

Novice Helper: Eclipse Integrated Development Environment Plugin to Support Novice Programmers

By: Caroline Berger

Supervised By: Professor Martin Robillard

Overview

1. Motivation
2. Relevant Research
3. Research Hypothesis
4. Novice Helper Goals
5. Solution
 - i. Programming Exercises
 - ii. Error Dictionary
 - iii. Software Implementation
6. Demo
7. Conclusion
8. Continuing Research

Motivation



Relevant Research

- Programming literacy, curriculum development
- Textual programming languages vs visual programming languages
- Tools: BlueJ, Alice, Espresso vs Scratch, Lightbot

Novice Helper Goals

- used in conjunction with a set of educational exercises
 - variables
 - types
 - loops
 - scope
 - control flow
- provide helpful debugging advice
- scaffold learning process
 - smooth transition into independent projects

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.

Solution

Programming
exercises



Error
Dictionary



Novice
Helper Plugin

Solution

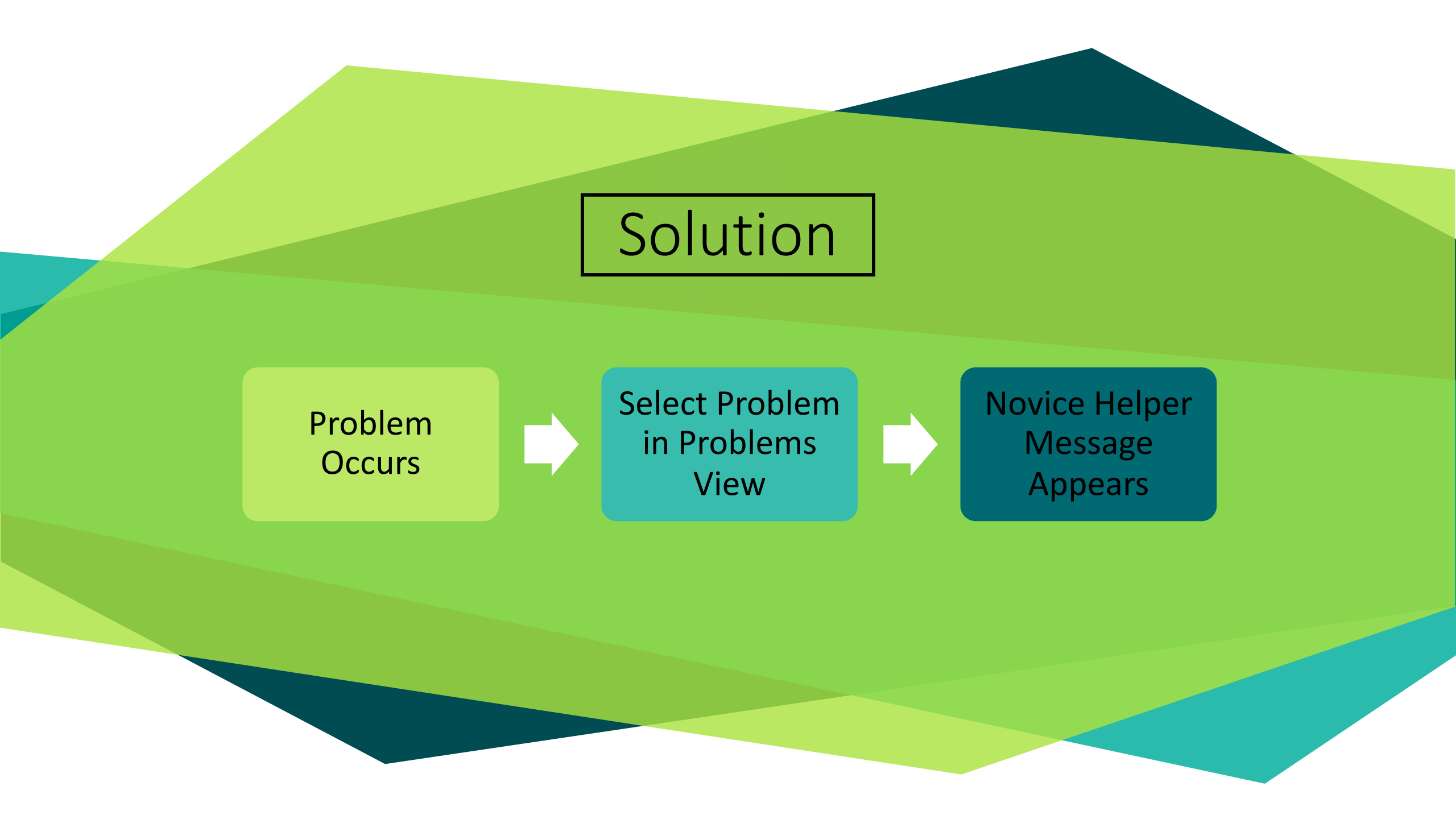
Problem
Occurs



Select Problem
in Problems
View



Novice Helper
Message
Appears



Example Exercise: Introduction to Variables

Tell a story about your family, favorite sport, what you did last weekend or something else entirely. Use your creativity! Declare and use at least 3 different types of variables and print your story to the console. This should be done in the main method.

```
graph LR; A[Problem Occurs] --> B[Select Problem in Problems View]; B --> C[JavaTutor Message Appears];
```

Problem
Occurs

Select
Problem in
Problems
View

JavaTutor
Message
Appears

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.

Error Dictionary Entry

```
int myAge = 12.5;
```

Java error:

Type mismatch:
cannot convert
from double to int

















Error Translation:

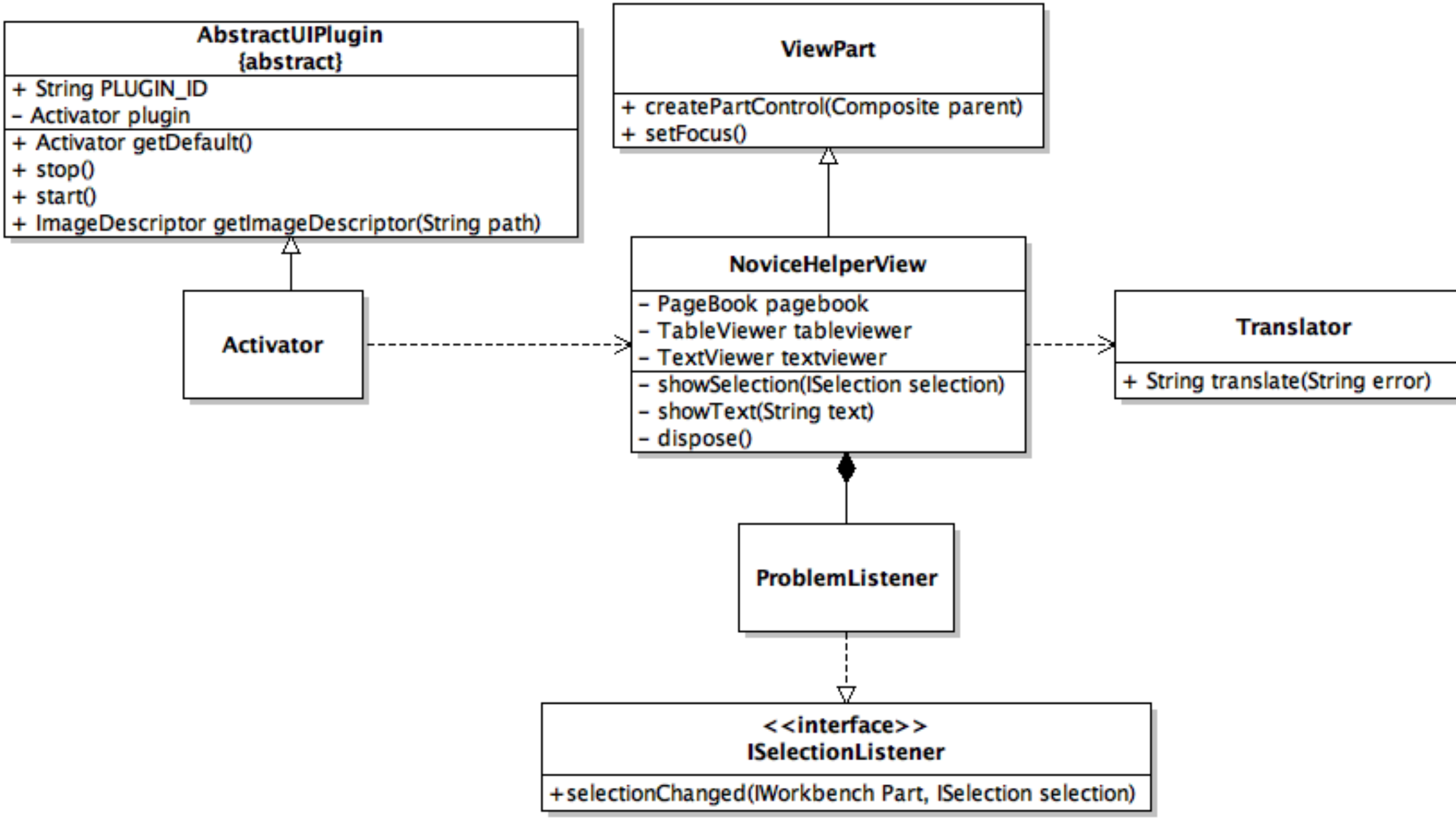
Java is a typed
language. Variables
of type int must be
assigned to whole
number values or
null.



Software Implementation

Structure

- ▼  ca.mcgill.cs.NoviceHelper
 - ▶  JRE System Library [JavaSE-1.8]
 - ▶  Plug-in Dependencies
 - ▼  src
 - ▼  ca.mcgill.cs.NoviceHelper
 - ▶  Activator.java
 - ▼  ca.mcgill.cs.NoviceHelper.translator
 - ▶  Translator.java
 - ▼  ca.mcgill.cs.NoviceHelper.views
 - ▶  NoviceHelperView.java
 - ▶  icons
 - ▼  META-INF
 -  MANIFEST.MF
 -  build.properties
 -  ErrorDictionary.properties
 -  plugin.xml



The background consists of several overlapping, semi-transparent geometric shapes. A large teal shape forms a wide horizontal band across the middle. Above and below this band are darker teal shapes that create a sense of depth and perspective, resembling a landscape or architectural structure. The remaining space is filled with a bright lime green color.

Demo

runtime-EclipseApplication - Java - DemoFinalPresentation/src/HelloWorld.java - Eclipse SDK

Quick Access

Package Explorer

DemoFinalPresentation

HelloWorld.java

```
1
2 public class HelloWorld {
3     public static void main(String args[]){
4         string myName = "Caroline";
5         System.out.println("Hello " + myName);
6
7     }
8 }
9
```

Outline

HelloWorld

main(String[])

Proble

@ Javado

Declar

Novice Helper View

2 errors, 0 warnings, 0 others

Description

▶ Errors (2 items)

Writable Smart Insert 9 : 1

Conclusion

Novice Helper, an Eclipse Integrated Development Environment (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.

Continuing Research

- Improvements
 - Software: better error translation process
 - General: hone exercise problems and error translations
- Summer 2017: Applying for approval for a user study to test Novice Helper on users aged 9 through 12

Acknowledgments

I would like to thank my supervisor, Professor Martin Robillard for his guidance and support throughout the project.

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

Citations

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

Platform architecture. (n.d.). Retrieved from Eclipse Help website: <https://help.eclipse.org/neon/index.jsptopic=%2Forg.eclipse.platform.doc.isv%2Fguide%2Farch.htm>

W. Robinson. From Scratch to Patch: Easing the Blocks-Text Transition. In Proceedings of the 11th Workshop in Primary and Secondary Computing Education, WiPSCE '16 2016, pages 96-99, New York, NY, USA, 2016. ACM. ISBN 978-1-4503-4223-0. doi 10.1145/2978249.2978265

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.

G. Marceau, K. Fislser and S. Krishnamurthi. Mind your language: On novices' interactions with error messages. In Proceedings of the 10th SIGPLAN Symposium on New Ideas, New Paradigms, and Reflections on Programming and Software, Onward! 2011, pages 3-18, New York, NY, USA, 2011. ACM. ISBN 978-1-4503-0941-7. doi 10.1145/2048237.2048241

J. Jackson, M. Cobb and C. Carver. Identifying Top Java Errors for Novice Programmers. In Proceedings of the Frontiers in Education Conference.

Guzidial, M., Ericson, B. (2005). Introduction to Computing and Programming in Java: A Multimedia Approach. Upper Saddle River, NJ: Prentice Hall.

Lister, R., Leaney, J. (2003). 5th Australasian Computer Education Conference. First Year Programming: Let All the Flowers Bloom.

Pomerantz, D. (2015, October 5). Assignment 1 COMP 202.

Shiffman, D. (2015). Learning Processing. Burlington, MA: Morgan Kaufmann.

Thank you!
Questions? Comments?

caroline.berger2@mail.mcgill.ca