From Sports to Science: Using Basketball Analytics to Broaden the Appeal of Math and Science Among Youth

John F. Drazan, Amy K. Loya, Benjamin D. Horne, & Ron Eglash / Rensselaer Polytechnic Institute / john.drazan@gmail.com

The STEM career path is inaccessible to members of society who are most in need.

- As the value of STEM degrees has increased due to economic forces, minority underrepresentation in STEM is now a matter of social equality.
- Universities and schools use traditional STEM topics, such as robotics, to engage students in the STEM fields.
- Most youths without a preexisting interest are not inclined to enroll in STEM intensive programs, thus perpetuating underrepresentation.
- Basketball and other sports are much more popular among the youth than STEM activities; however, creating authentic, accessible connections between the youth and STEM through sports analytics is difficult.

Motivation and Goals:

- Basketball’s popularity among marginalized youth, coupled with the analytics revolution, will provide a novel venue for STEM outreach.
- Analytics provides a tangible application of math and statistics, in which students gather and process data directly linked to their individual basketball performance and training.
- We have designed a scalable approach that creates an avenue for scientific inquiry, within a venue at which students are intrinsically motivated to improve: the basketball court.

Students Performed Shooting Data Collection

<table>
<thead>
<tr>
<th>College</th>
<th>Present Attempt %</th>
<th>Successful Attempt %</th>
<th>Total Success %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>25%</td>
<td>60%</td>
<td>35%</td>
</tr>
<tr>
<td>B</td>
<td>30%</td>
<td>40%</td>
<td>25%</td>
</tr>
<tr>
<td>C</td>
<td>20%</td>
<td>70%</td>
<td>60%</td>
</tr>
</tbody>
</table>

Analysis and Discussion of Shooting Percentages

\[
\% = \frac{\# \text{ Makes}}{\# \text{ Total}}
\]

Analysis and Discussion of Scoring Efficiency (S.E)

\[
S.E = \frac{\# \text{ Makes} \times \text{Point Value}}{\# \text{ Total}}
\]

Survey Analysis and Results

1. Use Wilcoxon Sign Rank to show significant shift in question answers (p < 0.05) between Pre- and Post- Tests
2. Use Chronbach’s Alpha to show internal consistency in Likert Scale Concepts

STEM Concepts

- Do you think that you learn in math and science class can be used in sports analytics?
  \[ p = 1 \times 10^{-05} \]

- Do you think that you learn in math and science class can make you a better basketball player?
  \[ p = 5.5943 \times 10^{-10} \]

- Do you enjoy using math and science when you are outside of school?
  \[ p = 1.8271 \times 10^{-04} \]

- Do you think that you learn enough about basketball to teach your goals on a playground?
  \[ p = 1.0878 \times 10^{-04} \]

- Do you know where on the court you need to practice shooting from?
  \[ p = 3.4942 \times 10^{-06} \]

- Do you know what you need to practice in order to improve your shooting skills?
  \[ p = 3.7114 \times 10^{-06} \]

- Do you know where on the court you need to practice shooting from?
  \[ p = 1.6311 \times 10^{-06} \]

- Do you know what you need to practice in order to improve your shooting skills?
  \[ p = 3.4942 \times 10^{-06} \]

Training Concepts

Conclusions

- We have shown evidence that sports analytics provides a venue for authentic STEM engagement for youth presently underserved by the STEM educational pipeline.
- Participants reported an increased confidence in sports training, an increased interest and awareness of applications of sports analytics, and an increased enjoyment and interest in pursuing STEM in college.
- We have shown that the impact of sports analytics extends far beyond wins and losses in professional sports; it can also address systematic inequalities within our educational system.