Public Perceptions/Acceptance Working Group
Phoenix, Arizona
March 26, 2010
Arizona Project WET, Director
Water Education Is the Key

How do we get people to shift their thinking, change their behavior; in this case become knowledgeable water stewards?

Learning is a process:
• Awareness
• Knowledge
• Understanding

Only then can we shift public perception.
The mission: to promote responsible water stewardship through excellent and effective water education.
Curriculum & Lesson Guides: Content & Method

- Developed in group writing events with teachers and specialists working together
- Use research-based pedagogy
- Address multiple intelligences and learning styles
- Develop critical thinking and problem solving skills
What do teachers and professors say about APW?

• Arizona Project WET provides us with the science-based educational resources to raise the students' environmental awareness and problem solving skills. **Budd Turner, 7th & 8th grade teacher, Mansfield Middle School**

• The lessons are very applicable for my seventh grade science class. The curriculum guides are excellent and are ready to use in the classroom, and the activities are very engaging. Also, all workshop presenters are very well informed, professional and used engaging teaching techniques. **Ben Briggs, 7th grade teacher**

• Thanks so much for all your great ideas, wonderful presentation, and energy. Think the soon-to-be teachers really benefited. Judging by the number of students who are turning in lesson plans that borrow heavily from your guide, I would judge that they are very appreciative of your workshop! **Linda Sargent Wood, Ph.D., Professor, History Department, Arizona State University**
Arizona Conserve Water Educators’ Guide

This Curriculum Guide:
• was published May 2007,
• covers Arizona’s specific water resources management picture, and
• focuses on water conservation which is to say that it focuses on reuse as well!

Arizona Project WET instructs learners about water use and reuse by referring to the four R’s: the right amount, at the right time and place, at the right quality, at the right price.
Water Reuse Case Studies

• Intel separates water needs by water quality from ultra pure to wastewater: they built the City of Chandler RO treatment plant where clean rinses from the manufacturing process go and are then recharged to the groundwater.

• The Desert Sweet Shrimp operation in Gila Bend reused nutrient-rich water from the shrimp ponds to irrigate crops.
Water Reuse Case Studies

• In Flagstaff, SCA Tissues now uses reclaimed water in its papermaking business after some study to ensure public approval of the process.

• In Yuma, Alsco is utilizing the discharged water from Dole Fresh Produce for their laundry facility.

Arizonans accept water reuse when they are educated on the subject!
Arizona Conserve Water: What are workshop participants saying?

• Wonderful – I can’t wait to apply it to the classroom.
• I really believe all children need to be aware of water conservation and the fact that we use groundwater. This was great!
• This was a great workshop. Arizona Conserve Water is the best WET book so far!
• The ideas & activities were wonderful and will definitely help in water education.
Supplemental Materials
Content Specific Student Booklets

Offer in-depth content for teachers and students to engage in learning about key water resource topics.
No Child Left Behind

Students
• Arizona Academic Standards
• Arizona Instrument to Measure Success (AIMS) test

Schools
• Adequate Yearly Progress
• Improvement Plans

Teachers
• Highly Qualified Teachers – pd plans
• Teacher Certification Requirements
All Educator Guides are correlated to the Arizona Academic Standards

It’s as easy as 1,2,3!

1) Click on lesson
2) Click on subject
3) Click on grade level

View the Results!

- Lesson Title
- Subject
- Grade level (select all that apply)

- Writing
- Reading
- Science
- Math
- Social Studies

*Note: 'High School' grade level applies only to Science and Math
Statewide Collaboration & Delivery Network

It’s all about partnerships!
Programming Examples
School Water Audit Program: SWAP Goals

• Educate students about the need for water conservation, by engaging in real-world, action-based projects that integrate science, language and math skills and utilize technology.

• Determine the amount of water used in a school.

• Implement behavior & technology-based conservation alternatives in schools and homes.

• Incentivize community involvement through student-led technology retrofit installments and student presentations to decision makers.

• Decrease water use in the school and community.
Cottonwood MS Case Study

- Students Involved: 120 7th Graders
- Volunteers Involved: 18, 100+ hours (including the mayor & ADWR AMA director) (at Independent Sector volunteer rate of $19.51 = ~$2,000)
- Monetary Investment: 0
- City of Cottonwood provided:
  - 270 aerators
  - 72 catch cans
  - 250 dye tabs
Cottonwood MS Projected Water Savings

Annual School Water Savings with Faucet Aerators

Gallons

Classroom Faucets  Bathroom Faucets

Without Aerators  With Aerators  Water Savings

53% Savings by retrofitting faucet aerators
Cottonwood MS Projected Water Savings

Pre-rinse Spray Head Annual Savings

- Old Head
- High-efficiency Head
- Water Savings

57% Savings by retrofitting pre-rinse spray head.
Cottonwood MS Projected Financial Savings

Annual Financial Savings of Cottonwood MS Retrofits

*$3.58/Ccf or $.00479/gal *assumed rate
Outdoor Irrigation Audit

DU = 35.7%
Grass not being evenly watered

Turf Watering Uniformity Analysis

Student

Group

Milliliters (mL)

10-12
8-10
6-8
4-6
2-4
0-2
### Home Water Audit

#### Projected Savings

<table>
<thead>
<tr>
<th>Home Retrofits</th>
<th>Annual Savings (gallons)</th>
<th>Annual Savings* (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators</td>
<td>876,000</td>
<td>$2,715.60</td>
</tr>
<tr>
<td>Dye Tablets (16% toilets had leaks)</td>
<td>2,464,480</td>
<td>$7,639.89</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,340,480</strong></td>
<td><strong>$10,355.49</strong></td>
</tr>
</tbody>
</table>

*Water rate = $3.10/1,000 gallons
Toilet savings based on 200 gallons/day for leaky toilets
Cottonwood MS Results

- Outdoor Audit led to an IA professional audit
- 6 Students presented findings to county Water Advisory Board
- Governor’s Excellence in Economic Development Award, Future Leaders
The SWAP Process

1 - Getting Their Feet Wet: A Home Water Audit
2 - Plunging In: The School Inventory

Indoor Audit
3.1 - Structured Inquiry: Bathroom Faucet Audit
3.2 - Guided Inquiry: Classroom Faucet Audit
3.3 - Guided Inquiry: Cafeteria Audit
3.4 - Student-driven Inquiry: Student-led Audit

Outdoor Audit
3.5 - Structured Inquiry: Athletic Field Audit
3.6 - Guided Inquiry: Non-athletic Field Audit
3.7 - Student-driven Inquiry: Student-led Audit

4 - Resurfacing: Communicating Data & Recommendations
APW Professional Development

• New National Staff Development Council Standards for professional development have been adopted by Arizona Department of Education.

• Guidelines for professional development have changed and APW is changing with them!
ADE Expectations

- Development of Learning Communities
- Ongoing continuous instructional improvement
- Support of adult learning and collaboration
- Assessment that uses multiple sources of information to guide improvement and demonstrate its impact
- Uses applied research that improves critical thinking skills
- Incorporates differentiated instruction
- Deepens teachers’ content knowledge
- Provides research-based instructional strategies to assist students in meeting rigorous academic standards
Conservation Champion

*Arizona Conserve Water Educators’ Guide*
Orange lapel pin and puzzle

<table>
<thead>
<tr>
<th>Puzzle Piece</th>
<th>Target Competency</th>
<th>Teacher Action</th>
<th>Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of AZ</td>
<td>Understand that the properties of water allow it to move and change form in the Earth’s water cycle.</td>
<td>Take the Plunge! Begin APW training</td>
<td><em>Arizona Conserve Water Educators’ Guide</em></td>
</tr>
<tr>
<td>(body)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face</td>
<td>Describe the interconnection of all water sources in the Earth system.</td>
<td>Register a friend for any WET workshop</td>
<td><em>Arizona Water Map</em></td>
</tr>
<tr>
<td>Arms and legs</td>
<td>Explain the direct and indirect uses of water.</td>
<td>Utilize any APW teaching tool. Submit at least three photos depicting classroom use.</td>
<td>Pictures posted on APW web site. Grade appropriate teaching materials.</td>
</tr>
<tr>
<td>Star</td>
<td>Identify the conservation adaptations of plants and animals</td>
<td>Present student work to others at an APW workshop</td>
<td>Student work posted on APW web site</td>
</tr>
<tr>
<td>Water drop</td>
<td>Investigate water conservation methods including rainwater harvesting and use of native plants.</td>
<td>Complete one specific portion of the SWAP</td>
<td>Beautiful Arizona photo DVD</td>
</tr>
<tr>
<td>Lasso</td>
<td>Communicate a message of efficient water usage</td>
<td>Support five Junior Water Champions or hold a water festival at your school</td>
<td>Classroom sets of PW’s <em>Discover the Waters of Arizona</em></td>
</tr>
</tbody>
</table>
Master Water Champion
Gold lapel pin
Special designation for those who have completed all four Champion programs.

<table>
<thead>
<tr>
<th>Puzzle Piece</th>
<th>Target Competency</th>
<th>Teacher Action (completed during the overall Champion process)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of AZ (body)</td>
<td>Know where the water that we use comes from</td>
<td>Become WET Water, River, Healthy Water, and Conservation Champions.</td>
</tr>
<tr>
<td>Face</td>
<td>Understand that life would not exist without water</td>
<td>Register four friends for any WET workshop</td>
</tr>
<tr>
<td>Arms and legs</td>
<td>Act to keep watersheds clean</td>
<td>Utilize four APW teaching tools. Submit at least twelve photos depicting classroom use.</td>
</tr>
<tr>
<td>Star</td>
<td>Exemplify water stewardship for others</td>
<td>Present student work to others at four APW workshops.</td>
</tr>
<tr>
<td>Water drop</td>
<td>Work actively toward a sustainable future</td>
<td>Complete all components of the school-wide SWAP or develop and complete any water stewardship/conservation project.</td>
</tr>
<tr>
<td>Lasso</td>
<td>Use water efficiently</td>
<td>Support twenty Junior Water Champions</td>
</tr>
</tbody>
</table>
Today’s students represent the first generations who’ve spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age. It is probable that today’s students think and process information fundamentally differently from their predecessors. These differences may go far further and deeper than most educators suspect or realize.

CPS Responders
Standards-based water education module for 6th grade students

An innovative interactive computer module engages students in instruction and assessment about the water cycle and weather.
Klentschy and Molina-De La Torre (2004) advocated writing in science notebooks as a way for students to **understand first** and **communicate second**. They found that students who used science notebooks also spent more time writing.
The Water Festival Model

APW developed the standards-based Arizona Water Festival (AWF) model which has engaged & instructed 33,337 4th grade students and 1,023 teachers in 20 Arizona communities.

Model includes: 1) pre- and post-festival lessons conducted in-classroom by teachers, 2) Teacher professional development, 3) volunteer training and 4) program evaluation.
The Water Festival Model

The Water Cycle
Children move through the hydrologic cycle

The Value of Water
Students learn the history and value of water

Groundwater

Watersheds

Yellow Area

Red Area

Blue Area

Green Area

Students learn hands-on about their watershed

Children learn what water looks like underground

WATER FESTIVAL LAYOUT

Parking and Bus Drop-off
Summative Evaluation (2009) demonstrated statistically significant results:

- Student knowledge about water increased pre- to post-water festival and their enthusiasm for water conservation and learning about water increased.
- Students in the classes of teachers who participate in the professional development workshop show greater gains than those who do not.
Before the water festival students only recognize groundwater as water under the ground, typically in a large lake or underground cave. After the water festival:
An AWF Success Story

• I heard nothing but positive things from teachers, administrators and children about the Arizona Water Festival. It was a fabulous hands-on learning opportunity for the children of the Verde Valley. I am sure they have a much stronger understanding of the complexity of water systems due to your work. Thank you so much for your efforts and for your support of this top notch activity.

• Barbara U'Ren
Superintendent
Cottonwood Oak Creek School District
What does District Science Coordinator say about the Water Festival field study?

It's a true field study. It's not a 'We're going out to have fun' field trip. It's just been great because for years we've had different business communities create and develop curriculum and say, 'Here, schools, this is what you need.' But in the case of the water unit and water festivals, she said, the community honored its teachers by asking what the teachers needed and offering to make it happen. What we need is for businesses and partnerships to look at our curriculum and say, 'This is how we can make it come alive.'

Quote from Arizona Daily Star
Summarizing Arizona’s Water Education Program

• Research-based, relevant and comprehensive content
• Built in to state education requirements
• Statewide delivery mechanism
• Programming that interests and inspires learning ….

So what’s needed?
Project Objective:
Development and Distribution of an effective Water Reuse Curriculum Supplement and an Integrated Water Management Simulation Model
So how do People Learn?

How do we shift preconceived notions and influence public perception?

- Constructivism
- Learning Styles
- Multiple Intelligences
- Neuroscience
- Brain-Based Learning
- Communities of Practice
- More research every day …..
What is effective teaching according to most research?

• activating background knowledge,
• building on pre-existing knowledge to deepen understanding,
• breaking the task into smaller, more manageable parts
• prompting concretely & questioning effectively,
• verbalizing thinking processes when completing a task,
• learning in cooperative ways,
• coaching and modeling,
• addressing misconceptions
Conclusions

It’s not just about content; instruction or messaging is just as important.

Efficient water use and reuse matters and is important for Arizona. APW can assist in the development of effective education programs.

Teachers can’t do it alone. Real world education that teaches lifelong lessons, critical thinking skills and problem solving is a community education project that will instill the practice of wise water use … the right quality for the right use.
Contact Information

Kerry Schwartz
Director, Arizona Project WET
Water Resources Research Center
Associate Specialist, Ag Education
The University of Arizona
350 N. Campbell Ave.
Tucson, AZ 85719
voice 520-621-9591 ext. 22
fax 520-792-8518
kschwart@cals.arizona.edu

Website: http://cals.arizona.edu/arizonawet/