Preparing The Workforce Of Tomorrow: One District’s Journey

Presented By:

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Tucson, AZ
Introductions

• Julie Waters – Director of Federal Programs and Staff Development

• George Woodley – Paxton Patterson Lab Teacher
Session Outcomes

• Share “The Altar Valley Story:” Where we were before the Helios Grant, where we are now, and where we hope to be moving forward.

• Discuss the *Paxton Patterson ActionLabs* curriculum: What it is, why we chose it, how we built our program, the challenges we faced, and the overall positive impact (assessment data!) it has had on our students.

• Provide specific examples of how the Paxton Patterson Lab is helping to prepare Altar Valley students for the workforce of tomorrow and why this matters.
The Altar Valley Story

Where Were We Before The Helios Grant?
Where We Were

Prior to last school year, we did not offer any classes that were entirely STEM-focused or college- and career-related.
Where We Were

Last school year, we offered four Paxton Patterson Lab modules to a pilot group of 23 8th grade students.
Where We Were

We saw significant differences in the assessment data of the 8\textsuperscript{th} graders who took the Paxton Patterson Lab last year.
The Altar Valley Story

Where Are We Now?
Where We Are

• We offer 14 different Paxton Patterson Lab Modules to all of our 6\textsuperscript{th} – 8\textsuperscript{th} Grade students.

• We offer STEM Train to all of our 5\textsuperscript{th} Grade Students.

• Our students are excited about the Paxton Patterson Lab and opportunities it provides them!
First... Some Background
Three Points

• The Altar Valley School District is located in Three Points, which is about 25 miles west of downtown Tucson.

• Three Points, also known as Robles Junction, is a small, rural community (45 square miles) of about 5,000 residents.

• Our community is located adjacent to the Tohono O’Odham Reservation, and is about 30 miles from the international border.
Three Points

• Three Points was almost exclusively a ranching and freight community with the opening of the first stage coach line in 1868.

• There are still several working ranches and farms in the community, including the King Anvil Ranch and the well-known Buckelelew Farm.
Three Points Demographics

• The median household income is about $34,000, and nearly 28% of the population is below the poverty line.

• Most residents live in single-family homes or mobile homes.
### Three Points Demographics

<table>
<thead>
<tr>
<th>Race / Ethnicity</th>
<th>Percentage Of Population</th>
</tr>
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<tbody>
<tr>
<td>American Indian</td>
<td>10%</td>
</tr>
<tr>
<td>Asian</td>
<td>.10%</td>
</tr>
<tr>
<td>African American</td>
<td>.10%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>51%</td>
</tr>
<tr>
<td>White</td>
<td>38%</td>
</tr>
</tbody>
</table>
Three Points Demographics

• About 73% of residents are high school graduates.
• Nearly 8% of the population holds a bachelor’s degree and 5% of residents have attained a graduate or professional degree.
About AVSD

- The Altar Valley School District is vast, covering nearly 600 square miles in Pima County.
- Student enrollment is about 700 students between two school sites: Robles Elementary School (Pre-K – 4th Grade) and Altar Valley Middle School (5th – 8th Grade).
About AVSD

There is no high school in Three Points, so students are bussed mainly to Flowing Wells High School in Tucson, which is about 30 miles away.
About AVSD

• AVSD is a Title I district and also receives funding from:
  – 21st Century Community Learning Center Grant
  – Small and Rural Schools Grant
  – Helios Grant 😊

• Under Arizona’s old A – F Letter Grade Accountability System, AVSD was a “B” school district.
What Exactly Is Paxton Patterson?

And Why Did We Select It For Our Students?
• Paxton Patterson ActionLabs are designed for 6<sup>th</sup> – 8<sup>th</sup> grade students.

• The Paxton Paterson Lab facilitates scientific inquiry through the use of computer programs and hands-on activities.

• There are 22 different Integrated Instructional Units (IIU’s), or modules.
• At Altar Valley Middle School, Paxton Patterson is offered as a special area class to all 6th – 8th grade students.

• Students have a choice of 14 different modules.
- Alternative Energy
- Computer-Aided Drafting
- Computer Graphics & Animation
- Digital Music
- Energy & Power
- Environment & Ecology
- Flight Technology
- Forensic Science
- Health & Fitness
- Information Technology
- Laser Technology
- Medical Imaging
- Robotics
- Veterinary Science
Preparing Today’s Students
Why Did We Select Paxton Patterson?

• Our Helios Grant Design Team, including Ms. Woodley, looked at several different programs.

• We selected Paxton Patterson because:
  – Our students love technology, but the Paxton Patterson modules are not solely technology-based.
  – Different modalities of learning are addressed: Students are required to read, write, submit online activities, and complete hands-on projects.
For Our 5th Graders…

• STEM Train is designed specifically for 3rd – 5th graders.

• All lessons are aligned with the AzCCRS Standards for Math and ELA.

• The lessons involve student inquiry and discovery, and promote problem solving and creative thinking.
Let’s Take A Look At One Of The Modules

Flight Technology
Flight Technology

• The science of rocketry and flight requires understanding and application of engineering, mathematics, and physics.

• During the Flight Technology Module, students design, build, and fly their own rockets.

• The learning? Students see for themselves that design and craftsmanship determine flight performance.
Before Students Build & Launch Their Rockets...
Activity: The Launch
Flight Technology: Hands-On Learning!
Flight Technology: Hands-On Learning!
Flight Technology: Hands-On Learning!
The Four C’s

• Collaboration
• Communication
• Critical Thinking & Problem-Solving
• Creativity & Innovation
Preparing The Workforce Of Tomorrow

Collaboration In The Paxton Patterson Lab
Preparing The Workforce Of Tomorrow

Throughout each Paxton Patterson module, students have a partner with whom they are required to collaborate.
Collaboration
Collaboration
Collaboration
Preparing The Workforce Of Tomorrow

• In STEM train: Students work in teams of at least five to complete assignments and projects.

• After teams complete their tasks, they are placed into new groups with different students.
Team Work In STEM Train
Preparing The Workforce Of Tomorrow

Communication In The Paxton Patterson Lab
Preparing The Workforce Of Tomorrow

• During each module, students are required to **communicate** their learning by completing two writing assignments.

• Halfway through the module, students complete a **narrative** writing assignment.
Sample Narrative Prompt

The World of Graphics magazine is in search of two young designers who know how to target advertisements to readers in specific age groups. The magazine will hire two students, who seem the most creative and knowledgeable about graphic design, as interns. Their thinking is pretty simple: If they can identify ads that connect with students your age, they’ll have a formula that attracts readers to their advertisers’ product every time. Then, they can charge those advertisers more money for each ad.
Sample Narrative Prompt

Before you are given an opportunity to interview for the internship, you must write and submit an essay, responding to the questions below. World of Graphics offers paid internships, so be creative and thorough in your essay:
Sample Narrative Prompt

• What do you think makes an advertisement layout appeal to students your age?

• What elements in an ad send powerful messages to your age group?

• Explain why logos and font choice are important.

• Describe an advertisement that exists today and explain why you feel it is so appealing to your age group.
Preparing AVSD Students For College & Career

AzCCRS Writing Standard #3: Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. (W.6.3 / W.7.3 / W.8.3)
Preparing The Workforce Of Tomorrow

At the end of each module, students complete an argumentative, evidence-based writing assignment.
Think about what the world will be like twenty-five years from now. Some people believe that alternative energy solutions are too expensive and current energy sources are okay. Others feel it’s important that we find ways to conserve energy and continue working on alternative energy sources. Consider the questions below, form your own opinion, and write at least two paragraphs defending your position.
Sample Argumentative Prompt

• Is the price of gasoline likely to go up or down in the future? Explain.

• Are there any potential alternative energy sources where you live, like spaces to build wind farms, place solar energy panels, or grow switchgrass in fields?

• Is there a public transportation system that uses alternative fuels or do you rely on buses and cars that burn gasoline?
Sample Argumentative Prompt

• **Describe all possible ways to conserve energy in your home.**

• **Describe / Defend any alternative energy solutions that tend to be controversial.**
Preparing AVSD Students For College & Career

AzCCRS Writing Standard #1 for 6th – 8th Grade: Write arguments to support claims with clear reasons and relevant evidence. (W. 6.1 / W.7.1 / W.8.1)
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Critical Thinking In The Paxton Patterson Lab
Preparing The Workforce Of Tomorrow

Students **think critically** throughout each Paxton Patterson module when they:

- Conduct research and take notes to gather information about their topic.
- Apply their learning to complete the various activities in each module.
- Complete periodic *Knowledge Tests*, which require them to think critically about each question.
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Students **think critically** throughout each Paxton Patterson module when they:

- Conduct research on the Internet to locate evidence to support their arguments.
- Align the evidence with the argument.
- Consider both sides of an argument.
Thinking Critically In The Paxton Patterson Lab
Thinking Critically In The Paxton Patterson Lab
Thinking Critically In The Paxton Patterson Lab
Preparing The Workforce Of Tomorrow

Creativity & Innovation In The Paxton Patterson Lab
Preparing The Workforce Of Tomorrow

In the Paxton Patterson Lab, students demonstrate **creativity and innovation** during the project-based portion of each module.
Flight Technology

• Students are required to construct a rocket.
• If the rocket does not launch properly, students have to figure out why.
• Students must then apply innovative solutions to address the design flaws in their rocket and ensure that it can fly successfully on its next launch.
Digital Music

Students are required to compose an original piece of music.
Laser Technology
Alternative Energy
Alternative Energy
Preparing The Workforce Of Tomorrow

In Addition To The Four C’s…
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• Paxton Patterson modules are career-focused.
• Students have the opportunity to “try out” different careers.
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• All background information (what students need to know in order to complete their projects) is computer-based and on the Cloud.
• Students are required to learn how to navigate the Cloud to access and save information.
• Students submit assignments to Ms. Woodley via the Cloud.
Preparing The Workforce Of Tomorrow

• Students learn how to navigate the Internet and use it as a resource in their chosen “career.”

• Examples:
  – The Veterinary Medicine and Medical Imaging Modules contain a great deal of career-specific technical terms.
  – Students utilize the Internet to research the meanings of new vocabulary.
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Students are held accountable throughout each module, which requires them to take ownership of their learning.
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Students learn that it pays to be thorough and responsible because they are permitted to use their notes on the tests!
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Students learn the importance of time management and self-control:

• Modules are set up to be completed in 10 days.
• Our students get 22 days per module.
• If they don’t come in and get started right away, they will not finish in 22 days because each day has multiple tasks that must be completed in 45 minutes.
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• Ms. Woodley posts a calendar to help students manage their time.

• Students are welcome to come into the lab after school, and they also have the option to read and take notes at home.
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Why Does It Matter?
The following 6 slides were taken directly from a PowerPoint Presentation presented to Science Foundation Arizona by Claus von Zastrow from the organization Change the Equation. The PowerPoint was electronically shared with all of the Helios partner schools on October 29, 2015.

**Our Mission:** Change the Equation works at the intersection of **business and education** to ensure that all students are **STEM literate** by collaborating with schools, communities, and states to **adopt and implement excellent STEM policies and programs.**

~ http://www.meetchangetheequation.org/#about
Preparing The Workforce Of Tomorrow

Why Does It Matter?
Arizona Leads In STEM Job Growth

Between 2014 & 2024:

**Arizona**
- STEM jobs will grow: 23%
  - 27% Computing
  - 17% Engineering
  - 23% Advanced Manufacturing

**U.S.**
- STEM jobs will grow: 16%
  - 19% Computing
  - 12% Engineering
  - 16% Advanced Manufacturing

Arizona Leads In STEM Job Wages

Median earnings in Arizona STEM jobs are:

$36.62/hour

Median earnings in Arizona all other jobs are:

$17.64/hour

Arizona Leads In STEM Employment Advantage

STEM and non-STEM Unemployment rate, 2011-2014

Source: U.S. Census Department, 2011–2014
Despite The Promising Statistics About STEM Jobs And STEM Wages In Arizona…

…Several Key Indicators Show That Arizona Lags Behind.
Arizona Lags In STEM Credentials

What percentage of certificates and degrees is in STEM fields? (2012-2013)

21.6%  
Arizona

23.9%  
United States

SOURCE: U.S. Department of Education
Arizona Lags In STEM Diversity

Under-Represented Minorities: Computing

46% of population, but only 23% of degrees.

Arizona Lags In STEM Diversity

Under-Represented Minorities: Engineering

Arizona rank: 22

46% of population... but only 14% of degrees

As Hadi Partovi Mentioned…

- Currently in Arizona, there are 11,202 job openings for computer programmers, which equates to over $1 billion in payroll.
- Last year, 401 students graduated from Arizona universities with degrees in Computer Science.
As Hadi Partovi Mentioned...

- There were fewer Computer Science graduates in 2012 than there were in 2000, and most of these were men.
- The Bureau of Labor Statistics predicts that there will be over 1 million computing job openings by 2022.
Preparing The Workforce Of Tomorrow

Why Does It Matter?
Why Paxton Patterson Matters

By providing Altar Valley Middle School students with the opportunity to explore a variety of different STEM-related careers in the Paxton Patterson Lab:

• We are preparing our students to have a competitive edge if they seek a job in the growing, high-paying STEM workforce in Arizona or elsewhere.

• We are encouraging our students to pursue a STEM-related certificate or degree.
Why Paxton Patterson Matters

• We are hoping to increase the percentage of under-represented minorities who pursue STEM-related careers.

• We have already provided our students with a well-equipped, state-of-the-art computer lab.
How Did We Build Our Paxton Patterson Program?
Step 1: Funding

*Helios Grant*

- Facility
- Materials & Supplies
- Teacher Training
Step 2: Facility

• The current Paxton Patterson Lab was previously a Music Room.

• Contractors remodeled and re-wired the space to accommodate the computers and all of the Paxton Patterson equipment and materials.
Step 2: Facility

Representatives from Paxton Patterson were on-site during this time to provide guidance and support during the renovation process.
Step 3: Materials

• All materials are provided by Paxton Patterson and paid for out of our Helios Grant.

• Ms. Woodley carefully monitors all equipment and supplies to ensure that nothing is damaged or wasted.
Step 4: Professional Development

Ms. Woodley attended an intensive, one-week training course in North Carolina the summer before we rolled out Paxton Patterson to our students.
Step 5: Roll Out

- **Pilot Year 1 (SY 2014-15)**
  - Four Paxton Patterson Modules
  - One group of 23 8th grade students

- **Year 2 (SY 2015-16)**
  - 14 Paxton Patterson Modules
  - All 6th – 8th Grade students
  - STEM Train for all 5th Grade students
The Results

• We analyzed the assessment data of the 23 8th graders who had the Paxton Patterson Lab as a class last year.

• We then compared those students’ data with the data of the entire 8th grade class.
## The Results

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<tr>
<th></th>
<th>% Of All 8&lt;sup&gt;th&lt;/sup&gt; Grade Students At Mastery - Fall</th>
<th>% Of Paxton Patterson Students At Mastery - Fall</th>
<th>% Of All 8&lt;sup&gt;th&lt;/sup&gt; Grade Students At Mastery - Spring</th>
<th>% Of Paxton Patterson Students At Mastery - Spring</th>
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<tr>
<td>Reading CBM</td>
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<td>43</td>
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<tr>
<td>Math CBM</td>
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<td>Reading District Benchmark</td>
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<td>AIMS Science</td>
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<td></td>
<td>33</td>
<td>100</td>
</tr>
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What The Data Tells Us

We attribute the higher assessment scores of the Paxton Patterson Lab students to a variety of factors:

• Interacting with complex text
• Communicating ideas in writing and citing textual evidence
• Critical thinking
• The integration of reading and writing with STEM assignments and activities
Challenges & How We Overcame Them
The Altar Valley Story

Where Do We Hope To Be Moving Forward?
Where We Hope To Be Moving Forward

• We have already added two new modules this year: Computer-Aided Drafting and Medical Imaging.
• We hope to continue to add more and more modules to our Paxton Patterson Lab.
Where We Hope To Be Moving Forward

• Paxton Patterson continually updates and adds new activities to existing modules:
  – Alternative Energy
  – Robotics

• We would like to keep up with Paxton Patterson’s updates and improvements.
Our Long Term Wish List

• Expand our program by establishing a second Paxton Patterson Lab and training a second teacher in the program.

• This would provide students with the opportunity to complete more than just two modules per school year.

• Offer STEM Train to our 3rd and 4th graders.
Contact Information

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