ADVANCE-ENG Girls to Women: An Innovative Engineering Faculty-Student Mentoring Summit for Underrepresented Minority (URM) Girls and their Mothers

Garrett Swan, Eric Carpenter, Tuere A. Bowles PhD\(^1\), Christine S. Grant PhD\(^2\) and Pamela P. Martin PhD\(^3\)

North Carolina State University

Introduction

As a culturally relevant educational intervention, the ADVANCE-ENG Girls to Women Summit included over 70 underrepresented minority (URM) girls and their mothers (or other adult caregivers) to attend a day of engineering career exploration while interacting with over 60 URM women engineering professors from around the United States. The day was informative, empowering and encouraging, providing an opportunity for middle school girls to meet real women of color who are engineering professors, real women who at one time were girls making a critical move towards an engineering career. The prevailing Summit goal was to attract girls at a critical stage in the K-12 pipeline to engineering careers. The two-day event enabled the girls to take the time to envision themselves in the future, just like the faculty present, and for daughters and mothers/caregivers to connect or re-connect, forging an alliance to sustain the mothers/caregivers through the challenges they will face as their daughters become future women in engineering. A combination of faculty motivational speeches, a three-session rotation through hands-on activities (e.g., making lip gloss) and interactive career sessions culminated in a gala dinner for the girls, faculty/student/community volunteers, and special guests. The girls had continuous interaction with URM women engineering college students as role models throughout the event.

Background

Women are disproportionately represented in engineering professions. Previous research has documented that there is a leaky pipeline in all stages of women’s career trajectory in engineering. As early as at six-years of age gender stereotyping occurs in the treatment of children, which shapes their perceptions of STEM related opportunities.\(^1\) While it is in middle school, however, that girls begin to show lower levels of confidence and interest in engineering related fields than those of boys.\(^1, 2\) Additionally, it has been found that girls do not participate in as many science and engineering relevant activities as boys outside of school; hence, extracurricular activities have been suggested as a method of intervention to remedy this lack of experience.

While several venues that encourage pursuit of a career in engineering for young female students; there is not, to the authors’ knowledge, a venue that connects a group of underrepresented minority (URM) women faculty with a group of peer mothers and their daughters to talk about excellence in science, math and engineering. The inclusion of both undergraduate and graduate students will result in a program that has representation from all points in the engineering pipeline. For women of color, there are some unique aspects of both the mother-daughter relationship, and the “instant sisterhood” that many women feel that is not a function of their career-path or social standing. We utilized both of these points to foster an exciting, community building, intergenerational intervention that uses the special “sister-connection” to communicate with the mothers of potential leaders in engineering.

Table 1: Child Demographics

<table>
<thead>
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<th>Grade</th>
<th>n</th>
<th>%</th>
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<tbody>
<tr>
<td>6</td>
<td>26</td>
<td>37.1</td>
</tr>
<tr>
<td>7</td>
<td>26</td>
<td>37.1</td>
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<tr>
<td>8</td>
<td>18</td>
<td>25.7</td>
</tr>
</tbody>
</table>

Purpose

The ADVANCE-ENG Girls to Women Summit represented a unique opportunity for women at all levels of the K-12 middle school to faculty pipeline to interact in a proverbial “mentoring village” – promoting careers in engineering. The purpose of this research study was to assess and evaluate an engineering summit for middle school girls and their mothers/caregivers. Overarching research questions included: What are the learning experiences of middle school girls in an engineering careers summit? What are the learning experiences of parents in an engineering careers summit? What impact has the summit made for adolescent girls, their mothers, and other stakeholders?

Methods

This study is part of a larger study, which consists of both quantitative and qualitative components. For this report, however, we share only the quantitative analysis of one of the event’s surveys.

70 mothers/caregivers and female adolescent dyads were invited to participate in the intervention. The event lasted for 2 days and included numerous informative sessions and hands-on activities. As participants left the intervention they were asked to complete an Exit Survey that included questions concerning participant satisfaction with several areas of the event, why participants decided to attend the event, how participants heard about the event, and recommendations for improvement. Open-ended responses were analyzed using chi-square analysis, while all other items were analyzed using Kruskal-Wallis tests due to issues with normality.

Results

Satisfaction with the speakers at the intervention was significantly affected by a child’s grade level, as determined by a Kruskal-Wallis test (H(2)=7.207, p < .05). Mann-Whitney tests using a .0167 level of significance found eighth graders had significantly higher satisfaction ratings than seventh graders (U=246.5, r=.41).

Level of agreement concerning the intervention’s level of organization were significantly different between the grade level of the daughters in attendance, as evidenced by a Kruskal-Wallis test (H(2)=9.23, p<.05). Mann-Whitney tests using a .0167 level of significance determined that seventh graders rated the event as significantly more organized than eighth graders (U=113.5, r=.042), and that seventh graders rated the event as significantly more organized than the ratings of sixth graders (U=101, r=.45).

Conclusions

Results suggest speakers or topics presented at the intervention may have been relevant or interesting to eighth graders but not as much so for seventh graders. Specializing events based on grade should be considered. Regarding event organization, seventh graders may have been more interested in the content presented to them at the intervention than the level of order or smooth transition between activities at the event.

Chi-square tests were conducted concerning how individuals heard about the intervention and why they attended. Analyses looked for differences between children based on grade level and for differences between children and adults. The lack of significant differences found suggests examined forms of advertisement for the intervention were equally effective for reaching participants and that no changes are needed in the location of advertisements. Also, all examined reasons to attend appear equally important. This suggests advertisements emphasizing different aspects of the event should be equally successful in recruiting participants.

All participants indicated this to be their first event tailored to URM child/caregiver pairs. This suggests results from this data will only generalize to the targeted population for their first experience in such an intervention. Further studies with follow-up interventions should be conducted to examine the influence of repeated exposure to such events.

Contact information gsswan@ncsu.edu

Authors’ Note:

1: Tuere A. Bowles, PhD – Adult and Higher Education
2: Christine S. Grant, PhD – Chemical and Biomolecular Engineering
3: Pamela P. Martin, PhD – Psychology