The goal of the Young Scientist Program (YSP) at Washington University in St. Louis (WUSM) is to broaden science literacy and recruit talent for the scientific future. In particular, YSP seeks to expose underrepresented minority high school students from St. Louis public schools (SLPS) to a wide variety of careers in the sciences. The centerpiece of YSP, the Summer Focus Program (SFP), is a nine-week, intensive research experience for competitively chosen high school seniors (Scholars). Scholars are paired with graduate student, medical student, or postdoctoral fellow mentors who are actively part of the practicing scientific community and serve as guides and exemplars of scientific careers. SFP seeks to increase the number of underrepresented minority students pursuing STEM undergraduate degrees by making the Scholars more comfortable with science and science literacy. The data presented here provide results of the objective, quick, and simple methods developed by YSP to assess the efficacy of SFP from 2006-2013. We demonstrate that YSP successfully used formative evaluation to continuously improve the various activities within SFP over the course of several years and in turn enhance student experiences within SFP. Additionally, we show that SFP effectively broadened confidence in science literacy among participating high school students and successfully graduated a high percentage of students who went on to pursue STEM majors at the undergraduate level.

**Background**

- Minorities are underrepresented in STEM fields at the undergraduate level and beyond.
- In 2013, underrepresented minorities earned 7% of doctorates in science and engineering in the United States, and in 2010, women made up 21% of full professors with science and engineering doctorates.
- To attract underrepresented high school students into scientific careers, two MD/PhD students founded the Young Scientist Program (YSP) at the Washington University in St. Louis School of Medicine in 1991.
- YSP led by graduate student volunteers who design, organize, and participate in the different components of the program.
- YSP works in partnership with St. Louis Public High Schools (SLPS) to recruit, mentor, and teach students from underrepresented backgrounds.
- >80% of the students in SLPS were African-American, an underrepresented minority in STEM fields and more than 80% of students in SLPS qualified for free or reduced-price lunch.
- YSP operates a suite of outreach programs that aim to strengthen science literacy and promote interest in scientific careers and STEM undergraduate studies.

**The Summer Focus Program (SFP)**

The Summer Focus Program is a nine-week, paid summer research internship held each summer for 12-16 rising high school seniors (Scholars).

The goal of the SFP is to broaden scientific literacy and recruit new, diverse talent to scientific professions by making Scholars more comfortable with science and increasing their science literacy.

The internship provides an immersive experience in laboratory research by pairing high school students with YSP Volunteer mentors.

YSP focuses on several key skills needed to be a successful laboratory scientist: basic laboratory skills and safety, understanding scientific articles, peer review, and verbal and written science communication.

**Abstract**

The internship provides an immersive experience in laboratory research by making Scholars more comfortable with scientific professions by making Scholars more comfortable with science and science literacy. The Summer Focus Program is a nine-week, paid summer research internship among participating high school students and successfully graduated a high percentage of students who went on to pursue STEM majors at the undergraduate level.

**Evaluation Method**

- **1. Assessment:** superficial, unhelpful, peer review
- **2. Goals:** useful peer review; help students write in their own words
- **3. Survey Outcomes:** students felt more comfortable explaining work to others; students planned to enter more national competitions; students felt peer review was more useful
- **4. Implementation:** work at the end of every class; evaluation at the end of the program

**Scientific Writing Skills**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of Students</th>
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<tbody>
<tr>
<td>2006</td>
<td>0%</td>
</tr>
<tr>
<td>2007</td>
<td>2%</td>
</tr>
<tr>
<td>2008</td>
<td>6%</td>
</tr>
<tr>
<td>2009</td>
<td>10%</td>
</tr>
<tr>
<td>2010</td>
<td>15%</td>
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<td>2011</td>
<td>20%</td>
</tr>
<tr>
<td>2012</td>
<td>25%</td>
</tr>
<tr>
<td>2013</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Science Communication**

- Comfortable explaining lab results to others?
  - 1 = Not comfortable
  - 2 = Somewhat comfortable
  - 3 = Very comfortable

**Writing Course Evaluation**

- How useful was the Writing Course?
  - 1 = Least useful
  - 2 = No change
  - 3 = Most useful

**SFP High School Graduation and College**

- Before 2009, no SFP Scholars were semifinalists in the Siemens Competition, so SCC instructors encouraged Scholars to submit their findings to this competition. Between 2009 and 2012, SFP Scholars comprised 6 of the 15 Missouri semifinalists.
- SFP students graduate high school at a higher rate (100%) than SLPS students (84%) (p < 0.001).
- SFP students matriculate at 2 or 4 year colleges at a higher rate (82.3%) than SLPS students (31.9%) (p < 0.001).
- SFP students pursue STEM majors in college (73%) at a higher rate than both SLPS (9.7%) and United States (10.7%) students (p < 0.001).

**Conclusions**

- YSP successfully implemented objective, quick, and simple methods to assess program efficacy and to make program improvements, and demonstrated that a volunteer outreach organization can economically and efficiently improve its educational programs targeting underrepresented minorities.
- Faculty and students at other institutions can benefit from implementing similar assessment methods to begin and/or enhance their own science education and outreach programs to target communities.
- We present this program as a "pipeline" to increase the recruitment of underrepresented minority and disadvantaged students to scientific undergraduate study.
- In the future, YSP intends to conduct summative evaluations using data from ten or more years of SFP participants. We also plan to track the impact of SFP participation on the career choices of former Scholars and the perceived impacts of SFP on broader aspects of the careers of past Scholars.
- The data presented here show that SFP makes use of formative evaluation to continuously improve the learning experience for high school students, significantly impacting Scholar graduation rates, college matriculation, and pursuit of STEM degrees.

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