


## 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



## An Environmental Scan ...


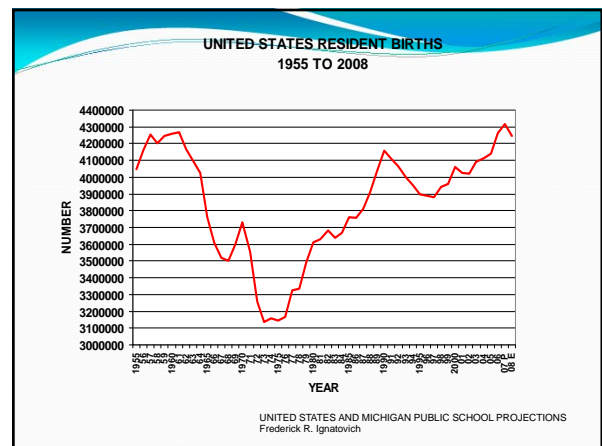
Stagnant / Declining number HS graduates per year

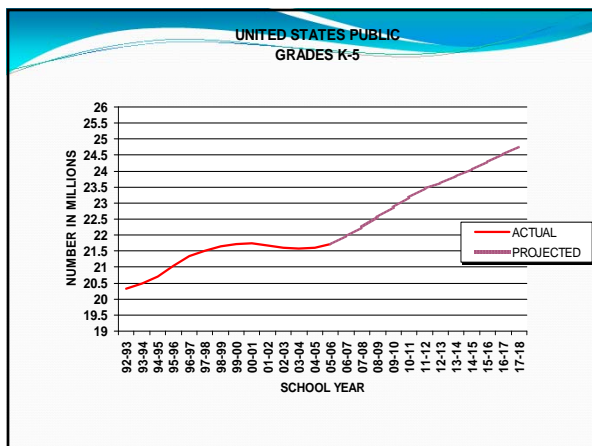
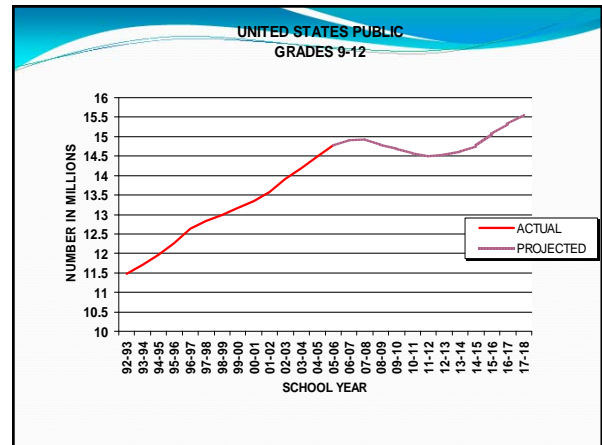
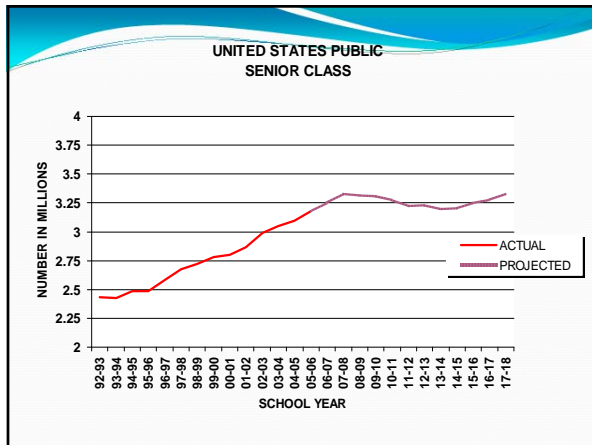
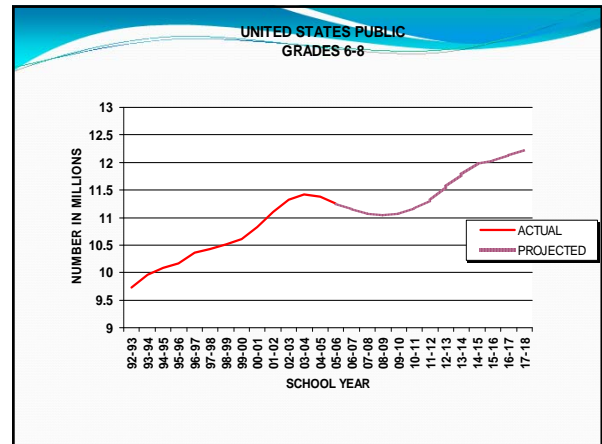
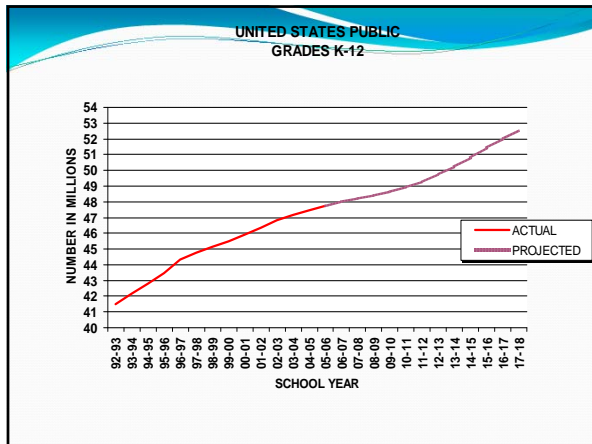
- Population demographics
- The impact of retention and high school graduation rates



### QUICK FACTS ABOUT WEST MICHIGAN

Grand Rapids - 2<sup>nd</sup> 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 ...

- 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

### An Environmental Scan ...

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

Major	Median
Petroleum Engineering	120,000
Planning, Physiological Sciences and Administration	105,000
Mathematics and Computer Science	98,000
Aerospace Engineering	87,000
Chemical Engineering	86,000
Electrical Engineering	85,000
Naval Architecture and Marine Engineering	82,000
Mechanical Engineering	80,000
Manufacturing Engineering	80,000
Mining and Mineral Engineering	80,000

Major	Percent of All Majors	Median
Business Management and Administration	8	58,000
General Business	5	60,000
Accounting	5	61,000
Nursing	4	69,000
Psychology	3	45,000
Marketing and Marketing Research	3	58,000
Communications	3	50,000
Elementary Education	3	40,000
Computer Science	3	75,000
Finance	3	65,000

WHAT ITS WORTH  
Anthony P. Carnevale, Jeff Strohl, Michelle Melton

### Examples of Outreach Programs

Program Name	Student Level	Focus/Type	Primary Partner(s)	Involvement
FIRST Lego League	Elementary	Robotics Competition	FIRST	Coaches, judges, speakers, fund raising
If You Build It	Upper Elem.	Summer Camp Design & Build	Grand Rapids Pub. Museum	Design contest, robotics, CAD, CNC, bridge competition
Sibley Elem. Sch. Science & Math Partnership	5 <sup>th</sup> Grade	Science & Math - Hands on Curriculum Enhancement	Grand Rapids Public Schools	Curriculum, teacher and student coaching, use of lab facilities
A World in Motion	Elementary	Curriculum module offerings	SAE	Faculty & staff offering of modules in schools
Thinking Big & Building Small	Grades 3 - 12 and general public	Hands on engineering activities	Grand Rapids Pub. Museum, NSPE	Robotics, electronics, bridge construction activities

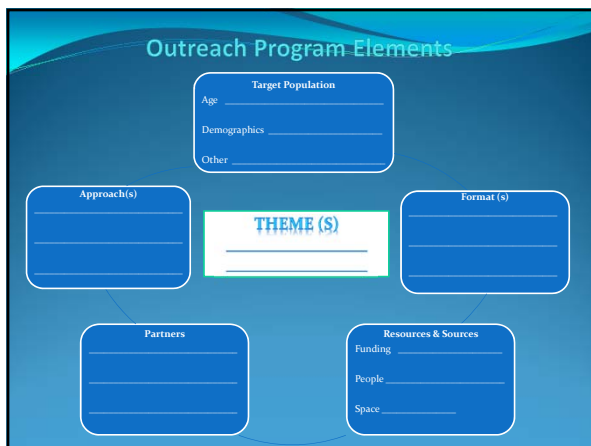
### An Environmental Scan ...

What does impact choice?

Cultivating STEM  
Center for Social Research

### Examples of Outreach Programs

Program Name	Student Level	Focus/Type	Primary Partner(s)	Involvement
STEPS	7 <sup>th</sup> grade	Summer camp for girls – aviation theme	RMSC, SME, Alcoa, NASA	Complete offering of program
Get-With-The-Program	8 <sup>th</sup> grade	Summer camp for girls – programming theme	NASA, Grand Rapids Foundation	Complete offering of program
MathCounts	Middle Sch.	Math competition	MSPE	Facilities, speakers, scholarship
Science Olympiad	Middle & High Sch.	Science competition	Support RMSC who organizes	Event coordinators, coaches
JA Reverse Job Shadow Program	Middle & High School	Job shadowing	Junior Achievement	Engineering & career presentations



### Examples of Outreach Programs

Program Name	Student Level	Focus/Type	Primary Partner(s)	Involvement
Project Days	Middle & High School	Display of GVSU student projects for local middle & high school students	Regional K-12 Systems	Organize poster sessions, logistics, hosting, funding
Career Presentations	Middle & High Sch.	Presentations at schools	Regional K-12 Systems	Presentations, GVSU tours
Electrathon	High Sch.	Electric car competition	Electrathon America	Workshops, judging coordinator, judges
FIRST Robotics	High Sch.	Robotics Competition	FIRST	Host events, support organizing team, facilities, fund raising, clerical support, scholarship
GRAPCEP	High Sch.	Engineering & Health High Sch.	Grand Rapids Public Sch.	Curriculum development, fund raising, internships, teacher & student coaching

### 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

### Basic Outreach Philosophies and Elements

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

### Basic Outreach Philosophies and Elements

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

### Basic Outreach Philosophies and Elements

Program Sustainability  
*Continued Commitment is Essential*

- Engaging Partners
  - Schools & teachers
  - Community groups
  - Students & families
  - Volunteer base

### Basic Outreach Philosophies and Elements

Program Sustainability  
*Continued Commitment is Essential*

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

### Critical Elements in Partnerships

A World in Motion

Project Day

Career Kaleidoscope

Sibley Elementary Partnership

Summer Science Adventure Camps

Statistics Poster Competition

World Year of Physics 2005

### 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)

MATHCOUNTS

SCIENCE OLYMPIAD

Sky Night

FIRST Robotics

CAMP CURIOSITY PUBLIC MUSEUM '08

Electric Car Workshop

STEPS

### 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

## 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?*

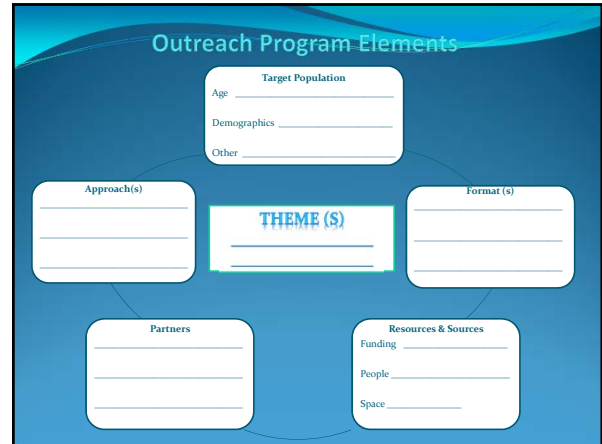
- Classroom only –vs– on-site activities
- Real-world context and connection
- Application of learning

## 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://soinc.org/>  
STEPS <http://www.gvsu.edu/steps/>  
ASEE K-12 Division <http://k12division.asee.org/>  
Reference Documents on Data Disc

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