Investigating the Impact of the Technovation Challenge Program on High School Girls, Mentors, Instructors, and Teaching Assistants

Final Report

Prepared by Dr. Harouna Ba
Submitted to Iridescent – Technovation Program

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INTRODUCTION

The purpose of this evaluation is to document the implementation of the Technovation Challenge program and determine its impact on high school girls, mentors, instructors, and teaching assistants (TAs). Program staff plan to use the evaluation findings to improve and promote the program.

This report is organized into five sections: (1) program description, (2) data collection, (3) data analysis, (4) key findings, and (5) conclusion and recommendations.

PROGRAM

Technovation Challenge is a technology and entrepreneurship program for high school girls, founded by Dr. Anuranjita Tewary, a senior data scientist at Linkedin, and implemented by Iridescent, a national, science-education nonprofit (iridescentlearning.org/technovation-challenge). The program is a technology and entrepreneurship program for high school girls. Over the course of nine weeks, girls work with mentors, teaching assistants, and instructors in technology to develop mobile phone apps. The girls learn to use a visual programming language called App Inventor. Finally, they present their phone apps and business plans to a panel of Venture Capitalists from industry at a high visibility “Pitch Night” event.

In the spring of 2011, the Technovation Challenge program was implemented at six sites across the country: (1) Google Inc. in Mountain View, (2) Google Inc. in San Francisco, (3) Google Inc. in New York City, (4) LinkedIn in Mountain View, (5) Berkeley Wireless Research Center in Berkeley, and (6) Iridescent Science Studio in Los Angeles. With the support of Technovation staff, women professionals working in the high-tech industry (mentors), graduate students in computer science or education at local universities (instructors), and women undergraduate computer science majors (teaching assistants) implemented the programs at the various sites. The Iridescent Science Studio in Los Angeles and Berkeley Wireless Research Center relied more on teaching assistants than mentors. Program staff could not find corporate sites located in the girls’ community willing to host the program in Los Angeles. This was also the case for finding mentors willing to make it to sites in Los Angeles and the Berkeley Wireless Research Center.

The program was held twice a week for two hours for nine weeks at five of the sites and once a week for three hours for twelve weeks at the remaining site (Google Inc. in New York City) during the spring of 2011. The overall contact time was 36 hours at all six sites.
DATA COLLECTION

The focus of the data collection is to (1) document participants’ background information and feedback on the implementation of the program and (2) measure its impact on participants. Five surveys (see Appendix) were used to collect the data:

- One survey with 7 close-ended and 17 open-ended questions was administered to the instructors.
- One survey with 9 close-ended and 17 open-ended questions was administered to the mentors.
- One survey with 9 close-ended and 17 open-ended questions was administered to the teaching assistants.
- One pre-survey and one post-survey were administered to the girls. The pre-survey with 5 close-ended and 6 open-ended questions. The post-survey with 8 close-ended and 18 open-ended questions.

Table 1 shows the number of respondents to the each of the above surveys.

Table 1: Survey Respondents

<table>
<thead>
<tr>
<th>Participants</th>
<th>Types of Surveys</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructors</td>
<td>Post-survey</td>
<td>5</td>
</tr>
<tr>
<td>Mentors</td>
<td>Post-survey</td>
<td>41</td>
</tr>
<tr>
<td>Teaching Assistants</td>
<td>Post-survey</td>
<td>46</td>
</tr>
<tr>
<td>Students</td>
<td>Pre-survey</td>
<td>168</td>
</tr>
<tr>
<td></td>
<td>Post-survey</td>
<td>179</td>
</tr>
</tbody>
</table>

DATA ANALYSIS

Researchers employed a mix of qualitative and quantitative methodologies to analyze the data. For the quantitative data, researchers used SPSS, a statistical software package, to conduct descriptive analysis, analysis of variance (ANOVA), and analysis of covariance (ANCOVA) where appropriate. While the ANOVA was used to compare the means of groups of measurement data, the ANCOVA allowed the comparison of one variable in two or more groups taking into account (or to correct for) variability of other variables, called covariates. For the qualitative data, researchers used a grounded theory approach (Strauss & Corbin, 1990). They read and coded the open-ended survey questions to identify and document the salience and substance of the themes and sub-themes that surfaced about changes in participants’ experiences of the program and its impact on them.
KEY FINDINGS

The findings are organized by participants and draw on both the quantitative and qualitative data. The qualitative and quantitative research findings are integrated and presented in the following order:

1. Girls’ pre- and post-results
2. Girls’ post-survey question results
3. Mentors
4. Instructors
5. Teaching Assistants

Girls’ Pre- and Post-Results

There were 12 items in both the pre and post-surveys. In step 1, paired t-test was conducted to compare the pre- and post-survey differences in participants’ answers. There is statistically significant increase in the post survey scores on all items except items 7 [I am interested in a career in computer science/computer engineering.], 9 [I am interested in starting my own technology related company.], and 11 [I have been encouraged to take advanced classes in math and science.]. Table 2 shows results for the significant nine items.

Table 2. Means for Pre- and Post- Surveys

<table>
<thead>
<tr>
<th>Item</th>
<th>Pre mean</th>
<th>Post mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am confident using technology.</td>
<td>3.79</td>
<td>3.98</td>
<td>-.308, -.073</td>
<td>-3.192</td>
<td>167</td>
<td>.002</td>
</tr>
<tr>
<td>2. I know how to write computer programs.</td>
<td>2.00</td>
<td>3.02</td>
<td>-1.176, -.860</td>
<td>-12.745</td>
<td>167</td>
<td>.000</td>
</tr>
<tr>
<td>3. I am comfortable making presentations.</td>
<td>3.54</td>
<td>3.69</td>
<td>-.284, -.026</td>
<td>-2.367</td>
<td>167</td>
<td>.019</td>
</tr>
<tr>
<td>4. I know about entrepreneurship.</td>
<td>2.62</td>
<td>3.41</td>
<td>-.959, -.624</td>
<td>-9.337</td>
<td>167</td>
<td>.000</td>
</tr>
<tr>
<td>5. I know about the design process that engineers use to create products.</td>
<td>1.89</td>
<td>3.55</td>
<td>-1.853, -1.469</td>
<td>-17.066</td>
<td>167</td>
<td>.000</td>
</tr>
<tr>
<td>6. I know about user interface design.</td>
<td>1.68</td>
<td>3.54</td>
<td>-2.036, -1.667</td>
<td>-19.799</td>
<td>167</td>
<td>.000</td>
</tr>
<tr>
<td>8. I know what computer scientists and computer engineers do.</td>
<td>2.16</td>
<td>3.6</td>
<td>-.905, -.571</td>
<td>-8.732</td>
<td>167</td>
<td>.000</td>
</tr>
<tr>
<td>10. I have talked with someone about her/his job in technology.</td>
<td>3.04</td>
<td>4.00</td>
<td>-1.180, -.737</td>
<td>-8.547</td>
<td>167</td>
<td>.000</td>
</tr>
<tr>
<td>12. Adults have told me I should think about a career in technology.</td>
<td>3.45</td>
<td>3.65</td>
<td>-.376, -.029</td>
<td>-2.301</td>
<td>167</td>
<td>.023</td>
</tr>
</tbody>
</table>

In step 2, it was speculated that GRADE might make a difference in participants’ survey scores. GRADE in this study includes 9, 10, 11, and 12. Using GRADE as the co-variate...
for the post-survey score, the one-way analysis of variance (ANOVA) was conducted to compare the difference in the post-survey scores among the 4 different grades.

There are significant differences for item 1 [I am confident using technology.], (F(3, 164) = 2.62, p=.05), and item 12 [Adults have told me I should think about a career in technology.], (F(3, 164) = 3.21, p=.025). For item 1, the 12\textsuperscript{th} grade students are more confident using technology than the other groups; the 9\textsuperscript{th} grade students are the least confident. For item 12, it is mostly likely that adults have told the 12\textsuperscript{th} grade students to consider a career in technology and less likely they did so with the 9\textsuperscript{th} grade students. Table 3 shows key findings by grade levels.

Table 3. Mean, Standard Deviation for the Post-Survey Scores Among the Four Grades

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>95% Confidence Interval for Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>I am confident using technology.</td>
<td>9</td>
<td>28</td>
<td>3.75</td>
<td>.844</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>53</td>
<td>4.06</td>
<td>.908</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>59</td>
<td>3.86</td>
<td>.753</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>28</td>
<td>4.29</td>
<td>.713</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>168</td>
<td>3.98</td>
<td>.826</td>
</tr>
<tr>
<td>Adults have told me I should think about a career in technology.</td>
<td>9</td>
<td>28</td>
<td>3.36</td>
<td>1.193</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>53</td>
<td>3.87</td>
<td>1.161</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>59</td>
<td>3.37</td>
<td>1.496</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>28</td>
<td>4.11</td>
<td>.916</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>168</td>
<td>3.65</td>
<td>1.286</td>
</tr>
</tbody>
</table>

In step 3, using GRADE as co-variate, controlling the pre-survey score difference, a one-way analysis of covariance (ANCOVA) was conducted to find out if GRADE makes a significant difference in the post-survey scores. The independent variable, the girls’ grade level, included 9\textsuperscript{th}, 10\textsuperscript{th}, 11\textsuperscript{th}, and 12\textsuperscript{th} grades. The dependent variable was girls’ post-survey result and the covariate was their pre-survey scores.

The result is significant for item 7 [I am interested in a career in computer science/computer engineering.]. The underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by F (3, 164) = 3.35, p = .02 < .05. The ANCOVA result is significant F(3, 163) = 3.043, p = .03. In other words, by controlling the pre-survey differences among different grades, the 12\textsuperscript{th} grade students have the most interest in a career in computer science and computer engineering, while the 9\textsuperscript{th} grade has the least interest in a career in computer science and computer engineering. The following graph shows the differences among the 4 groups.
In step 4, it was speculated that RACE might make a difference in participants’ survey scores. RACE in this study includes Asian, Hispanic/Latina, White and Other. For the participants who completed both pre- and post- surveys, American Indian/Alaska Native only had 2, African American/Black had 12, and Other had 4. These 3 categories were combined as one category – Other in the analysis. Each cell had to have at least 20 subjects for the analysis to hold meaningful results. Using RACE as a covariate, steps 2 (ANOVA) and 3 (ANCOVA) were conducted to determine if there were significant differences among the following four different ethnic groups: Asian, Hispanic/Latina, White and Other.

The results from the ANOVA shows that there are statistical significances among the four different ethnic groups for the following four items:

- **Item 5: [I know about the design process that engineers use to create products.]** There were significant differences among the four ethnic groups for Item 5 (F(3, 164) = 2.94, p=.035). The multiple comparisons – Tukey HSD test showed that Asian (mean=3.62), Hispanic/Latina (mean=3.66), and White (mean=3.65) participants have significant higher knowledge scores on this item than participants in the Other ethnic category (mean=2.89).

- **Item 8: [I know what computer scientists and computer engineers do.]** There were significant differences among the four ethnic groups for Item 8 (F(3,164) = 4.12, p=.008). The multiple comparisons – Tukey HSD test showed significant differences among the following groups: Asian participants (mean = 3.82) have significant higher knowledge on this item than Hispanic/Latina participants (mean =3.29) with p = .03 and participants in the Other ethnic category (mean = 3.17) with p=.01.

- **Item 11: [I have been encouraged to take advanced classes in math and science.]** There were significant differences among the four ethnic groups for
Item 11 (F(3,164) = 5.31, p=.002). The multiple comparisons – Tukey HSD test showed significant differences among the following groups: Asian participants (mean = 4.35) have significant higher knowledge on this item than Hispanic/Latina participants (mean =3.71) with p = .01. Asian participants (mean = 4.35) have significant higher knowledge on this item than participants in the Other ethnic category (mean = 3.44) with p=.008.

The results from the ANCOVA show that there are significant differences among the four ethnic groups in the following two items:

- **Item 5: [I know about the design process that engineers use to create products.]**
  The underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by F (3, 164) = 2.872, p = .04 < .05. The ANCOVA result is significant F(3, 163) = 2.695, p = .048. These results indicate that by controlling the pre-survey scores difference, Asian (mean=3.62), Hispanic/Latina (mean=3.66), and White (mean=3.65) participants have significant higher knowledge scores in this item than participants in the Other category (mean=2.89).

- **Item 8: [I know what computer scientists and computer engineers do.]** The underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by F (3, 164) =2 .303, p = .079 > .05. The ANCOVA result is significant F(3, 163) = 3.221, p = .024. It means that by controlling the pre-survey scores differences, Asian participants (mean = 3.82) have significant higher knowledge on this item than Hispanic/Latina participants (mean =3.29) with p = .03. Asian participants (mean = 3.82) have significant higher knowledge on this item than participants in the Other category (mean = 3.17) with p=.01.
In step 5, it was speculated that SITE might make a difference in participants’ survey scores. SITE in this study includes Google Inc. in New York City, Google Inc. in San Francisco, Google Inc. in Mountain View, LinkedIn in Mountain View, Iridescent Science Studio in Los Angeles, and Berkeley Wireless Research Center in Berkeley. Two programs, which were held on Mondays/Wednesdays and Tuesdays/Thursdays at the Berkeley Wireless Research Center, had less than 20 participants. The two programs were combined into a one program in order to make the quantitative analysis meaningful. Using the SITE as the covariate, steps 2 (ANOVA) and 3 (ANCOVA) were conducted to test if there were significant differences among the following six sites: Google Inc. in New York City, Google Inc. in San Francisco, Google Inc. in Mountain View, LinkedIn in Mountain View, Iridescent Science Studio in Los Angeles, and Berkeley Wireless Research Center.

The results from the ANOVA show that there were significant differences between Google Inc. in New York City and LinkedIn in Mountain View on item 2 [I know how to write computer programs.], $F(5, 167) = 2.62, p = .026$. Participants at Google Inc. in New York City (mean=2.45) have significantly lower score on this item than participants at LinkedIn in Mountain View (mean=3.45) ($p=.009$).
The results from the ANOVA show that there were significant differences between Google Inc. in New York City and LinkedIn in Mountain View on item 5 [I know about the design process that engineers use to create products.], F (5, 167) = 3.5, p = .005. Participants at Google Inc. in New York City, (mean=2.95) have significantly lower score on this item than participants at LinkedIn in Mountain View (mean=3.9) (p=.012).

The results from the ANOVA show that there were significant differences between Google Inc. in New York City and the other sites on item 6 [I know about user interface design.], F (5, 167) = 5.286, p = .000. Participants at Google Inc. in New York City (mean=2.9) have significantly lower score on this item than participants at the other sites.
The results from the ANOVA show that there were significant differences between Google Inc. in New York City and LinkedIn in Mountain View on item 11 [I have been encouraged to take advanced classes in math and science.], F (5, 167) = 3.422, p = .006. Participants at Google Inc. in New York City (mean=3.6) have significantly lower score on this item than participants at LinkedIn in Mountain View (mean=4.52) (p=.042).

The results from the ANOVA show that there were significant differences among the following sites: Google Inc. in San Francisco, LinkedIn in Mountain View, and Google Inc. in Mountain View on item 11 [Adults have told me I should think about a career in technology], F (5, 167) = 2.675, p = .024. Participants at Google Inc. in San Francisco (mean=3.09) have significantly lower score on this item than participants at both LinkedIn and Google Inc. in Mountain View (mean=4.00) (p=.023).
The results from the ANCOVA show that there were significant differences on the following items:

- **Item 2: [I know how to write computer programs.]].** The underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by $F(5, 162) = .383, p = .86 > .05$. The ANCOVA result is significant $F(3, 163) = 2.384, p = .04$. Pairwise comparisons showed that participants at Google Inc. in New York City (mean=2.373) have significantly lower knowledge in writing computer programs than participants at the other sites (Google Inc., San Francisco, mean=3.032, $p = .007$; Google Inc., Mountain View, mean = 2.986, $p = .008$; LinkedIn, Mountain View, mean=3.435, $p = .000$; Iridescent Science Studio, Los Angeles, mean=3.115, $p = .008$; Berkeley Wireless Research Center, mean=2.979, $p = .024$). Participants at Google Inc. in Mountain View (mean = 2.986) have significantly lower knowledge in writing computer programs than participants at LinkedIn in Mountain View (mean=3.435, $p = .024$).
Item 4: [I know about entrepreneurship]. The underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by F (5, 162) =1.772, p = .121 > .05. The ANCOVA result is significant F(5, 161) = 2.294, p = .048. Pairwise comparisons showed that participants at Google Inc. in San Francisco (mean= 3.103) have significantly lower knowledge about entrepreneurship than participants at Google Inc. in Mountain View (mean= 3.545, p=.037), LinkedIn in Mountain View (mean= 3.65, p=.018), and Iridescent Science Studio in Los Angeles (mean=3.719, p=.022). Participants at Berkeley Wireless Research Center (mean=3.13) have significantly lower knowledge about entrepreneurship than participants at LinkedIn in Mountain View (mean= 3.65, p=.045), and Iridescent Science Studio in Los Angeles (mean=3.719, p=.048).
Item 5: *I know about the design process that engineers use to create products.*

The underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by $F(5, 162) = .569, p = .723 > .05$. The ANCOVA result is significant $F(3, 163) = 3.304, p = .007$. Pairwise comparisons showed that participants at Google Inc. in New York City (mean=2.958) have significantly lower knowledge in design process that engineers use to create products than participants at the following sites (Google Inc. in Mountain View, mean=3.633, $p = .011$; LinkedIn in Mountain View, mean=3.883, $p = .001$; Iridescent Science Studio in Los Angeles, mean=3.809, $p = .008$; Berkeley Wireless Research Center, mean=3.733, $p = .012$). Participants at Google Inc. in San Francisco (mean=3.234) have significantly lower knowledge in design process that engineers use to create products than participants at LinkedIn in Mountain View (mean=3.883, $p = .010$), and Iridescent Science Studio in Los Angeles (mean=3.809, $p = .049$).
Item 6: [I know about user interface design.]. The underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by F (3, 164) = .382, p = .861 > .05. The ANCOVA result is significant F(3, 163) = 5.154, p = .000. Pairwise comparisons showed that participants at Google Inc. in New York City (mean=2.934) have significantly lower knowledge in user interface design than participants at the following sites (Google Inc. in Mountain View, mean = 3.684, p = .004; LinkedIn in Mountain View, mean=3.808, p = .001; Iridescent Science Studio in Los Angeles, mean=4.155, p = .000). Participants at Google Inc. in San Francisco (mean = 3.136) have significantly lower knowledge in user interface design than participants at the following sites (Google Inc. in Mountain View, mean = 3.684, p = .013; LinkedIn in Mountain View, mean=3.808, p = .005; Iridescent Science Studio in Los Angeles, mean=4.155, p = .000). Participants at Berkeley Wireless Research Center (mean=3.488) have significantly lower knowledge in user interface design than participants at Iridescent Science Studio in Los Angeles (mean=4.155, p = .029).
Girls’ Post-Survey Question Results

The survey questions being analyzed in this section were only answered in the post-survey. The one-way analysis of variance (ANOVA) is used to compare if there are significant differences among the groups. The grouping factors are GRADE (9th, 10th, 11th, 12th), RACE (Asian, Hispanic/Latina, White, Other), and SITE (Google Inc. in NYC, Google Inc. in San Francisco, Google Inc. in Mountain View, LinkedIn in Mountain View, Iridescent Science Studio in Los Angeles, and Berkeley Wireless Research Center in Berkeley).

It is important to note that there were 50% of Asian students participating in this phase of the study. Table 4 shows the breakdown by ethnic groups.

Table 4. Ethnic Groups

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>1</td>
<td>.6</td>
</tr>
<tr>
<td>African American/Black</td>
<td>14</td>
<td>7.8</td>
</tr>
<tr>
<td>Asian</td>
<td>90</td>
<td>50.3</td>
</tr>
<tr>
<td>Hispanic/Latina</td>
<td>38</td>
<td>21.2</td>
</tr>
<tr>
<td>Native Hawaiian/Other Pacific Islander</td>
<td>1</td>
<td>.6</td>
</tr>
<tr>
<td>White</td>
<td>23</td>
<td>12.8</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>5.0</td>
</tr>
<tr>
<td>Total</td>
<td>176</td>
<td>98.3</td>
</tr>
<tr>
<td>Missing System</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>179</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Some of the ethnic groups have small cell sizes. As a result, we combine them into the Other category, which represents American Indian/Alaska Native, African American/Black, Native Hawaiian/Other Pacific Islander, and Other. The new distribution of the different ethnic groups is presented in Table 5.

Table 5. New Ethnic Group Distribution

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Asian</td>
<td>90</td>
<td>50.3</td>
</tr>
<tr>
<td>Hispanic/Latina</td>
<td>38</td>
<td>21.2</td>
</tr>
<tr>
<td>White</td>
<td>23</td>
<td>12.8</td>
</tr>
<tr>
<td>Other</td>
<td>25</td>
<td>14.0</td>
</tr>
<tr>
<td>Total</td>
<td>176</td>
<td>98.3</td>
</tr>
<tr>
<td>Missing System</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>179</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Two programs at the Berkeley Wireless Research Center in Berkeley had less than 20 participants. The two sites were combined for the analysis. Table 6 shows the number of participants at each site.

Table 6. Technovation Challenge Sites

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Google Inc., SF</td>
<td>38</td>
<td>2.11</td>
<td>.727</td>
</tr>
<tr>
<td>4. LinkedIn, Mountain View</td>
<td>30</td>
<td>2.10</td>
<td>.662</td>
</tr>
<tr>
<td>5. Iridescent Science Studio, LA</td>
<td>18</td>
<td>1.56</td>
<td>.511</td>
</tr>
<tr>
<td>6. Berkeley Wireless Research Center</td>
<td>23</td>
<td>1.91</td>
<td>.596</td>
</tr>
<tr>
<td>Total</td>
<td>179</td>
<td>2.01</td>
<td>.662</td>
</tr>
</tbody>
</table>

The results from the descriptive analysis of the girls’ post-surveys show that the program has a very positive impact on them. They said that as a result of participating in the Technovation Challenge program, they believe a career in technology is a good career for women (94%), know more about different kinds of careers (89%), learn that team work is good for solving problems (89%), know more about programming concepts (88%), feel more confident (81%), are more comfortable troubleshooting problems (79%), can see themselves in a career in technology (75%), are more interested in working in a career in technology (75%), are considering studying computer science or engineering in college (70%), and know more about how to prepare for college (68%).

The results from the ANOVA show that there were statistical significances on the following items:
- **Item: [Because of the Technovation Challenge, I feel more confident.].** There were statistically significant differences among the six sites on this item ($F(5, 173) = 2.72, p = .02 < .05$). The post hoc tests show that significant differences exist between Google Inc. in San Francisco and Iridescent Science Studio in Los Angeles ($p = .04$), and Google Inc. in Mountain View and Iridescent Science Studio in Los Angeles ($p = .01$). The following graph shows the differences.

- **Item: [Because of the Technovation Challenge, I am more comfortable troubleshooting problems.].** There were statistically significant differences among the six sites on this item ($F(5, 173) = 3.005, p = .01 < .05$). The post hoc tests demonstrate that significant differences exist between Google Inc. in San Francisco and Iridescent Science Studio in Los Angeles ($p = .017$), and Google Inc. in San Francisco and Berkeley Wireless Research Center ($p = .041$).
Item: [Because of the Technovation Challenge, I know more about programming concepts.]. There were statistically significant differences among the four ethnic groups (F(3, 175) = 3.315, p = .021 < .05). The post hoc tests show that Asian participants (mean=1.89) have significantly higher score on this item than the Hispanic/Latina participants (mean=1.47).

Item: [Because of the Technovation Challenge, I know more about programming concepts.]. There were statistically significant differences among the six sites on this item (F(5, 173) = 4.059, p = .002 < .05). The post hoc tests indicate that significant differences exist between Google Inc. in San Francisco and Iridescent Science Studio in Los Angeles (p = .004), Google Inc. in San Francisco and Berkeley Wireless Research Center (p = .022), and Google Inc. in Mountain View and Iridescent Science Studio in Los Angeles (p = .027).
○ Item: [Because of the Technovation Challenge, I am considering studying computer science or engineering in college.] There were statistically significant differences among the four ethnic groups on this item ($F(3, 175) = 6.84, p = .00 < .05$). The post hoc tests show that Hispanic/Latina participants (mean=1.84) have significantly lower score on this item than participants from all the other three ethnic groups (Asian=2.31, White=2.65, Other=2.04).

○ Item: [Because of the Technovation Challenge, I am considering studying computer science or engineering in college.] There were statistically significant differences among the six sites on this item ($F(5, 173) = 5.618, p = .00 < .05$). The post hoc tests show that significant differences exist between Google Inc. in San Francisco and Iridescent Science Studio in Los Angeles ($p = .001$), Google Inc. in San Francisco and Berkeley Wireless Research Center ($p = .002$), Google Inc. in Mountain View and Iridescent Science Studio in Los Angeles ($p = .008$), Google Inc. in Mountain View and Berkeley Wireless Research Center ($p = .021$), and
Linked Inc. in Mountain View and Iridescent Science Studio in Los Angeles (p = .045).

- **Item: [Because of the Technovation Challenge, I am considering studying computer science or engineering in college.].** There were statistically significant differences among the six sites on this item (F(5, 173) = 2.889, p = .016 <.05). The post hoc tests show that significant differences exist between Linked Inc. in Mountain View and Iridescent Science Studio in Los Angeles (p = .025).

- **Item: [Because of the Technovation Challenge, I know more about different kinds of careers.].** There were statistically significant differences among the six sites on this item (F(5, 173) = 3.017, p = .012 <.05). The post hoc tests show significant differences exist between Google Inc. in New York City and Google Inc. in San Francisco (p=.013), and Google Inc. in San Francisco and Berkeley Wireless Research Center (p=.037).
o Item: [Because of the Technovation Challenge, I am more interested in working in a career in technology.] There were no statistically significant differences among the four grades on this item (F(3, 175) = 3.251, p = .023 > .05). The post hoc tests demonstrate that pairwise significant differences were found between the 9th & 12th (p=.048), the 11th and 12th grades (p=.037).

o Item: [Because of the Technovation Challenge, I am more interested in working in a career in technology.] There were statistically significant differences among the six sites on this item (F(5, 173) = 2.538, p = .03 < .05). The post hoc tests show that significant differences exist between Linked Inc. in Mountain View and Berkeley Wireless Research Center (p=.05).
Item: [Because of the Technovation Challenge, I believe a career in technology is a good career for women.]. There were statistically significant differences among the four ethnic groups on this item (F(3, 175) = 3.145, p = .027 < .05). The post hoc tests show that Asian participants (mean = 1.73) have significantly higher score on this item than Hispanic/Latina participants (mean = 1.39).
MENTORS

Forty-one mentors completed the survey. Descriptive analysis conducted on the teaching assistants’ surveys shows that most participants were White (56%) and Asian (27%). Table 7 presents the race/ethnic backgrounds of the mentors.

Table 7. Mentors’ Race/Ethnicity

<table>
<thead>
<tr>
<th>Race</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American/Black</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td>Asian</td>
<td>11</td>
<td>26.8</td>
</tr>
<tr>
<td>Hispanic/Latina</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td>Hispanic/Latina, White</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td>Native Hawaiian/Other Pacific Islander</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td>White</td>
<td>23</td>
<td>56.1</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>100</td>
</tr>
</tbody>
</table>

Overall these mentors’ prior mentoring experiences were quite limited. About half of the participants had 1-2 times mentoring experience, and 24% had no mentoring experience. Table 8 shows the summary of their prior mentoring experience before participating in the Technovation Challenge program.

Table 8. Mentoring Experience Before Technovation

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>24.4</td>
</tr>
<tr>
<td>1-2 times</td>
<td>46.3</td>
</tr>
<tr>
<td>3-5 times</td>
<td>14.6</td>
</tr>
<tr>
<td>6 or more times</td>
<td>12.2</td>
</tr>
<tr>
<td>Other</td>
<td>2.4</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Most of the mentors indicated that the Technovation Challenge program helped them improve their skills. It offered the opportunity to engage girls in technology (95%), network with women working in technology (95%), increase their knowledge of entrepreneurship (83%), learn to be effective mentors (88%), and improve their technical skills (63%). The results are summarized in Table 9.

Table 9. Mentor’s skills development through Technovation

<table>
<thead>
<tr>
<th>Your technical skills n(%)</th>
<th>How to be an effective mentor n(%)</th>
<th>To engage girls in technology n(%)</th>
<th>Entrepreneurship n(%)</th>
<th>Your network of women working in technology n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>5(12.2)</td>
<td>8(19.5)</td>
<td>24(58.5)</td>
<td>13(31.7)</td>
</tr>
<tr>
<td>Agree</td>
<td>21(51.2)</td>
<td>28(68.3)</td>
<td>15(36.6)</td>
<td>21(51.2)</td>
</tr>
<tr>
<td>Disagree</td>
<td>13(31.7)</td>
<td>4(9.8)</td>
<td>1(2.4)</td>
<td>6(14.6)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>2(4.9)</td>
<td>1(2.4)</td>
<td>1(2.4)</td>
<td>1(2.4)</td>
</tr>
</tbody>
</table>

1 The mentor data were not organized by program site because the number of the mentors for each site is comparatively small for statistical analysis.
Most of the mentors thought that the following program components were effective: guest speakers (73%), promoting girls in technology-related fields (88%), curriculum (76%), mentor (76%), and program structure (52%). The results are presented in the following table.

Table 10. Mentor’s Assessment of Program effectiveness

<table>
<thead>
<tr>
<th></th>
<th>The program to promote girls in technology-related fields n(%)</th>
<th>The curriculum n(%)</th>
<th>The career exploration activity n(%)</th>
<th>The college advising activity n(%)</th>
<th>The guest speakers n(%)</th>
<th>The program structure n(%)</th>
<th>As a mentor n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very effective</td>
<td>14(34.1)</td>
<td>8(19.5)</td>
<td>8(19.5)</td>
<td>3(7.3)</td>
<td>9(22)</td>
<td>9(22)</td>
<td>12(29.3)</td>
</tr>
<tr>
<td>Effective</td>
<td>22(53.7)</td>
<td>9(22)</td>
<td>11(26.8)</td>
<td>8(19.5)</td>
<td>21(51.2)</td>
<td>12(29.3)</td>
<td>19(46.3)</td>
</tr>
<tr>
<td>Somewhat effective</td>
<td>4(9.8)</td>
<td>10(24.4)</td>
<td>9(22)</td>
<td>13(31.7)</td>
<td>9(22)</td>
<td>17(41.5)</td>
<td>7(17.1)</td>
</tr>
<tr>
<td>Minimally effective</td>
<td>1(2.4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not effective</td>
<td>1(2.4)</td>
<td>4(9.8)</td>
<td>8(19.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to the mentors, the curriculum and instruction could be improved in the following ways:

- Have the activities about defining users and their needs done throughout the implementation of the entire curriculum.
- Pack every session with curricular activity from beginning to end so that participants are prepared for the amount/pace of work that the final project requires.
- Limit lecture time to no more than 15 minutes at a stretch and provide more hands-on and interactive activities.
- Check whether the program’s curriculum assumptions for these girls (e.g. the girls want to go to college, had rich experience with smart phones) are valid.
- Eliminate the “tea parties” or the name of this activity.
- Provide more time for the girls to practice in depth and understand the fundamentals, work on their apps, get more guidance on what final products should look and feel like, and finish their projects.
- Extend curriculum from 9 to 10 weeks.
- Integrate the entrepreneurship and business aspect of the curriculum.
- Combine together college advising activity and career exploration activity.
- Avoid planning classes during spring breaks and deal with attendance.
- Provide more focus on coding concepts, examples of coding, and examples of programming concepts.
- Require intermediate deadlines for the following products: summary of the app idea, business plan, demonstration, and pitch.
- Have the guest speakers at the beginning of the program.
- Make the program description more clearly about product design and pitching.
- Have a more systemic evaluation process for deciding what app to pick after brainstorming.
- Train the girls on debugging their applications.
o Ensure there is a connection between most of the high-level principles and the application.

Most mentors would you like to see the following items changed about the career exploration activity:
  o Need more time to talk about their careers and engage in Q&A sessions.
  o Provide online information about the mentors and let the girls pick what they would like to know.
  o Establish more efficient rotation and exposure to the mentors.
  o Match girls’ career interests and mentors’ expertise.
  o Have the girls think about STEM careers before the session.
  o Offer internships/ summer jobs to the girls with Google to explore the real world of app development.

Most mentors would you like to see the following items changed about the college advising activity:
  o Avoid having advising done by college freshman TAs.
  o Introduce each mentor and TAs educational experience and then have the girls go around and talk to the ones they find interesting to them.
  o Have them talk about actual school choice and personal experience.
  o Hold the college advising activity toward the end of the program.
  o Have counselors give a talk to the girls about courses to take in high school, how to write personal statement, how to get ready for college, show the girls samples of college’s computer science curricula, etc.

Most mentors would you like to see the following items changed about the guest speaker presentations:
  o Move this activity toward the beginning of the program.
  o Have them prepared about the audiences that they are going to address and be sensitive to issues of gender, culture, and underserved communities.
  o Vet the guest speakers’ plans with the instructors or some staff member to make sure it aligns with the program activities.
  o Have the girls prepare questions to ask the guest speakers.
  o Make sure they respect the time allotted for their presentations.
  o Focus on women who are actually creating technology and have technical backgrounds as guest speakers.

Most mentors would you like to see the following items changed about the program structure:
  o Have more time to get App Inventor setup.
  o Have more time to network with other mentors during the program.
  o Reduce the time spent on learning support in each session and team meetings.
  o Reduce the time dedicated to the tea parties.
  o Provide more time for building the apps.
  o Have few expert TAs who help all the teams with App Inventor setup and exercises.
o Use some rigorous criteria to select the girls.
o Have the business/entrepreneurship instruction woven throughout the program.
o Create less regimented lesson structure.
o Provide the girls with more examples and time to experiment with the phones to determine what types of apps are available and what they typically look like.
o Have a "reunion" and/or have a way to help the girls stay in touch.
o Be clear about the mentor's role and responsibilities.

Box 1: Suggested Program Structure

Lesson 1: Introduction
Lesson 2: Design Thinking, Events and Variables
Lesson 3: Brainstorming and Teamwork
Lesson 4: Databases and Animation
Lesson 5: User Interface Design
Lesson 6: Prototypes, Lists and Loops
Lesson 7: Conditionals and Multiple Screens
Lesson 8: work on Apps
Lesson 9: Work on App
Lesson 10: Work on App
Lesson 11: Work on App
Lesson 12: Work on App
Lesson 13: Entrepreneurship, Business Plans and Work on App
Lesson 14: Presentation Skills and Work on App
Lesson 15: Finalize Presentations and Work on App
Lesson 16: Career Exploration and College Q&A
Lesson 17: Dress Rehearsal
Session 18: Pitch Night

Most mentors noted that the instructors supported their teams and programs in the following ways:
o Being enthusiastic and knowledgeable about the material.
o Providing one-to-one interaction and feedback.
o Ensure the girls have all the necessary tools and resources.
o Keeping the information flow thorough and timely.
o Keeping girls focused on their tasks.
o Troubleshooting problems with App Inventor.
o Simplifying programming concepts for the girls.
o Engaging the girls and dealing with classroom management issues.

They indicated that the instructors could have done the following activities better:
o Arriving in class on time.
o Keeping the course focused and fast-paced.
o Sending regular emails about deliverables.
o Being sensitive to the challenges women face in the STEM field.
o Less reading from the slides and engaging more actively with the group.
They felt that their TAs supported their teams. Here are some of the ways that the TAs supported them during the program:

- Provided programming resource.
- Related to the girls by acting as good listeners and problem solvers.
- Helped in the management of classes.
- Encouraged the girls to participate.

They also acknowledged that the TAs could improve in the following areas:

- Get TAs to commit to the entire course duration.
- Ensure they are comfortable in this type of learning environment.

Most mentors and teams faced the following challenges:

- Faced difficulties deciding on a final app.
- Spent a lot of time determining what features to include.
- Faced challenges in time managing the program.
- Could not deal with some TAs and girls dropping out, being absent, and coming to classes late.
- Had limited time for programming.
- Had no access to spaces capable of accommodating large group activities.
- Had no online materials available for the girls.
- Needed more time for the girls to finish their projects.
- Was hard to get all the work done in time for the pitch.

The mentors suggested that staff could offer the following solutions in order to alleviate these challenges:

- Provide more time for key activities.
- Have the girls start working on their apps early in the process.
- Emphasize that the girls submit initial drafts of their business plans and presentations.
- Conduct pre- and post-follow-up sessions with the girls.
- Ensure that teams have participants with some technology expertise.
- Require clear milestones each week.
- Set team ground rules and expectations upfront.
- Provide more coaching around common mentoring situations.
- Facilitate communications within teams outside of class.

Their best practices as mentors include:

- Provided gentle nudges to the girls to keep them engaged and focused.
- Managed team dynamics by making sure all participants present their perspectives.
- Allowed the girls to think for themselves and sort out best decisions.
- Let them explore and learn on their own.
- Built trust among participants.
o Treated the girls as adults.
o Ensure they understand what they were coding.
o Pushed them to participate in class.
o Made sure to arrive on time and not be absent.
o Used humor to diffuse tense situations.
o Built rapport with each student.
o Stayed neutral during discussion and kept an open-minded approach.
o Met with the girls after class.

They would like to receive the following types of support in the future:
  o Plan the expectations for mentors on a per session basis.
o Create a mentor manual.
o Decide on the agenda in advance.
o Communicate clear expectations around absences and tardiness.
o Have access to sample presentations.
o Have intermediate deadlines and more time to do the work.
o Provide additional support for managing all the logistics.
o Help in facilitating team discussions.
o Provide clear guidance about how to support the implementation of the class.

Most of the mentors said that they are interested in participating in next year’s program (89%) and assisting Iridescent recruit students (74%).
INSTRUCTORS

Five out of seven instructors participated in this study. They are from various ethnic backgrounds (2 African-Americans, 2 White, and 1 Asian) and Technovation settings (Los Angeles, Berkeley, San Francisco, New York City, Mountain View); and seem to have some prior experience teaching and perceive themselves as effective instructors.

Most of these instructors agreed that Technovation increased or refreshed their technical skills, provided support on how to be an effective instructor, increased their ability to engage girls in technology, increased their knowledge about entrepreneurship, and expanded their network of women working in technology.

Most of them indicated that Technovation is effective in promoting girls in technology-related fields, and supporting college advisement activity.

“Overall, I think the curriculum gives the girls a solid introduction to programming and entrepreneurship as is.”

While they found the overall program structure to be effective and indicated that they are interested in participating in the Technovation Challenge next year, they felt that the curriculum, instructor training, and guest speakers to be somewhat effective. They indicated that the overall communication and support from staff was effective.

“It was always very easy to get a hold of fellow staff members; they were all quite prompt at returning emails and/or phone calls. It was also very clear that everyone was quite committed and dedicated to the program, so I consistently felt that my questions were given thought and answered thoroughly.”

To continue to improve the program’s communication and support, the instructors suggested the following ideas:

- Provide more event details about guest speakers and transportation
- Give a little more thought to communication with people involved in the program who are not Iridescent staff members
- Coordinate better communication between program staff, instructors, and TAs in order to create transparency and alignment of roles and responsibilities.
- Use blog to store instructors’ reflections
- Provide all the information about the implementation of the activities and critical materials early on in the process (e.g., timing of pitch night, document cameras, slides for classes).

The instructors shared the most significant influences of the Technovation Challenge on them personally and professionally. They felt that their experiences with the Technovation program were rewarding and broadened their professional networks such STEM mentors and members of the business community.
“I really enjoyed having the opportunity to touch the lives of the girls in this program. Even if the girls I taught don't end up majoring in Computer Science or pursuing engineering as a profession, I think that their involvement in this program gave them some excellent tools for their future experiences in college, the working world, and beyond. I feel honored to have helped provide these girls with those tools. Being a part of the Technovation Challenge reaffirmed my desire to reach out to young computer scientists -- especially women -- in this way.”

They suggested the following changes to the curriculum:
- Personalize the lessons.
- Reorder the curriculum sequence and include intermediate milestones during the team meeting prompts. One example is to have the college advising activity before the career exploration activity.
- Make the curriculum more technically rigorous.
- Focus more in-depth learning as you expose them to the same curriculum breadth.

They would you like to see the career exploration activity be changed in the following ways:
- Designate more time for all mentors to share their careers and experiences with the girls.
- Form a single mentor panel and have them take a few minutes to talk about their careers and share pictures of their work and work place.
- Provide the girls the opportunity to ask questions.
- Provide support in classroom management.
- Provide a way to monitor time during activities (e.g., a displayed countdown clock).

They would you like to see the college advising activity be improved in the following ways:
- Provide TAs’ college, major(s) and minor(s) to participating girls.
- Encourage the girls to ask TAs questions about college or course of study.
- Have TAs share information about their college life.
- Invite college counselors to some of the sessions.
- Ensure the girls have opportunities to interact with all the TAs.

They would you like to see the guest speaker presentations be changed in the following ways:
- Plan the guest speakers’ program early on in the process.
- Provide guest speakers information about how the program works, the girls’ background and interests, and what would be useful for their prototypes and business plans.
- Have them use their own PowerPoint slides.

They would you like to see the program structure be improved in the following ways:
- Increase class periods to three hours.
o Include more demos in lectures.
o Have students engage in more hands-on activities.
o Provide more support to the mentors.

They believe that the mentors are critical to the program. In addition to doubling as project managers for each team, they provided support to the TAs and girls. Specifically, they helped the girls complete their projects and provided them feedback about their presentation skills, helped them see the big picture, and assisted them in understanding the overall goals of the program.

“[They] were an asset. Without them I don't think the girls would be able to come up with projects, actualize them & pitch. They are essential.”
“I really saw the mentors mentoring the TAs in a way that was delightful and heartwarming.”

“The mentors in my class worked as hard as the TAs and carried the same responsibilities as the TAs.”

They recommended that the mentors adopt the following practices: have mentors review lecture slides before the lesson, and try out the tutorials on their own time to make sure everything makes sense.

Most instructors believe that the TAs are critical to the implementation of the program. As the mentors, they were a rich resource for the girls. They helped them understand the coding concepts, troubleshoot issues and complete their projects, and acquire presentation skills.

The instructors suggested that the TAs be reminded that the classes are for the girls.

“There were many times when a single team would need additional help understanding a concept or fixing a bug in their code, and when I'd ask a question, that team's TA would immediately answer it instead of letting the girls think critically and try to understand the answer for themselves.”

They faced the following challenges during the implementation of their programs:
o Recruitment of TAs, mentors, students, and guest speakers.
o Few TAs and mentors were not the best fit with the program.
o There was not enough time to complete the work.
o Lack of input about the structure of the program.

They believe that the staff should implement the following programmatic changes to alleviate these challenges:
o Recruit TAs, mentors, students, and guest speakers early in the process.
o Incorporate some sort of technical and/or business aptitude questions into the instructor, TA, and mentor recruiting/interview process.
Include previous year's instructor and/or program coordinator in the interview process for TAs and mentors.
Provide strategies for instructors to shape the delivery of the program.

Their best practices as instructors include:
- Had regular communication with the girls, TAs, and mentors.
- Provide positive feedback to the girls, TAs, and mentors.
- Use presentation slides when necessary.

They would like to have the following types of support in the future:
- Identify the Iridescent contact person at each site prior to the start of the program.
- Need help in getting the girls to utilize their work time wisely.

They believe that the instructor training should be improved in the following ways:
- Provide enough time to instructors for the personalization of the slides.
- Require that the instructors, TAs, and mentors experiment with the technology and complete the tutorials before the training.

Most of the instructors are not interested in helping Technovation staff recruit students.
TEACHING ASSISTANTS

Forty-six teaching assistants completed the survey. Descriptive analysis conducted on the teaching assistants’ surveys shows that most participants were Asian (44%) and African-Americans (28%). Table 11 presents the race/ethnic backgrounds of the teaching assistants.

Table 11. Teaching Assistants Race/Ethnicity

<table>
<thead>
<tr>
<th>Race</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American/Black</td>
<td>13</td>
<td>28.3</td>
</tr>
<tr>
<td>African American/Black, White</td>
<td>1</td>
<td>2.2</td>
</tr>
<tr>
<td>Asian</td>
<td>20</td>
<td>43.5</td>
</tr>
<tr>
<td>Asian, White</td>
<td>1</td>
<td>2.2</td>
</tr>
<tr>
<td>Hispanic/Latina</td>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td>Hispanic/Latina, White</td>
<td>1</td>
<td>2.2</td>
</tr>
<tr>
<td>Native Hawaiian/Other Pacific Islander</td>
<td>1</td>
<td>2.2</td>
</tr>
<tr>
<td>White</td>
<td>7</td>
<td>15.2</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>100</td>
</tr>
</tbody>
</table>

Most of the teaching assistants are college students (76.1%). Table 12 presents the education backgrounds of the participants.

Table 12. Teaching Assistants Education Background

<table>
<thead>
<tr>
<th>Education Background</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>College Graduate</td>
<td>1</td>
<td>2.2</td>
</tr>
<tr>
<td>College student</td>
<td>35</td>
<td>76.1</td>
</tr>
<tr>
<td>Graduate student</td>
<td>4</td>
<td>8.7</td>
</tr>
<tr>
<td>High school student</td>
<td>6</td>
<td>13.0</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Most of them did not have prior experience in teaching assistantship (65.2%). Table 13 shows the participants’ prior experience in being teaching assistants.

Table 13. Teaching Assistant Experience Before Technovation

<table>
<thead>
<tr>
<th>Experience Before Technovation</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 times</td>
<td>30</td>
<td>65.2</td>
</tr>
<tr>
<td>1-2 times</td>
<td>10</td>
<td>21.7</td>
</tr>
<tr>
<td>3-5 times</td>
<td>5</td>
<td>10.9</td>
</tr>
<tr>
<td>6 or more times</td>
<td>1</td>
<td>2.2</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The TA data were not organized by program site because the number of the mentors for each site is comparatively small for statistical analysis.
Most of the teaching assistants indicated that the Technovation program helped them network with women working in technology (96%), expand their knowledge about technical careers (96%), engage girls in technology (94%), increase their knowledge of entrepreneurship (86%), be effective teaching assistants (80%), and improve their technical skills (74%). The results are summarized in the following table.

Table 14. Teaching Assistants Skill Development

<table>
<thead>
<tr>
<th></th>
<th>n(%)</th>
<th>How to be an effective TA n(%)</th>
<th>To engage girls in technology n(%)</th>
<th>Entrepreneurship n(%)</th>
<th>Your network of women working in technology n(%)</th>
<th>Technical careers n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>3(6.5)</td>
<td>8(17.4)</td>
<td>13(28.3)</td>
<td>13(28.3)</td>
<td>13(28.3)</td>
<td>21(45.7)</td>
</tr>
<tr>
<td>Agree</td>
<td>31(67.4)</td>
<td>29(63)</td>
<td>30(65.2)</td>
<td>27(58.7)</td>
<td>31(67.4)</td>
<td>23(50)</td>
</tr>
<tr>
<td>Disagree</td>
<td>11(23.9)</td>
<td>8(17.4)</td>
<td>2(4.3)</td>
<td>5(10.9)</td>
<td>2(4.3)</td>
<td>2(4.3)</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>1(2.2)</td>
<td>1(2.2)</td>
<td>1(2.2)</td>
<td>1(2.2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Most of the teaching assistants assessed most of the program components as being effective: the guest speakers (78%), their effectiveness as TA (77%), the career exploration activity (56%), promoting girls in technology-related fields (52%), and the program structure (52%). The results are presented in the following table.

Table 15. Teaching Assistants’ Assessment of Program Effectiveness

<table>
<thead>
<tr>
<th></th>
<th>The program to promote girls in technology-related fields n(%)</th>
<th>The curriculum n(%)</th>
<th>The career exploration activity n(%)</th>
<th>The college advising activity n(%)</th>
<th>The guest speakers n(%)</th>
<th>The program structure n(%)</th>
<th>As a TA n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very effective</td>
<td>10(21.7)</td>
<td>5(10.9)</td>
<td>10(21.7)</td>
<td>4(8.7)</td>
<td>13(28.3)</td>
<td>3(6.5)</td>
<td>14(30.4)</td>
</tr>
<tr>
<td>Effective</td>
<td>14(30.4)</td>
<td>17(37)</td>
<td>16(34.8)</td>
<td>14(30.4)</td>
<td>23(50)</td>
<td>21(45.7)</td>
<td>19(46.3)</td>
</tr>
<tr>
<td>Somewhat effective</td>
<td>18(39.1)</td>
<td>20(40.3)</td>
<td>16(34.8)</td>
<td>23(50)</td>
<td>8(17.4)</td>
<td>17(37)</td>
<td>10(21.7)</td>
</tr>
<tr>
<td>Minimally effective</td>
<td>3(6.5)</td>
<td>4(8.7)</td>
<td>3(6.5)</td>
<td>2(4.3)</td>
<td>2(4.3)</td>
<td>4(8.7)</td>
<td>3(7.3)</td>
</tr>
<tr>
<td>Not effective</td>
<td>1(2.2)</td>
<td>1(2.2)</td>
<td>3(6.5)</td>
<td>1(2.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to the TAs, most instructors and staff worked effectively to communicate and support program participants. “The staff and instructors were very supportive in that if you needed an answer they would make sure you got it. They were always able to explain and guide us to solutions.” They engaged in the following activities:

- Shared information through Google Docs.
- Communicated through email.
Delivered clear instruction.
Allowed participants to understand what each command in the blocks were instead of just telling them how to program each app.
Had suggestions about how to handle the participating students.

The TAs reported that the instructors or staff could improve their communication and support by engaging in the following activities:
Have the Instructors communicate with the staff on the progress of the students.
Make instructors’ PowerPoint presentations accessible to the Mentors and TAs.
Make more explicit the roles of the mentors and TAs.
Increase the number of speakers with start-ups or marketing experiences.
Have TA and instructor meet once a month to go over important announcements, details, and communications.
Provide instructional sessions on how to work effectively in a group.
Provide more handouts about business plan guidelines and different kinds of programming operations to the girls.
Provide maps and detailed driving directions to sites.
Have more clearly defined roles for all staff and instructors.
Have a password-protected area of the Technovation site that has all the rules and logistics that TAs/mentors need to know, and links to all the Google Docs.

Most of the TAs explained that the Technovation Challenge program had a positive impact on them personally, academically and professionally. It helped in the following ways:
Gained more confidence with holding a leadership position.
Improved leadership skills.
Introduced me to the NCWIT Award and get an internship.
Improved my App Inventor skills.
Provided the opportunity to ask some life changing questions to mentors and inspired to think of future career paths.
Increased job/career experiences and opportunities.
Improved their problem solving skills.
Improved their speaking and teaching skills.
Made computer science seem fun and manageable.
Learned a lot about careers in technology and business.
Became aware of the diverse questions and issues that underserved high school girls face, especially how they perceive the technology field and why there are not more of them in it.
Connected with other students.

“I am now confident that I can help guide a group of girls in other situations. It has also encouraged me to be open to various careers.”

“I'm grateful to the connections I've made with other women working in technical fields and feel very hopeful for the future of young women
heading into science. I also feel a strong connection to the high school students I’ve had the privilege to work with.”

“It helped me get rid of the stereotype of working in the field of computer science. It made me feel more confident and interested in working in the field of computer science.”

“It was very informative to have access to women who were professionals in the public sector, not just in academics. I got the chance to ask questions that many of my professors couldn’t necessarily answer, and the opportunity to network.”

The TAs would like to see some changes made to the curriculum and delivery of the lessons. They suggested the following changes:
- Provide more time for teaching and completing App Inventor.
- Introduce App Inventor tutorials earlier into the program.
- Improve the tutorial part of the curriculum, team meeting, tea party and the journal.
- Need more programming support.
- Emphasize the promotion of technology skills.
- Select appropriate paper handouts for the girls.
- Create more visual than text-based beginning tutorials.
- Ensure the delivery of more interactive lectures.
- Provide more hands-on activities.

They would you like to see the following changes made to the career exploration activity:
- Have each pair of mentor presents to each group.
- Have the mentors just moved around from group to group.
- Dedicate a full day to career exploration and have a PowerPoint encompassing the various engineering fields in college.
- Provide more organization and more time to ask questions.
- Have the session earlier in the program.
- Organize the session as mini Q&A sessions with a moderator exploring different career options.
- Have the women presenting show more concrete examples of their projects.
- Create a list of "Top Careers as a Computer Engineer".
- Have the girls do a little research on the careers they are interested in.

They would you like to see the following changes made to the college advising activity:
- Remove or implement earlier in the program.
- Allocate more time for this activity.
- Introduce them to computer science concepts early in the process.
- Have the girls think about the issues before the session.
- Create rotating sessions like in the career exploration activity.
- Focus this activity on key topics: college prep, applications, advice for first year in college, etc.
They would you like to see the following changes made to the guest speaker presentations:
  o Do more hands on activities led by the speakers.
  o Focus on how they achieved their educational and professional goals.
  o Increase the number of speakers.
  o Ensure long-term connection between speakers and girls.

They would you like to see the following changes made to the program structure:
  o Have it implemented in more organized and professional ways.
  o Allocate more time for the application.
  o Develop some rules around attendance and tardiness.
  o Increase length of program.
  o Balance out technology programming and business planning activities.
  o Allow the implementation of the tutorials to be more flexible.
  o Have partner groups to critique the app and the presentation before pitch night.
  o Use some kind of analysis methodology to get them to understand the flow of the application development process.
  o Try to include more coding lessons in the beginning.
  o Have them learn from other girls who have gone through the program.
  o Have the girls walk around and get to know everyone in every group in the first two sessions in order to feel comfortable in the Technovation environment.
  o Create more hands-on activities.

Most of the TAs said that the instructors supported their teams and programs in the following ways:
  o Presenting content.
  o Providing support: answering questions, monitoring participants’ progress, being accessible when needed, going over time to help participants, helping with technical issues, etc.

They suggested that the instructors could improve in the following areas:
  o Think deeply about the types of programming languages they will use with the girls.
  o Be involved during the entire course.
  o Make the course more engaging by creating quality slides and shorter lessons.
  o Review presentation before class.
  o Have a more robust phone checkout process.
  o Learn more about how to teach app development

They shared the various ways that the mentors supported their team:
  o Gave practical and professional advice about business planning and prototyping.
  o Offered good advice about how to be successful in the professional world.
  o Offered a lot of support throughout the program.
  o Helped the students with the application.
Motivated participants and kept them organized with deadlines and group structure.
Acted as great role models.
Providing information and materials.
Helped them put design thinking into practice and solve technical problems.

They suggested couple of ways that the mentors could improve:
Have basic understanding of App Inventor.
See themselves as coaches to the girls and team leaders to the group.

Most TAs and their teams face the following challenges:
Spent a lot of time selecting apps.
Faced lack of time.
Faced challenges programming applications.
Managing time and learning App Inventor.
Got frustrated/bored working on the Google App tutorials.
Registered absences, especially during spring break.
Had communication issues with emails.
Lack of interest in the program.

They suggested various ways that Technovation staff could implement to alleviate these challenges:
Have instructors monitor attendance and send out messages/calls.
Have brief team meetings both at the beginning and end of the day.
Set the date/time for Pitch Night before the beginning of the program.
Introduce Google Sites or something similar as a central hub for the group to meet
in would improve communication within the team.
Screen the girls in terms of STEM interest.

In addition, the TAs said that they need more directions from the instructor about specific
tasks, to be provided a thorough description of roles and responsibilities, and to have
more time to talk with the team.

Their best practices as TAs include:
Improved ability about team guidance and time management.
Gained teaching, collaboration, and communication skills.
Gained knowledge about the programming.
Communicate with instructors, mentors, and other TAs.
Encourage team to stay on task.
Delegate tasks.
Have the girls work in pairs.
Support interactive sessions.
Act as a coach to the girls.
CONCLUSION AND RECOMMENDATIONS

The Technovation Program had positive impact on the girls, mentors, instructors, and technical assistants. While the overall program structure and various program components received positive assessment from participants, it faced some challenges.

**Program.** The effective components of the programs include (1) promotion of girls in technology-related fields, (2) guest speakers, (3) teaching assistants, (4) curriculum, (5) mentor, (6) career exploration, and (7) program structure.

To improve the program, participants recommended that the following changes be made:

1. Integrate the college advising and career exploration activities of the program.
2. Eliminate the “tea parties” or the name of this activity.
3. Require intermediate deadlines for the following products: summary of the app idea, business plan, demonstration, and pitch.
4. Have the guest speakers at the beginning of the program.
5. Make the program description more clearly about product design and pitching.
6. Extend program from 9 to 10 weeks.
7. Limit lecture time to 15 minutes.
8. Provide more hands-on and interactive activities.
9. Provide training about debugging applications.
10. Set the date/time for Pitch Night before the beginning of the program.
11. Screen the girls in terms of STEM interest.
12. Have instructors monitor attendance and send out messages/calls.
13. Check the validity of the program’s curricular assumptions (e.g. the girls want to go to college, had rich experience with smartphones) for these girls are valid.
14. Integrate users’ definitions and needs throughout the curriculum.
15. Pack every session with curricular activity from beginning to end.
16. Provide more time for the girls to practice in depth and understand the fundamentals of programming, work on their apps, get more guidance on what final products should look and feel like, and finish their projects.
17. Avoid planning classes during spring breaks and deal with attendance.
18. Provide more focus on coding concepts and examples of coding, and programming concepts.
19. Integrate the technology and entrepreneurship/business aspects of the curriculum.
20. Ensure there is a connection between most of the high-level principles and the application.
21. Have a more systemic evaluation process for the selection of the applications.

**Girls.** As a result of participating in the Technovation programs, the girls improved in the following three STEM areas:

1. Felt more confident using technology. This was especially true for the 12th grade students. This is especially true for most students from Linked Inc. in Mountain View, and Google Inc. in San Francisco and Mountain View. Further, most
students from Google Inc. in San Francisco felt more comfortable troubleshooting problems.

2. Learned more about computer programming, engineering design, and user interface design. The Hispanic/Latina, White, and Asian students demonstrated high levels of knowledge about the engineering design process. The LinkedIn in Mountain View did an excellent job of helping students learn computer programming and engineering design. Most of the sites (except Google in New York City) helped the students increase their knowledge about user interface design. Students at LinkedIn and Google in Mountain View received the highest level of encouragement to think about a career in technology. Most students from Linked Inc. in Mountain View, and Google Inc. in San Francisco and Mountain View are considering studying computer science or engineering in college. Most students from Google Inc. in San Francisco and Google Inc. in Mountain View said that they learned more about programming concepts.

3. Learned more about computer scientists, computer engineers, and entrepreneurship; and were encouraged to think about a career in technology. As a result, the 9th and 11th grade students indicated that they are more interested in working in a career in technology. The Asian students demonstrated high levels of knowledge about the careers of computer engineers and computer scientists, and programming concepts. They also believe that a career in technology is a good career for women, and felt that they have been encouraged to take advanced classes in math and science. The LinkedIn in Mountain View did an excellent job of encouraging students to take advanced classes in math and science. Most students from Google Inc. in San Francisco said that they learned more about different kinds of careers. Most students from Linked Inc. in Mountain View and Google Inc. in San Francisco indicated that they are more interested in working in technology.

**Mentors.** The Technovation program offered participating mentors the opportunity to engage girls in technology, network with women working in technology, increase their knowledge of entrepreneurship, learn to be effective mentors, and improve their technical skills. In addition, other program’s participants recognized the critical roles that the mentors played in the successful implementation of the program. The mentors doubled as project managers for each team, provided support to the TAs and girls, and acted as great role models.

<table>
<thead>
<tr>
<th>Box 2: Mentor’s Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Provide leadership</td>
</tr>
<tr>
<td>2. Manage team dynamics</td>
</tr>
<tr>
<td>3. Act as a role model and coach to the girls</td>
</tr>
<tr>
<td>4. Provide one-to-one interaction and feedback to the girls</td>
</tr>
<tr>
<td>5. Stay neutral during class discussion</td>
</tr>
<tr>
<td>6. Assist girls after class</td>
</tr>
</tbody>
</table>
Most mentors faced multiple challenges during the implementation of the program: difficulties helping students select final applications, time management challenges, difficulties dealing with TAs’ and girls’ absences and dropping out, difficulties sharing online resources with the girls, and lack of sufficient time to help the girls complete their projects.

Participants recommended that the mentors adopt the following practices: review lecture slides before the lesson, experiment with the tutorials, acquire basic understanding of App Inventor, and act as coaches to the girls and team leaders to the group.

**Instructors.** The Technovation program increased or refreshed the instructors’ technical skills, provided them support on how to be an effective instructor, increased their ability to engage girls in technology, increased their knowledge about entrepreneurship, and expanded their network of women working in technology. They contributed to the successful implementation of the program by delivering clear instruction, being responsive to participants’ questions, sharing information effectively, being caring and supportive, and providing classroom management skills.

**Box 3: Instructor’s Best Practices**

1. Be enthusiastic and knowledgeable about the instructional material
2. Provide one-to-one interaction and feedback to the girls
3. Ensure the girls have all the tools and resources needed for the class
4. Keep the information flow thorough and timely
5. Keep the girls focused on their tasks
6. Troubleshoot problems with App Inventor
7. Simplify programming concepts for the girls
8. Deal effectively with classroom management issues

Most of the instructors dealt with some challenges during the implementation of the program. They had difficulties with the recruitment of TAs, mentors, students, and guest speakers; and lacked time to complete the work. They felt that few of the TAs and mentors were not the best fit with the goals of the program.

Participants suggested that various ways that the instructors could improve their practices:

1. Think deeply about the types of programming languages they will use with the girls.
2. Be involved during the entire course.
3. Make the course more engaging by creating quality slides and shorter lessons.
4. Review presentation before class.
5. Have a more robust phone checkout process.
6. Learn more about how to teach app development.
7. Have access to an Iridescent contact-person at each site prior to the start of the program.
8. Implement effective time management strategies.
9. Provide more time for the personalization of the slides.
10. Experiment with the technology and complete the tutorials before the training.
11. Be punctual.
12. Keep the course focused and fast-paced.
13. Send regular emails about deliverables.
14. Be aware of the challenges women face in the STEM field.

*Teaching Assistants.* The Technovation program helped the teaching assistants network with women working in technology, expand their knowledge about technical careers, engage girls in technology, increase their knowledge of entrepreneurship, become effective teaching assistants, and improve their technical skills. Specifically, it improved their leadership skills, technology skills, communication skills, teaching skills, understanding of girls and technology, and knowledge of technology and business careers.

**Box 4: Teaching Assistant’s Best Practices**

1. Provide programming resources
2. Provide team guidance
3. Help with time management
4. Encourage teams to stay on task
5. Help in the management of classes
6. Communicate with instructors, mentors, and other TAs
7. Delegate tasks
8. Support interactive sessions
9. Act as a coach to the girls
10. Encourage the girls to work collaboratively and participate in class

Most of the teaching assistants indicated that they spent a lot of time on the selection of the applications, lacked time to complete projects, faced challenges programming applications and learning App Inventor, and had difficulties managing their time effectively.

Participants recommended that the teaching assistant’s role could be improved in the following ways:

1. Be provided a thorough description of roles and responsibilities.
2. Have more time to talk with the team.
3. Be reminded that the classes are for the girls.
4. Commit to the entire course duration.
5. Are comfortable in this type of learning environment.
6. Ensure that participating instructors provide them with more directions about the implementation of specific tasks.
APPENDIX

List of research instruments:
1. Student pre-survey
2. Student post-survey
3. Mentor survey
4. Instructor survey
5. Teaching-assistant survey
Technovation Challenge Student Pre-Survey Spring 2011

Thank you for taking a few minutes to fill out the Technovation Challenge Pre-Survey below. Please complete this survey before you come to your first class.

What is your first name? *

What is your last name? *

What is the name of the school you attend? *

What grade are you in? * 9th 10th 11th 12th

What is your date of birth? *

Which Technovation Challenge site are you attending? *
   Google Inc., New York City
   Google Inc., San Francisco
   Google Inc., Mountain View
   LinkedIn, Mountain View
   Iridescent Science Studio, Los Angeles
   Berkeley Wireless Research Center, Berkeley on Mondays and Wednesdays
   Berkeley Wireless Research Center, Berkeley on Tuesdays and Thursdays

Please read each of the sentences below and think about how much it describes YOU. Once you decide how much you agree with the statement, put a check mark in the correct box. There is no “right” or “wrong” answer: only what is true for you. *

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>A little</th>
<th>Some</th>
<th>Quite a lot</th>
<th>Definitely</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am confident using technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know how to write computer programs.</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I am comfortable making presentations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know about entrepreneurship.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I know about the design process that engineers use to create products.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know about user interface design.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am interested in a career in computer science/computer engineering.</td>
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<td></td>
</tr>
<tr>
<td>I know what computer scientists and computer engineers do.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I am interested in starting my own technology related company.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have talked with someone about her/his job in technology.</td>
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<tr>
<td>I have been encouraged to take advanced classes in math and science.</td>
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<td></td>
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</tr>
<tr>
<td>Adults have told me I should think about a career in technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What kind of job do you want to have when you are older? If you have more than one, list your TOP THREE CHOICES *

What are you planning to study in college? *

I heard about the Technovation Challenge through: [check all that apply] *
   Presentation at school
   Teacher
   Counselor
   Friend
   Someone who attended previously
   Facebook
   Other:

Please tell us which best describes you. Please check all that apply *
   American Indian/Alaska Native
   African American/Black
   Asian
   Hispanic/Latina
   Native Hawaiian/Other Pacific Islander
   White
   Other:
Technovation Challenge Student Post Survey Spring 2011

Please take a few minutes to fill out the Technovation Challenge Post Survey below. Thank you!

What is your first name? *

What is your last name? *

Which Technovation Challenge site are you attending? *
  Google Inc., New York City
  Google Inc., San Francisco
  Google Inc., Mountain View
  LinkedIn, Mountain View
  Iridescent Science Studio, Los Angeles
  Berkeley Wireless Research Center, Berkeley on Mondays and Wednesdays
  Berkeley Wireless Research Center, Berkeley on Tuesdays and Thursdays

What grade are you in? *  
  9th  10th  11th  12th

How old are you? *

What is the name of the school you currently attend? *

What school will you attend next year? (If going to college, please list school) *

Do you plan to attend college? *

What are you planning to study in college? *

What kind of job do you want to have when you are older? If you have more than one, list your TOP THREE CHOICES *
Please read each of the sentences below and think about how much it describes YOU. Once you decide how much you agree with the statement, put a check mark in the correct box. There is no “right” or “wrong” answer: only what is true for you. *

<table>
<thead>
<tr>
<th></th>
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<th>A little</th>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>I am comfortable making presentations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know about entrepreneurship.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know about the design process that engineers use to create products.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know about user interface design.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am interested in a career in computer science/computer engineering.</td>
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<td></td>
<td></td>
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<tr>
<td>I know what computer scientists and computer engineers do.</td>
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<tr>
<td>I am interested in starting my own technology related company.</td>
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<tr>
<td>I have talked with someone about her/his job in technology.</td>
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<tr>
<td>I have been encouraged to take advanced classes in math and science.</td>
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<tr>
<td>Adults have told me I should think about a career in technology.</td>
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</tbody>
</table>

Read each sentence carefully, and describe how YOU feel after your experience in the Technovation Challenge. There is no “right” or “wrong” answer. What is most important is that you stop and think – for each statement – whether it is true for you. *

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Because of the Technovation Challenge, I feel more confident.</td>
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<tr>
<td>Because of the Technovation Challenge, I am more comfortable trouble shooting problems.</td>
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<tr>
<td>Because of the Technovation Challenge, I learned that teamwork is good for solving problems.</td>
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<tr>
<td>Because of the Technovation Challenge, I know more about programming concepts.</td>
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<tr>
<td>Because of the Technovation Challenge, I know more about how to prepare for college.</td>
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<tr>
<td>Because of the Technovation Challenge, I am considering studying computer science or engineering in college.</td>
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<tr>
<td>Because of the Technovation Challenge, I know more about different kinds of careers.</td>
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<tr>
<td>Because of the Technovation Challenge, I can see myself in a career in technology.</td>
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<tr>
<td>Because of the Technovation Challenge, I am more interested in working in a career in technology.</td>
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<tr>
<td>Because of the Technovation Challenge, I believe a career in technology is a good career for women.</td>
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</tbody>
</table>
Please tell us what you learned about programming in the Technovation Challenge. *

Please tell us what you learned about the design thinking process in the Technovation Challenge. *

Please tell us about what you leaned about developing a product and starting business in the Technovation Challenge. *

Please tell us what you learned about different types of careers in the Technovation Challenge. *

Please tell us how the instructor supported you and your team. *

What did you like? Is there anything she could do better? *

Please tell us how your mentor supported you and your team. *

What did you like? Is there anything she could do better? *

Please tell us how your teaching assistant (TA) supported you and your team. *

What did you like? Is there anything she could do better? *

Please tell us how we can improve the program for next time. *

Would you like to help us recruit students at your school next year by serving as a Campus Outreach Coordinator for the Technovation Challenge? *

What language does your family speak at home most of the time? *
   English
   Spanish
   Chinese
   Other:

Please tell us which best describes you. Please check all that apply *
   American Indian/Alaska Native
   African American/Black
   Asian
   Hispanic/Latina
   Native Hawaiian/Other Pacific Islander
   White
   Other:
Technovation Challenge Mentor Survey Spring 2011

Please take a few minutes to fill out the Technovation Challenge Post Survey below. Thank you!

What is your first name? *

What is your last name? *

At which Technovation Challenge site are you a mentor? *
- Google Inc., New York City
- Google Inc., San Francisco
- Google Inc., Mountain View
- LinkedIn, Mountain View
- Iridescent Science Studio, Los Angeles
- Berkeley Wireless Research Center, Berkeley on Mondays and Wednesdays
- Berkeley Wireless Research Center, Berkeley on Tuesdays and Thursdays

How many years have you been a mentor for the Technovation Challenge? *

If this is your second year with the program, please describe your experience compared with the previous year.

Prior to being a mentor for the Technovation Challenge, how many times have you been a mentor in the past? *
- 0
- 1-2 times
- 3-5 times
- 6 or more times

In what ways did the communication and support from the instructor and staff work effectively? *

How can instructors or staff improve their communication and support? *

Please rate the extent to which the Technovation Challenge did the following: *

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
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<tbody>
<tr>
<td>Increased or refreshed your technical skills.</td>
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<tr>
<td>Provided support on how to be an effective mentor.</td>
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<td>Increased your ability to engage girls in technology.</td>
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<td>Increased your knowledge about entrepreneurship.</td>
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<td>Expanded your network of women working in technology.</td>
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</tbody>
</table>

What have been the most significant influences of the Technovation Challenge on you personally and professionally? *
<table>
<thead>
<tr>
<th>Question</th>
<th>Very effective</th>
<th>Effective</th>
<th>Somewhat effective</th>
<th>Minimally effective</th>
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</tr>
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<td>How do you rate the overall effectiveness of the curriculum?</td>
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<td>How do you rate the overall effectiveness of the career exploration activity?</td>
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<td>How do you rate the overall effectiveness of the guest speakers?</td>
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<td>How do you rate the overall effectiveness of the program structure?</td>
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<tr>
<td>How do you rate your overall effectiveness as a mentor?</td>
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</tbody>
</table>

What would you like to see changed about the curriculum? *
What would you like to see changed about the career exploration activity? *
What would you like to see changed about the college advising activity? *
What would you like to see changed about the guest speaker presentations? *
What would you like to see changed about the program structure? *
What were your best practices as a mentor and what support could you use in the future? *
Please tell us how the instructor supported your team and program. *
Is there anything your instructor could do better? *
Please tell us how your teaching assistant (TA) supported your team. *
Is there anything your TA could do better? *
What challenges did you or your team face? What can the staff do to alleviate these challenges? *
Are you interested in participating in the Technovation Challenge next year? *
Are you interested in helping recruit students next fall? *
Please tell us which best describes you. Please check all that apply *
  African American/Black
  American Indian/Alaska Native
  Asian
  Hispanic/Latina
  Native Hawaiian/Other Pacific Islander
  White
Technovation Challenge Instructor Survey Spring 2011

Please take a few minutes to fill out the Technovation Challenge Post Survey below. Thank you!

What is your first name? *

What is your last name? *

At which Technovation Challenge site are you an instructor? *
  - Google Inc., New York City
  - Google Inc., San Francisco
  - Google Inc., Mountain View
  - LinkedIn, Mountain View
  - Iridescent Science Studio, Los Angeles
  - Berkeley Wireless Research Center, Berkeley on Mondays and Wednesdays
  - Berkeley Wireless Research Center, Berkeley on Tuesdays and Thursdays

Prior to being an instructor for the Technovation Challenge, how many times have you been an instructor in the past? *
  - 0
  - 1-2 times
  - 3-5 times
  - 6 or more times

In what ways did the communication and support from staff work effectively? *

How can staff improve their communication and support? *

Please rate the extent to which the Technovation Challenge did the following: *

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
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<th>Agree</th>
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<tr>
<td>Increased or refreshed your technical skills.</td>
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<td>Provided support on how to be an effective instructor.</td>
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<td>Increased your ability to engage girls in technology.</td>
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<td>Expanded your network of women working in technology.</td>
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</table>

What have been the most significant influences of the Technovation Challenge on you personally and professionally? *
Please tell us how effective the program has been.*

<table>
<thead>
<tr>
<th></th>
<th>Very effective</th>
<th>Effective</th>
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<td>How do you rate the overall effectiveness of the career exploration activity?</td>
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<td>How do you rate the overall effectiveness of the college advising activity?</td>
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<td>How do you rate the overall effectiveness of the guest speakers?</td>
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<td>How do you rate the overall effectiveness of the program structure?</td>
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<td>How do you rate your overall effectiveness as an instructor?</td>
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<tr>
<td>How do you rate the overall effectiveness of the instructor training?</td>
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What would you like to see changed about the curriculum? *
What would you like to see changed about the career exploration activity? *
What would you like to see changed about the college advising activity? *
What would you like to see changed about the guest speaker presentations? *
What would you like to see changed about the program structure? *
What would you like to see changed about the instructor training? *
What were your best practices as an instructor and what support could you use in the future? *

Please tell us how the mentors supported your program.*
Is there anything mentors could do better? *
Please tell us how the teaching assistants (TAs) supported your program.*
Is there anything the TAs could do better? *
What challenges did you or your program face? What can the staff do to alleviate these challenges? *

Are you interested in participating in the Technovation Challenge next year? *
Are you interested in helping recruit students next fall? *
Please tell us which best describes you. Please check all that apply *

- African American/Black
- American Indian/Alaska Native
- Asian
- Hispanic/Latina
- Native Hawaiian/Other Pacific Islander
- White
Technovation Challenge Teaching Assistant Survey Spring 2011

Please take a few minutes to fill out the Technovation Challenge Post Survey below. Thank you!

What is your first name? *

What is your last name? *

At which Technovation Challenge site are you a teaching assistant (TA)? *
   Google Inc., New York City
   Google Inc., San Francisco
   Google Inc., Mountain View
   LinkedIn, Mountain View
   Iridescent Science Studio, Los Angeles
   Berkeley Wireless Research Center, Berkeley on Mondays and Wednesdays
   Berkeley Wireless Research Center, Berkeley on Tuesdays and Thursdays

Which best describes you? *
   High school student
   College student
   Graduate student
   Other:

What school do you attend? *

Prior to being a TA for the Technovation Challenge, how many times have you been a TA in the past? *
   0
   1-2 times
   3-5 times
   6 or more times

In what ways did the communication and support from the instructor and staff work effectively? *

How can instructors or staff improve their communication and support? *

Please rate the extent to which the Technovation Challenge did the following: *

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
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<tr>
<td>Increased or refreshed your technical skills.</td>
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<tr>
<td>Provided support on how to be an effective TA.</td>
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<td>Increased your ability to engage girls in technology.</td>
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<td>Increased your knowledge about entrepreneurship.</td>
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<td>Expanded your network of women working in technology.</td>
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<td>Expanded your knowledge about technical careers.</td>
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</tbody>
</table>
What have been the most significant influences of the Technovation Challenge on you personally, academically and professionally? *

Please tell us how the effective the program has been. *

<table>
<thead>
<tr>
<th>How do you rate the overall effectiveness of the program to promote girls in technology-related fields?</th>
<th>Very effective</th>
<th>Effective</th>
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<tr>
<td>How do you rate your overall effectiveness as at TA?</td>
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</tbody>
</table>

What would you like to see changed about the curriculum? *

What would you like to see changed about the career exploration activity? *

What would you like to see changed about the college advising activity? *

What would you like to see changed about the guest speaker presentations? *

What would you like to see changed about the program structure? *

What were your best practices as a TA and what things could you use support with in the future? *

Please tell us how the instructor supported your team and program. *

Is there anything your instructor could do better? *

Please tell us how your mentor supported your team. *

Is there anything your mentor could do better? *

What challenges did you or your team face? What can the staff do to alleviate these challenges? *

Are you interested in participating in the Technovation Challenge next year? *

Are you interested in helping recruit students next fall? *

Please tell us which best describes you. Please check all that apply *

African American/Black  
American Indian/Alaska Native  
Asian  
Hispanic/Latina  
Native Hawaiian/Other Pacific Islander  
White