

Building STEM in Bernards Township: Parent Forum
Ridge High & William Annin Middle School Joint PTO Meeting

Thursday, May 21, 2015, 9 am William Annin Middle School Auditorium

Brian Heineman, Director of Curriculum and Instruction
With

Michael Fackelman, Supervisor of Fine and Practical Arts
Kristin Wolf, Supervisor of Mathematics

(Matt Hall, Supervisor of Science and Technology, unable to attend)

3 Handouts provided:

- 1 page, double-sided “Project Lead the Way (PLTW) Engineering”
- 1 page, double-sided “Project Lead the Way (PLTW) Computer Science”
- 2 pages, double-sided “AP Capstone: 2 course sequence, AP Seminar & AP Research”

Power Point Presentation by Brian Heineman, Michael Fackelman, and Kristin Wolf

<http://www.oucoursesystems.com/school/webpage/12015227/1350910>

Focus of the presentation:

1. Introduce new programmatic options for Ridge High
2. Outline lesser changes to the existing William Annin technology program

DISTRICT STEM COMMITTEE

Composed of district administrators and faculty (listed in power point slides)

Solicited advice and engineering expertise from outside sources including:

- Chris Anderson - TCNJ - Director of iSTEM initiatives
- Seann Dikkers - Ohio University – Makerspaces
- Carolyn Malstrom - Project Lead the Way

Formulated the resulting proposals with three goals:

1. Strengthen instruction in problem solving
2. Improve students’ skills in working collaboratively
3. Develop students’ abilities as creative and divergent thinkers

Visited 4 high schools with well-developed technology programs to observe best practices

FOUR HIGH SCHOOL PROGRAMS OBSERVED

1 - Morristown: 1500 student, comprehensive public school

- “Academy Model,” grant-funded by a pharmaceutical company, enrolls 50 students per grade level, chosen from 100 applicants

- Academy courses offered mostly as electives, open to students outside the academy, may carry honors weight
- Academy 9th graders participate in a required summer institute
- Academy students participate in required field research experiences
- Academy offers 5 tracks:
 - Biomedicine
 - Engineering
 - Architecture
 - Sustainability
 - Computer Science

2 – Philadelphia Science Leadership Academy: 500 student magnet school in the Philadelphia public school system, operated in partnership with the Franklin Institute

- Application process based on passion determined from interviews and prior projects
- Grade level instructional themes: 9th-Identity, 10th- Systems, 11th-Change, 12th-Creation
- Laptop-based coursework
- Grading rubrics reflect engineering based standards: Design, Knowledge, Application, Presentation, and Process
- Standards-based assessments: taken when a student feels ready, with a retake policy

3 – Teaneck: 1300 student, comprehensive public school in Bergen County

- TEAMS = Technology Enriched Academy for Math and Science, enrolls 40 students per grade chosen from 80 applicants.
- Admission based on grades, recommendation, essay, and interview
- Required freshman orientation with a team-building, problem-solving focus
- Academy is run on a separate bell schedule in the morning for two 85 minute periods
- Require participation in outside STEM competitions
- Separate course sections for students not in the academy

4 – Watchung Hills Regional: 2200 student regional, comprehensive public school

- Not an academy model
- Program in engineering from national provider: “Project Lead the Way” (PLTW)
<http://www.pltw.org>
- Program options include:
 - Architecture
 - Civil Engineering

Key Elements of successful programs:

- Project-based courses
- Partnerships with outside organizations (possibly Liberty Science Center for Bernards Township)
- Equipment (3D printers, laser cutters, vinyl cutter, etc.)

PROPOSAL FOR RIDGE HIGH

- A school-within-a-school 4-year “Academy” model for motivated students chosen by application, utilizing national programs like PLTW and AP and offering 3 tracks:
 - Computer Science
 - Engineering
 - Sustainability
- Academy would begin with a 2-day summer orientation program prior to 9th grade, and academy students would be scheduled in common mathematics and science sections as a cohort, in addition to the academy electives.
- Most academy courses and an open Makerspace would be available to all Ridge students

Academy Students’ Elective Courses on the 3 tracks:

Year to roll out	Grade	Computer Science	Engineering	Sustainability
2016-2017	9	1. Computer Science & Software Engineering (CSE) 2. Design & Creation*	1. Introduction to Engineering Design (IED) 2. Design & Creation*	1. Introduction to Engineering Design (IED) 2. Design & Creation*
2017-2018	10	1. Computer Science Applications (CSA)	1. Principles of Engineering (POE)	1. Principles of Engineering (POE)
2018-2019	11	1. AP Computer Science 2. AP Seminar	1. Civil Engineering & Architecture (CEA) 2. AP Seminar	1. Environmental Sustainability (ES) 2. AP Seminar
2019-2020	12	1. Computational Problem Solving (CPS) 2. AP Research **	1. AP Physics C 2. AP Research **	1. AP Environmental Science 2. AP Research **

*All academy course would be open to all Ridge students except “Design & Creation” to keep flexibility for all students while providing the academy model for students who commit to it.

** AP Research = possible 2nd elective senior year, not required for academy completion

Additional STEM Elective Changes:

- Redesign Robotics I and II for 2016
- Add “Game Design and Development” course in 2016
- Add “Entrepreneurship & Modern Marketing” in 2016
- Add “Sustainable Design” course in 2017
- Add PLTW courses:
 - “Simulation and Modeling” (SAM) in 2017
 - “Cybersecurity” (SEC) in 2018

Project Lead the Way (PLTW): used in 6500 schools nationally

- Requires schools to use a 3-year curriculum, “PLTW Pathway” (also open to non-academy students)
- Software is licensed and teachers must go for training
- Some colleges may offer substitution credit or admission preference for students completing PLTW courses

AP Capstone Diploma/AP Seminar & Research Certificate (also open to non-academy students)

- “AP Seminar” elective course, paired with another AP or PLTW course in 11th grade to explore relevant research
- “AP Research” elective course, 12th grade option to complete the AP Certificate or AP Capstone Diploma

STEM Academy Application: Admission determined by demonstrated interest in winter of 8th grade, primarily through essay and personal interview, in addition to grades and achievement.

Costs: Difficult to determine exactly, but, for equipment, estimate \$35,900

- **Staff:** STEM Program Administrator, Makerspace Advisor, admission interviewers, 2-Day summer orientation staff, AP and PLTW teacher training
- **Facilities:** Conversion of a room to Makerspace
- **Equipment:** 2 MakerBot Replicator 3D printers, 10 VEX Robotics Kits, 2 Phantom 2 Vision + Drones, CNC Machine, Materials testing equipment, Metal fabrication equipment, Project Lead the Way software

PROPOSAL FOR WILLIAM ANNIN MIDDLE SCHOOL

- Redesign 6th and 7th grade technology and computer cycles to emphasize the Engineering Design Process Loop
- Admit 25 students* to a new 8th grade elective and link the class to grade 8 science and possible math classes.
- Open Makerspace before and after school.
- Tie Makerspace study hall to technology cycles and the 8th grade STEM elective.

(*Admission based on essay and personal interview in winter of 7th grade.)

Costs: Similar drivers as Ridge, for Annin, Makerspace equipment estimate \$25,000

THE MAKER MOVEMENT

<http://makerfaire.com>

Modern day tinkering (examples: computer code, metals, textiles)

Tools and technology: (Makerbot 3D Printing, Lego Mindstorms and Vex robotics, Arduino and Pololu Programmable Microcontrollers, Scratch and Alice Visual Programming Languages)

Makerspaces contain a wide variety of equipment and consumable for students to work on projects that may or may not be related to academic work during non-class hours.

Abridged Q & A

1. Q: Does the proposal address improving our science courses?
A: (Mr. Heineman) Our existing science program remains intact.

1a. Q: Would you consider improving our current science courses rather than implementing this program with expensive toys?
A: (Mr. Fackelman) It's more than toys.
2. Q: This pushes toward the manufacturing side. What about redesigning courses and improving rather than adding something new? Why not include the biomedical track?
A: (Mr. Heineman) Our traditional AP science track is already excellent. We considered the biomedical track but do not currently have the staff or equipment for that track.
3. Q: The science program at Ridge is weak. The typical Ridge student takes only one year of biology, chemistry, and physics. Other schools in the world offer multiple years of these courses. Why not strengthen these? Why not include medicine in the program? That would have more traction in the community.
A: (Mr. Heineman) Ridge is one of few high schools to require one year of physics from all students.
4. Q: This program sounds good for students who want to pursue computer science and engineering. Other districts send students to summer internships, for example at Lockheed-Martin. Are there any plans to partner with industry?
A: (Mr. Heineman) Partnerships with local universities will be critical. Such plans cannot proceed until we have a program in place.
5. Q: Will the application processes for the Ridge and Annin programs be separate?
A: (Heineman) Yes.
6. Q: Will it be difficult for non-academy students to get into a section of an academy course?
A: (Mr. Heineman) We almost always find a way to get a student with a strong desire into a course.
7. Q: How many academy students at the other schools visited are girls? Do you need to guide girls into the program?
A: (Mr. Heineman) The private interview in the application process, separated from their peers, may help attract girls.

(Mrs. Hudock) The WAMS cycle teachers are already skilled in identifying and encouraging kids who have a gift or innate ability, especially girls.

8. Q: What about increasing the class size of the 8th grade computer science elective to accommodate more students and meet the demand?

A: (Mr. Heineman) We will take as many kids as staffing allows. We only plan to offer one section in the first year. The priority will be linking the new course to a science class.

(Mrs. Hudock) Our lab and our only 8th grade computer elective teacher, Steve Issacs' schedules are full with the current 3 courses.

9. Q: What do kids in the music department do, for example those in Wind Ensemble, which is a 4 year elective commitment?

A: (Mr. Heineman) Music students that need four years of a music elective cannot be in the academy cohort because one year the academy takes both electives. The music kids can still complete the 3 year PLTW sequence or AP Seminar and AP Research.

10. Q: How much parent involvement has there been in this process before now and going forward?

A: (Heineman) No parents were included on the STEM committee, only administrators and faculty. We envision future parent involvement at the level of coming into the classes and telling students about their science or engineering careers.

11. Q: Biotechnology is big in New Jersey so why not include it?

A: (Heineman) Biotech would be fantastic to add if the community supports it.

11a. Q: Rather than adding biotech, what about switching it for one of the other 3 tracks?

A: (Heineman) The tracks chosen to start the program were selected to maximize the resources and teaching expertise we already have in the district.

12. Q: How many kids leaving Ridge pursue science as a career?

A: (Heineman): We do not have data on the specific majors of Ridge students who graduate from college. A past survey of our AP Science students asked what they plan to study in college, most said business and finance.

13. Q: Would you consider conducting a Bernards Township parent survey on what career they want their children to pursue?

A: (Heineman): We are out of time, but please submit your questions by email and check my website for a FAQ document of further answered questions.