Novice Helper: Eclipse Integrated Development Environment plugin to support novice programmers

Caroline Berger, Martin P. Robillard
School of Computer Science
McGill University

Introduction

71% of teachers in the U.S. say that “offering CS (Computer Science) is more important than or just as important as required courses like math, science, history and English” [1]. To match the rise of CS learning in schools, effective educational tools must be implemented into curriculum. Of the tools that are marketed towards young users, such as Scratch and Lightbot, few have been rigorously tested for their educational effectiveness. Yet, these visual programming tools are widely used in academic settings [2]. Novice Helper, an Eclipse IDE plugin, is designed to support novice programmers in learning a textual programmig language in a professional development environment.

Scratch, a drag and drop visual programming tool [3].

Novice Helper Components

Eclipse plugin

The plugin is used inside of the Eclipse IDE and in conjunction with the set of programming exercises.

Error dictionary

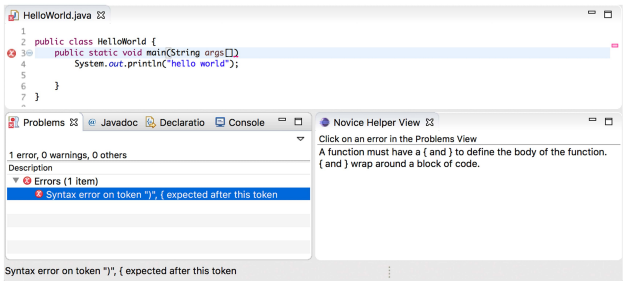
An error dictionary entry is comprised of the Java error message and the corresponding translated Novice Helper message. To form the dictionary, we applied prior studies on common error messages to the context of the set of programming exercises. We tailored the messages to the set of exercises and level of background knowledge of a young user.

Research Hypothesis

Users aged 9 through 12 can learn elementary computer science concepts by programming in a professional development environment with support from the Novice Helper plugin.

User Interaction

When the user creates any type of error, the error message appears in the Problems View of the Eclipse IDE. When the user selects the error in the Problems View, if the error is recorded in the error dictionary, then a translation of the error appears in the Novice Helper View. If the original error message clearly and correctly indicates what the user has done wrong, then the original error message appears unaltered in the Novice Helper View. Once the user selects outside of the Problems View or the Novice Helper View, the message in the Novice Helper View disappears. Once the error has been fixed, it will disappear from the Problems View and the user will have nothing to select, so no error translation will appear.



On selection to a problem, a translated message appears in Novice Helper View.

Example Error Dictionary Entries

Java error message	Novice Helper message
Type mismatch: cannot convert from int to boolean	Java is a typed language. Variables of type boolean can be assigned to true or false.
Type mismatch: cannot convert from double to int	Java is a typed language. Variables of type int must be assigned to whole number values.
Type mismatch cannot convert from int to String	Java is a typed language. For a number to be considered a String, the number must have quotation marks around it “ ”.
Type mismatch cannot convert form boolean to int	Java is a typed language. Variables of type int must be assigned to whole number values.
string cannot be resolved to a type	String must be capitalized.

Conclusion

Novice Helper, an Eclipse IDE plugin aims to teach young students about computer science and programming by translating Java’s compiler error messages into age appropriate debugging advice embedded with computer science concepts.

Future Research

To test the research hypothesis, we intend to conduct a user study with young novice programmers in the summer of 2017. Before the study occurs, we will make a few software improvements to extend the functionality of the plugin

Acknowledgements

I would like to thank Taciana Pontual da Rocha Falcao from McGill’s Department of Education who provided insight and expertise in creating the programming exercises and error translations.

Citations

[1] Trends in the state of computer science in U.S. K-12 schools. (2016). Retrieved from http://services.google.com/fh/files/misc/trends-in-the-state-of-computer-science-report.pdf

[2] H. Tsukamoto, Y. Takemura and Y. Oomori. Textual vs. Visual Programming Languages in Programming Education for Primary Schoolchildren. In Frontiers in Education Conference, FIE 2016.

[3] Scratch [Screen Shot]. (n.d.). Retrieved from http://news.mit.edu/sites/mit.edu.newsoffice/files/images/2013/20130514110054-1_0_0.jpg