

Guppies and Plants Find Harmony at Potlatch Elementary School, Potlatch, Idaho, USA

Submitted by Josh Egan and Dr. Ed Galindo

The University of Idaho (UI) is the state's land grant research university. The UI mission statement (UI strategic plan 2011-2015) explains the university's commitment to enhancing the scientific, economic, social, legal, and cultural assets of the state. To accomplish this mission, the UI strategic plan presents a framework to guide and promote activities in the areas of teaching and learning, scholarly and creative activity, outreach and engagement, and community and culture. We have participated in a number of outreach activities with Potlatch Elementary School that incorporate scholarly and educational activities addressing all aspects of this framework. However, this article will primarily discuss the Harmony Box project and its contribution to the UI's goal of engaging communities via outreach.



Mr. Lam's class and Josh Egan assembling a Harmony Box at Potlatch Elementary School.

Establishing Inter-Institution Relationships

A great class of students starts with an excellent teacher and Mr. Gary Lam of Potlatch Elementary School is that teacher with over 25 years of experience. Lam met Dr. Galindo, Director of the Natural Resources Tribal Cooperative at the UI Aquaculture Research Institute (ARI), in 2010 while attending Galindo's NASA Summer of Innovation (SOI) workshop. This workshop provides elementary teachers with new ideas about how they can inspire students in the subjects of science, technology, engineering, and math (STEM). The positive relationship between Lam and Galindo continued

after the workshop and grew into a collaborative relationship focused on engaging students in non-traditional inquiry-based STEM activities. This relationship provided an opportunity to test the new "Harmony Box" classroom aquaponics system, designed at the ARI by Galindo and collaborator Josh Egan.

Potlatch Elementary School (Home of Logger Pride)

Potlatch Elementary School is located in the town of Potlatch in northern Idaho and has approximately 234 students (PK-6). The average classroom student to teacher ratio is 13.4 to 1 and

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Potlatch Elementary students at the University of Idaho Aquaculture Research Institute.

This visit showed students that the scholarly research and creative activities taking place at the UI-ARI promote the expansion of knowledge and the application of natural and applied sciences

47% of students are eligible for either reduced or free lunch. The most common industry (2005-2009) in Potlatch is construction, and the most common occupations are fishing, hunting, and logging. Potlatch Elementary is located approximately 15 miles north of UI.

An Introduction to Aquaponics

When fish and other aquatic organisms are grown in an artificial environment, toxic nitrogenous waste is produced, which can accumulate and become harmful to the cultured organisms if not removed from the water with water changes or filtration. Additionally, these waste products, along with unutilized nutrients from fish food, may pollute streams, rivers, and lakes if not treated properly. Aquaponics is the combined culture of plants and aquatic animals using a single system. These systems are often used to culture terrestrial and aquatic edible plants (vegetables, herbs, fruits) and aquatic organisms, usually fish. Aquaponics systems use plants to remove these excess nutrients from the water, simultaneously cleaning the water and producing valuable plant biomass.

The Harmony Box Classroom Aquaponics Kit

The Harmony Box program is funded

by two NASA research/education grants and involves postdoctoral, graduate, and undergraduate students who construct and deliver Harmony Box kits to schools and science centers. The kit contains materials needed to construct a miniature recirculating aquaponics system. It is delivered in a plastic tote and presented to classrooms as a model of our earth. Some cultures believe a lack of good health is the result of not being in harmony or balance, thus the name "Harmony Box." Our thesis was that students would be engaged in learning about STEM topics if they could combine knowledge learned in traditional classroom activities with a yearlong hands-on, hearts-on, and brains-on classroom STEM activity. Thus, Harmony Box was designed to allow manipulation for conducting experiments that provide a focal point for classroom activities focusing on health, science, research, math, and art. Additionally, this kit provides students an opportunity to learn valuable, real-world, plant and animal culture techniques.

Harmony Box and Mr. Lam's Class

Lam's class was selected to test the first Harmony Box. For maximum student engagement, the students assembled their own harmony box system in their classroom in the fall of 2011. Lam's students cared for the box for a full school year, during which they cared for their fish (guppies), grew several plant species, including edible herbs, and performed weekly water quality monitoring and cleaning. Each student maintained detailed records of plant growth, fish health, and system function and at the end of the school year provided ideas for how the system might be improved.

Outreach Opportunities and the University Experience

Egan's personal story illustrates how participation in outreach may positively impact college students. He participated in the Harmony Box project as a senior at UI in hopes of further exploring his interests in fish culture and conservation and sharing these interests with others. This project allowed him to apply and disseminate

Aquaculture Research Institute

The ARI newsletter will be produced semi-annually and available online in Adobe Acrobat format through www.uidaho.edu/aquaculture. If you would like to be notified via email when the latest edition is available on our web page, please notify the editor at aqua@uidaho.edu.

We would be happy to include appropriate contributions from those of you working in the field! Feedback and suggestions on how to improve this newsletter would also be appreciated.

This issue of the newsletter highlights various projects being conducted on the Moscow campus, the Hagerman Fish Culture Experiment Station and includes various extension activities.

The Aquaculture Research Institute Newsletter provides information about aquaculture-related activities at the University of Idaho. It is intended to complement rather than duplicate the Idaho Aquaculture Association Newsletter, although some articles may overlap. Articles in this newsletter may be reproduced without permission, provided they are properly cited. Please feel free to submit comments or material you would like us to consider for publication to:

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skills and knowledge in a non-university environment, hone his communication and teaching skills, and realize his passion for teaching. Additionally, he was able to see the benefits that collaborative relationships with community members offer to both the UI and the partner community. We argue that outreach makes an invaluable contribution to the multifaceted university experience available to UI students by providing the opportunity to discover new interests, which assists in career path decisions.

Mr. Lam's Class Travels to the UI-ARI

To promote the University of Idaho's mission of teaching and learning we believe that interactions with community members should occur on campus in addition to offsite locations, such as Lam's classroom. In April 2012 Galindo and Egan hosted Lam's class for a visit at the ARI. This visit showed students that the scholarly research and creative activities taking place at the UI-ARI promote the expansion of knowledge and the application of natural and applied sciences. Themes promoted during this fieldtrip included education and enrichment of education through collaboration, diversity, and creative interdisciplinary problem solving. During the fieldtrip, students

were encouraged to take note of and ask questions regarding similarities and differences between their Harmony Box and the aquaculture systems and species at the UI-ARI. Furthermore, we wanted to demonstrate that it can be fun to come to the University of Idaho and ARI campus.

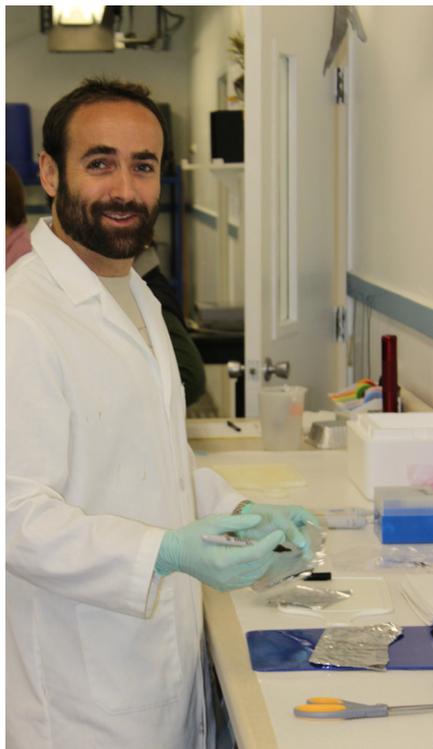
Conclusions

As we reflect on our role of outreach and engagement and as a land grant institution, we are mindful of our mission at the University of Idaho. We ask ourselves this important question: Are we meeting our obligation to work across disciplines, integrating teaching, research and outreach; and partnering with schools? We think we are. It is crucial that we continuously evaluate the effectiveness of our project, seek input from others, and make changes to improve the Harmony Box for future recipients. The benefits of outreach are too numerous to discuss exhaustively in this article, but include: 1) increased visibility to our communities, 2) development of new partnerships and opportunities for UI students and other students like Lam's sixth grade class, and 3) strengthened and expanded relationships of multiple cultures and perspectives.



Potlatch Elementary students touring the University Aquaculture Research Institute during spring 2012.

Featured Student: Alejandro Villasante



Alejandro Villasante was born in San Martin de Mendoza, Argentina and raised in Santiago, Chile. He received a degree from the Veterinary School at the University of Chile where his thesis project was the role of oxidative stress in the joint and degenerative diseases in horses. He also received his master's degree in Aquaculture Sciences from the same institution. While pursuing his master's, he was a member of the Aquaculture Genetics Lab where he learned to use molecular techniques in breeding selection of blue-back rainbow trout (Coho salmon phenotype), and zebrafish. He also conducted research identifying preferences to attributes and market segments of the blue-back rainbow trout in Japan.

Alejandro traveled to the University of Idaho to study under Dr. Ronald W. Hardy. When his studies are complete, he will have a Ph.D. in Animal Physiology in the Department of Animal and Veterinary Sciences with emphasis in fish nutrition and physiology.

Doctoral candidate Villasante's Ph.D.

project is focused on the interaction between amino acids and carbohydrate levels in plant meal-based diets in rainbow trout. This will lead to better understanding the role specific amino acids play in the metabolic compensation of carnivorous fish (such as rainbow trout) when fed a non-traditional based diet with high carbohydrates.

In addition to his Ph.D. research, Alejandro collaborated on a study in transcriptional response in selected genes towards nutritional stress such as high dietary carbohydrates levels in rainbow trout of different ages. He also studied the relationship of a novel ingredient that could improve both the antioxidant status and the lipid metabolism of the fish. This could result in improvement in fish health and quality of the final product, such as a leaner fish.

The experience and techniques gained at the ARI will be of great value when he returns to home to Chile where the aquaculture industry has become important and highly sophisticated.

Hagerman Laboratory Improves Energy Efficiency, Reduces Cost, and Improves Comfort

The University of Idaho's Hagerman Fish Culture Experiment Station's new 14,000 ft² building was completed in 2006. Since it was completed laboratory and office space have been suffering from temperature swings and very high propane heating costs, 3-4 times higher than the designers predicted. The laboratory space contains six hoods that together exhaust 600 ft³ of air per minute. This air must be continuously replaced to maintain positive air pressure in the analytical laboratories and, of course, the incoming air must be heated in winter or cooled in summer to normal room temperature. The Hagerman Station laboratories contain highly sophisticated equipment for genetic analysis that requires a relatively narrow room temperature range to operate properly and provide reliable results. The office space is heated or chilled using recirculating air like a

normal office building or residence, but also relied on propane for heating and conventional air conditioning for cooling.

To meet the University's goal of providing an expeditious and economical solution for reducing energy costs and providing more reliable heating and cooling, the University reached out to their ESCO partner, McKinstry. Together, the University and McKinstry developed innovative and cost savings solutions involving the Hagerman property's main asset, an abundant supply of constant temperature (60°F) spring water. A new water coil for pre-heating and pre-cooling the lab-side incoming air and new water source heat pumps for the office area all utilize spring water as their energy source. No water is consumed by the heating and air conditioning equipment. Water is discharged after use

into an adjacent spring-fed creek with no measurable effect on creek water temperature or quality.

Funding for the \$220,000 HVAC upgrades was supplied by a grant to the University's research partner in Hagerman, the Columbia River Inter-Tribal Fish Commission, and by the Vandal Loan Fund. The upgrade project started in December and was completed in March. The University is realizing the impact of the project through a significant (>50%) reduction in propane use and more reliable heating and cooling. Additional benefits of the project include \$30,000 in utility incentives (rebates) from Idaho Power Corporation that will be used to repay a portion of the loan from the Vandal Loan Fund. The Aquaculture Research Institute is on schedule to repay the loan within three years with energy cost savings.

Columbia River Treaty tribes and the University of Idaho

Submitted by Dr. Ed Galindo

CRITFC (Columbia River Inter-Tribal Fish Commission) is composed of Columbia River Treaty tribes which include Warm Springs, Yakama, Umatilla and Nez Perce tribes. One meeting per year is held at the University of Idaho Aquaculture Research Institute (ARI) facility located at Hagerman, Idaho. The meeting was held on May 24-25, 2012 at the Hagerman facility which is the home of CRITFC's fish genetics research team. This enables the Commissioners to see first-hand what the team is doing and to discuss other collaborative opportunities with the University of Idaho.

ARI Director, Dr. Ron Hardy and Director of the Natural Resources Tribal Cooperative, Dr. Ed Galindo made several presentations to the Commissioners. These presentations included University efforts to provide training to tribal fisheries biologists and on the number of Native Americans with higher education degrees in various STEM (Science, Technology, Engineering and Mathematics) fields throughout the USA. This led to a discussion on how best to design training courses for tribal biologists and what other programs could be designed to increase enrollment of American Indians in STEM programs, especially at the graduate student level.

It is an honor for the University of Idaho to host such an event with the American Indian community and we look forward to many more opportunities to work together.

This enables the Commissioners to see first-hand what the team is doing and to discuss other collaborative opportunities with the University of Idaho.



Top Row: (Left to Right): Dr. Shawn Narum, CRITFC; Leslie Bill, CTWSRO; Rafael Queahpama, CTWSRO; Bruce Jim, Sr., CTWSRO; Mitchell Pond, CTUIR; Emerson Squiemphen, CTWSRO; Donald Winishut, Sr., CTWSRO; Wilbur Slockish, Jr., YN; Raymond Colfax, YN; Dr. Ronald Hardy, UofI

Bottom Row: (Left to Right): Gerald Lewis (Chairman of CRITFC), YN; Quintin Ellenwood, NPT; Herbert Jackson, NPT; Daniel Kane, NPT; Johnny Jackson, YN

The tribal abbreviations are:

CTUIR - Confederated Tribes of the Umatilla Indian Reservation

CTWSRO - Confederated Tribes of the Warm Springs Reservation of Oregon

NPT - Nez Perce Tribe

YN - Yakama Nation

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CALENDAR

July 31, 2012-August 3, 2012

American Fisheries Society, Fish Health Section Meeting Radisson Hotel,
La Crosse, Wisconsin.

August 19-23, 2012

Annual Meeting of the American Fisheries Society, Minneapolis-St. Paul, MN.
Fisheries Networks: Building Ecological, Social and Professional Relationships.

September 1-5, 2012

Aqua 2012, Prague Czech Republic.
World Aquaculture Meeting

February 21-25, 2013

Aquaculture America, World Aquaculture Meeting,
Nashville, Tennessee.

April 15-18, 2013

Western Division and the Idaho Chapter of American Fisheries Society Annual Meeting,
Boise, Idaho.

This will replace the regular Annual Meeting of the Idaho Chapter.