

Mathematics Engineering Science Achievement (MESA) - Period 5, Nathan Balasubramanian (Mr. Bala), Room 506 Join this Class

The Mathematics Engineering Science Achievement (MESA) academic enrichment program is designed to encourage educationally disadvantaged students to excel in math and science in preparation for a college education in math and science based fields. Modeled like California MESA, Colorado MESA (www.cmesa.org) strives to support K-12 schools for nurturing a pool of future scientists and engineers. MESA gives students an opportunity to apply their skills at competitions. Students build mouse-trap cars, gliders, bridges, and more to compete with other schools. Students learn skills needed for team projects, practice project management skills, and develop their self-confidence as they participate in various field trips and competitions.

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Why You Should Explore Technology Middle school years, often called the wonder years, represent a critical period in students' development. During these crucial years, students develop their interest, knowledge, skills, and attitudes about various subjects, including science, mathematics, engineering, and technology (SMET). Besides learning, applying, and reinforcing various "SMET" connections, the technology program at Angevine helps all students learn important life skills, including collaborating and working effectively in teams, solving problems creatively, making strategic decisions, and thinking critically as they engage in hands-on activities and design challenges. While creating, testing, and improving their product designs, students master the design process and feel more satisfied. Some of their peers even "consult" and "patent" their prototypes! These active, hands-on DESIGN activities are bound to serve our students well and help them cope with challenges of globalization. Besides, our preliminary studies indicate that students who excel in "SMET" in middle schools, not only perform better academically in other subject areas and pursue higher-level science, mathematics, and engineering classes at high schools, but it also empowers them with numerous career options. Courses currently offered at Angevine include: Applied Technology Exploratory, Applied Technology, Gateway To Technology (GTT), and Mathematics Engineering Science Achievement (MESA).

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Class Quizzes Kaleidoscope Adventures Post Lego Drop Post-test Kaleidoscope Adventures Nobel Prizes Lego Drop Laser Challenges 2 Laser Challenges Please login to take a quiz.

Images from the Classroom Some Images from the MESA Classes November 8, 2005

Standards-based Scenarios and Students' Thoughtful Online Responses: Schoolwork & Homework Students should know and be able to describe how people use science and technology in their professions (Colorado Model Content Standard 5.d)

As students, although you might know the names of a few scientists and their discoveries, you rarely get a feel for how they did science. In this two-day exercise, you will have an opportunity to learn more about these scientists' personal lives and behind the scene drama, successes, and failures.

After you have read the scientist's biography, make sure you elaborate on seven areas associated with these scientists (identified below) and a personal reflection in your post.

- a. Scientist's Personal Information (Name, Country, Life, etc.)
b. Scientist's Background (Family, Economic Status, etc.)
c. Scientist's Challenges (Health, Living Conditions, etc.)
d. Scientist's Opportunities (Parents, Peers, Teachers, etc.)
e. Scientist's Contributions (to Human Understanding, Science, etc.)
f. Scientist's Publications (Books, Research, etc.)
g. Scientist's Tipping Point(s) (Breakthroughs due to People, Events, etc.)
h. Finally, YOUR REFLECTIONS having done a - g (Lessons Learned, What you Found Interesting, Questions You Have, etc.)

Students will learn that "Invention is a product of turning ideas and imagination into devices and systems. Innovation is the process of modifying an existing product or system to improve it" (Standard 10G in the Standards for Technological Literacy, ITEA, p. 110).

Now that you have had a chance to experiment and build audio speakers and electric motors, answer the following questions.

- 1. Compare and contrast the working of an audio speaker with an electric motor (Make sure your answer includes energy changes, principle, working, suggestions/modifications and challenges).
2. Explore the various challenges & questions in the Bose Learning Center. What challenge/question did you find most interesting and why?
3. What was Gilbert's contribution to childhood science learning in pre-computer/video game and pre-television America? List any two of his 152 patents, and why you find it interesting.

Students will develop an understanding of how "creative thinking and economic and cultural influences shape technological development" (Standard 1D in the Standards for Technological Literacy, ITEA, p. 26).

Having experimented with static charges and static electricity, write down:

- 1. What effects does static charge have on your daily life?
2. What can you do to minimize their effects?

You have experimented with mirrors, multiple reflections and symmetry. Before we build kaleidoscopes in our next class, click on the link Line Symmetry. EXPLORE the various links there that illustrate an abundance of symmetry in the world. After exploring one or more links there, TYPE in:

- 1. What you DID?
2. What you LEARNED?
3. What you found INTERESTING?
4. What QUESTIONS you have?

Make sure you have had a chance to play with the virtual kaleidoscope and investigate rotational symmetry by the end of this class.

Based on your experiments and subsequent observations with the mirror, type your revised explanation for what you observed with the acrylic tube in the TITANIUM DIOXIDE activity.

Can you coin an interesting phrase on your own now, using the concepts you've learned? After you have observed the TITANIUM DIOXIDE experiment, write down your explanation for the odd behavior you observed.

Students should know and be able to describe what might be the cause of change in a before and after picture" (Standard 2.3.a.2 in the Colorado Science Assessment Frameworks)

Before we start our new module on Kaleidoscope Adventures, for our class discussion today, respond to the following scenario.

Dorothy and her friend Erin went to see Harry Potter and the Goblet of Fire. On the way to the movie, Erin took some pictures with Dorothy's automatic focus camera. Dorothy looked great on the photos. After returning from the movies, Dorothy had a "cool" idea and wanted to surprise Erin the next day. She took several pictures of herself standing in front of a mirror using her automatic focus camera. She was very disappointed with the poor results from her camera as she reviewed them with Erin.

- 1. Why did Dorothy get poor results with her camera when she was standing in front of a mirror in her well illuminated room?
2. How could you support your idea? (Think of your experiments with "Laser Challenges" and reflections from a mirror, in particular)
3. Make sure you understand how an automatic focus camera works (with SONAR or infrared beams) and include that in your reasoning.

As always, make sure you include:

- 1. Your CLAIM
2. Your supporting EVIDENCE, and
3. Your justifying REASON(S)

Students should know and be able to explain the destination and purpose of a recent space exploration event" (Standard 4.4.d.4 in the Colorado Science Assessment Frameworks)

In our last discussion, we discussed whether humans really walked on the moon. Here is another interesting NASA website with useful hyperlinks about the moon hoax.

Before we drop LEGO's from the roof of our building, here is Wikipedia's story about the two-part Deep Impact spacecraft, built by Ball Aerospace & Technologies Corporation in Colorado. Did you know an Angevine MESA student witnessed the successful launch of Deep Impact from Cape Canaveral on January 12, 2005? He even shared some photographs with other MESA students in Spring 2005 after his return!

Returning to Deep Impact, the copper-core "smart impactor" collided with the comet Tempel 1 on July 4, 2005 and the camera-loaded "flyby spacecraft" monitored the event from a distance of ~500 km. Read the article and write down:

- 1. What hypothesis was falsified after scientists observed this collision?
2. What did you find interesting about this story?

In the past, an invention or innovation was not usually developed with the knowledge of science." (Standard 5E in the Standards for Technological Literacy, ITEA, p. 84)

Did man really walk on the moon or was it the ultimate camera trick? Some conspiracy theorists believe it was all a fake. Others argue that it was not so. After quick reading the two articles,

- 1. Write down, what is YOUR position?
2. Support your position with at least ONE evidence from the article.
3. Based on the experiments you have done with retroreflectors in class, what would you tell a naysayer?

Students will reflect on their learning experience by summarizing (a) what they liked and (b) what they would like to do differently

when students inquire about math, engineering, and science through "Laser Challenges" in MESA.

Students will explain their set up, challenges, and costs incurred for their "Hit the Target" competition

Interpret and evaluate the accuracy of the information obtained and determine if it is useful." (Standard 6D in the Standards for Technological Literacy, ITEA, p. 137).

There are two parts to your writing assignment here. 1st part (Post your draft 1 reply after you have answered questions 1 & 2) 10 Points

1. Summarize, in your own words, the main theme or feature and findings of the author(s) (Make sure you include the Article # you selected in your post).
2. Think and write down at least one question that comes to your mind after you have read the article. Would you like to discuss this in class?

2nd part (Post your 2nd reply after reading your 1st post) 10 Points

3. Now that you have read your own post, copy (Ctrl + C, or Right Click on mouse and Copy), paste (Ctrl + V, or Right Click on mouse and Paste), and EDIT your own post. Feel free to add more evidence (Answers the question, "HOW DO YOU KNOW") and reasons (Answers the question, "IF ... THEN ...") in your edited post.

4. Identify five words that you have learned from your reading of the newspaper article, and type them before your post your 2nd reply. Feel free to include the sentence in which the words were used for your future reference and/or add the words to your spelling list.

In preparation for the "Hit the Target" challenge using lasers, every team had its own share of problems on Monday, October 3, 2005. As scientists and engineers, we are innate problem solvers. After COPYING & PASTING any three benchmarks from the three columns; lines of reasoning, failure, and interacting parts, one from each column, write down one example from your experience that illustrates what you have learned so far (in your own words). Each example you use will carry 5 points and this assignment is worth a total of 15 points. [To copy something from a table or anywhere, select what you want to copy, use Ctrl + C to COPY and Ctrl + V to PASTE into your "Compose your Reply" box].

Students should know and be able to measure quantities associated with energy forms and identify different forms of energy (e.g. light), and quantify energy forms (e.g. measure angles of incidence and reflection when laser light bounces off a mirror" (Standard 2.2.a.1 and 2.2.a.2 in the Colorado Science Assessment Frameworks)

Now that you have spent the past few weeks experimenting with lasers, explain in your own words, the meaning of the vocabulary words you've learned (Each word carries a maximum of two points).

- 1. Reflection
2. Angle
3. Normal
4. Angle of reflection
5. Vertex
6. Angle of incidence
7. Reflected ray
8. Ray
9. Incident ray
10. Bouncing off
11. Protractor
12. LASER
13. Irregular reflection
14. Diffuse reflection
15. Regular reflection
16. Specular reflection
17. Center of curvature
18. Radius of curvature
19. Focus
20. Focal length

Write down one use you might think of, for reflections produced by a curved mirror.

Identify trends and monitor potential consequences of technological development" (Standard 6H, p. 137, Standards for Technological Literacy). Having seen and heard about some uses for the polarization rotator and optical shutter from Mr. Bauchert, talk to a friend and then, each of you write down one use for a polarization rotator/optical shutter to solve an individual or community problem (real or imagined) Colorado Science CMS 5.c

Hint: If you can't think of some uses, use the following guiding questions for your quick write: What did you do/remember; What did you learn; What did you find interesting; and What questions do you have?

"People plan in order to get things done" (Standard 2E, p. 34 in the Standards for Technological Literacy). Having listened to Mr. Bauchert (Optical Engineer) and Mr. Bala (Teacher), type in your top two career choices and compare the number of jobs you find at http://www.monster.com in the QUICK KEYWORD search area with those for a teacher and an optical engineer today.

Based on your observations with rolling golf balls and bouncing tennis balls, do you continue to believe that these balls bounce just like lasers? Two people in your team are going to talk and type out your responses here. Remember, always include your claim, evidence, and reason in your responses.

Students should know and be able to identify cause and effect pairs involved in changes associated with a system (e.g. changing the position of a mirror alters the path and direction of light)." (Standard 2.3.a.1 in the Colorado Science Assessment Frameworks)

Before we start experimenting with lasers, for our class discussion today, respond to the following scenario.

Cody, whose uncle is a cop, said and noticed that the his uncle's protective jacket not only had a live and loud color, but the word POLICE in the jacket seemed to be visible in whatever direction he saw it from at night. Chatting with Diana, he said he could not believe that the reflected light could be seen in all directions. He thought light always bounced off in only one direction like a basket ball. Otherwise, how could one pass the basket ball so predictably, he said. Diana, disagreed with him and said light coming in one direction reflected in all directions and that's why the word POLICE was visible in the jacket.

- 1. Do you agree with Cody or Diana?
2. How could you support your idea?
3. What reasons would you give Cody or Diana, if you disagreed with them.

Make sure you include: 1. Your CLAIM 2. Your supporting EVIDENCE 3. Your justifying REASON(S) in your online posts.

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