching Introductory Computer Science," *IEEE Transactions on Education*, vol. 53, no. 4, pp. 677-680, November 2010.