Development and Continuous Improvement of K-12 Outreach Programs in STEM

Paul Plotkowski, Dean
Padnos College of Engineering & Computing
Grand Valley State University

Introductions
Tell us about yourself:
- Name
- Organization / company
- Community information
- Schools information
- Potential topic or population of interest

QUICK FACTS ABOUT GVSU
Established in 1960
Liberal education foundation
Campuses in Allendale, Grand Rapids, Holland, Muskegon
Faculty and staff: 1,985
Undergrad programs: 81
Grad programs: 29
Average Class Size: 27
Students (Fall ’10): 24,541
Undergraduates: 20,986
Graduates: 3,555
Freshman profile:
GPA 3.5-: ACT 24+
83% live on campus

QUICK FACTS ABOUT WEST MICHIGAN
Grand Rapids - 2nd largest city in MI - metro pop approx. 1.1 mill
Diversified communities - Urban, suburban, rural
Diversified economy - Top 20 employers in 19 different industries
Extensive manufacturing
Extensive health care
Many school systems & private
Extensive philanthropy

An Environmental Scan ...
Stagnant / Declining number HS graduates per year
- Population demographics
- The impact of retention and high school graduation rates

UNITED STATES RESIDENT BIRTHS 1955 TO 2008

ASQ Advancing the STEM Agenda in Education, the Workplace and Society
Conference at the University of Wisconsin-Stout July 19-20, 2011
Conference Workshop: Development and Continuous Improvement of K-12 Outreach Programs in STEM by Dr. Paul Plotkowski

July 19, 2011

ASQ Advancing the STEM Agenda in Education, the Workplace and Society Conference at the University of Wisconsin-Stout July 19-20, 2011

An Environmental Scan...

- Women represent 53% - 60% of college students
- Women, Ethnic Minorities and First Generation to College are under-represented in STEM enrollments
- Hispanics are the fastest growing ethnic group in the general population – but not in college and STEM majors
- As many as 60% of high school students taking physical science classes and 30% taking mathematics classes are taught by a teacher who did not major in science or mathematics in college
Conference Workshop: Development and Continuous Improvement of K-12 Outreach Programs in STEM by Dr. Paul Plotkowski

July 19, 2011

Examples of Outreach Programs

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Student Level</th>
<th>Focus/Type</th>
<th>Primary Partner(s)</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST Lego League</td>
<td>Elementary</td>
<td>Robotics Competition</td>
<td>FIRST</td>
<td>Kristi Ralph Park Museum</td>
</tr>
<tr>
<td>If You Build It</td>
<td>Upper Elem.</td>
<td>Design &amp; Build</td>
<td>Grand Rapids Public Schools</td>
<td></td>
</tr>
<tr>
<td>Sibley Ele. Sch. Science &amp; Math Partnership</td>
<td>5th Grade</td>
<td>Curriculum, Teacher, &amp; student coaching, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching Big &amp; Building Small</td>
<td>Grades 5-12 and general public</td>
<td>Workshops, robotics, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEPS</td>
<td>7th grade</td>
<td>Summer camp for girls, etc.</td>
<td>RMSC, SME, NASA</td>
<td></td>
</tr>
<tr>
<td>Get With The Program</td>
<td>8th grade</td>
<td>Summer camp for girls, etc.</td>
<td>NASA, Grand Rapids Foundation</td>
<td></td>
</tr>
<tr>
<td>MathCounts</td>
<td>Middle Sch.</td>
<td>Math competition</td>
<td>MSPE</td>
<td></td>
</tr>
<tr>
<td>Science Olympiad</td>
<td>Middle &amp; High Sch.</td>
<td>Science competition</td>
<td>Grand Rapids Public Sch.</td>
<td></td>
</tr>
<tr>
<td>JA Reverse Job Shadow Program</td>
<td>Middle &amp; High Sch.</td>
<td>Job shadowing</td>
<td>Regional K-12 Systems</td>
<td></td>
</tr>
<tr>
<td>Project Days</td>
<td>Middle &amp; High School</td>
<td>Display of projects</td>
<td>Regional K-12 Systems</td>
<td></td>
</tr>
<tr>
<td>Career Presentations</td>
<td>Middle &amp; High School</td>
<td>Presentation of talks</td>
<td>Regional K-12 Systems</td>
<td></td>
</tr>
<tr>
<td>FIRST Robotics</td>
<td>High Sch.</td>
<td>Robotics Competition</td>
<td>FIRST</td>
<td></td>
</tr>
<tr>
<td>GRAD/CIP</td>
<td>High Sch.</td>
<td>Engineering &amp; Career Preparation</td>
<td>Regional K-12 Systems</td>
<td></td>
</tr>
</tbody>
</table>

An Environmental Scan ...

• Stagnant college STEM enrollments
• Disconnect of careers –vs- college majors

An Environmental Scan ...

What does impact choice?

Outreach Program Elements

<table>
<thead>
<tr>
<th>Target Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic: ______</td>
</tr>
<tr>
<td>Source: ______</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>______</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>______</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources &amp; Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding: ______</td>
</tr>
<tr>
<td>Source: ______</td>
</tr>
</tbody>
</table>
Basic Outreach Philosophies and Elements

Increase Visibility & Highlight Advantages of STEM Careers
- Enjoying the fields
- Emphasize impact on society / helping people
- Career opportunities and high demand
- Earnings potential

Possible formats / approaches
- Free standing
- Curricular integration
- Co-curricular activities
- School year programming
- Summer programming

Basic Outreach Philosophies and Elements

Engage Students Early
- Elementary and Middle School
- Early enough to impact course choices
- Help ensure a solid foundation in math, science & technology

Targeting Your Efforts
- Particular population
- Specific community
- Specific age group
- Specific school or school system

Basic Outreach Philosophies and Elements

Continued Engagement Approach
- Keep students motivated
- Reduce drop out and drift from STEM rates
- Provide supplement / support for K-12 instruction

Program Sustainability
Continued Commitment is Essential
- Engaging Partners
  - Schools & teachers
  - Community groups
  - Students & families
  - Volunteer base

ASQ Advancing the STEM Agenda in Education, the Workplace and Society Conference at the University of Wisconsin-Stout July 19-20, 2011
Basic Outreach Philosophies and Elements

Program Sustainability
Continued Commitment is Essential

• Developing & Refining Program Elements
• Developing funding sources
• Tracking impact

Critical Elements in Partnerships

Summer Science Adventure Camps

Statistics Poster Competition

Setting the Stage

QUESTION: What needs to be in place to allow you to pull others in and build team?

• Targeting the interests and needs of “players” in the project
• Setting clear objectives (common vision)
• Collecting and effectively presenting data or information on past successes (research driven)

Securing Funding

QUESTION: Where will funding come from?

• Applying for grants
• Partnering with professional organizations
• Private and corporate foundations
• Private individuals
• Working with university / corporate development

ASQ Advancing the STEM Agenda in Education, the Workplace and Society Conference at the University of Wisconsin-Stout July 19-20, 2011
**Human Resources**

**QUESTION:** How will we staff this effort?
- Community and professional organizations
- University “volunteers”
- Corporate volunteers

---

**Communication and Program Promotion**

**QUESTION:** Who is the target participant and support audience and what are the most effective vehicles for communication?
- Generate participants
- Sustainability: generate future partners, volunteers, and funding
- Recognizing the partners

---

**Planning for and Utilization of Physical Resources**

**QUESTION:** Where will the event take place? What equipment will be needed?
- Facility (ies) / location(s)
- Materials and equipment
- Action items for each
- Person for each

---

**Celebration**

**QUESTION:** How do you provide visibility for program successes and the contributions made by all partners?
- Say “Thank you”
- Share success
- Visibility for partners and donors
- Staff morale / effort appreciated at home organization (value at employer)

---

**Active Learning & Community Field Trips**

**QUESTION:** What real-world experiences provide context and motivation?
- Classroom only—vs—on-site activities
- Real-world context and connection
- Application of learning

---

**Top Ten Ways to Avoid Pitfalls – Look Before You Leap**

1. Channel your efforts through your institution’s Development Office (don’t work against them)
2. Assess your resources (particularly space)
3. Frame your commitment (with respect to both timeline and resources)
4. Plan well ahead (this will help avoid burnout)
5. Be aware of legal implications (releases, waivers, and volunteer checks)
Top Ten Ways to Avoid Pitfalls – Look Before You Leap

6) Be cognizant of the readiness of schools (which schools are a good fit for your program) – schools cannot be forced to participate
7) Know who you are talking to and who has the power to make the decisions and who will do the work
8) Embrace diversity in the broadest sense (roles, demographics, skills)
9) Remember – volunteers are not corporate America
   Time and commitment varies from individual to individual
10) Choose your partners carefully

Web sites / Resources

FIRST Robotics  http://www.usfirst.org
Math Counts  http://www.mathcounts.org
Science Olympiad  http://usino.org/
STEPS  http://www.gvsu.edu/steps/
ASEE K-12 Division  http://k12division.asee.org/
Reference Documents on Data Disc

Development and Continuous Improvement of K-12 Outreach Programs in STEM

Paul D. Plotkowski, Dean
Padnos College of Engineering & Computing
Grand Valley State University

Outreach Program Elements

- Target Population
- Theme(s)
- Appraoch(es)
- Partners
- Resources & Sponsors

ASQ Advancing the STEM Agenda in
Education, the Workplace and Society
Conference at the University of Wisconsin-Stout July 19-20, 2011