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Innovation. In all domains.

LASER: Leadership And Science Ensures Results – A STEM Partnership Between Industry and Education

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6/21/2011

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Agenda

- Approach
- Program Content
- Results



LASER: A Partnership

- Raytheon and McKinney Independent School District (MISD)
 - MathMovesU Class Visits, Rallies
 - Summer Program Support
 - National Engineering Month visits to classes, and students visiting Raytheon
 - Tutoring and Mentoring
 - Science Fair Judging and more
- Raytheon and MISD wanted to build on this relationship
 - Sustained Presence
 - Build on MathMovesU
 - Include Leadership Elements



A Raytheon Initiative



LASER Development Approach

- Development Team included Raytheon and MISD
- Professional Development Day
- Volunteer Training
- Pre Program Survey
- Post Module Surveys
 - General Elements
 - Module-Specific Elements
- Post Program Survey



LASER Program Contents – Introduction

- Mental Models
- Strategic Life Plan
- Think Tank Introduction
- Module Format
 - Challenge Description
 - Learning Objectives mapped to Texas Standards
 - Activity Materials, Description, & Objectives
 - Discussion Questions
 - Key Take Aways
 - Real Life Applications: Skills & Applications (careers)
 - Career Summary Questions

Congratulations! You have been selected for an internship at Cogitate. Cogitate is a leading-edge professional think tank organization that provides consulting and research services to a variety of government and commercial customers in various scientific and engineering domains. As part of Cogitate, you will be required to work with your fellow interns to address the needs of your customers in an innovative, high-quality, timely, and cost-efficient manner. Show us what you've got!



LASER Program Contents – Module 1 A Splinter of Truth

- Leadership elements: Teaming, Communication, Diversity
- Technical elements: spatial recognition
- Challenge: Each team member assembles a perfect square, no talking, no gestures, no taking pieces from another



**LASER Program Contents – Module 2
Modeling Green**

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- Leadership elements: Innovation, Goal Setting, Critical Thinking, Decision Making / Problem Solving
- Technical elements: Force, Speed, Friction, Standard Deviation
- Challenge: Assemble and test a prototype of a vehicle that is only propelled by wind power



**LASER Program Contents – Module 3
Bob's Benign Bird Ballistics**

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- Leadership elements: Teaming, Innovation, Decision Making / Problem Solving, Critical Thinking
- Technical elements: Distance, Average / Mean, Accuracy / Variation, Standard Deviation, levers, trajectory, current state, root causes,
- Challenge: Propose modifications to the catapult system to maximize distance and minimize variation



**LASER Program Contents – Module 4
Weaving With Light, Capstone Discussion**

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- Leadership elements: Teaming, Communication, Innovation, (Problem solving)
- Technical elements: Electromagnetic spectrum, in particular the infrared portion, refraction, temperature, tools to measure temperature
- Challenge: Measure the temperature differences between the visual portion of the electromagnetic spectrum and the infrared portion of the spectrum

Module 4: Experimental Data

Time (min)	Blue (°C)	Yellow (°C)	IR (°C)
0	22	22	22
1	23	24	23
2	24	25	24
3	24	25	25
4			26
5			27
			27



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**LASER Program Contents – Capstone
Taking It to the Next Level**

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- As a team, select one of the four businesses:
 - Forensic Technology—A Splinter of Truth
 - Environmental Research—Modeling Green
 - Aerodynamic Systems and Technology—Bob's Benign Bird Ballistics
 - Thermodynamic Systems and Technology—Weaving With Light
- Determine the challenges associated with the project
- Select three professionals from the real life applications list to interview. In the interviews...
 - Evaluate techniques (technical and leadership) used by professionals listed in the real life applications at the end of the module chosen
 - Determine what challenges they
 - Understand how the professional challenges are similar to those associated with your project
- Define and prioritize the challenges.
- Choose one technical or leadership issue from the list and take it to the next level. Conceptualize a method to solve the problem. Develop a white paper capturing the above items and your recommendations
- In the white paper, convey what leadership skills were used by your team and how they were used
- Present the white paper to the Engineering leadership team



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**LASER Program Contents – Capstone
District Level Competition**

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- Top 15 performing teams from schools participate in a day-long, district-wide competition
- Present projects to MISD and Raytheon leadership
- Winners selected for
 - Advanced Placement Physics
 - Pre-Advanced Placement Physics
 - Academic Physics
 - Technical Innovation
 - Teaming
 - Communication



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LASER Results – By the Numbers

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- 9 months to develop
- 2 handbooks (instructor and student)
- 5 in-class visits
- 3 traditional high schools, 2 alternative schools
- 1500+ students
- 40+ volunteers
- 1 School Year complete!



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LASER Results – From Students

- "...I was completely unaware of any possibilities to explore such a field. After only one visit from Raytheon, I had a completely new perspective on what I could do in the future....." R. Johnson, Student
- "Each visit has come with a hands-on, interactive activity that not only teaches the students about Raytheon but also promotes teamwork, leadership and ingenuity...." G. Lim, Student
- "I enjoyed the opportunity to work with Raytheon. I think their presence in physics classes has given the students an opportunity to relate the study of physics with real world examples. I would like Boyd's physics department to use some of the techniques that Raytheon did all year long: the ability to use the scientific process to hypothesize, plan, design, execute and interpret the data collected. I believe that the inclusion of these basic scientific principles will increase the awareness of physical properties in the real world and increase the rate of learning that occurs in the classroom." J. Magargle, Student

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LASER Results – From Teachers and Administration

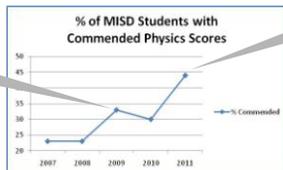
- "At the beginning of the program this year, my students were typical teenagers taking a general population science course: "Physics is hard, it's too much math, I want to be a dancer, I want to be a professional baseball player, etc." After a few of our LASER sessions, and with the positive influence of the engineers from Raytheon, a great number of my students are now expressing a desire to pursue a career in the sciences. Several have decided to try becoming engineers." F. Wiatroski, Physics Teacher
- "... (LASER) is reaching scores of students with engaging, exciting content with real-world connections." S. Biles, Physics Teacher
- "I have had numerous young women come up and show interest in technical and scientific related jobs. I know that this is directly from the energy and influence that Raytheon volunteers have out into our kids." J. Thiem, Physics Teacher
- "The fact that teachers and students alike are already discussing ways in which the program could be expanded for future years speaks volumes about the impact it has had." K. York, Science Department Chair and Instructional Specialist.

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LASER Results – Survey Says....

- Post Module Surveys
- When asked if they would recommend the module activity to others, 88% stated that they would recommend the activities
- When posed the statement "I had fun participating in this module," 91% responded positively
- The program caused 42% of the participants to consider pursuing a career involving science, technology, engineering, or math
- In addition, 15% of the participants stated that the program re-affirmed their interest in STEM careers



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