Integrating CTE Through a STEM Pathways Program

Helios STEM @ Bagdad Unified School District #20
Focus

STEM Pipeline: Preparing the Workforce of Tomorrow

Integrating & Innovating STEM across the Curriculum
Abstract: Integrating CTE and engineering practices under the STEM umbrella. The process of innovation and collaboration between teachers, students, businesses and the community to engage students in a worthwhile real-world STEM experience, which emphasizes the human elements as well as the physical elements.
Bagdad Background Summary

- Community
  - Company Town
- Industry
  - Mining - FMI
- Schools / District
- Student / Staff Attrition
- Resources / Facilities
HELIOS STEM GRANT SPECIFICS

* 3 year grant

* $167,000 for Bagdad Schools
  * Bagdad Schools matched $X

* 7 schools in AZ received this grant

* Partnership with Google, Helios Foundation and Science Foundation AZ

* Building a national model!

* STEM Immersion Guide - Exploratory into Partial Immersion

* Boosts opportunities to apply for additional grants
What would you need to create a STEM Initiative at your school/district?

* Identify your Vision / Goal.
* Identify your current resources.
* Identify your needs.
* Develop Strategic plan for Implementation
Resources that can be modified to meet your school’s STEM goals.

* Financial (Budget, Grants & Donations)
* Facilities
* Staff Experience / Interest (Electives & Clubs)
* Community Resources/Events
* Professional Development
Intangibles

* Academic Performance History
* Budget / Grants
* Staffing / Personnel
* Facilities
* PD
* Etc.
VISION: TO INCREASE STEM OPPORTUNITIES

(1) Technology in the classroom
(2) Bridle Creek Habitat Enhancement Area - Outdoor learning center
(3) STEM efforts through integration and collaboration
(4) Provide more pertinent professional development for district teachers
(5) Collaboration with outside higher education resources
1. TECHNOLOGY

- Laptops for High School students
- Google Platform / Online Resources
- Paxton Patterson Lab
- Flight Simulator Software
- Drones
- Bat Monitoring Equipment
- Vernier Probes & Software
- Robotics Kits (Elementary & High School)
- Bridle Creek Equipment (Densiometers, Clinometers, Game Cameras, GPS, Bug Nets and Cages, Soil and Water Test Kits, Plant Presses, Herbarium etc.)
2.) BRIDLE CREEK OUTDOOR CLASSROOM

27 acre riparian habitat - W/ FMI

* Plant identification using plant presses & herbarium
* Scavenger Hunt (Liberty Wildlife, FMI & AZ Fish and Game)
* Pollinator species study / Monarch Butterflies
* Animal study utilizing trail cameras & GPS
* Create trail, wildlife or plant guides
* Invasive species and their impact
* Soil and stream study
* Solitary bee houses
* Canopy measurements
* CTE - built benches
* Comparing seasons - Elementary
* Bat Night - Anabat
* General clean up/Wellness Walk
3.) Integration and Collaboration/STEM Driven Classes

- Industrial Tech (Paxton Patterson Lab)
- Construction Trades
- Welding
- Automotive
- Engineering
- Computer Science - Code.org
- Aviation (Middle and High School)
- Culinary / Family Consumer Science
- Hydroponics
- Desert Ecology
- Clubs/Camps (Aviation, Cranium Crushers, Engineering)
- Summer STEM Kids Camp Replaced Title I Summer School
- CTSO’s Leadership
4.) **Professional Development**

* ASTA Conference
* NSTA Conference
* Google Docs Training
* Website Building
* AZ Dash Training
* EDU Impact Training (PD opportunities online)
* Project Based Learning Review and Lesson Planning
* Authentic Learning
* Journeys Webinar (performance based approach to student learning)
* Science and Engineering Fair Review w/ packet
* PBS Learning Media
* PD done by Dusty (Biozone) - Plant collecting and pressing for herbarium
* PD Tara (FMI) and Dusty (Biozone) – Ecology at Bridle Creek
5.) **Collaboration & Field Trips**

* Science Foundation Arizona
* AZ STEM Network - SFAZ - [www.sfaz.org/stem/](http://www.sfaz.org/stem/)
* TERC - 3rd Party Evaluator (Data Collection)
* Freeport McMoran (FMI) - Geologists, Engineers, Metallurgists, Environmentalist etc.
* Biozone
* Liberty Wildlife
* Arizona Fish and Game
* ASU – Discover-E Day
* GCU – Science Expo (binary coding etc.)
* Midwestern University – Health Science Career Day
* Yavapai College - Science Day
* Embry Riddle – Aviation Academy
* California Trip – Aviation Trip to see the Blue Angels
Core Values:

We value breadth of knowledge, skills, learning readiness, independence, innovation, student centeredness, access, communication, collaboration, creativity, and critical thinking.

Vision:

Inspired and Elevate STEM Learners

Mission:

The mission of our Bagdad learning community is to fully immerse our learners in a rigorous STEM curriculum of inquiry based, experiential learning to develop breadth of knowledge, independence, creativity, and vital critical thinking, communication, and collaboration skills that will enable learners to access and compete in a global marketplace.
Goals - Strategic Plan

**Administrative Leadership**
**Goal 1:** Develop collaborative, shared decision making
**Goal 2:** A professional development plan will be initiated for the school board, administration and faculty
**Goal 3:** Evaluation protocols will be set in place and followed

**The Teachers**
**Goal 1:** Teachers will effectively use the project/problem based model in the classroom
**Goal 2:** Teachers will embed a variety of technology in the instructional process
**Goal 3:** Using cross curricular STEM content, teachers will provide an opportunity for students to participate in guided inquiry and problem solving - developing solutions and/or product development

**The Students**
**Goal 1:** Students will engage in problem-based, teacher directed guided inquiry that may result in a product creation or solution
**Goal 2:** Students will use a variety of technology

**The Evaluation Process**
**Goal 1:** An Evaluation Process will be developed in conjunction with technical advisors

**Sustainability**
**Goal 1:** Actively develop tools for sustainability
OUR STEM DESIGN TEAM

Bryan Bullington (Superintendent) Joanna Chadwick (School Board)
Tom Finnerty (Principal) Bill Webster (School Board)
Austin Temperley (Principal) William D. Griffith (Teacher)
JJ DePanfilis (STEM Director/Teacher) Pradip Misra (Teacher)
Linda Coyle, Eric Savage & Stephanie Frimer (SFA) George Diehl (Teacher)
Laura Phelps (FMI) Tracie Loveall (Parent)
Tara Woodcock (FMI) Tracie Castro (Teacher)
Dusty Eiker (Biozone) Amos Salinas (student)
Karen Anderson (Grant Writer) John Morgan (Yavapai College)
Lee Methany (Business Dept.) Rita MacWilliam (Teacher)
Gary Cummins (IT Dept.) Jeremiah Loveall (Student)
1.) What is your induction program for new teachers?
   a.) Introduce new hires to the STEM initiative and provide pertinent PD.
   b.) Each new teacher is provided the opportunity to focus on the area that they are certified in, as well as asked to expand into areas that they have prior experience and are passionate about!

2.) Introducing your STEM program to your community
   a.) Newsletters, school website and board meetings etc.

3.) Creating a sustainable vision for a STEM culture
   a.) Bagdad has integrated their Career and Technical Education program into their content areas. From welding, autos, building trades, culinary, engineering and robotics, Paxton Patterson labs all of the STEM workplace competency skills within these content areas are aligned and thematically taught.
Sustainability Plan - Pathways

1.) **Networking with other schools that act as feeders for your students.**

   a.) Bagdad believes the pipeline is developed and galvanized with college and career fairs, campus tours, and different events at these schools to engage students into various STEM-related careers and endeavors.

2.) **STEM pathways (or pipelines) for your students once they leave your school(s)**

   a.) Bagdad has an understanding of the connections CTE progressions can have at local universities such as ASU, UofA, Prescott College, ERAU, and Community Colleges.

   b.) Bagdad Unified has increased the Dual Credit offerings in Math and CTE content areas through the partnership between Yavapai College and Mountain Institute JTED. This partnership includes the opportunity for Bagdad students to earn up to 36 college credits prior to high school graduation tuition free.

   c.) Bagdad graduates are also offered tuition free educational opportunities in CTE programs that lead to industry certification or a degree program until the age of 21. This opportunity exists through the partnership with MIJTED and Yavapai College.
2015-2016 STEM Events

**June/July** – Summer Science STEM Camp (Elementary – High School)

**September 12th** - Arizona FIRST Tech Challenge (Robotics Competition Kickoff for Engineering Class)

**September** – Industrial Tech class designed, built and installed benches @ Bridle Creek

**September** - Scavenger Hunt and Raptor Release @ Bridle Creek (Liberty Wildlife, AZ Fish & Game & FMI Environmental Specialist)

**October – May** – Grade and Subject Specific Mine visits and presentations (done yearly for sustainability)

**October** – Meeting with geologist at mine with 7th grade

**October 21st-24th** - NSTA Conference for Science Teachers

**October 31st** – Pumpkin Chunkin Competition (Mortimer Farms)

**November 6th & 7th** – ASTA Conference for Science Teachers
November 13th – Young Eagles Aviation Program—students actually flew airplanes
November 21st – FTC Robotics Competition in Chandler
December 10th – Pollinator Field Day @ Bridle Creek
December 12th – FTC Robotics Competition in Phoenix
December 15th - Lexus Eco Challenge
January – Attending and presenting @ STEM Conference
February - Clean-Tech Competition (Worldwide Research and Design Challenge)
February - World of 7 Billion Contest (Global Competition Challenge)
February - Brain Bee Neuroscience Competition
March 16th – SciTech Festival @ Bagdad Unified School District with Star Gazing event to follow on the football field w/ Mike Scott from Az Science Center
March – Engineering Week w/ FMI Engineers, Metallurgists etc.
March - Lexus Eco Challenge (STEM Contest)
March 30th-April 3rd - NSTA National Conference for Science Teachers

April – Canopy Study @ Bridle Creek

April - Envirothon (Environmental Education Competition)

April/May – Engineering Olympics Competition @ Bagdad Unified School District

Fall-Winter-Spring – Comparing seasonal changes @ Bridle Creek w/ FMI Environmental Specialist

Spring 2016 - Rodent Trapping Study @ Bridle Creek w/ FMI Environmental Specialist & Biozone

June/July – Summer Science STEM Camp (Elementary – High School)

May/August - PBL campus projects integrated with Facilities Director and CTE Programs
Examples of STEM Projects

* Robotics - Elementary & High School
* Electric/Solar Powered Car
* Solar Charging Station
* Trebuchets
* Bridle Creek Studies
* Benches @ Bridle Creek
* Plant Boxes
* Cardboard Boats
* PBL campus projects
Bridle Creek
Contribute stories and class activities to showcase your achievements to educators across the state.

Contact: JJ DePanfilis (STEM Coordinator)
@ depanfilisj@bagdadschools.org

Newsletters: Bi-Monthly

TERC – data collection helps us evaluate effectiveness of programs
With your continued vision and collaboration and the help of Helios STEM, BUSD #20 will lead the way for rural schools nationwide.