

# Greater Southern Tier STEM Education

Preparing students for the 21<sup>st</sup> Century

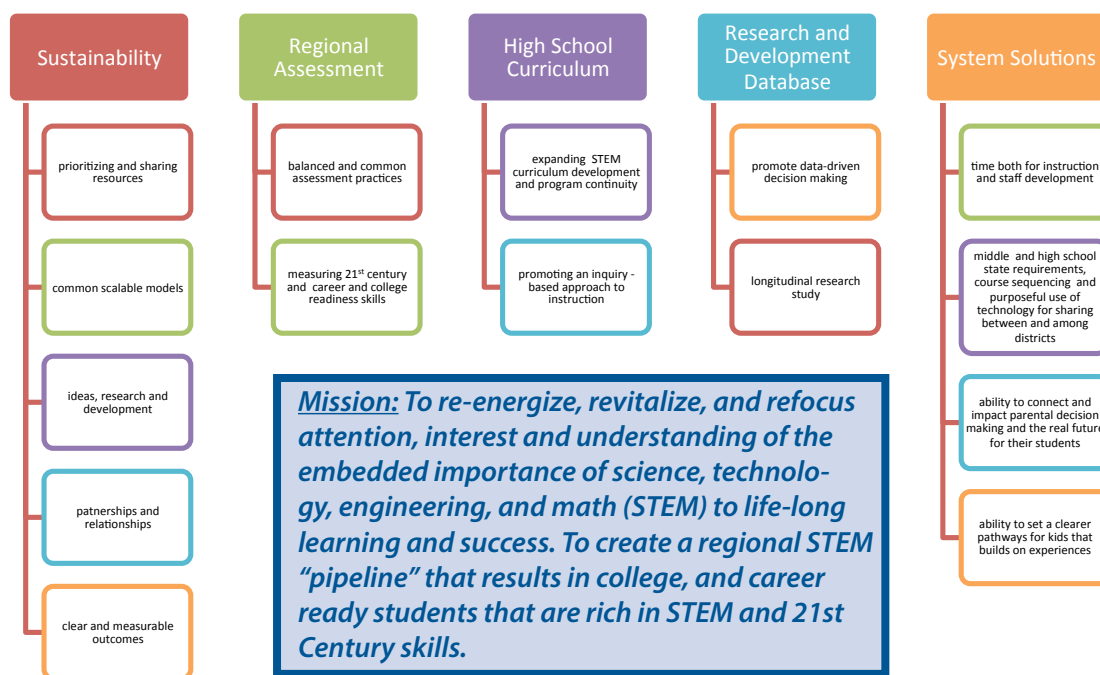
SCIENCE | TECHNOLOGY | ENGINEERING | MATH



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## A message from the GST BOCES STEM Staff Development Coordinator

The GST Regional STEM Program continues to reenergize and refocus priorities as we plan for and continue to improve STEM learning opportunities for students. The priorities indicated in the diagram below summarize five critical areas of focus for the STEM Deployment Team to consider as we continue to sustain programs, make decisions and carry out actions that will move us forward in reaching the Regional STEM Mission and Vision.



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A critical component to the priority of sustainability is the ability to promote and communicate common scalable models that work. The regional STEM science model is based on the criteria indicated below:

- **Access:** All district teachers attend Regional STEM Inquiry Training that is specific to the curriculum to be implemented. They also are provided job embedded support and access to high quality instructional materials
- **Application:** Fidelity of implementation is related to adequate time allotted for students to be engaged in STEM instruction that is specific to the training in which teachers have participated
- **Application:** Instruction follows the BSCS 5E /7E Inquiry Model Engage, (Elicit) Explore, Explain, Elaborate, Evaluate, (Extend)
- **Application:** Utilization of the STEM notebook "model" provided in the training and common assessment practices as modeled in training

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## Q & A with GST BOCES Special Education staff

### Lisa Henderson, teacher

#### *What positive changes have you seen in your students while engaged in STEM?*

My current student population contains first through third grade students with varying degrees of needs. Students are fully engaged during our STEM science time and love the hands-on learning. I model some investigations and lessons for the students, modifying the packets to meet each of their needs. Students follow the step by step instructions, adhere to “lab rules” and are encouraged to answer questions using their own thoughts. I have students who require much prompting to answer questions and another who is answering well beyond his grade level. Students look forward to STEM time each day and get excited about each investigation to a point where they even want them set up during recess times.

#### *How does STEM help to foster skills in a Special Education population?*

STEM fosters not only the learning of the science curriculum but independent thinking. Students realize that it is okay to be wrong and learn to determine why their estimate or prediction is not correct. Students learn there is always more than one way to find an answer and that investigating a problem can be fun. This also has encouraged some of my students to help others who are struggling with a task by working together and showing them different ways to find an answer. Each student shows his or her own intelligence and feels a sense of pride and accomplishment with each task.

#### *What is your favorite part of STEM?*

My favorite part of STEM is watching the students’ faces as they place their hands on a lab and see how cool science can be. The “wow” factor that each student expresses when he or she does or sees something cool is exciting.



*A third-grade student in Lisa Henderson's class is engaged in a STEM lesson.*

### Kasi Washburn, principal

#### *What has been your favorite part about implementing STEM?*

As a GST BOCES Principal of Special Education, I have identified that many of our special education students are eclectic in their learning styles. Generally speaking, instruction geared toward solely the visual learner is not effective. Rather, instruction that is geared to meet the needs of visual, auditory, tactile and kinesthetic learners is much more effective. The STEM kits, trainings and lessons are geared to meet the different learning styles. We now have students arriving in the mornings asking their teachers, “What are we doing in STEM today?” Also, I have noticed a sharp increase in the level of active participation and engagement during science instruction.

#### *How do you feel STEM meets the needs of the Special Education population?*

It is my professional belief that STEM should be offered to all students, but especially those with Individual Education Programs (IEPs), as it aligns so well with their needs and learning

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styles. We have piloted STEM in BOCES 6:1:1 Emotional Disability (ED). These students have highly intensive needs and the results have been overwhelmingly positive. The teachers feel supported with the monthly, on-going, face-to-face trainings. Teachers also receive the kits, so resources are not a barrier. Lastly, they receive student notebooks to help guide the lesson and collect data.

***As an administrator, what are your goals for implementing STEM and how well do you feel these goals are being met?***

My original goal was to pilot STEM in the 2013-14 school year in just one class. However, after the summer training and roll out, the Special Education teacher who attended was so excited she shared with the other teachers. I quickly moved from one to two teachers implementing STEM at a host site. BOCES Special Education has now doubled our classrooms utilizing STEM. How exciting! I also have made it a point as part of APPR to observe teachers during STEM instruction. Generally, there are more opportunities to meet the level of distinguished during a STEM lesson by the nature, variety, resources and level of student participation and engagement.

***How have the professional development model and the curriculum materials helped to support teacher success with implementation?***

Amazing! It is my belief that this is one of the main reasons for success. Teachers don't feel like it's one more thing they have to do, they want to do it. They don't have to learn it all at once. They receive on-going monthly trainings, collaborate and network with other teachers from various districts. They also receive student kits with all the materials they need and the student notebooks have been prepared as well. Many of my teachers are using the notebooks as a foundation, but adapt and modify as needed. For example, one teacher inserted a table that allowed students to gather their data, but also communicate with their peers and add their data. This prompted students to communicate, use critical thinking skills and consider questions such as, "Does my answer make sense? Does it align with what my peers got? Why might our scores be different?" As a former engineer, I have a great love of math and science. I really feel this is a great step to getting our students ready for NGSS standards and an ever-changing, scientific world.

***What are your plans for growing STEM with your program?***

I have plans to add on STEM Earth Science next year. I want STEM in ALL of my classes!



*Students in Lisa Henderson's class enjoy hands on learning during STEM lessons.*

## Students compete in underwater robotics event

On February 27, seven area school districts competed in an underwater ROV competition as the capstone to weeks of preparation. More than 50 students from Bath, Avoca, Addison, Horseheads, Elmira City, Corning East and Corning West comprised the 18 teams that participated.



(Above) Domonic Mathews (left), grade 12, Southside High School, and Kyle Janeski, grade 8, Broadway Middle School prepare to submerge their ROV.

(Right) The underwater ROV competition took place at the Haverling High School pool.

In preparation for the event, students worked through investigations about balance, buoyancy, circuitry and Newton's Laws of Motion. Applying these concepts, students were asked to design and pilot their own ROV through a series of challenges designed to simulate the real-life work of an ROV. Throughout all of the events, students had only a remote control and a small camera mounted on the ROV to help them navigate.

The first of the competition challenges was Artifact Retrieval, in which teams designed a tool that allowed their ROV to pick up objects from the bottom of the pool and bring them to the surface. Horseheads #1 was the winner of this event, collecting more than twice the artifacts of any other team. The second event was Artifact Measuring, in which teams took measurements of an artifact that could not be brought to the surface. Teams developed a number of different plans for successfully finding the dimensions of a board positioned at the bottom of the pool, but Avoca #2 proved to be the most successful, with accurate measurements and recording of data. The final challenge was Rise to the Top, in which students needed to make their ROV nearly neutrally buoyant. The first place team for this event was Corning East #1.

In addition to challenges, students also were scored on their ability to work together as a team and to support one another when designing, communicating and competing and on their accuracy and enthusiasm in telling "their story." In a science fair format, students of each team were asked to tell about the design of their ROV, how they handled frustration with the design process and why they thought their ROV would be successful. All of the teams had creative, innovative designs and we look forward to the next competition.

Funding for this program was provided through a Perkins Grant supervised by Chris Weinman, GST BOCES Executive Director of CTE. Professional development and training was provided by the GST BOCES STEM Team.



## Broadway students participate in Science Fair

On February 27, students at Broadway Elementary School in the Elmira City School District demonstrated their STEM skills in the school's first Science Fair. Sixty-six students in grades 3-6 selected their own projects to investigate and presented their information and findings to judges during the event. Student investigations explored circuits, density, simple machines, wind energy and even if crickets could be a new type of thermometer. Participants were awarded certificates and first, second and third place winners were awarded for each grade level. This was a wonderful opportunity for students to expand on the learning that has been taking place in STEM in their classrooms.



Broadway student Landyn Gunderson won a ribbon and certificate for his volcano experiment.

# First regional VEX robotics competition held

What do you get when you combine four school districts and more than twenty students staying after school with a handful of dedicated teachers and a whole lot of metal, gears, bolts, wheels and a claw? The first regional GST BOCES after school VEX robotics competition, along with a lot of fun! Hornell Jr. High School was the host of the successful event, which was the capstone activity for seven teams of students who worked through the construction and programming of a "clawbot." The after school programs in Alfred-Almond, Bradford, Canisteo-Greenwood and Watkins Glen school districts were funded by a Perkins Grant and supported by GST BOCES.

The student engineer-programmers used their clawbots as the centerpiece in this multifaceted competition, which included a science forum and multiple rounds of "robotic basketball." Students shared their experiences with judges and peers to start the day. Later, they demonstrated their driving proficiency by competing in the individual and collaborative matched rounds requiring the robot to retrieve, transport and successfully deposit a block into a basket. Teams were recognized for their performance in each phase of the competition with awards for communication skills, individual team performance, collaboration and overall performance.



*(Above) Students directed their robots in a "robotic basketball" exercise.*



*(Left) Participants were grouped into teams to design and construct their clawbots.*

This program seeks to promote the awareness and development of the youth in our region in the disciplines of Science, Technology, Engineering and Math (STEM). The students enjoyed their experiences and the opportunity to meet and interact with kids from other districts. Look for another competition in May with a new group of students from the after school robotics program in the Southern Tier region.



*Students from four school districts participated in the VEX robotics event.*

## STEM Challenges taking flight

The STEM Challenges have been an exciting way to incorporate STEM content to solve a problem or complete a task. Accessible on our website, [www.gstboces.org/stem](http://www.gstboces.org/stem), the STEM Team has posted monthly challenges that students across the region are experimenting with. The purpose of these challenges is to simply increase the conversations relating to STEM, encouraging students to ask questions and find solutions.

Taking a positive spin on our freezing temperatures this winter, the STEM Challenge in January was to identify the effects that temperature had on bubbles. Students blew bubbles and watched as the “Polar Vortex” caused liquid bubbles to crystallize, and in some cases, solidify before their eyes.

In honor of the 2014 Winter Olympics in Sochi, students were asked to analyze the many aspects of science, technology, engineering and math that were present in their favorite Olympic event. One of the most talked about aspects of the Olympics this year was the many ways that engineering and technology have improved the performance of competitors world-wide.



This month, we're excited to challenge students to soar to new heights – with Peeps®, that is! For March, the STEM Team is challenging students to create a device that will launch a Peep® a great distance. This is a challenge that is perfect for students to try at home or it can be used as a STEM competition between students at school. Submissions for this challenge will be accepted in video format that answers the following questions:

- How was the device built?
- What was the purpose of the design?
- How far can the device launch a Peep®?

For detailed information about this month's challenge, please access our website at [www.gstboces.org/stem/march-challenge.cfm](http://www.gstboces.org/stem/march-challenge.cfm). We look forward to seeing flying Peeps®!

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### Message, continued

- **Administrative Support:** Models also commit to administrative support both explicitly, through formal communication and policy and implicitly, informally observing and connecting with teachers to assess and address concerns.

With somewhat varied participation levels in the region regarding the model, understanding where a district falls on a continuum related to the model will be important as we embark on data driven decision making as noted in the R&D STEM Database Priority.

The R&D STEM Database priority is fueled by the idea that the STEM Deployment Team has embraced the act of becoming inquirers in order to improve student experiences in STEM. The Regional Data-Base Tool, designed by GST BOCES Computer Services, has the ability to house qualitative, quantitative and demographic data related to the regional STEM program. This tool can be utilized in the region to access and filter data that is based on inquiries regarding the impact of STEM program implementation in specific districts. This data will be critical in sustainability, decision making and bringing models to scale in the region. In future issues, we will focus on the data and inquiries related to the R&D STEM Database Priority as well as highlight progress related to the other priorities as indicated in the chart on page 1.

Thank you for your continued support of the GST Regional STEM Program.

Sincerely,

*Jeremy Wheeler*

GST BOCES STEM Staff Development Coordinator