

Middle School Engineering Program Restructuring 2014-2015

Introduction of
Lego Mindstorms platform

Why restructure?

- Need for a vertical articulation of the curriculum that offers a progressive sequence of learning objectives and skills from 6th through 8th grade
- Need for horizontal articulation of the program across three schools to provide all students at each grade level with a common experience
- Intent to provide access to all students for enriched opportunities to develop problem solving skills and to express creativity

How did we arrive here?

- Ongoing discussions with middle school engineering teachers about increased coherence to curriculum among three schools
- Engineering roundtable discussion suggestions – creativity, problem solving, coding
- Visit to Reading HS and MS to review PLTW
- NSTA conference research and consultation – Lego, Arduino workshops

New Components to Program

- Integration of Legos Mindstorms Core and Expansion Sets into 7th and 8th grade courses
- 12 Repurposed laptop computers in each engineering classroom for use in programming Lego brick processors and providing internet access
- Completion of an independent capstone project during 8th grade year working in student teams of two
- Presentation of independent projects to audience of peers and guests

6th Grade Program

Introduction to Engineering

- Introduction to engineering
 - Types of engineering
 - Products of Engineering
 - Engineering Design Cycle
- Reverse engineering – taking something apart to see how it was put together
- Engineering design projects
 - Involving multiple iterations
 - Involving scaling
 - Use of basic hand tools
- Introduction of coding

7th Grade Program

Training and Skill Building

- Using Lego Mindstorms base kits, students will learn how to manipulate construction materials and how to code “brick” processors
- Use of Robot Educator program for coding and meeting specified design challenges
- Completion of non-Lego design project – wind turbine design, wooden bridge design

8th Grade Program

Capstone Project

- Working in pairs, students identify a problem or need they want to address through an engineered solution
- Each team is provided with base and expansion Mindstorms resources as basic platform for constructing solution prototype
- Teams will present the problem they addressed and their solution to an audience

Lego Mindstorms – Cost Proposal

Grade 7	\$ 16,202.83
Grade 8	\$ 32,087.25
Site license	<u>\$ 399.95</u>
Total	\$ 48,690.03
Less ACE grant -	<u>\$ 34,000.00</u>
Balance – APS	\$ 14,690.03

(Budgeted FY 15 – School 3)

Implementation Plan

- June-August: professional development for teachers, develop curriculum resources, order and receive kits
- Fall, 2014: focus on implementation of 7th and 8th grade program. 8th grade project presentations TBD based on learning curve
- Throughout 2014-2015: gradual implementation of components of 6th grade program.

Expectations for 2014-2015

- Lots of student excitement !
- Teacher and student learning will be highly reciprocal
- Emphasis on Lego resources as platform for building any type of device, not just robots
- Opportunities for 8th grade project integration with PBL projects on their academic teams
- Creation of a “maker space” environment in the engineering classrooms

Thank You - See You Soon !

