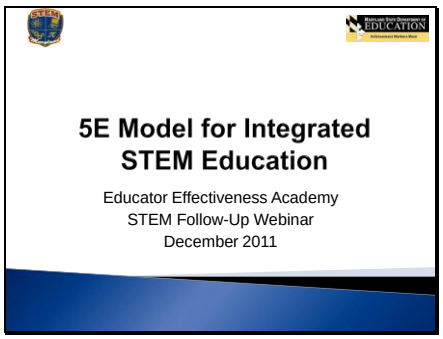
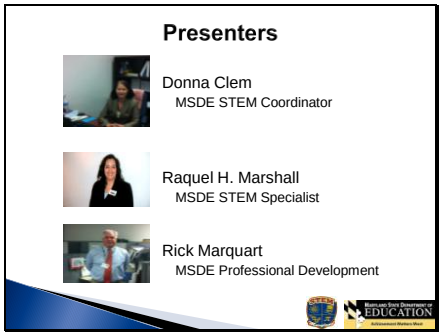
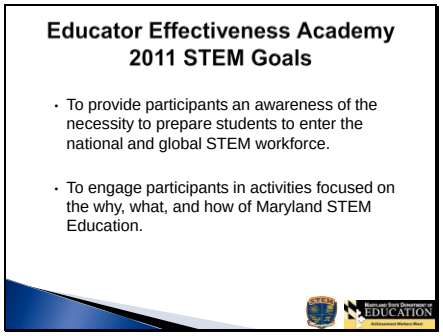


Welcome to the Educator Effectiveness Academy STEM Follow up Webinar. It was a pleasure meeting Maryland educators across the state during the 2011 Educator Effectiveness Academy. I hope the information presented in this webinar will provide additional support for you as you begin to implement STEM programs, units, and lessons in your home schools.



I am Donna Clem, STEM Coordinator at the Maryland State Department of Education.

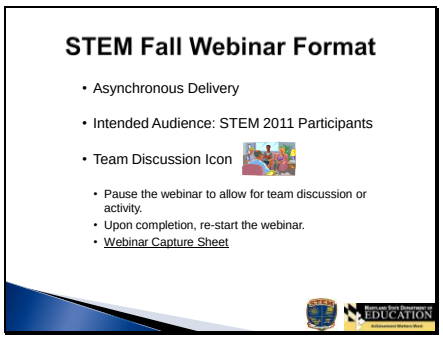
Joining me today is Raquel Marshall, STEM Specialist and Rick Marquart from MSDE Professional Development Department



Two overarching goals of the EEA were:

- To provide participants with an awareness of the necessity to prepare students to enter the national and global STEM workforce.
- To engage participants in activities focused on the why, what, and how of Maryland STEM Education.

This webinar is a follow up to the EEA from this past summer. At the EEA participants requested additional information of the 5 E model for integrated STEM education.

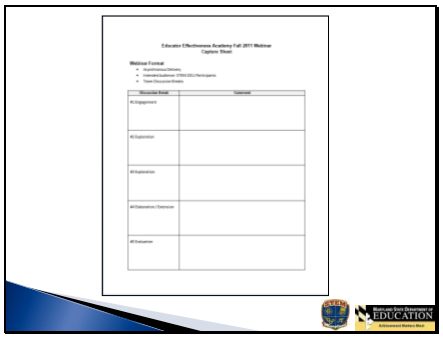


The format for this webinar is: follow slide is asynchronous Delivery which allows it to be viewed at any time.

The intended audience is STEM participants however, we hope that it will be a part of professional development for STEM PLC and school faculties.

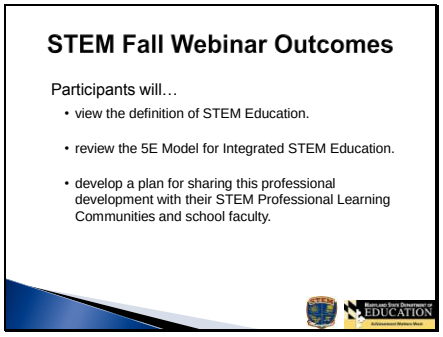
During the presentation you will see an icon for TEAM DISCUSSION. Please pause the presentation while you and other viewers participate in discussion activities.

A Webinar Capture Sheet has been developed. Hopefully you have taken the opportunity to download the Webinar Capture Sheet from MDk12.org website.



This document is designed to allow you to capture your thoughts, ideas, and comments as we move through the presentation.

Participants are encouraged to record their responses to the five discussion questions throughout the webinar.



In this webinar you will:

- Review the definition of STEM education.
- Review the 5 E model for Integrated STEM education

Design a plan for sharing this professional development with their STEM Professional Learning Communities and school faculty

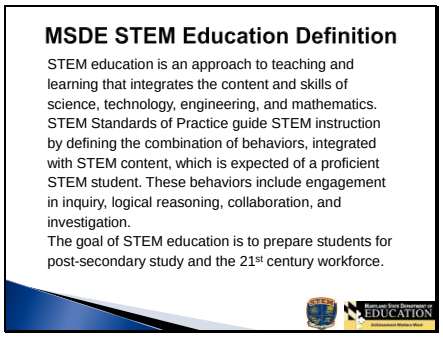
The Maryland State Department of Education Office of STEM Initiatives has developed a definition of STEM Education that provides a framework for consistent STEM Education across the state.

Stakeholders, including many participants of this webinar, provided critical input into the states definition of STEM Education.

In addition, a thorough review and research of:

- Maryland Governor's STEM Task Force Report
- Common Core State Standards for Mathematics and English Language Arts
- The next generation science standards framework for K-12 Science Education
- International Technology and Engineering Educators Association Standards for Technological Literacy
- Maryland Technology Education standards were thought of as we developed this definition.

The MSDE definition of STEM education incorporates our research and feedback from our stakeholders.

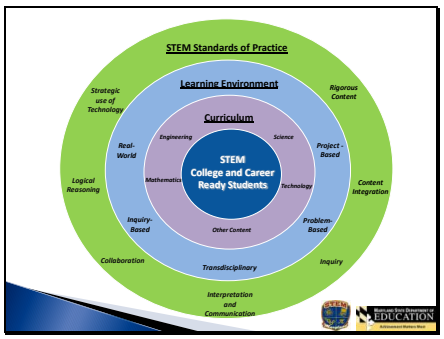


We've developed standards of practice that guide STEM instruction. We want these standards of practice to help us indicate behaviors for students and teachers.

STEM education is an approach to teaching and learning that integrates the content and skills of science, technology, engineering, and mathematics.

STEM Standards of Practice guide STEM instruction by defining the combination of behaviors, integrated with STEM content, which is expected of a proficient STEM student. These behaviors include engagement in inquiry, logical reasoning, collaboration, and investigation.

Finally, the goal of STEM education in Maryland is to prepare students for post-secondary study and the 21st century workforce.



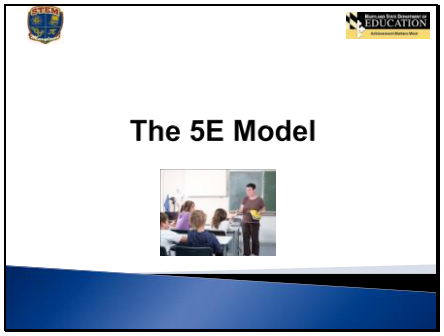
This is a Graphical Representation of STEM Education in Maryland

it involves STEM Standards of Practice, in engaging hands on learning environment, and transdisciplinary content.

The goal of STEM education is to prepare students to be college and career ready.

- STEM includes rigorous program of study in Science, Technology, Engineering and Mathematics from grades Pre K - 12.
- Students learn STEM content within a learning environment that includes problem based, project based, and inquiry based learning experiences.

The STEM Standards of Practice are intended to guide teachers as they prepare STEM units and lessons.



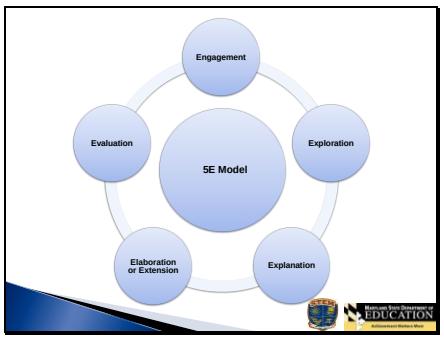
This webinar will focus on the 5E model for Integrated STEM Education.

Please welcome Raquel Marshall, STEM specialist at MSDE. She will present the 5 E model for Integrated STEM Education.

- During the 2011 Summer Educator Effectiveness Academies,
  STEM participants were introduced to the 5 E Model for effective STEM lesson designs.

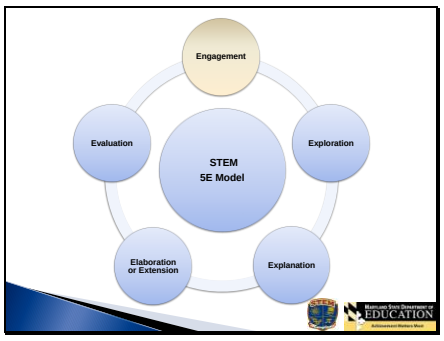
- As a follow-up, this webinar will expand on the 5E model for Integrated STEM Education by providing critical STEM LookFors

As we consider the definition of STEM Education
for the state of Maryland, let's explore its impact on implementing the 5E Model for an integrated STEM unit or lesson

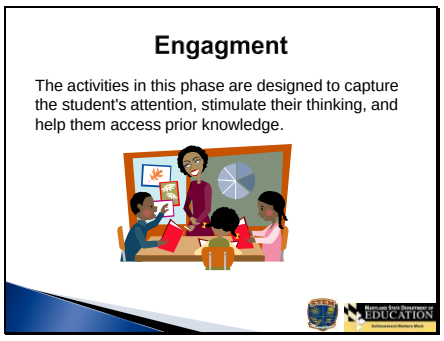


Thanks Donna.

- Many educators across Maryland are well familiar with the 5E Instructional design model. Hence, this constructivist based learning model is not new to K through 12 education.
- It is rooted on the belief that learning something new or developing a deeper understanding involves making sense of both ones prior experiences and first-hand knowledge gained through new explorations.
- The five stages of learning in the 5 E model are: Engagement, Exploration, Explanation, Elaboration, and Evaluation
- Each of the five stages builds upon the previous as students construct new understanding and develop new skills.

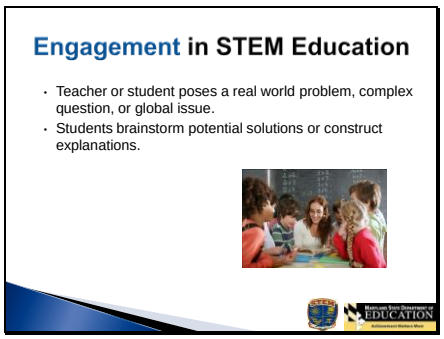


- Let's begin with the Engagement phase of the 5 E Model



The activities in the Engagement phase are designed to:

- Capture the student's attention
- Stimulate student thinking,
- Help student's access prior knowledge.

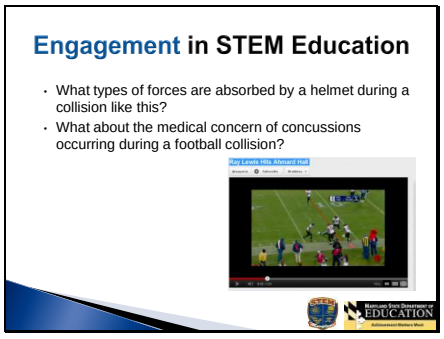


When considering a STEM application of Engagement phase,

- It is important to promote the real world connection to the desired content related learning goals.
- During Engagement, the teacher or student poses a real world problem, complex question, or global issue.
- Through the inquiry process, students brainstorm potential solutions or construct explanations in preparation for further exploration.

Let's take a look at an example of an engaging video that could be used in a Health – Sports Safety lesson unit. Please be warned that this is a video clip of a professional football collision during a game and hence may not be as appropriate for younger students.

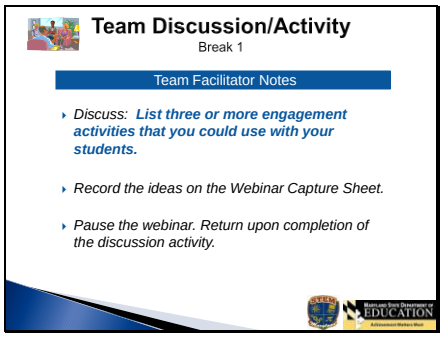
Please note that the player involved was not injured.



Wow! Just as the commentator stated…What a collision? I'm glad to see that the football helmet provided sufficient safety.

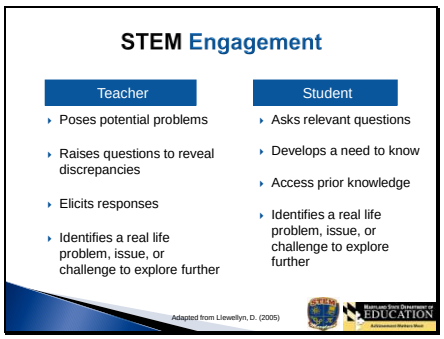
I wonder, what types of forces are absorbed by helmets during a collision like this?

Is there a particular manufacturing process required to ensure the safety performance of helmets?



Now it is time for our first Discussion Break:

- Brainstorm with your colleagues at least three or more engagement grade appropriate activities that you could use with your students.
- Consider non-typical STEM subjects like Art, Social Studies, and Health.
- Be sure to record your team's ideas on the Webinar Capture Sheet
- Upon completion of the group discussion, return to the webinar.
- At this time, pause the webinar.



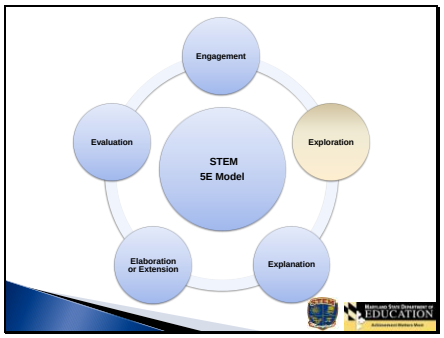
Welcome back!

Now that you have brainstormed some great engagement activities, consider how you would implement these activities in your classroom.

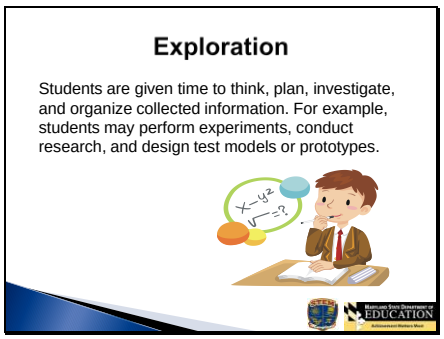
During your brainstorm session you may have thought of many different ideas, or hooks as we use to call them to capture students attention. Here are some engagement ideas that you may have on your list:

As a recap, the following are for the STEM application of Engagement:

Teacher	Student
Poses potential problems	Asks relevant questions
Raises questions to reveal discrepancies	Develops a need to know
Elicits responses	Access prior knowledge
Identifies a real life problem, issue, or challenge to explore further	Identifies a real life problem, issue, or challenge to explore further



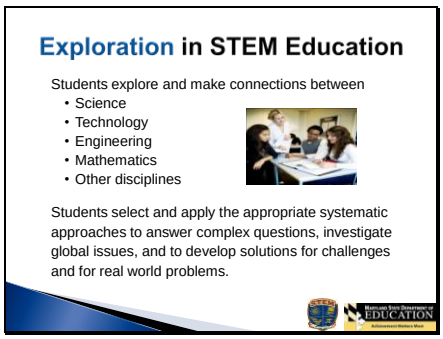
Our next phase is Exploration.



The activities in the Exploration phase are designed to give students time to

- Think
- Plan
- Investigate
- Perform experiments
- Conduct research

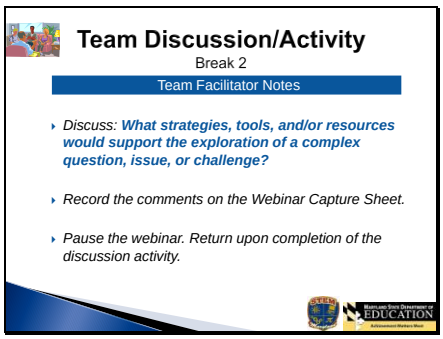
Design test models or prototypes



When considering a STEM application of the Exploration phase, let's recall that

- STEM Education is an approach to teaching and learning that integrates the content and skills of science, technology, engineering, and mathematics across all disciplines
- Therefore, during exploration, students develop a STEM perspective. That is, Through the process of inquiry, students explore the
    - Science
    - Technology
    - Engineering
    - Mathematics connection to the complex question or problem being considered.

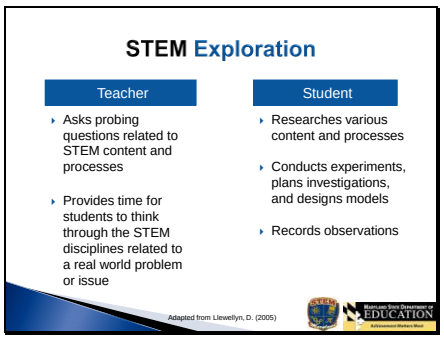
Students also select and apply appropriate systematic approaches for exploration that may include the scientific process and the engineering design process.



Now it is time for our second Discussion Break:

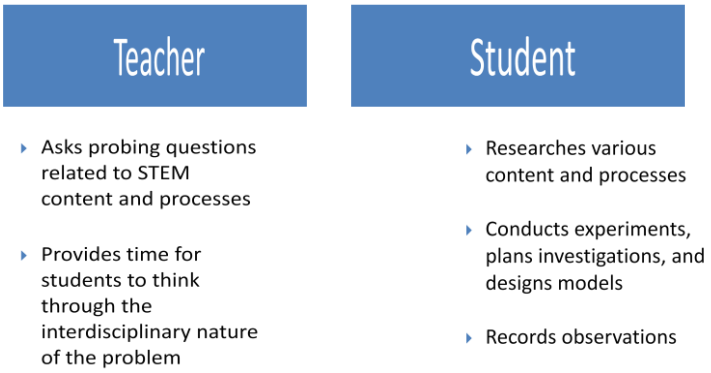
- As you consider your grade level, discuss with your colleagues the following question
    - What strategies, tools, and/or resources would support the exploration of the complex question, issue, or challenge?
- Be sure to record your team's comments on the Webinar Capture Sheet
- Upon completion of the group discussion, return to the webinar. This activity should take about 15 minutes.

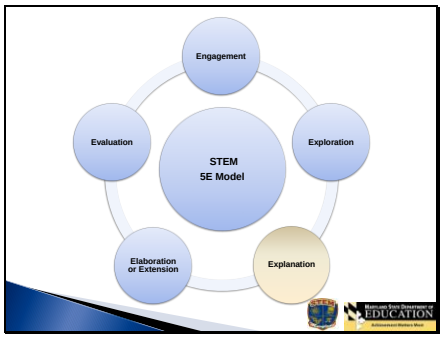
At this time, pause the webinar.



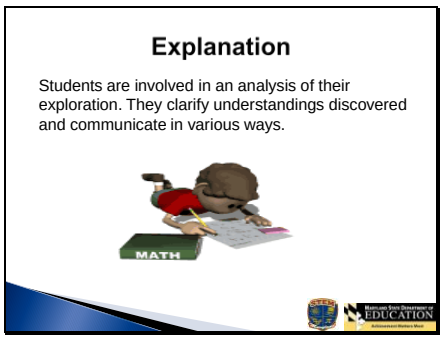
Welcome back!

What examples of Exploration do you have on your list? How does it reflect the type of students that you are working with? Elementary students might have different kind of Exploration in comparison to middle school or high school. I wish I could see what was on your list. Here's our list for STEM Exploration for both teachers and students.



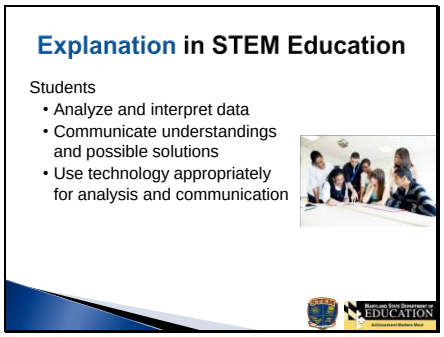


The next 5E phase is Explanation.



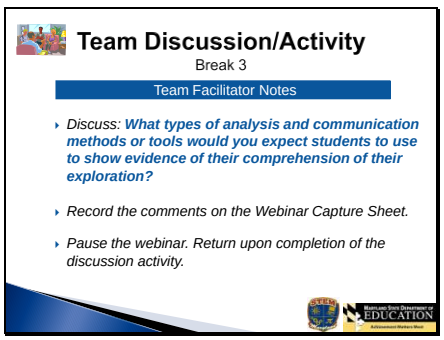
The activities in the Explanation phase are designed to support analysis of information and data collected during exploration.

- Students clarify understandings from their connections of prior knowledge to discovered understandings
- Students communicate this understanding to their team mates, classmates, teachers, and others using a variety of mediums as appropriate for the audience.



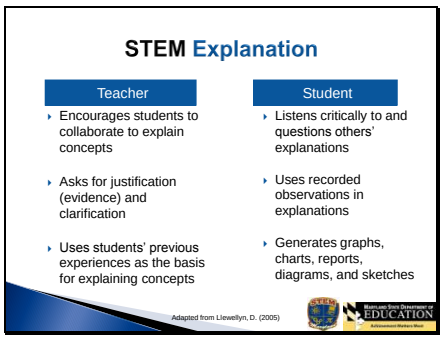
When considering a STEM application of the Explanation phase,

- Proper analysis of data and ethical data collection is an important skill to be developed for the STEM literate student.
- Communication is another essential skill to be developed in STEM Education.
- Often times students are able to communicate knowledge in one content area. However, STEM Education requires the integration of multiple content areas. Being able to synthesize and communicate information gathered from multiple content exploration is critical to developing a STEM literate student.
  Also, the appropriate use of technology for analysis and communication is an important element of this phase.



Now it is time for our third Discussion Break:

- Discuss with your colleagues the following question
  - What types of analysis and communication methods or tools would you expect students to use to show evidence of their comprehension of their exploration?
- Be sure to record your team's comments on the Webinar Capture Sheet
- Upon completion of the group discussion, return to the webinar. This activity should take about 15 minutes.
- At this time, pause the webinar.



Welcome back!

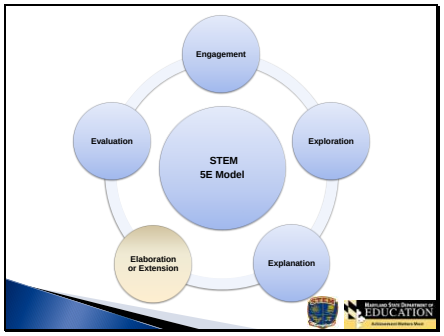
Teacher

- Encourages students to collaborate to explain concepts
- Asks for justification (evidence) and clarification
- Uses students' previous experiences as the basis for explaining concepts

Student

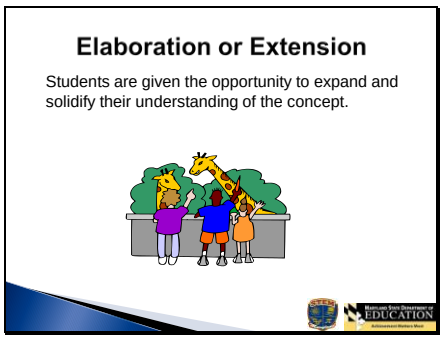
- Listens critically to and questions others' explanations
- Uses recorded observations in explanations
- Generates graphs, charts, reports, diagrams, and sketches

Explanation looks different depending on the grade level of students that you're working with. There will be some difference for how students in Elementary school explain things, how student's in middle school explains things and how student's in high school explains things.



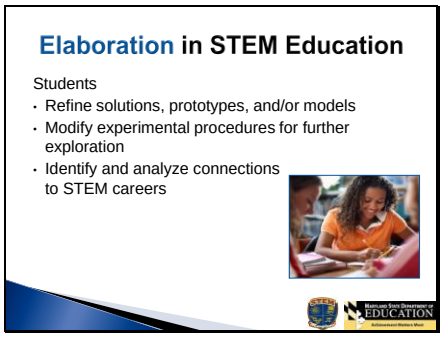
The next 5E phase is Elaboration. Some learning models split this phase into two: Elaboration and Extension.

We will combine these components into one phase.



The activities in the Elaboration phase are designed to give students the opportunity to

- Expand and Solidify their new understanding

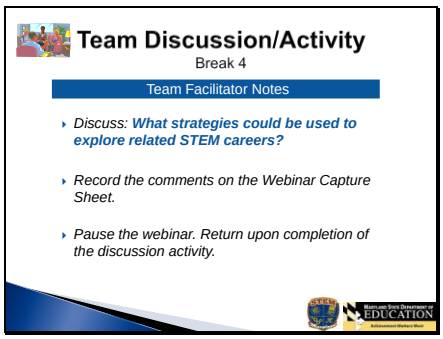


What about the STEM application of Elaboration? When considering a STEM application of Elaboration

Students:

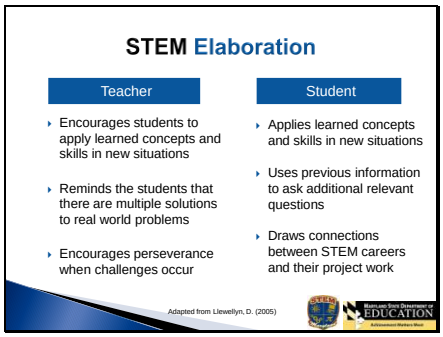
- Refine solutions, prototypes, and/or models
- Seek new clarification by Modifying experimental procedures for further exploration
- Also, what is unique to STEM Education is the connection to STEM careers. The goal of STEM Education is to prepare students for post-secondary study and STEM careers.
- In the Elaboration Phase, students identify and analyze connections to related STEM careers.

Having constructed new knowledge and deeper understandings through the STEM 5E learning model, students begin to see themselves as future STEM professionals, even as early as Kindergarten.



Let's take another Discussion Break

- Discuss with your colleagues the following question
  - What strategies could be used to explore related STEM careers?
- Be sure to record your team's comments on the Webinar Capture Sheet
- Upon completion of the group discussion, return to the webinar. This activity should take about 15 minutes.
- At this time, pause the webinar.



Welcome back!

STEM Elaboration, What's on your list?

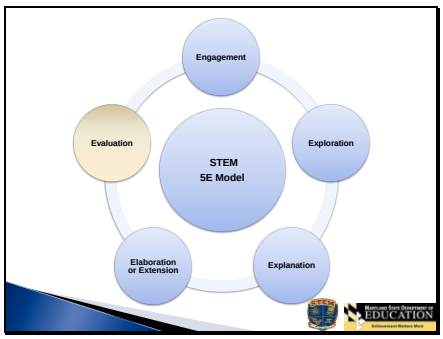
As a recap, the following are _____ for the STEM application of Elaboration:

Teacher

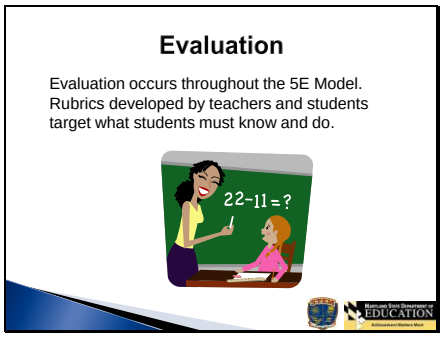
- Encourages students to apply learned concepts and skills in new situations
- Reminds the students that there are multiple solutions
- Encourages perseverance when challenges occur

Student

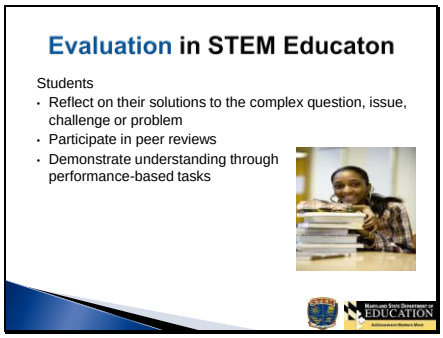
- Applies learned concepts and skills in new situations
- Uses previous information to ask additional relevant questions
- Draws connections between STEM careers and their project work



The last phase of the STEM 5E Model is Evaluation.



- Evaluation occurs throughout the 5E model and of course throughout the learning experience.
- Rubrics developed by teachers and students target what students must know and do.



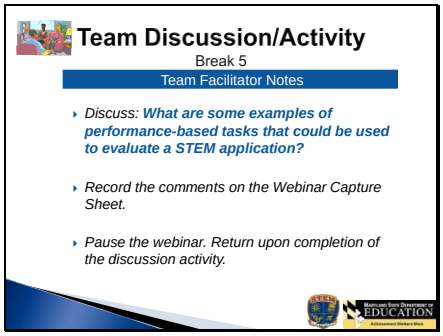
When considering a STEM application of Evaluation,

- Student reflection is essential.
    - Students should reflect on the ethical, environmental, societal impacts to their solutions to the complex question, issue, challenge or problem explored earlier.

  Students should also reflect on their individual contribution to the project work. (what worked well?, what was missed?, what changes would the student consider next ?)

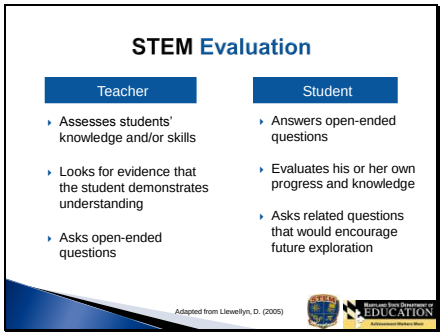
- Peer reviews offer students the opportunity to learn from their fellow classmates. This is an important 21st century workforce skill that should be developed in a STEM literate student.
- Students demonstrate understanding through performance-based tasks which are assessed via STEM rubrics
- Performance based tasks ask students to produce a product or do something rather than select an answer

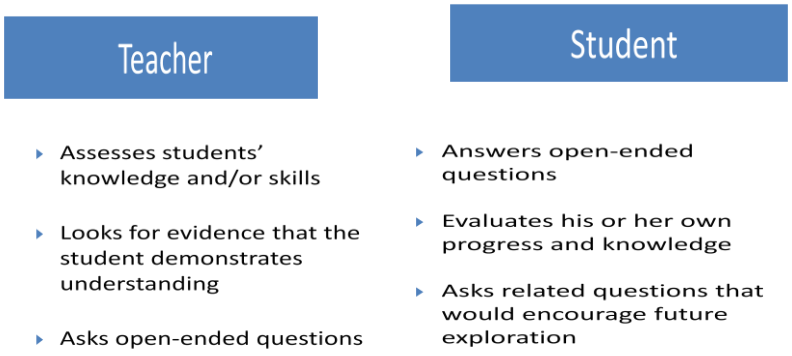
from a ready-made clip.



Now it is time for our final Discussion Break:

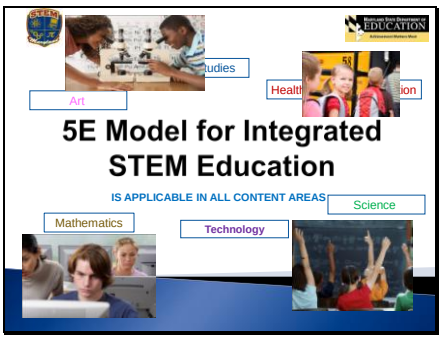
- Discuss with your colleagues the following question
  - What are some examples of performance-based tasks that could be used to evaluate a STEM application?
- Be sure to record your team's comments on the Webinar Capture Sheet
- Upon completion of the group discussion, return to the webinar. This activity should take about 15 minutes.
- At this time, pause the webinar.





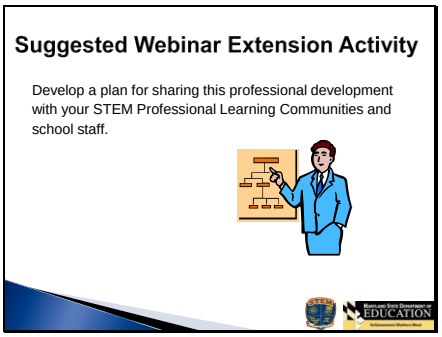
What are some of the things on your list?

There are many Evaluations that are performance based and can be used by the teachers in the classrooms.



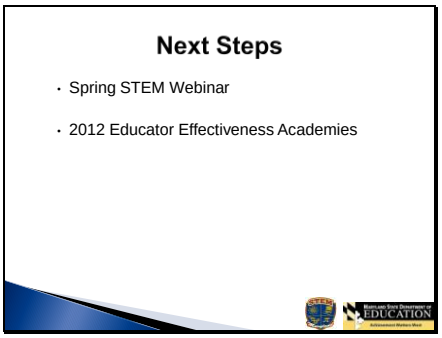
We hope that you were able to record vital information on the webinar capture sheet.

As an extended activity, consider developing a plan for sharing this professional development with your STEM PLCs and school staff.



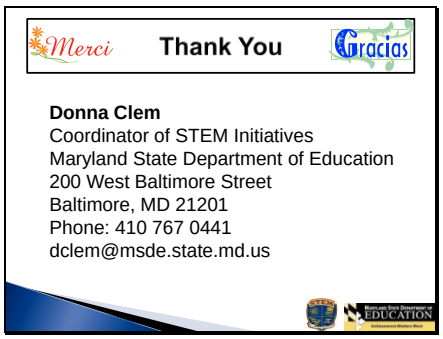
The Key take aways from this webinar are that

- STEM Education is primarily about the process of thinking through a real world problem through the lens of Science, Technology, Engineering, and Mathematics.
- There is STEM in Social Studies
- There is STEM in Science
- There is STEM in Health/Physical Education
- There is STEM in Mathematics
- There is STEM in Art
- There is STEM in Technology
- There is STEM in all Content Areas
- And that STEM Education is for ALL students



Next Steps

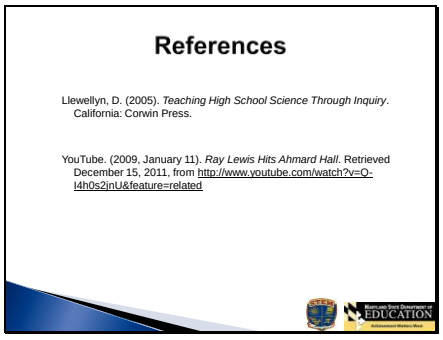
- Spring STEM Webinar
- 2012 Educator Effectiveness Academies



Thank you for taking time to watch this presentation. Again my name is Donna Clem, Coordinator of STEM Initiatives.

Don't hesitate to contact me if you have any questions or concerns.

Thank you and have a great day!!



References

Llewellyn, D. (2005). *Teaching High School Science Through Inquiry*. California: Corwin Press.

http://www.youtube.com/watch?v=Q-I4h0s2jnU&feature=related