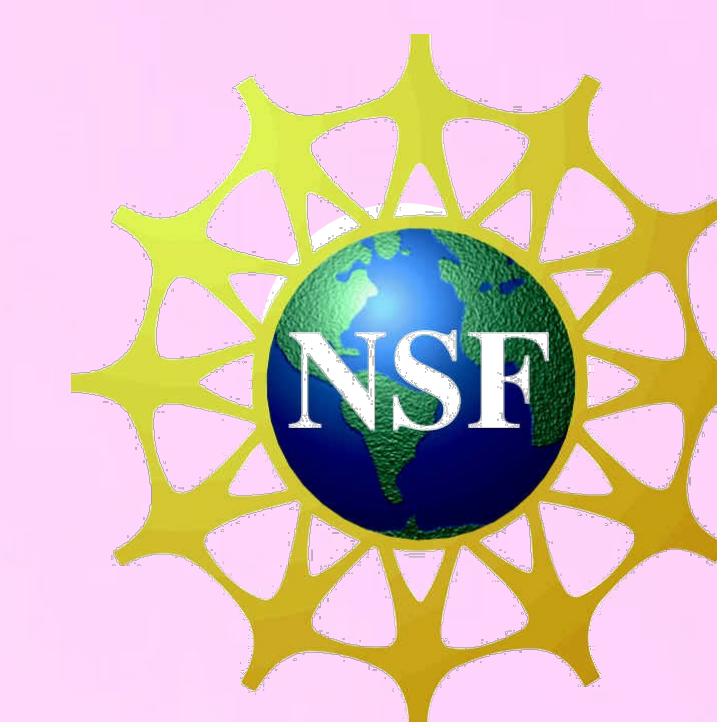


# Young Women in Computing



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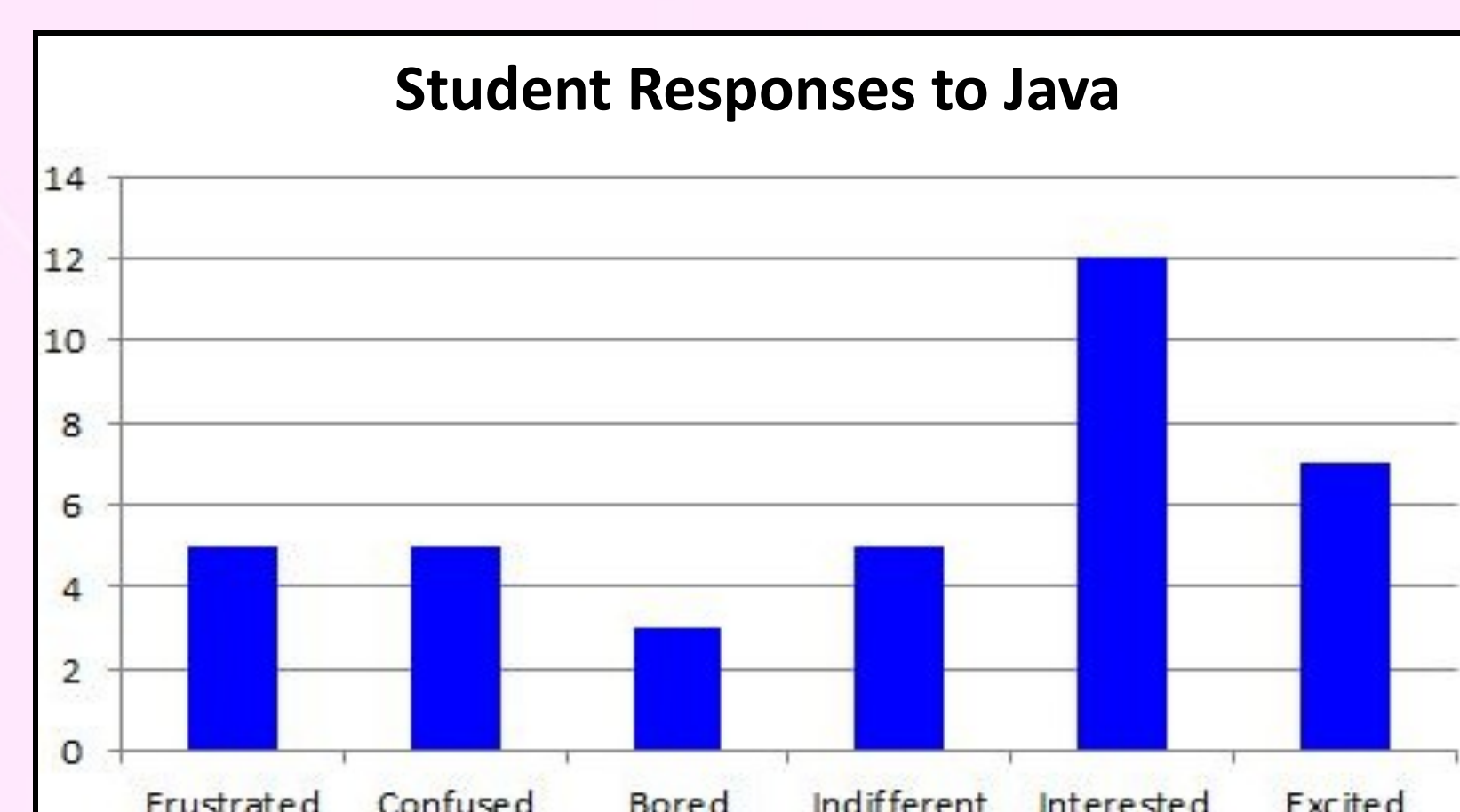
## Programming Impact of Diversity - Eclipse vs. App Inventor in Secondary Outreach

### The Young Women in Computing Program

YWiC is an outreach program at New Mexico State University that targets middle and high school females. Because women are vastly underrepresented in Computer Science (CS) and other technological fields, YWiC strives to create curriculum that is appealing and engaging to female students in particular. The program attempts to gradually introduce these students to computational and algorithmic thinking and allows them to explore careers in computing.

### Project: Application Competition

In December 2010, YWiC began the app programming competition at a local high school. Each week YWiC research assistants held optional meetings to aid students during their app development process. The goals were (1) to excite the students about the possibilities in CS and (2) to conduct research on the impact diversity has on productivity within same gender vs. mixed gender groups. Over 80 students formed co-ed or all-female groups of 2 to 3 students to design a socially beneficial app using the Android platform. The incentive? Winners would receive Android Tablets, on which they could run their apps. The incentive proved to attract many students, but when faced with programming using the Android SDK through the Eclipse IDE, many students became overwhelmed. It became apparent that most students had very little to no experience with Java programming. The chart below shows student responses of how they felt during each meeting according to the *Student Progress Survey*.



### Java Through Eclipse Pros/Cons

At the start of the competition, YWiC staff chose to engage the students with Java/Eclipse because:

- It is open source, so any of the students could access it for free.
- Java apps work on all operating systems, and therefore Eclipse works on any operating system.
- It is the official development tool recommended for Android.

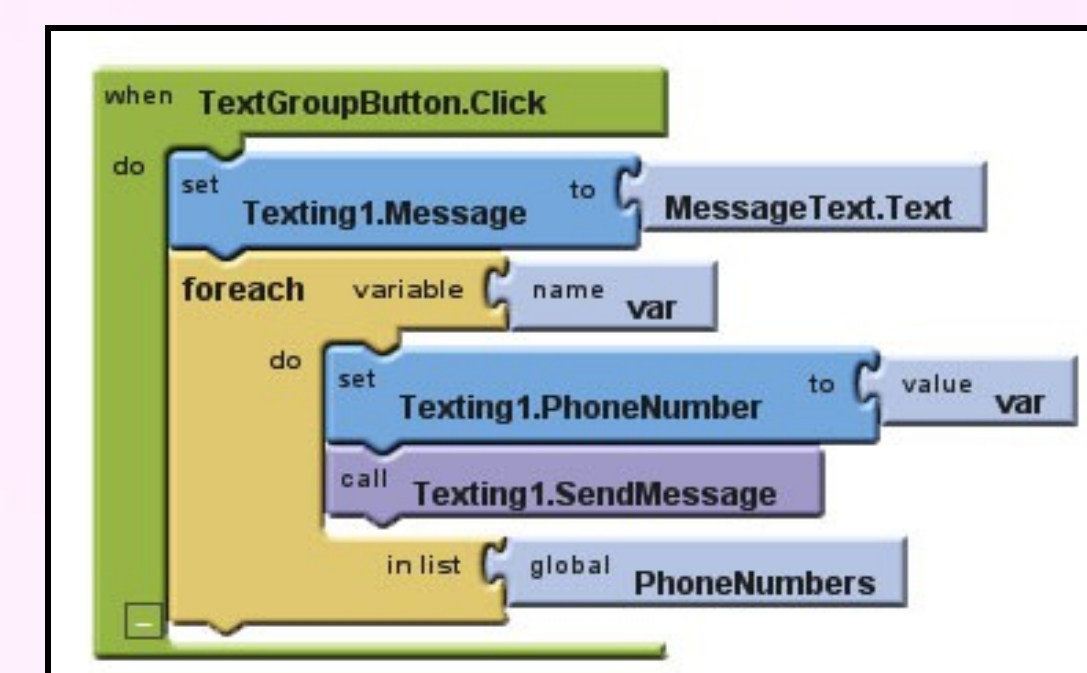
On the other hand, throughout the trial process students found:

- For those with little or no previous Java programming experience, it is confusing maneuvering through the Eclipse IDE to create a project.
- It was less accessible to those students who did not have laptops or home computers where they could download the software and SDK plug-ins.

### A New Direction: App Inventor

After a month trial period with the Android SDK, YWiC concluded that it required an advanced knowledge of Java above what could be expected of high school students. Thus decided to move in a new direction and gave the students the option to continue to use Java/Eclipse, or to switch software and use Google App Inventor to implement their app. App Inventor is a new tool that was added to Google Labs in 2010 that makes it easy for anyone to create their own phone applications, including programmers and non-programmers, professionals and students. App Inventor was particularly appealing to the students because of its:

- Simple Programming— Using the App Inventor Blocks Editor makes it very simple to program apps, because no programming experience is needed. Codes are represented as blocks and are assembled visually like pieces of a puzzle to specify the app's behavior.
- User Friendly Design Interface— Instead of having to program the design elements, users use the App Inventor Designer to visually design the way they want their app to look.
- Portability— App Inventor is web browser-based, and uses its own server so that users can access their projects on any computer with internet access.



### Judging Process

After a few months of school meetings and completely changing the software approach, the remaining groups gathered to present their product to a panel of judges of NMSU faculty, staff, and students. Groups were judged on three categories based on the following criteria:

1. The app's originality, quality/completeness, structure/efficiency of code, and user-friendliness.
2. An essay explaining the origin/formation of app concept, how it is educationally/socially beneficial, problems encountered and how the group overcame them, each member's contribution, and any lessons learned.
3. A final presentation discussing the development of the app idea, how the app is educationally/socially beneficial, problems encountered and how the group overcame them, conducting a successful demo of the app.

### The Winning App



Since the winning group had prior programming experience with Java, they opted to stay with Eclipse after encountering some of App Inventor's limitations. Their app, *MindFlex*, essay and presentation all impressed the judges. The purpose of their app was to test and strengthen different parts of the mind, such as concentration, memory, and flexibility. The team concluded that each member has gained valuable knowledge and experience in programming and have improved their collaboration skills.

### Results

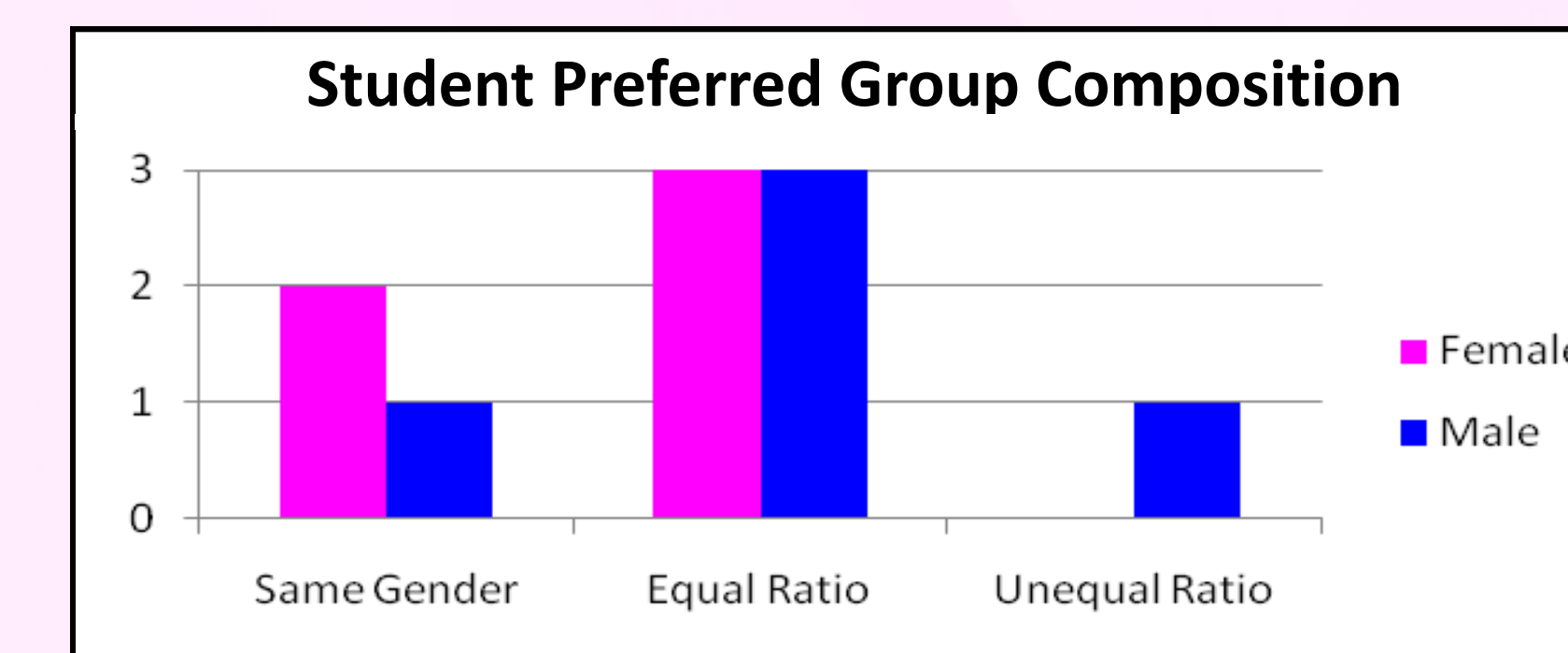
Research is ongoing and focuses on the performance of single-gender vs. mixed-gender groups in a secondary outreach initiative, specifically pertaining to software development. This research was initially based on participant surveys and observation, but there was not enough participation in surveys to draw clear results from the sample collected. However, from our observations we found that co-ed groups had a much lower expressed participation and communication level, while the same gender teams seemed to be more communicative and outgoing. The small sample of survey results also showed that in general females in mixed-gender groups felt that they had not taken a leadership position throughout the competition. To correlate the productivity, other observations and survey results revealed that once the students were given the opportunity to implement easier programming with App Inventor, both enthusiasm and productivity increased in every group.

The table below describes the productivity levels of the students after 4 weeks using each type of software, illustrating the positive effects of switching from Java/Eclipse to App Inventor. These results were compiled from the *Student Progress Survey* and the *Group Dynamic Survey*.

	Extremely Unproductive	Unproductive	Productive	Extremely Productive
Eclipse/Java	6%	72%	22%	0%
App Inventor	0%	0%	100%	0%

### Future Work

In the future YWiC hopes to sponsor another app competition. The competition would first and foremost teach the students to use App Inventor apps. Also, when analyzing group dynamics and in order to retrieve results from a broader spectrum, groups would be monitored to ensure that there would be approximately the same number of all-male groups, all-female groups, and mixed-gender groups. As indicated by the graph below, at the conclusion of the competition, interviews showed that the majority of the students preferred to work in a group environment with an equal gender ratio.



The knowledge gathered from the graph above would be useful when looking at group production levels in another app competition. Other improvements will be made based on current student feedback and staff observations, leading to a more streamlined competition and greater enjoyment on the part of the students. Research will continue to focus on the impact of diversity in software development.

### Acknowledgements

The authors acknowledge the New Mexico State University Computer Science Department, Department Head/PI Enrico Pontelli, Co-PI Karen Villaverde, Co-PI Inna Pivkina, and the National Science Foundation (grant no. CNS-0836632) for its support.

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### Competition Timeline

