

December 2013

A message from the STEM Staff Development Coordinator

The seven members of the GST BOCES STEM Team continue to provide high quality training to improve instruction to meet the regional STEM mission.

The STEM team has presented 54 full-day science and engineering trainings for 253 unique teachers between September and November. This cohort model requires teachers to participate in monthly professional development training sessions where they learn the curriculum they are teaching “just-in-time” for implementation. They also have opportunities to reflect on implementation and share strategies and resources with colleagues within the cohort. This training is supported with 24/7 access to resources and collaboration opportunities through a virtual professional learning community (VPLC) and job-embedded support.

Professional development session topics focused on K-12 science and engineering. The BOCES STEM staff adapts and enhances STEM science and engineering modules that are based on an inquiry-based science curriculum called FOSS (Full Option Science System), developed by the Lawrence Hall of Science and the Engineering is Elementary curriculum, developed by the Museum of Science, Boston. We also work with a number of other resources and materials to create the “STEMified” curriculum materials that are designed to intentionally support the current NYS science standards, Next Generation Science Standards and ELA and Math Common Core in an interdisciplinary approach to instruction. These include *Picture Perfect Science*, *Keely Formative Assessment Probes*, *Active Chemistry* as well as several NSTA publications and articles.

Professional development sessions also include short courses during the year. The first four sessions include:

Session 1:

- *What is STEM Education? Creating consistent mental models regarding STEM Education.*
- *Why STEM? Why do we need STEM programming and what is the regional STEM program?*
- *STEM instructional strategies – STEM Notebooking, Whiteboarding, Connections to Common Core Learning Standards and Collaborative Learning Structures.*

Session 2:

- *Assessment in the Inquiry Classroom – What do we want students to know, be able to do and value when they graduate? What is a Balanced Assessment System? What tools and metrics can we use to assess STEM outcomes: science and engineering practice, notebooks and habits of mind? Use of formative assessment and reflections on how what we assess demonstrates to students what we value.*

Session 3:

- *The Inquiry-Based Classroom – Establishing a common model form implementation of STEM in an inquiry-based classroom. Expanding the 5E Inquiry Model to the 7E Model, Reflections on Practice.*

Session 4:

- *Levels of Inquiry – How can you scaffold the inquiry process for varied learners in the classroom?*

Mission: To re-energize, revitalize, and refocus attention, interest and understanding of the embedded importance of science, technology, engineering, and math (STEM) to life-long learning and success. To create a regional STEM “pipeline” that results in college, and career ready students that are rich in STEM and 21st Century skills.

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Students solve crimes in STEM Forensics course



Arkport Forensics students practice their fingerprinting skills.

STEM Forensics is a new addition to the Regional STEM Program this year. Arkport Central is one of seven schools that is offering STEM Forensics as a high school elective. The course received such large enrollment numbers that there are two sections offered.

Students enrolled in STEM Forensics are learning techniques to help them solve crimes. They have studied the skills of observation and are currently learning techniques of fingerprinting and how fingerprints are used to identify individuals. The classes were divided into teams and given the challenge of creating a crime story that the producers of a popular show might be able to use. They will create a crime scene with evidence that requires the use of forensic techniques and identify a victim and suspects. The crime will then be solved by another team and compared with the intended solution.

Q & A with Arkport Central School teachers

What do you believe are the best features of the STEM program?

Fun, interactive, hands-on inquiry that keeps students interested. Dare I say fun again?

What changes have you seen in the classroom after implementing STEM?

It's very rewarding to hear ALL of the students within the classroom asking questions. They want to know the "why" behind the investigations.

What has the student response to STEM been like in your classroom?

My students found it challenging at first. Some students felt overwhelmed, but after having support from their group members and peers, the overwhelming feeling went away. They can handle more than they are usually given credit for. STEM allows them to see that they can.

How do you feel that STEM helps foster problem solving skills in students?

Students don't look to me for the answers, rather they know they can figure it out by investigating a problem.

Students are learning how to work better in groups and that problem solving is improved as a result.

What are you most pleased with regarding the implementation of your STEM course?

I am excited to see how engaged each student is and how much they retain.

I like that the students are more involved and that my role is more of a facilitator than a lecturer. I am also trying much of what I have learned in my other classes



An Arkport Forensics student shows off her freshly-inked fingers.

Message, continued

STEM notebooks are used by the GST STEM Team as the foundation for students to be engaged in documenting their learning progression. Through notebooking, students are engaged in developing and documenting plans to carry out investigations and design solutions to problems. They collect and analyze data, write claims with evidence, model and communicate explanations using evidence.

We also develop engineering modules that are integrated within the science modules as part of the STEM instructional program. Students investigate and follow an engineering design process to solve a problem by designing a new technology. All of the STEM modules offer opportunities for teachers to integrate ELA and math within the context of science and engineering.

As you can see, a great deal of resources, time, energy and passion have been dedicated to the GST Regional STEM Program to reach its vision. The 15 participating school districts, local business and industry and higher education partners are committed to expanding and sustaining the Regional STEM Program. This level of commitment is impressive; in order to sustain this level of commitment and continue to stay the course as indicated in the strategic plan (which can be found at www.gstbooces.org/stem), barriers to implementation need to be addressed.

A major barrier to implementation is how much time teachers have in the day to implement curriculum and the push and pull happening with different content areas vying for time. In order to address these barriers, the region must begin to reflect and consider the following questions: Why might STEM (science, engineering) often be the first component cut from the day? How might what we cut from the day demonstrate to students what we value and what they should value? How might this impact students long term and be counterintuitive in being able to meet the regional STEM vision and expected outcomes? How might STEM become the center of student learning and provide opportunities to meet Common Core Learning Standards in an interdisciplinary context?

I understand the time limitations and frustration from teachers as I hear their concerns daily. We must allow teachers the opportunity to have an integrated and interdisciplinary approach to instruction, where they are intentionally planning instruction and facilitating students through transfer of their practice and knowledge across multiple content areas. For this reason, STEM is very much needed and should be considered to be as important as any other content area.

Sincerely,

Jeremy Wheeler

GST BOCES STEM Staff Development Coordinator

Vision: Our region will be a model in generating math, science, technology and engineering interest, excitement and marketable skills.

STEM website is new and improved

The STEM website has been revised and updated. We are excited to introduce several new resources and concepts to our districts. The purpose for the renovation is to make the website more interactive and provide teachers and students with resources related to STEM. Our goal was to create a website that teachers and students can continuously utilize at school and at home. The new updates available include:

- Symbaloo – An interactive Web 2.0 resource that bookmarks helpful and useful online resources for students and teachers. We have incorporated about 50 websites, tools and resources that can be utilized to enhance STEM instruction
- Pinterest – A social media resource that incorporates innovative ideas, the latest news, and informative material.
 - What will you find on our Pinterest Boards?
 - Additional nonfiction texts associated with units
 - Project ideas
 - National Science Teachers Association updates and announcements
 - Common Core Connections
 - Web 2.0 Tools
 - New Inventions
 - ...and so much more!

Follow us on Pinterest at GSTBocesSTEM

- STEM Login – We have been working with Andy Gillete and Toolboxpro to add online assessments to the curriculum. The website now has a STEM Login box to connect teachers and students with the assessments that correlate with their grade level.

- STEM Challenges – To connect the 15 districts participating in the program, we have launched a new feature called “STEM Challenges.” Each month, teachers and students will be provided with a challenge that they can complete in the classroom as a group, individually or at home. November’s challenge incorporated a Web 2.0 tool called “Voki” and asked students to share what they were learning in their classroom that was associated with STEM. Participants could create their own avatar, type or record themselves and add a voice to the avatar. This resource is free to utilize in the classroom and can make instruction and classroom projects interactive and exciting.

Visit us soon at www.gstboces.org/stem/!

Students use math and science for lifejackets

Students across the region have been working as engineers to design a lifejacket to keep a plastic action figure afloat. Teachers and students worked through the 5E Inquiry Model and the Engineering Design Process in order to apply scientific knowledge to an engineering challenge. Students worked through science investigations to gain an understanding of mass and volume and then applied their mathematical knowledge of graphing independent and dependent variables, ratios and proportions to create and support their life jacket design.



Sixth graders from Arkport test their lifejacket prototype.

The challenge culminated with student groups presenting their lifejacket design and modeled the mathematics to prove that their design would be successful. Teachers and students were both surprised to see the value of ratios in real life and how math and science are connected!



Students worked in teams to design lifejackets.

New STEM Challenges offered each month

The GST STEM Team is now offering exciting STEM Challenges each month to all students in participating districts. In November, a Challenge was posted for participants to use a Web 2.0 Tool called Voki to create a talking avatar that could share what has been happening with STEM in their classroom. Our winner for November is Mrs. Conklin's First Grader Maeve Wheeler from Ridge Road Elementary School in the Horseheads Central School District. Maeve submitted a Voki that told us about investigating, counterweights and balancing a pencil on its point. Great job, Maeve!



Maeve Wheeler won the November STEM Challenge.



December's STEM Challenge poses the question: "Are Double Stuffed Oreos Really Double Stuffed?" Students will need to devise a plan, implement their plan and submit their claim and evidence to answer this question. We look forward to hearing about everyone's findings! More information about the Challenge, including hand-outs, a detailed description and tips on how teachers can

incorporate the Challenge into instruction, can be found on the GST STEM website at www.gstboces.org/stem.

GST Extended Day Engineering launched

The GST STEM Team worked in collaboration with GST BOCES Executive Director of CTE Chris Weinman and 11 districts in the region to launch the GST Extended Day Engineering Program. Weinman secured grant funding to launch the program and provide robotics materials and stipends to pay teachers who will provide after school instruction to enhance students' exposure to STEM learning experiences. The program was designed for districts to offer 10 week sessions in the fall and spring. These sessions offer experiences in constructing Underwater ROVs (Remotely Operated Vehicles) and VEX robotics.

The GST BOCES STEM Team coordinated and provided professional development and curriculum for participating teachers. This project was built on the successes of previous pilot activities that took place in select districts and the Summer of Innovation robotics program. Through extended day programs, students in the region will have the opportunity to learn about engineering and robotics, to master math, science and technology content knowledge, and to increase their understanding of scientific practices and the engineering design process while building an underwater ROV and/or VEX robot to compete in regional competitions. Participating students will engage in scientific and engineering practices by conceptualizing, designing, manufacturing, testing and evaluating prototypes of

underwater ROVs and VEX robotics. Students will collaborate with peers, STEM content-area teachers and professional engineers to complete science investigations and hands-on robotics projects that will help them prepare for the regional competitions.

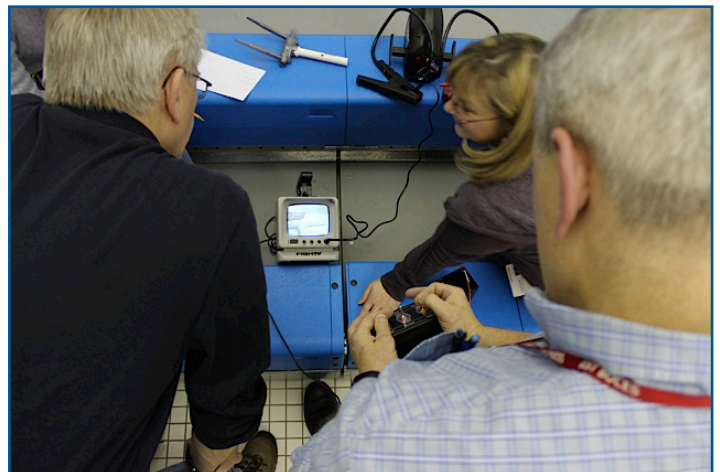
The first competition for ROV is set for February 27 at the Bath CSD High School pool. There are 24 teams in the region preparing for this competition. Students will be working in teams of up to four members to pilot their ROV to perform various tasks in the pool and present their project design.

A VEX Robotics competition also will take place, with the location and number of teams entered to be determined. Stay tuned to our next newsletter for updates and results of the regional competitions.

Participants practice controlling their underwater ROV.



Teachers test their ROV during a professional development session.



STEM Team members present at conferences

The Regional STEM Program continues to be recognized for providing high quality professional development at the state and national level. STEM Curriculum Mentor Brande Flaitz and STEM Coordinator Jeremy Wheeler presented two well-attended sessions at the NYSMSA Conference in October and the National Science Teachers Association Conference in November.

In Brande's session, *Crossing the Curriculum with an Engineering Design Challenge*, teachers and administrators experienced the 7E inquiry model, where they applied scientific knowledge in order to complete an engineering design challenge.

Jeremy's *Establishing Collaborative Learning Communities in a STEM Classroom* gave participants the chance to experience an inquiry based exploration that demonstrated how students can use data to understand the principles of collaborative learning.