WATKINS GLEN CENTRAL SCHOOL DISTRICT

STEM PROGRAMS

Superintendent of Schools: Tom Phillips
Director of Instruction: Nan Woodworth-Shaw

WHY STEM?

The World is Flat

- 11/9….The Fall of the Berlin Wall…What?
  - It “unlocked” half the planet
  - It made those citizens our potential partners and competitors
  - Technology allowed for the free flow of information
  - If you had a computer and access you had potential (Plug and play)
  - The new world is one of opportunity not expectation
  - Americans will have to work harder…become smarter….the most important attribute one can have…Creative Imagination

OUR STORY

- Mobile Learning Project (You Gave Them What?)
  - Cell Phones
  - Netbooks
- Building Consolidation (Vision for the future)
  - Fiscal Challenge (Opportunity Vs. Crisis)
  - Community Advisory Committee
  - $24.6 Capital project

Our Partners

The WGCSD STEM initiative has been made possible through evolving collaboration with numerous businesses, higher education institutions, local, state, and federal government agencies, as well as community members. Some of our partners include the following:

Catholic Charities
CHEMUNG AND SCHUYLER COUNTIES

CORNELL UNIVERSITY
FOUNDED A.D. 1865

The Greater Southern Tier BOCES

mazda

WINGS of EAGLES
DISCOVERY CENTER
...imagine the possibilities

Alfred University
FOUNDED IN 1836

CORNELL UNIVERSITY
FOUNDED A.D. 1865
Cornell University
Cooperative Extension
Schuyler County

Cargill
Salt

GST BOCES
Distance Learning

corning
community
college
State University of New York

Alfred State
SUNY College of Technology

ARC
APPALACHIAN
REGIONAL
COMMISSION

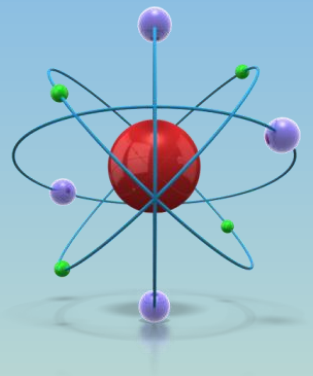
nyserda
Energy. Innovation. Solutions.

CORNING
Corning:
Innovators for Life

SYRACUSE UNIVERSITY

REGIONAL INITIATIVE

Through work with the Greater Southern Tier Regional Deployment Team, spearheaded by Corning, Inc. and GST BOCES, the District began to move toward providing more technological opportunities for our students. It was after this initial phase that we realized the need to build technology as a tool into broader programmatic shifts.



Watkins Glen's STEM education initiative began by embracing Technology as a tool to build 21st Century fluencies

MANY PHASES OF TECHNOLOGICAL IMPLEMENTATION

- Mobile Learning Device Project
- Interactive Whiteboards in Every Classroom
- Campus-wide Wireless Connectivity
- Distance Learning Opportunities, both short-term and college level classes, such as Mandarin Chinese and American Sign Language

MLD PROGRAM PURPOSE

- Provide all students equity of access to online learning tools via high-speed mobile broadband, regardless of family resources.

- Through the implementation of the Mobile Learning Project, students became actively engaged in developing 21st Century skills and fluencies needed to be competitive in a global economy.
- Program ended as grant funding ended and upon surveying, found a majority of families now have internet access.

INDIVIDUAL STUDENT COMPUTER USE

EVOLVED FROM:

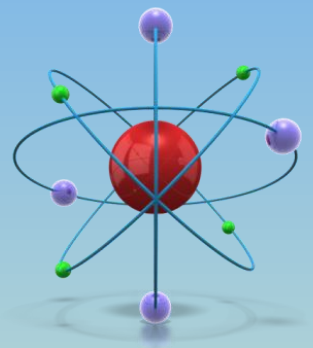
- 1:1 COMPUTING THROUGH VERIZON WIRELESS PROGRAM AND FEDERAL COMMUNICATIONS COMMISSION E-RATE GRANT …TO >

- LAPTOP CARTS IN EVERY CLASSROOM …TO >

- B.Y.O.D. IMPLEMENTATION

- Currently have laptops available and interactive whiteboards in every classroom

- Transitioning to a B.Y.O.D. procedure in which all students without their own device will have access to a laptop.



Further Steps in STEM Implementation

A SINGLE CAMPUS FACILITY COMMITTEE WAS FORMED IN FALL 2010 TO STUDY THE IMPACT OF DECLINING ENROLLMENT ON FACILITY NEEDS

The Facility Advisory Committee was comprised of diverse community membership.

Timeline of Committee Process

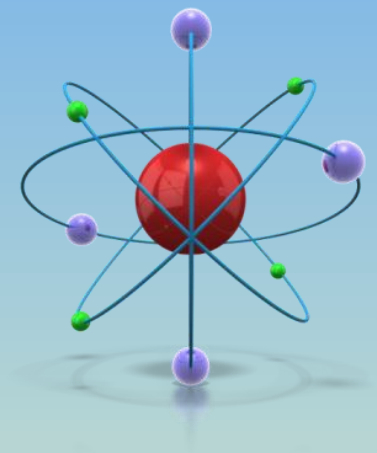
- November 17, 2010 Organizational meeting. Review of Purpose and a Middle School tour
- December 8, 2010 Review costs, Identify Pros and Cons and tour High School
- January 19, 2011 Review final pros and cons, poll the committee and timeline for recommendation to Board of Education.
- February 23, 2011 Review of findings and preparation for Board presentation

COMMITTEE RECOMMENDATIONS

The Facility Advisory Committee recommended that the District continue planning for the Single Campus concept inclusive of the development of facility plans and required voter referendums for closing and selling the Middle School and any renovations or additions needed at the Elementary and High School.

Building Project Nearing Completion

- Declining enrollment led to closing the Middle School and moving all students to a single campus
- A major part of the renovation has been the addition of a state-of-the-art STEM Room and providing wireless capability throughout the schools



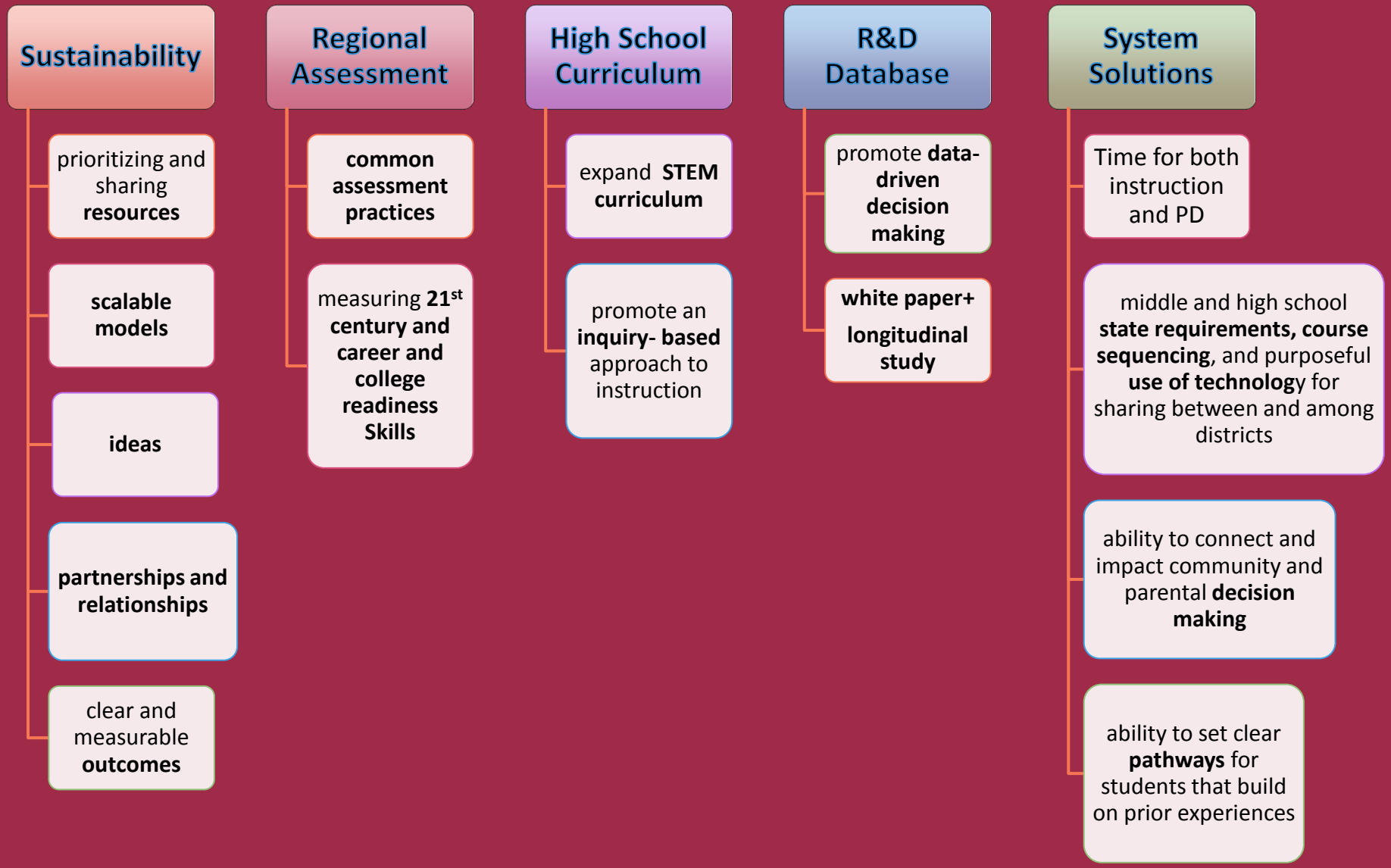
DISTRICT BECAME MORE ACTIVELY INVOLVED WITH THE REGIONAL STEM DEPLOYMENT TEAM

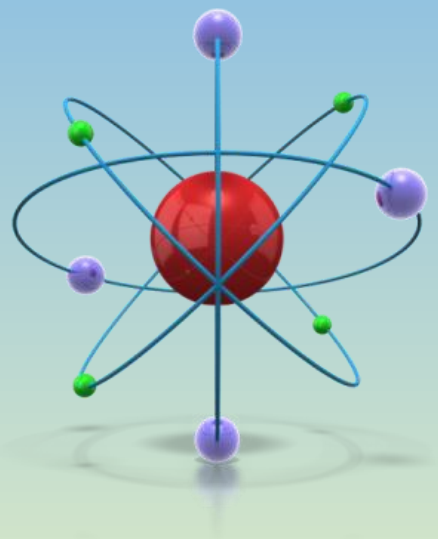
Regional STEM Deployment Team

The Greater Southern Tier Regional STEM Project, a consortium of business and industry, higher education organizations, local museums and 18 regional school districts, continues to lead the way in engaging students and educators in STEM-focused opportunities in the region. It, too, has evolved as strategic planning has led to clearer goals.

GST BOCES REGIONAL STEM 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.

Regional STEM Priorities





Curricular Shifts Begin to Round Out the Systemic Changes Necessary to Fully Implement STEM Education

THROUGH OUR COLLABORATION WITH THE GST STEM PROGRAM, THE WATKINS GLEN SCHOOL DISTRICT FOLLOWS THEIR BELIEFS THAT THE IMPLEMENTATION OF THE NGSS IN CONCERT WITH THE COMMON CORE LEARNING STANDARDS WILL FURTHER OUR EFFORTS TOWARD INCREASING STUDENTS' ENGAGEMENT IN, CAPACITY FOR AND CONTINUITY OF STEM LEARNING.

THIS REGIONAL COLLABORATION INCLUDES:

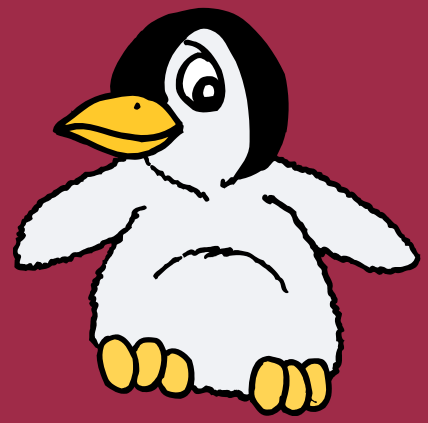
- Regional program continuity with inquiry based STEM instruction in grades K-12
- Job-embedded professional development and monthly STEM training for cohort groups of teachers in grades K-12
- Opportunities for teachers to pilot innovative curriculum and STEM materials
- Regents-assessed science courses delivered using inquiry based instruction
- STEM modules aligned with NGSS that support math and ELA Common Core Standards
- STEM Career Pathways using an Early College High School model
- Alignment of Extended Day experiences with Common Core/NGSS expectations
- Collaboration with regional colleges and universities for teacher preparation, program evaluation and resource allocation

The Watkins Glen School District

- Has fully implemented STEM Science (adapted FOSS – Full Options Science System) in Grades K-8
- Offers STEM electives at the high school level in Forensics, Environmental Science, and various modules in Technology (Robotics, Nanotechnology, Alternative Energy) and in Regents level Science Classes
- Uses NGSS as they clearly blend with Common Core implementation

Example of Elementary STEM in action:

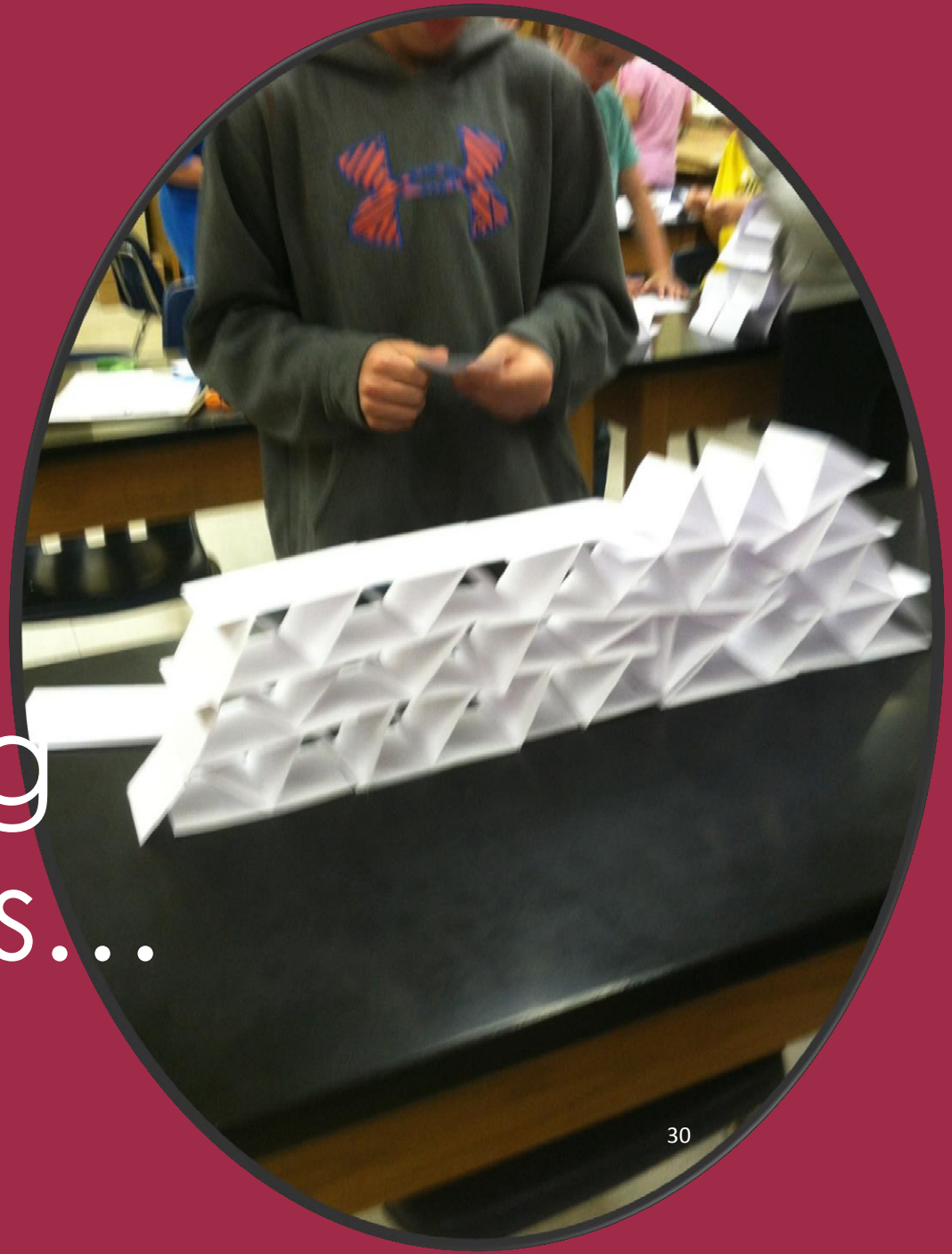
Students were challenged to use math and science knowledge to build a tower as tall as possible for a toy penguin to stand on without collapsing for 20 seconds.



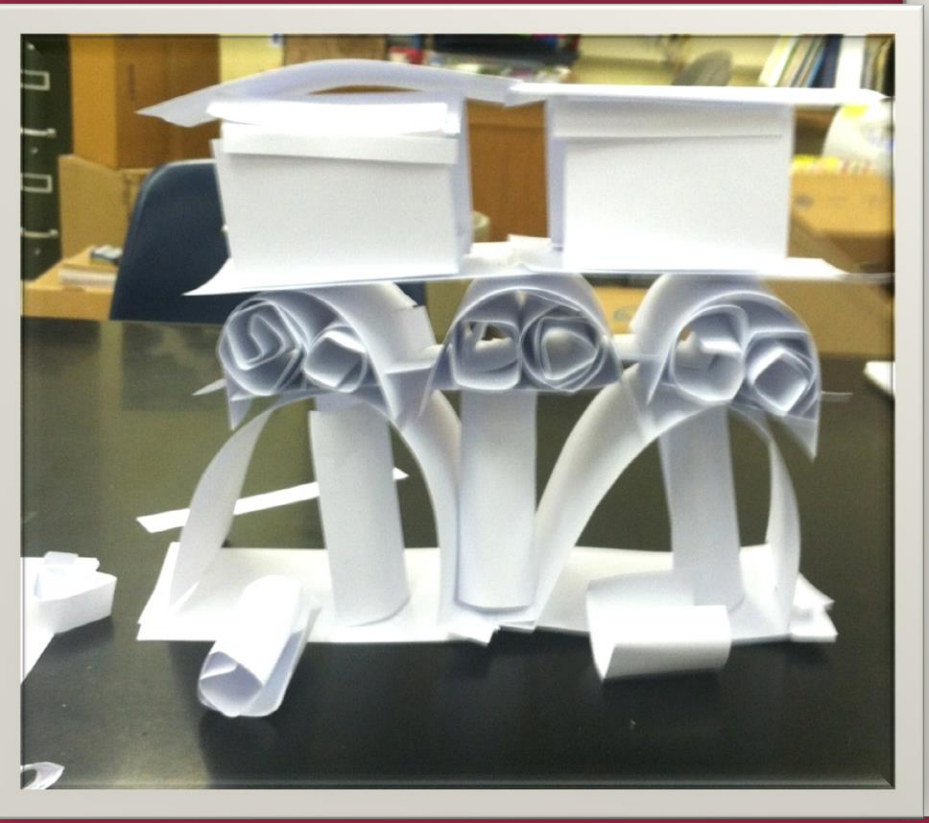
- They begin every investigation with a Big Question.

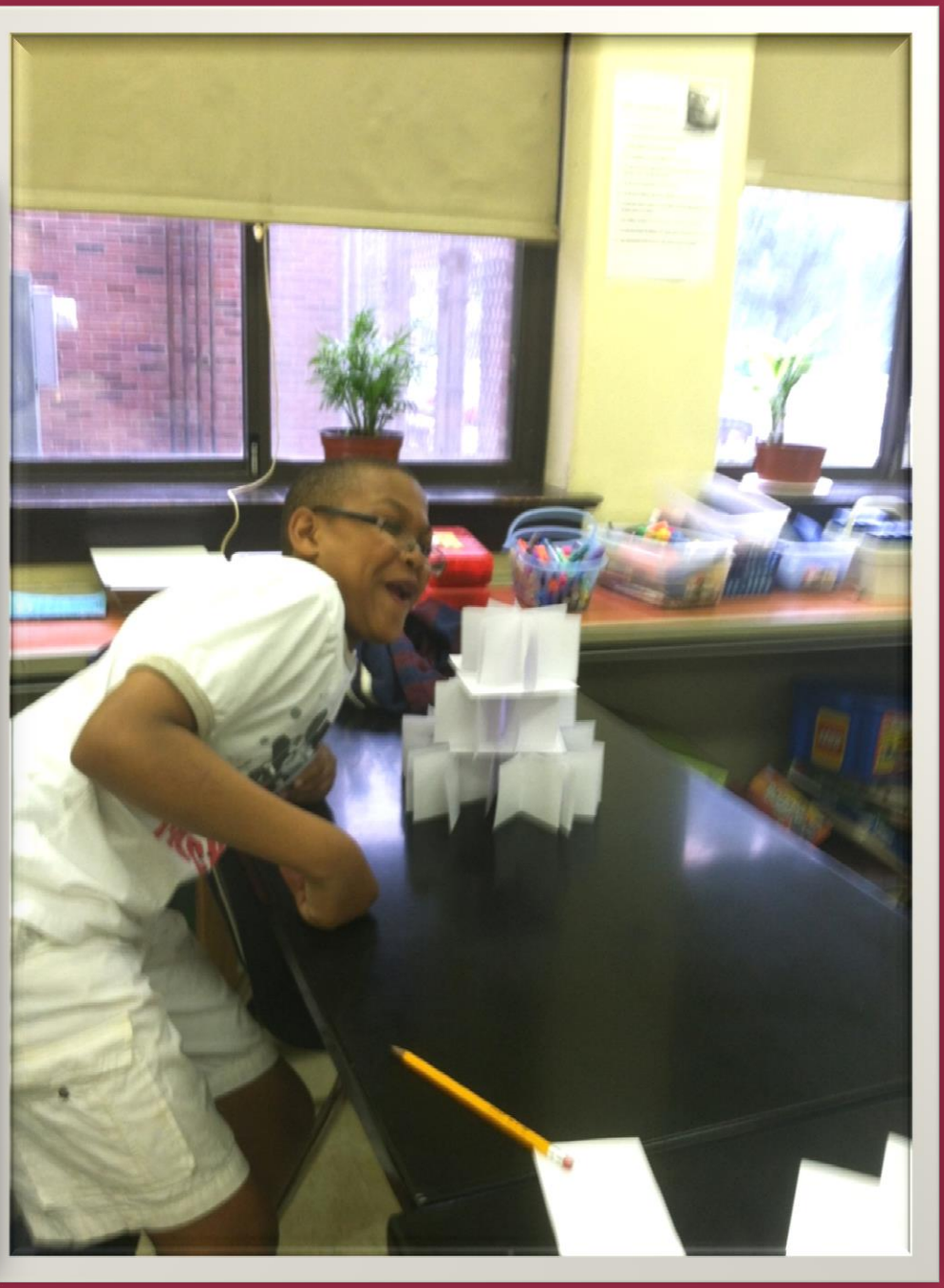
- They then journal their investigations, including focus questions, planning experiments, gathering data, and then answering the Big Question by providing evidence of their claim with specific data from their experiments.

Trying ideas…



“I am getting it” moments!





Success

Jim Murphy, WGCSD Middle School Science Teacher (from the perspective of 30 years of teaching Middle School Science)

"For two years I have taught science using the STEM model. I have seen my students take greater responsibility for their learning in the following ways:

- formulating their own plans for problem solving
- discovering the strength in fixing their own mistakes
- overcoming the challenges of seeking help
- supporting each other within the context of peer group collaboration.”

Jim uses Geospatial Projects to Promote STEM

- Made possible through our site license for ArcGIS Maps as a result of training for our teachers at Hobart & William and Smith Colleges provided by National Science Foundation
- The Finger Lakes Institute produces graphs from data submitted by students.
- Projects involve crossdisciplinary skills.

Where Does Our Water Come From and How Can We Protect it For Future Generations?

Yellow: Watershed

Red: Glen Creek, ending at Seneca Lake

Course allows integration of STEM and CCSS as students:

- Take stream samplings of organisms for a Biotic Index
- Submit and access data from the Stream Monitoring Network database at the Finger Lakes Institute on the campus of Hobart and William Smith Colleges
- Complete independent readings on topics related to their inquiry
- Use microphotography of stream specimens
- Use geospatial software (Google Earth and ArcGIS)
- Use cloud computing (Google Drive) for collaboration within a web-based file sharing platform to produce presentations

MEASURING THE QUALITY OF WATER IN GLEN CREEK

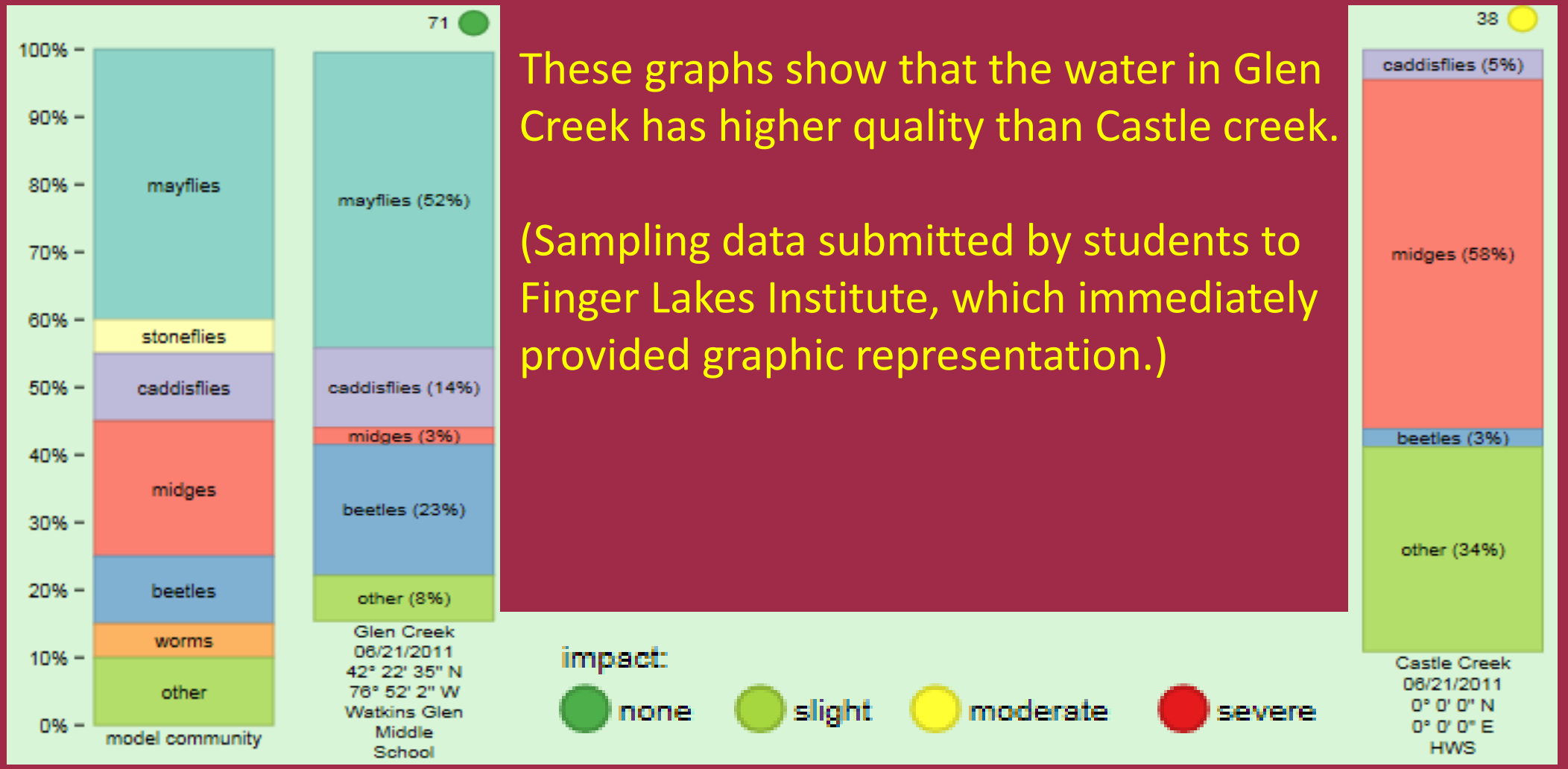
STREAM SAMPLING

Students used microscope with digital camera for this study

Aquatic Macroinvertebrates

Water penny, caddisfly, and a mayfly

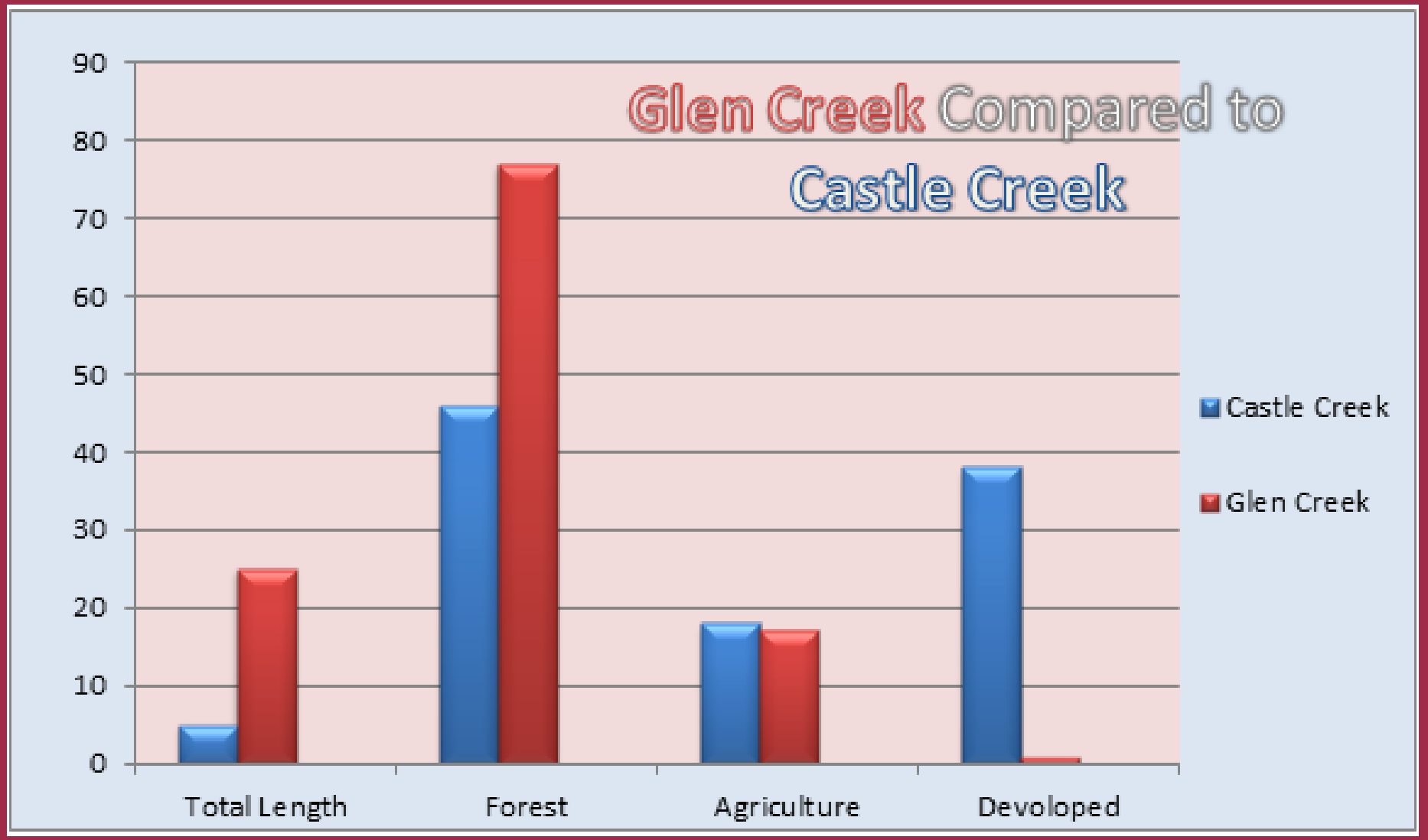
COMPARISON OF A RURAL CREEK WITH AN URBAN CREEK



These graphs show that the water in Glen Creek has higher quality than Castle creek.

(Sampling data submitted by students to Finger Lakes Institute, which immediately provided graphic representation.)

Creek Comparison Chart



All project slides created by 7th grade students.

This chart compares Castle Creek and Glen Creek. It shows the different percents of forest area, agriculture area, and developed areas in each watershed .

Watkins Glen High School and Middle School Students Vex Robotics After School Team

- GST BOCES sponsored culminating competition
- Provided by Perkins Grant
- 60 Regional Middle and High school students participated

Watkins Glen students brought home two first place and one second place trophies.

Mazda R.A.C.E at Watkins Glen June 2014

R.A.C.E. – Racing Accelerates Creative Education

Skyactiv Technology


FIELDHOUSE
mazda
SKYACTIV TECHNOLOGY
SKYACTIV
mazda
Dynamic Fuels
70
SKYACTIV
SKYACTIV
SKYACTIV

APPALACHIAN REGIONAL COMMISSION

ECO-SMART PROJECT

WATKINS GLEN RECEIVED TWO GRANTS

HYBRID RENEWABLE ENERGY SYSTEMS

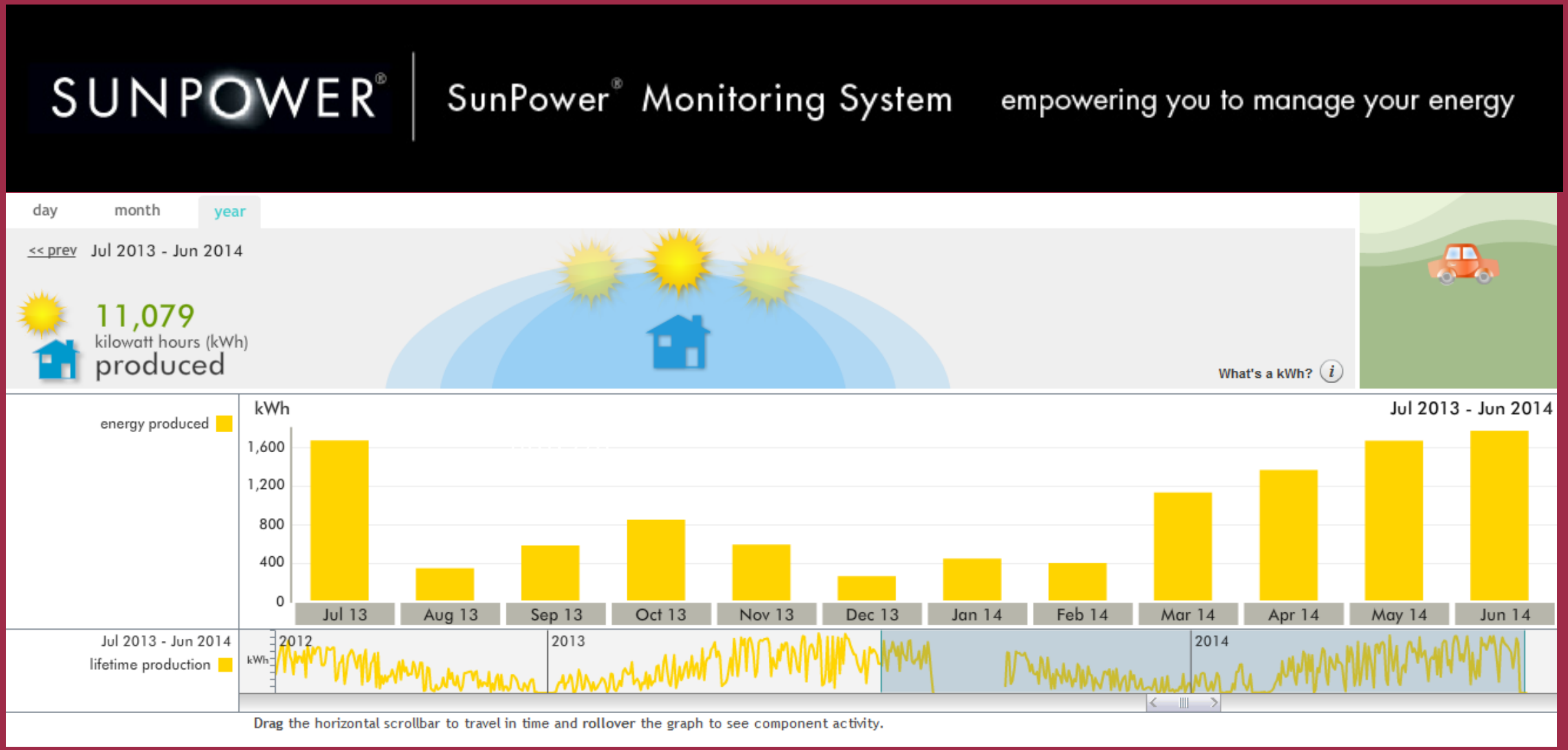
- Development of a Teaching and Learning Laboratories on the Middle and High School Roofs
- Vertical Wind Turbines
- Solar Arrays (Panels)
- Data Acquisition Package
  - Converter
  - Wind and Solar Data Analysis
  - Application Performance Software

STEM FOCUS

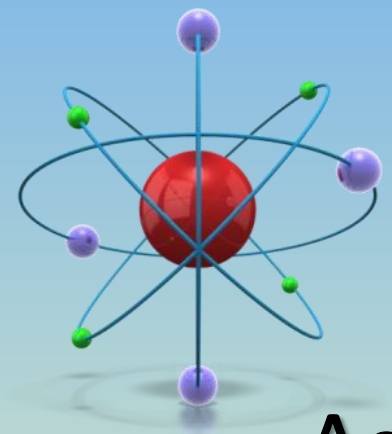
- Led to the Development of creative, interactive and integrated lesson plans aligned with learning standards in Math, Science and Technology
- Through the use of data analysis, students evaluated energy production based on:
  - Quality of products
  - Product design as related to energy production
  - Placement of Equipment

STUDENT OUTCOMES FOR THESE GRANTS:

- Develop understanding of Renewable energy systems (functionality, as well as design and production)
- Study effects of Wind and Solar related to energy production and consumption
- Develop educated consumers who understand the relationship between the environment, energy production and consumption

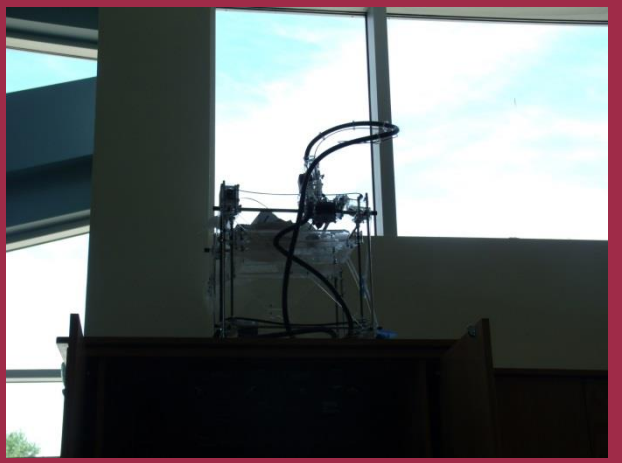


[Watkins Glen CSD Website](#)

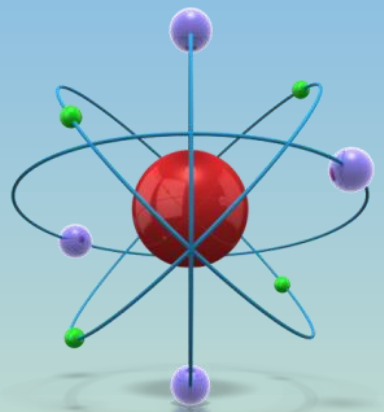


As curricula continues to shift toward meeting STEM goals, secondary science and technology teachers have worked to expand the tools available to students. Some of these include:

STEM-related Equipment:



- Green Wall
- Table-top CNC lathe
- Tetrix Robotics Equipment
- Mobile Photo Voltaic Energy System
- Wind Turbine
- Windtunnel
- Fluorescence Microscope with Camera
- Map plotter
- 3-D Printer
- 3-D Scanner
- Seismic System
- Geomorphology Model
- Digital Telescope
- Neulog Neuron Logger Sensor – applications for all areas of Science



What's Next with STEM Education in Watkins Glen?

Strategic Planning to: Challenges and Sustainability

- Fully implement inquiry-based STEM classrooms through current state standards with a greater emphasis on cross-disciplinary planning, blending current MST Standards with Next Generation Science Standards to greatest extent possible.

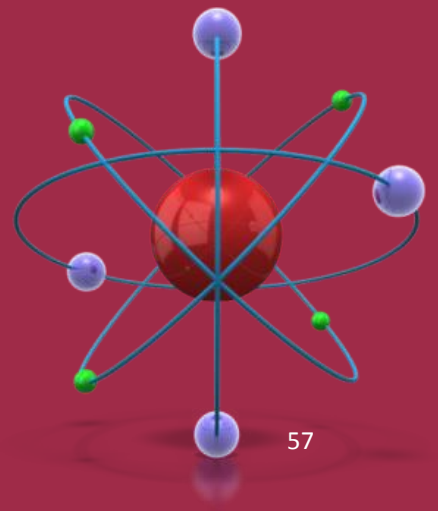
- Coordinate various efforts to fully utilize equipment and room use

Strategic Planning continued:

- Sustain and stay current with Technology tools
- Utilize district resources to provide extended school day and summer opportunities for students and community

Strategic Planning continued:

- On-going professional development
- Continue to build corporate and post-secondary partnerships
- Seek creative funding to sustain these innovative efforts



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Grodem, Greg. Watkins Glen School District Technology Teacher.

Murphy, Jim. Watkins Glen School District Science Teacher.