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INSTRUCTIONAL PRACTICES FOR 21ST CENTURY AGRICULTURAL EDUCATION TEACHERS

EDITORIAL

Teaching in the 21st Century: New Technologies Combined with Tried and True Techniques

by Harry N. Boone, Jr.

The basic concepts of teaching have not changed drastically in the past 150 years, however, the technologies associated with these concepts have changed radically. For example, John Dewey's principles of problem solving as a teaching method are as applicable today as they were when he developed the concept. Benjamin Bloom's taxonomy (or some variation of it) is still a major part of educational systems across the nation. Rufus Stimson's concept of experiential learning through supervised agricultural experience programs was a major theme of the 2011 National Agricultural Education Summit held this winter in Orlando, Florida. While these tried and true techniques remain the cornerstones of our profession, new technologies are constantly being introduced that change the face of the educational process. For every example of a concept that has remained the same, I can name several new and innovative technologies that have entered the education profession.

I am going to show my age with the following statement but I can remember when the personal computer was introduced to the education system. The easy access to computers and computer technologies created numerous discussions on the role of computerized instruction in education. Many thought that computerized instruction would replace teachers in the classroom. Twenty-five years later the teacher is still the essential component of the classroom.

Today we have the Internet, smart phones, Facebook, distance education, and computer conferences to name a few. At the college level we are delivering many courses via distance education. I can only guess what the next twenty-five years will bring.

While this issue centers on the theme of "Instructional Practices for 21st Century Agricultural Education Teachers," each of the authors have taken a unique approach to the topic. Two articles examine technologies available to agricultural education teachers. There are articles offering suggestions on encouraging diversity and methods of inclusion. This issue also has articles on instruction strategies for agricultural education teachers. Dr. De Lay offers suggestions for "future proofing" your program.

Take a few minutes and enjoy this issue's contributions on "instructional practices" for the 21st century. Hopefully you will pick up a few ideas to enhance your own teaching efforts.

2012 Theme Suggestions

It's hard to believe that the time has come for me to select my third, and final set of themes for *The Agricultural Education Magazine*. It seems like yesterday that I struggled to compile my first series of topics for the *Magazine*. Here is where I need your help. I am asking you, the readers, to suggest themes for the 2012 issues. You can send your suggestions to hnboone@wvu.edu.

I would like to take this opportunity to thank the theme editors and authors that have written for *The Agricultural Education Magazine* over the past eighteen months. Without individuals willing to advance the profession and share their ideas, *The Agricultural Education Magazine* would not be possible. Also thank you to those who will contribute in the future.

Dr. Harry N. Boone, Jr., is an Associate Professor at West Virginia University and Editor of ***The Agricultural Education Magazine.***

Front Cover*:*
Daniel Goodrich and Amy Pint teach Memorial Middle School students how to test pond water for dissolved oxygen. Photo courtesy of Thomas Dormody.

Back Cover:
Photo 1: State Entomologist Carol Sutherland shows exotic insect species to the class. Photo courtesy of Thomas Dormody.
Photo 2: Inclusion techniques. Photo courtesy of Susie Whittington.
Photo 3: A Mayfield High School student practices CPR on a canine mannequin. Photo courtesy of Thomas Dormody.

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Article Submission

Articles and photographs should be submitted to the editor or theme editors. Items to be considered for publication should be submitted at least 90 days prior to the date of the issue intended for the article or photograph. All submissions will be acknowledged by the Editor. No items are returned unless accompanied by a written request. Articles should be typed double-spaced, and include information about the author(s). One hard copy and one electronic copy of the article should be submitted. A recent, hardcopy photograph should accompany the article unless one is on file with the editor. Articles in the magazine may be reproduced without permission but should be acknowledged.

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THEME EDITOR COMMENTS

An Introduction to Instructional Practices for 21st Century Agricultural Education Teachers

by Benjamin Swan

It doesn't seem very long ago that Y2K was on our doorstep as we moved from one millennium into another. Here we are a full eleven years into the 21st century with many things changing in front of our eyes: economic challenges, population increases, demographic shifts, natural catastrophes, wars, etc. Despite all of the chaos and change that is occurring across our land and globe, we have the opportunity to help and positively affect one student at a time.

I remember sitting at the National AgEd Summit in Indianapolis a couple of years back when the mystery speaker, Dr. Marshall Stewart from North Carolina, challenged the group to make the effort to reach out to recruit and impact all of the students who walk through the doors of our schools. His simple point was that statistics illustrated that the national student demographics of agricultural education don't even come close to mirroring what is enrolled in our high schools. There is a huge gap and we need to fill it.

Just last week I was visiting a student teacher in the Central Valley of California. After school we went on a couple of home visits, including a visit to a Spanish speaking family. As we conducted the visit, the FFA member served as our interpreter. I clearly remember the student teacher handing the latest *New Horizons* magazine to the parents. As the mother flipped through the pages, she focused on the pictures. On the way home, I flipped through my copy of the magazine and noticed what Marshall Stewart had brought to our attention, there aren't many minorities represented, whether it's in our magazine or in our programs. I then thought, I wonder what the mother saw or didn't see; was she concerned? I do know that the simple fact we made a home visit made a huge impact on the student and his parents. The student teacher made an impact on that family by showing that their child is valuable and that his future is important to the teacher. If we each reach out to those similar and different than ourselves, we can each make a larger difference for our shared future.

Agriculture teachers at all levels need to consider how we can serve the students best in each of our schools that we are stationed within. We each have the opportunity to truly make a difference in the lives of the students we serve; we need to strive to reach all of the students on each of our campuses. In this edition, we will look at how we can address recruiting, teaching, retaining, and utilizing the students on our campus to build and strengthen our programs across our nation. It is my hope you might get some new ideas to implement into your program as you read through the articles composing this edition.

Dr. Benjamin Swan, the May-June Theme Editor, is an Assistant Professor in the Department of Agricultural Education and Communication at California Polytechnic State University, San Luis Obispo.

Upcoming Themes for *The Agricultural Education Magazine*

September-October: Keeping Up-to-Date: Professional Development Opportunities for Agricultural Education Teachers

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November-December: Balancing Career and Family: Preventing Burnout

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Planting Seeds: Growing Diversity

by Jamie Cano and Warren Tyler Agner

One basic educational premise is that all people can learn. There are cultural and historical practices, however, that have placed some students at risk of educational failure. Research (Goldenberg, Reese, & Gallimore, 1992) has emphasized the importance of understanding the impact that cultural and historical factors have on educational success.

Another basic assertion is that successful societies make the best use of their resources. So why isn't the agricultural education profession making the best use of its resources? No, this is not about drilling for oil. It is about drawing on an even more valuable resource – one abundant in every state in the country: talented Latino students whose intellectual potential too often goes untapped, and frequently leads to educational failure.

The ethnic and racial composition of the population of the United States is changing. In 2005, the United States population was 69% white and 15% Latino. The United States' population will continue to diversify with a projected Latino population growth rate of 45% from 2010 to 2030. For example, by 2020 Latinos are projected to make up the majority of Texas' population, while just one-third of the Texas population will be white.

Therefore, the education of Latino students has reached a critical stage. Although the number of Latino students attending public schools has increased dramatically in recent decades, Latino students, as a group, have the lowest level of education and the highest dropout rate of any group of students. Conditions of poverty and health, as well as other social problems, have made it difficult for Latinos living in the United States to improve their educational status.

Clearly, the national picture is dismal. The demographic data for agricultural education parallels the dreary national data. Within agricultural education, only six percent of the high school population completed coursework in agriculture in 2009, with the majority of them being white. At the same time, the National Research Council (1988) stated that agriculture was a topic too important to be taught to only a relatively small percentage of students. Millions of students each year, from all ethnicities, are missing out on the numerous benefits provided through agricultural education.

Agricultural education has provided many benefits for students enrolled in the program; however underrepresented minorities are not gaining from those benefits. In order for agricultural education to grow and enhance the quality of programs, the agricultural education enrollment must resemble the diversity of this country, of local communities, and of individual schools. The seriousness of the educational plight of Latino students from disadvantaged backgrounds underscores the urgency of developing a solid knowledge base of awareness on the effective teaching characteristics, learning characteristics, and personal development characteristics which focus on alterable practices which may improve the academic achievement of Latino students.

> Agricultural education enrollments must resemble the diversity of this country, of local communities, and of individual schools.

Improving the education of Latino students, however, will take more than just an awareness of the problems and knowledge of solutions. It will require the concerted efforts of all educators to respond to the crisis by insisting on immediate attention and accepting no more excuses. It will require a call to action and collaboration among educational systems, community organizations, educators, parents, and students. The development will also require a change in attitudes to make educators aware of the severity of the problems facing Latino students and seriously commit to reversing the cycle of educational failure that Latino students have unjustifiably endured.

Some educators have argued that the most serious barriers to achievement among Latino students has been the lack of funding for programs that address their educational needs, or political opposition to programs

that focus mostly on linguistics (Melendez, 1993). However, there are other alternative factors that have been found to contribute to the underachievement of Latino students. The top three critical factors found (Padron, Waxman, & Rivera, 2002) to contribute to the underachievement of Latino students are the lack of qualified teachers to teach them, inappropriate instructional practices, and at-risk school environments.

Many scholars have suggested that inappropriate instructional practices of pedagogical-induced learning problems may account for some of the poor academic performance and low motivation of many Latino students. Therefore, it can be concluded that teachers may need to make pedagogical adaptations to address Latino students' needs.

According to Bronfenbrenner (1989), young people (students) need to have adults (teachers) who are "crazy" about them. Unfortunately, in our most troubled schools, teachers are not crazy about students and students are not crazy about teachers -- instead, they are driving each other crazy. In these troubled schools, support networks are weak or nonexistent for both students and teachers. Teachers may resent what they perceive as inadequate encouragement, assistance, and resources to do their job. Students may feel that nobody at school knows or cares about them.

By attending schools that are poorly maintained, in addition to having teachers who are not qualified or use inappropriate instructional approaches, Latino students are learning in a school environment that can at best, be qualified as at-risk. Alternative strategies or approaches for reforming schools call for changing the circumstances under which students attend school, rather than changing the students.

All indicators clearly proclaim the need to increase diversity in agricultural education and at all levels of the educational system and to increase student engagement in education. Further, many researchers have opined, asserted, and suggested methods of engaging Latino students in the classrooms. So tell us then, why are we as agricultural educators not planting many more seeds in an effort to grow diversity?

References

Bronfrenbrenner, U. (2007). *Beyond the deficit model in child and family policy.* New York, NY: Teachers College Press.

Goldenbert, C., Reese, L., & Gallimore, R., (2010). Effects of literacy materials from school on Latino children's home experiences and early reading achievement. *American Journal of Education, 117*(4), 497-536.

Melendez, M. (2000). Bilingual education in California: A status report. *Thrust for Educational Leadership, 29*(4), 30-32.

National Research Council. (1988). *Understanding agriculture: New directions for education.* Washington, DC: National Academy Press.

Padron, Y. N., Waxman, H. C., & Rivera, H. H. (2002). *Educating Latino students: Obstacles and avenues to improved academic achievement.* Santa Cruz, CA: Center for Research on Education, Diversity, and Excellence.

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Inclusion techniques. *Read the complete article on page 10.*

The Wonder of Words: Using Technology to Support Vocabulary Instruction

by Wendy Warner and Jennifer Jones

While observing in a 9th grade agriculture classroom recently, a teacher kept using the term "commodities." At the conclusion of the lesson, I asked the teacher if her students knew what the word commodities meant. She considered my question for a second and truthfully admitted that the students probably were not aware of the contextual meaning. In her next class, she introduced the term again and then asked the students if they knew the meaning. In the class of 25, only two students offered reasonable and accurate responses.

This is not an uncommon scenario in agriculture classrooms across the country. Consider new or difficult terminology you have introduced or used in the classroom over the past week. Chromosome? Deciduous? Eradication? Asexual propagation… sound familiar? Challenging vocabulary can extend beyond content-specific terms. Larry Bell (2005) identified twelve words that can confuse students during assessment such as infer, predict, and formulate. One student teacher found when she asked her students to evaluate their welds, she was met with blank stares.

When I was in high school, direct vocabulary instruction involved little more than a vocabulary worksheet with 20 assigned terms per week. We were required to complete workbook exercises consisting of matching, fill-in-the-blank, and multiple-choice items and take a weekly quiz that often included similar question types. Beck, McKeown, and Kucan (2002) caution that this approach to vocabulary instruction is detrimental to student development of interest and awareness in new and unfamiliar vocabulary terms. The researchers claim that in order for students to develop substantial vocabularies, they must be encouraged to continually interact with and use new words and examine relationships among new terms.

A wealth of research has documented the beneficial relationship between vocabulary knowledge and student achievement (Baker, Simmons, & Kame'enui, 1997). As a result, several approaches to direct vocabulary instruction are being promoted in schools and categorized as "instructional best practices in the 21st century." For example, Feldman and Kinsella (2005) suggest that when introducing a new term, students should first pronounce the word. Then the teacher can provide the meaning and additional examples of the word. Students are encouraged to elaborate on word meaning through the creation of additional examples and visual or graphic representations. Finally, the teacher assesses student understanding using both formative and summative means. Marzano and Pickering (2005) developed a similar approach in which the teacher first provides a description or example of a new term. Then students have the opportunity to rephrase using their own terminology and develop a visual representation. After the initial exposure to a new term, Marzano and Pickering encourage sustained interaction and reinforcement with vocabulary through additional activities, discussion, and games. This process of six steps offers multiple exposures and experiences with essential academic vocabulary where deep and long term understanding of the term is key (Marzano & Pickering, 2005).

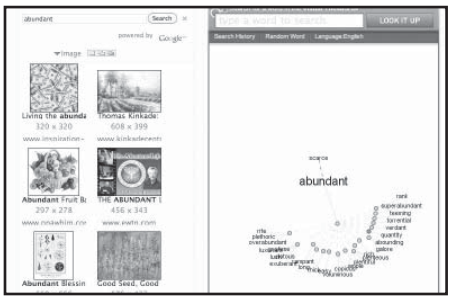
Dalton and Grishman (2011) identified the contribution of eVoc strategies to support direct vocabulary instruction and promote interest in words. This integration of technology can add a novel twist to the vocabulary instruction I experienced in high school and capitalize on the learning styles of this generation of students. The use of visual representations can support students as they learn word meanings and examine the interconnected relationships with other terms (Beck & McKeown, 2001). Visual representations known as visualizations whereby students create mental images and mind movies with pictures are tried and true research based strategies that help students understand and comprehend words, terms and new learning (Harvey & Goudvis, 2007). With the participatory nature and user-centeredness of Web 2.0, there are a plethora of free web tools and online based resources that students can access and use to aide in their understanding of new words and terms in fun, interesting and creative ways. With many of these interactive and collaborative applications, students are using higher order thinking skills to create, synthesize, and apply their understanding.

Wordle (http://www.wordle.net/) allows for the creation of word

clouds prominently displaying the most common words in an excerpt of text. The generation and analysis of images can promote students' thinking about the meaning and hierarchical relationships among words (Dalton & Grisham, 2011).

For example, when introducing the FFA Creed, students can examine the individual words that make up the creed and talk about how the words connect to create meaning. Students can also identify words that are unfamiliar or challenging so the meaning can be discussed amongst the entire class. Due to the nature of the formatting and word size feature of Wordle (and many other word cloud applications like **Tagxedo, Image Chef** and **ABCya Word Clouds**) teachers can use Wordle prior to beginning a lesson to predict main idea and preview the selection. Word clouds from units of study can be generated before, during, or after lessons to allow students to hypothesize upcoming lesson content and explore some of the new terminology that will be introduced and integrated throughout the unit.

WordSift (www.wordsift.com) is another technology tool that allows for the visualization of text. From the word cloud that is created from a segment of text, specific terms can be selected. For the selected term, related images are displayed and a conceptual map of related words is generated using **Thinkmap Visual Thesaurus** (http://www.visualthesaurus.com/). These features can assist students in developing visual representations of new terms and increasing vocabulary



by examining synonyms and antonyms.

Wonder Wheel, a left sidebar feature of Google search, can be used to identify and investigate related terms. For example, when entering the word pollination into the Google search box, a concept map is generated with several related terms such as seed dispersal, self pollination, germination, and photosynthesis. In addition, links to related websites are featured and auto-populated on the right. This technology tool provides a great way to introduce terminology and related terms for a lesson or unit. Wonder Wheel works best when the search word is broad and general.

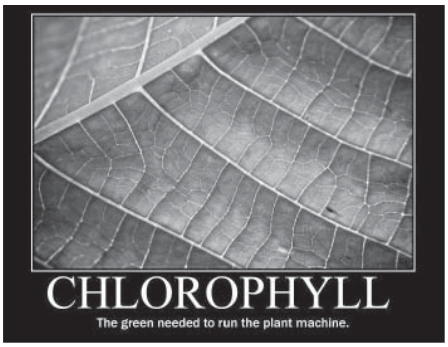
In addition to encouraging students to visually examine new terms, other technology tools can encourage students to examine vocabulary utilizing multiple modes such as writ-

ing, audio, graphic, video, and animation (Nikolova, 2002; Xin & Rieth, 2001). Using these various modes can enhance vocabulary comprehension as students read a definition, view, construct, or identify a related graphic, listen to a word, articulate a more personal definition for a word, add a caption to a graphic, or develop a conceptual word map (Proctor, Uccelli, Dalton & Snow, 2009).

At **Flickr** (www.flickr.com) students can select photos that represent the meaning of new words. Students describe or identify images using newly learned terms in a Google Image search feature called Image Swirl. Similar to the Wonder Wheel for words and terms, **Image Swirl** creates conceptual image maps based on related categories of the searched image. A web application such as **Animoto** (www.animoto.com) allows users to produce videos from user-selected photos, video clips and music. With such an application, students can create slideshows using terms and definitions as well as related graphics to showcase one word or numerous words related to one main concept. Since most of today's students have grown up with YouTube as part of daily life, consider having students produce their own vocabulary videos; short 60 second videos that situate word learning in a specific context, using Flip cameras in conjunction with free audio applications like **Voicethread, Blabberize, Audacity or Voice Memos** to narrate their productions.

BigHugeLabs (www.bighugelabs.com) is another site that encourages visual fun with words. Students can create motivational posters, magazine covers, or movie posters featuring new vocabulary. The example on the following page includes an appropriate visual, the term, and a definition generated using a student's own terminology.

Technology is like electricity, it's everywhere and unavoidable. Using technology and multimedia in the development of students' academic vocabulary through generative, multi-



modal expression, not only gives students experience with digital technologies required in the 21st century but the use, application and creation with them is motivational and academically beneficial.

References

Baker, S. K., Simmons, D. C., & Kame'enui, E. J. (1997). Vocabulary acquisition: Research bases. In Simmons, D.C. & Kame'enui, E. J. (Eds.), *What reading research tells us about children with diverse learning needs: Bases and basics.* Mahwah, NJ: Erlbaum.

Beck, I. L., & McKeown, M. G. (2001). Text talk: Capturing the benefits of read-aloud experiences for young children. *The Reading Teacher, 55*(1), 10 – 20.

Beck, I. L., & McKeown, M. G., & Kucan, L. (2002). *Bringing words to life: Robust vocabulary instruction.* New York, NY: Guilford Press.

Bell, L., (2005). *12 Powerful words that increase test scores and help close the achievement gap: A resource for educators and parents.* Manassas, VA: Multi-cultural, Inc.

Dalton, B., & Grisham, D. (2011). eVoc strategies: 10 Ways to use technology to build vocabulary. *The Reading Teacher, 64*(5), 306-317.

Feldman, K., & Kinsella, K. (2005). *Narrowing the language gap: The case for explicit vocabulary instruction.* New York, NY: Scholastic.

Harvey, S., & Goudvis, A. (2007). *Strategies that work: Teaching comprehension for understanding and engagement.* Portland, MN: Stenhouse Publishers.

Marzano, R. J., & Pickering, D. J. (2005). *Building academic vocabulary: Teacher's manual.* Alexandria, VA: Association for Supervision and Curriculum Development.

Nikolova, O. (2002). Effects of students' participation in authoring of multimedia materials on student acquisition of vocabulary. *Language, Learning & Technology, 6*(1), 100-122.

Proctor, C. P., Uccelli, P., Dalton, B., & Snow, C. E. (2009). Understanding depth of vocabulary online with bilingual and monolingual children. *Reading and Writing Quarterly, 25*(4), 311-333.

Xin, J. F., & Rieth, H. (2001). Video-assisted vocabulary instruction for elementary school students with learning disabilities. I*nformation Technology in Childhood Education Annual*, p. 87.

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Yvonne Diaz pipettes fish proteins for separation by polyacrylamide gel electrophoresis. Read the complete article on page 25.

Looking Through a Peephole or an Open Door?: Insights into Inclusion

by Caryn Hoerst Filson and M. Susie Whittington

The time had come. After four years of preservice education, I was finally on my own, teaching in my classroom, with my students, and my carefully constructed lessons. I anxiously waited for my first students to walk through the door so I could grab their attention and immerse them in my love of agriculture. However, students weren't the first through the door that initial morning on the job, the special education coordinator was. She walked in, handed me a stack of file folders labeled with students' names, asked me to sign a sheet of paper, and waltzed back out, all within one minute. Curious, I opened the top folder and scrolled down until I saw the intimidating word "Accommodations." Suddenly, I realized my carefully, yet narrowly constructed lessons weren't going to work for my students, at least not the way I had originally planned. My excitement dwindled and panic took over….was I really ready to teach ALL of my students? How was I going to accommodate the varied special needs of my students? How, in my preservice education, did my view of what my students needed to be successful become so narrow? Was I alone in this feeling, or were my peers feeling the same way?

Brief Evolution of Inclusion

The inclusion of learners with special needs is not only mandated by law, but is a civic and moral duty for secondary agriculture teachers. The driving force behind federal mandates that schools must follow is the Individuals with Disabilities Education Act (IDEA), which was originally established in 1975 and known as Public Law 94-142. It was this landmark legislation that established mainstreaming and prescribed that which schools must do to serve the handicapped (Iverson, 1993).

Inclusive education of learners with special needs "recognizes that special learning needs can arise from social, psychological, economic, linguistic, cultural, as well as physical (or disability) factors, hence the term 'children with special needs' rather than 'children with disabilities'" (Kisanji, 1999, p. 3); they are learners first, and their special needs should not define who they are. Disability advocates argue that disability is socially constructed and that society places barriers on certain groups of people. Therefore, these advocates believe that learner-centered classrooms provide the most effective education for learners with special needs.

Preservice Teacher Education

Teacher education programs, designed to address the instruction of learners with special needs, have existed since at least the late 1800s. However, as the number of learners with special needs increases in agriculture programs, agriculture teachers' needs for additional training also increases (Elbert & Baggett, 2003).

The need currently exists to prepare teachers to use effective methods of teaching for learners in an inclusive setting. A 2007 census study of secondary agriculture teachers in Ohio was used to report that teachers needed more competency when teaching learners with special needs (Hoerst & Whittington, 2009); the preservice agriculture teachers from the land grant university in Ohio were required to complete only one course on teaching learners with exceptional needs. Thus, teacher preparation programs need to be aware of the limitations and consequent concerns of those teachers who are currently serving learners with special needs.

Special education teachers often work in their own classroom or office and can be underutilized by agriculture teachers. The continued separatist approach in teacher preparation considers special education as a separate entity "and one that did not and need not involve intensive collaboration or even cooperation with regular classroom teachers…" (Osgood, 2005, p. 120). However, special education teachers are responsible to collaborate with all teachers to develop effective Individualized Educational Plans (IEP) for learners. Agricultural education teachers, given their current preservice education curriculum, typically have limited experience with IEPs. According to Elbert and Baggett (2003), secondary agricultural education teachers need additional training to help develop IEPs. In addition, 60% of secondary agriculture teachers in Ohio reported needing more training in writing educational goals and objectives for IEPs (Hoerst & Whittington, 2009).

In summary, secondary agricultural educators will be working with learners with special needs. It is essential that they know and understand how to contribute to an IEP, as well as how to follow what the requirements state of them as directed through an IEP. However, many preservice agricultural education programs are lacking this skill development.

Teaching Techniques and Strategies

In a 1993 study, Powers found that historically, teachers of learners with special needs practiced two teaching strategies: 1) learners with special needs were grouped among other students and expected to do the best that they could without any assistance, or 2) they were isolated from the other students and given some type of label. "With learners with special needs, techniques that appeal to multiple senses and those that reinforce and re-emphasize learning are needed" (Newcomb, McCracken, Warmbrod, & Whittington, 2004, p. 305).

In the previously mentioned study of Ohio secondary agriculture teachers, it was indicated that discussion and lecture were among the most-used teaching methods when teaching learners with special needs (Hoerst & Whittington, 2009); however, those were also the most-used techniques reported in a study of learners in a traditional classroom (Falk, Beck, & Whittington, 2009). Preservice teachers need to be taught to step outside of their comfort zones, and experiment with teaching strategies that they may not traditionally use, such as role play or peer teaching in order to reach learners with special needs. Teaching by demonstration and learning-by-doing should also characterize the instruction used in inclusive classrooms (Newcomb, et al., 2004). In addition, the problem-solving approach to teaching has been used throughout agricultural education, and is an effective approach for implementing instruction for learners, regardless of ability (Newcomb, et al., 2004).

Summary

"If our teaching is to be student-centered, we must accept the idea of teaching individual students in classes rather than teaching classes" (Priebe, 1971, p. 239). Education is successful only as it relates to the needs, interests, and attitudes of the learners to whom it is directed. Teachers of agriculture have been proponents of this philosophy and have structured their programs accordingly. As we move forward, it will be increasingly important to prepare our preservice teachers for thinking beyond the narrow peephole approach to accommodations, and instead to embrace an open door of inclusion for learners with special needs.

References

Beck, W. M., & Whittington, M. S. (2009). Describing teaching techniques for assessing student cognitive retention. *NACTA 2009 Abstracts and Awards,* p. 42.

Elbert, C. D. & Baggett, C. D. (2003). Teacher competence for working with disabled students as perceived by secondary level agricultural instructors in Pennsylvania. *Journal of Agricultural Education, 44*(1), 105-115.

Falk, J. M., Beck, W. M., & Whittington, M. S. (2009). Describing student cognitive retention in an animal science unit. *NACTA 2009 Abstracts and Awards*, p. 43-44.

Hoerst, C. M., & Whittington, M. S. (2009). The current status of classroom inclusion activities of secondary agriculture teachers. *Journal of Agricultural Education, 50*(2), 38-51.

Iverson, M. J. (1993). Will we serve the academically disadvantaged? *The Agricultural Education Magazine, 66*(6), 4.

Kisanji, J. (1999, March). *Historical and Theoretical Basis of Inclusive Education.* Keynote address at the meeting of Inclusive Education in Namibia: The Challenge for Teacher Education, Namibia.

Newcomb, L. H., McCracken, J. D., Warmbrod, J. R., & Whittington, M. S. (2004). *Methods of Teaching Agriculture* (3rd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Osgood, R. L. (2005). *The History of Inclusion in the United States.* Washington, D.C.: Galladuet University Press.

Powers, L. (1993). Teacher expectations. *The Agricultural Education Magazine, 66(*6), 8.

Priebe, D. (1971). Privileged with good teaching or disadvantaged by poor teaching? *The Agricultural Education Magazine, 43*(10), 238-239.

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Do You Google?... It's More Than Just a Search Engine

by Danny Silva

Most of us have used Google to search for information and we may have even told our students to "Google it" at some point in time. But did you know that Google has a lot more to offer. Google is more than just a search engine. Google has technology that educators and students can benefit from and the best part: it's free.

As an educator, I try to use technology in my classroom all the time either to present or share information, communicate with colleagues, or produce materials for the class. I have my students use technology for the exact same processes.

One of the problems that I used to face with students and the use of technology was inconsistency of software and hardware students were using between school and home. The other problem was how to turn in, share and collaborate with assignments and information. Google Apps has helped to solve these problems for the school environment.

Students now do not have to print out their assignment or email an attachment to turn it in. They are able to share it with the teacher for correcting and other students for peer editing. Teachers and students can leave comments on the document. More importantly comments and even editing can be done on the same document at the same time with multiple people.

Students also do not have a need for a flash drive or other storage media. Anywhere students have access to the Internet they will have access to their documents. They are even able to upload and/or convert documents from different software to Google Apps.

Google Apps is platform agnostic software that is used in an Internet browser. Students can use any operating system (Windows, Apple, or Linux); all they need is an Internet browser that is up to date. Google Apps gives you access to a word processing program, a spreadsheet program, a presentation program, email, and a calendar program. You can use your personal Gmail account to access your personal Google apps (little a), but a better alternative for Education is to sign up for Google Apps (Big "A") for Education. (http://bit.ly/googleapps4ed) This allows you to have more control over the programs and lets you sign up students through your school account for these great tools. Let's take a look at what Google can do for your classroom, school, and ag program.

Google is known for its search page, but are you and your students utilizing its full potential? There are some great resources on the Internet to show the capabilities of search. Google even has a set of lesson plans (http://www.google.com/educators/p_websearch.html) on using search.

Here are some of the things that might be useful for your classroom.

Google Advanced Search: Something that is easily missed on Google's Search page is a link to Google's Advanced Search. This takes the place of having to know Boolean Search Language, but more importantly Advanced Search will let you pick a file type, look for only recent information, designate usage rights (free to use), and even define a region. For example, let's say you wanted to do a search for corn on Google's main search page. You would get back around 123,000,000 results. But if you used advanced search, you could limit your search to results for corn, PowerPoint files, and information within the past year from the United States. What you would receive are 800 PowerPoint files from the United States posted in the last year – current information ready for you and your students.

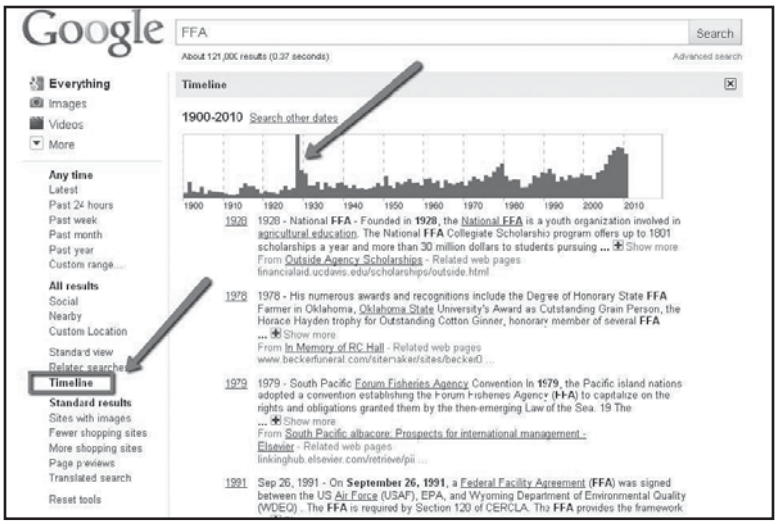
Google Timeline: Timeline is a great way to put information in historical or chronological perspective for students. If you do a search for FFA in Google, then click on "Timeline" under "more search tools" you get a visual representation of the

events that have happened. You will see a significant spike in 1928. "Students look at this time line, what do you think happened in 1928 to get such a huge spike of news?" This could be a great way to get your students thinking when introducing FFA to them. Timeline will let you "drill down" from a decade, to the year, to the month to better refine the information you are looking for.

For more information on Google Search, see the links at the end of this article. Behind search, the second most known product that represents Google is Gmail. As stated before you can use your personal Gmail account or you can sign up for free for Google Apps for Education and use your own domain name. This is the preferable method. I was able to buy a domain name for $10 per year (lgffa.org) and this allows my chapter to have their own email address for our advisors, officers, and even all the members if we choose. Having email accounts for my students is wonderful. First, I don't feel weird corresponding with a student that has an email account that we have given them (example: Johnny@lgffa.org) instead of their personal email account. As we know our students don't always pick the most appropriate email address. Second, students are able to communicate effectively with me about class assignments, projects, FFA events, etc.

Being an agriculture teacher we have to be away from the classroom to take students to different events. During this time I am able to keep in contact with my students during class even when I am not there. Students are able to ask questions about assignments as needed. This is one example of how effective email has been for my class.

Along with Google Apps Mail, there is the opportunity to turn on Chat. This has been a boon for my students. During class students can communicate throughout the room without leaving their seats to ask questions of one another and teach each other quickly and efficiently in a manner they are used to. Granted chat can be a great tool and also a huge distraction, but with some simple classroom management this can easily be controlled. This year I had a student with three chat windows open and I went over to investigate, thinking the student might be using chat for the wrong purpose. To my delight the student was helping three other students at the same time with the current assignment through the chat windows.



For more information on Google Apps Email, see the links at the end of this article. Another great tool that I have found students as well as teachers do not use to its full advantage is Google Calendar. This is by far my favorite application of the Google Tools. Most people think of a calendar application as just a simple way to keep events in order, but Google Calendar offers so much more and has so many ways to take advantage of this seemingly mild mannered application. Google's Calendar application allows you to have multiple calendars visible in one location as well as being able to share calendars with others, embed calendars in websites, send out reminders by email, and the ability to invite guests to an event. These are just the basics of Google calendar. Teachers and administrators are always coming up with new ways to use Google Calendar in their schools and classrooms.

There are many ways to take Google Calendar to the next level. Use it to make a class pacing guide with due dates for assignments, attach the assignment to the event and then share it with students directly and on your class website. Set up reminders to come straight to your phone through SMS messages. Even have Google Calendar send reminders of events to your community on your FFA Twitter, FFA Facebook page, FFA Website and to a list of email subscribers (Google Calendar by default will not Tweet or send information to Facebook, but with a couple of

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Inquiry Based Instruction in Agricultural Education Programs: How it Can be Done!

by Michael Clark, John C. Ewing and Daniel D. Foster

Introduction

Inquiry based instruction has been promoted as a best practice for educating students in, and about, scientific principles (National Research Council, 2000). Agricultural education concepts are steeped in the sciences of biology, chemistry, physics, earth science, and the related areas of engineering and mathematics. In agricultural education we have promoted the problem based approach to learning as a model for educating our students in the agricultural sciences (Crunkilton & Krebs, 1982; Crunkilton, 1984). Parr and Edwards (2004) indicated that the two models of inquiry based instruction and problem based learning are not too different. Blanchard, Southerland, and Granger (2008) provided a table related to the continuum of inquiry based instruction from that of learner centered to teacher centered. The authors indicated that inquiry occurs at each of these levels; however, the more learner centered options require the student(s) to develop their own questions and methods for answering these questions rather than the teacher providing a structured sequence of steps to reach a conclusion. However, there are some slight variations worthy of noting.

Similarities of the problem based learning approach and inquiry based instruction include that both models strive to have students find answers to problems through hands-on exploration of the problem. Problem based learning has at its core, a notion that there are problems that need to be explored and answers to these questions need to be "found" and explained by the student. Inquiry based instruction also has this as a goal (Parr & Edwards, 2004). One difference in the two approaches, however, is that the problem, and oftentimes the steps for finding the answer to the problem, is provided by the teacher in a problem based learning model. In an inquiry based instruction model the problem is something that arises from questions that the student(s) ask. In fact, inquiry-based instruction encourages more critical thinking on part of the students by challenging them to form the question and identify the evidence to solve the question. Myers, Thoron, and Thompson (2009) found that a group of agriculture teachers that were trained in inquiry based instruction believed: "that students are more motivated to learn, better prepared in science, provided more opportunities to solve problems, and have a deeper understanding of agriculture when science is enhanced in the agriculture curriculum" (p. 1).

> Inquiry based instruction allows for students to become active participants in their learning beyond the traditional models.

Resources Required

In many ways inquiry based instruction is not a far cry from what we have done in the past in agricultural education. However, it does have important nuances that make it an effective learning model for our students. Certain elements (teacher, student, resource materials) are still required for successful learning when a teacher wants to utilize an inquiry model to teaching. However, the way in which each acts/interacts with the resources is different from traditional models of teacher led instruction. Inquiry based instruction requires that the teacher act in support of the students' exploration (Blanchard, Southerland, and Granger, 2008). To make the inquiry based instruction the most student centered, and successful, students must be encouraged to be active in the development, experimentation, and assessment of questions that are of interest to the student in a particular content area. So, does the teacher need to abandon their content? Certainly not! The inquiry based instruction model allows the teacher to guide students through the content, while allowing the students to become a more active "partner" in their own learning.

Depending upon the students' questions, there may be a need for different resources than what the teacher typically utilizes. However, this situation should be used as a learning experience for the students. If the resources are accessible (financially and in a timely manner), the student should be charged with obtaining

these materials with the teacher's help. This experience will require students to think through the process of material use, and communication skills on many levels to actually obtain these materials. When resources are not able to be obtained this will require students to re-think their original plan; again, a great learning opportunity in the "real world" of going back to the drawing board when devising a plan for experimentation and/or implementation.

Implications of Inquiry Based Instruction for Agricultural Education

In a time when our students are being inundated with requirements for high levels of academic achievement, could there be a more engaging content area than agriculture to teach the scientific and math concepts that will make them employable in the future? As agricultural educators we need to realize that inquiry based instruction can be incorporated into our current programs. Will it take a conceptual shift in our thoughts regarding our role as teachers? Yes. Is it worth the effort? Yes. Why is it worth the effort? Students that develop their own questions and problems are inherently more engaged in the content, because they have helped to develop the process of learning. The students' abilities to transfer information to future situations is enhanced due to the fact that the inquiry based learning situations closely align with the situations that will be seen in future careers (Duffy & Raymer, 2010).

How can I Implement Inquiry Based Instruction into my Program?

Inquiry based instruction can be implemented by taking a look at the current content areas taught in the agricultural education program and then incorporating a learner centered approach to the instruction. The instructor must be willing to give up "power" in determining the direction of that lesson. However, the teacher must continually make certain that the overall learning objectives are being met within the inquiry based instruction classroom or laboratory setting. The National Science Teachers' Association encourages teachers to have students investigate the world around, ask questions, answer the questions using appropriate methods, and then communicate conclusions that they have reached (National Science Teachers' Association, 2004). Below are a few examples of how these "steps" can be implemented into an agriscience classroom and laboratory setting.

Implementing Inquiry based instruction into the classroom is no different than implementing other instructional types. As an instructor one must first evaluate the content areas being taught in order to make the desired adjustments in educational practices within the classroom. Once the instructor has relinquished ownership to the student, inquiry based instruction begins to take shape. Practicing inquiry based instruction in my own classroom has enabled the students to regain ownership and once again develop the desire to question, explore, answer and communicate their process to not only me as an instructor, but their peers. For example, I may introduce a particular topic regarding knowledge or skill to my students and require them to formulate conclusive information through investigation of the relevance and applicability. The students are then challenged to develop their own procedure for such investigation utilizing only the available supplies. I am always amazed at how students can acquire similar results through different avenues and acquire different results through similar avenues. This particular inquiry technique has eliminated a multitude of questions prior to and during the laboratories. Students have developed a unique academic peer relationship that encourages them to dialog among their group and with other groups when faced with unforeseen variables, questions or concerns. My students' classroom has become more learner-centered. I have always garnered educational gratification through student success during those "light bulb" moments. Through inquiry based instruction those light bulb moments have progressed from blinking to illuminating, simply by prodding and probing, rather than lecturing and evaluating.

AXED 485 student Lindsay Thomen teaches Mayfield High School students how to build a self-watering indoor garden from a plastic water bottle. *Read the complete article on page 25.*

Summary

A great opportunity for agricultural education to promote itself as a quality provider of scientific knowledge and skills to our students through the content area of agriculture is here! Examples of opportunities for professional development for agricultural education teachers to incorporate inquiry based instruction into their programs are provided through the National Agriscience Ambassadors' program, the National Science Teachers' Association, and the CASE project. All three of these projects/programs promote education of our students through a hands-on/minds-on approach for our students. Inquiry based instruction allows for our students to become active participants in their learning, beyond the traditional models that allowed the students to complete the tasks set before them utilizing a pre-determined set of questions/answers. More information can be found on each of these projects/programs at the following websites:

- Curriculum for Agricultural Science Education - http://www.case4learning.org/
- National Agriscience Ambassadors - http://www.naae.org/prodev/nataa.html or
- https://www.ffa.org/programs/outreach/AgriscienceAmbassadors/Pages/default.aspx
- National Science Teachers' Association - http://www.nsta.org/

References

Blanchard, M. R., Southerland, S. A., & Granger, E. M. (2008). No silver bullet for inquiry: Making sense of teacher change following an inquiry-based research experience for teachers. *Science Education, 93*(2), 322 - 360. DOI 10.1002/sce.20298

Crunkilton, J. R. (1984). Problem solving—The art and science of teaching. *The Journal of the American Association of Teacher Educators in Agriculture, 25*(2), 2, 11-17.

Crunkilton, J. R., & Krebs, A. H. (1982). *Teaching agriculture through problem solving* (3rd ed.). Danville, IL: The Interstate Printers and Publishers, Inc.

Duffy, T. M. & Raymer, P. (2010). *Achieving adaptability through inquiry based learning*. Research report available at http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA523892&Location=U2&doc=GetTRDoc.pdf

Myers, B. E., Thoron, A. C., & Thompson, G. W. (2009). Perceptions of the national agriscience teacher ambassador academy toward integrating science into school-based agricultural education curriculum. *The Journal of Agricultural Education, 50*(4), 120 – 133.

National Research Council (2000). *Inquiry and the national science education standards: A guide for teaching and learning.* Committee on Development of an Addendum to the National Science Education Standards on Scientific Inquiry - Center for Science, Mathematics, and Engineering Education. National Academy Press. Washington, D.C. Available at http://www.nap.edu/openbook.php?record_id=9596

National Science Teachers' Association. (2004). *NSTA position statement - Scientific inquiry*. Available at http://www.nsta.org/about/positions/inquiry.aspx

Parr, B. & Edwards M. C. (2004). Inquiry-based instruction in secondary agricultural education: Problem-solving – an old friend revisited. *The Journal of Agricultural Education, 45*(4), 106 – 117.

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A Future-Proofing Plan for Agricultural Education

by Ann Marie De Lay

Our world is changing faster than we can. Those in disagreement with this statement should buy a computer or cell phone. Within mere months of purchase, companies market the new model to the public and very soon after the device in our hands is rendered obsolete. Teachers in classrooms today are charged with the task of preparing today's students for tomorrow's careers… and many of them have yet to be developed. If this is true, what is today's educational system to do about adequately addressing this very real need? Can we possibly future-proof agricultural education?

Teacher leaders must emerge from the ranks to reflect on those practices which have worked in the past and consider the student needs that have yet to be capitalized. They must also develop these innovations in a climate of standards and assessment reform. It is in this space, our 21st Century curriculum and instructional practices will arise.

Another Dimension to Agricultural Education?

Agricultural education has long been a team player in helping to meet school-wide learning goals. When the administration tried to bolster students' reading and writing skills, agriculture programs did their part by including more reading and writing assignments in the curriculum. The discipline has yet another opportunity to demonstrate its ideal position for expanding opportunities for students to strengthen their skills and knowledge related to science, technology, engineering and mathematics (STEM). Threads of those subject areas are naturally woven throughout agricultural education, providing a context for students to discover the interrelationship among concepts. Students also have the chance to transfer knowledge and skills gained from all corners of campus, by practicing and applying new skills within the agriculture environment through engagement in authentic, relevant learning experiences.

The 21st Century world craves leaders who can fill careers requiring they be masters of critical thinking, collaboration, individual performance, and the desire to continue to learn when there may be gaps in preparation (Hassel & Lourey, 2005). SAE is a perfect environment for students to exercise both independent and collaborative innovation, as they work to solve real-world problems involving STEM concepts. For example, Joshua Fridlund, a recent graduate from Kingsburg High School in California, has a placement SAE working in an area agricultural laboratory. Fridlund discovered so much of his academic content knowledge was applicable to the work he was doing in the lab and so much of his work deepened his understandings of science, math and technology. Consequently, as a new freshman at California Polytechnic State University, San Luis Obispo, Fridlund feels confident and able to perform at the high level expected in the university environment.

There are many resources available for agriculture teachers to infuse more STEM into their programs. The National FFA Organization has recently publicized the availability of one of the latest, the Curriculum for Agricultural Science Education (CASE). CASE is a STEM-based curriculum helping teachers to present topics to students in an inquiry-based format. Course packages are available in Introduction to Agriculture, Food and Natural Resources, and Principals of Agricultural Science – Animal and Plant versions. There are also a number of summer institutes offered across the country, designed to help teachers experience the CASE model just as their students would. To learn more, check out their website (http://www.case4learning.org/)!

Technological Enhancements

Students in classrooms today are digital natives. They grew up with technology and are comfortable learning and thinking in a 21st Century environment. However many teachers leading them are apprehensive about incorporating these new tools into their teaching. Yet, because of students' natural inclination for going to the Web before going to the library, teachers seeking to use student-centered instructional practices must work hard to infuse technology into the teaching and learning environment. The following are three simple ways to inject technology into the classroom and the hands of students.

Wikispaces (http://www.wikispaces.com/) - A free digital tool, Wikispaces allows teachers to create an online location for posting lesson plans, projects, and all related support materials including documents and media (images, audio and video). Wikispaces allows teachers to invoke privacy controls and create bulk student accounts without the use of student email addresses. To protect work, all revisions are saved so nothing is lost. Austin Large, an agriscience teacher at Minarets High School in O'Neals, California uses a Wikispace to organize the courses he offers. As students arrive to his

classroom, they boot up their laptops or smart phones and access the course Wikispace. There, he has the basic expectations for the day. If a laboratory activity is on the day's agenda, lab sheets are posted, along with images to guide student efforts. Should students fail to complete their work due to a slower pace or absence, they may access the Wikispace from home to catch up as needed. As an agriculture teacher, Large must miss a number of school days due to other activities. By maintaining a Wikispace, the substitute is able to quickly and easily get the students to work and keep them on track in the teacher's absence.

Evernote (http://www.evernote.com/) - It is difficult to motivate students to take notes using paper and pencil yet many do not need much encouragement when it comes to using a laptop, digital pad or a smart phone device. Evernote is a digital tool used to capture and store notes and other information pertinent to a teacher or student's class work. By creating a free account, or making use of educational discounts for the premium version, students can type in text notes from the lecture or add images, audio files, or PDFs to their online notebooks. This way, all information related to the course is stored on their computer, the Web and their smart phone. There is a "share" feature permitting teachers and students to make their notebooks readable by others and they may even collaborate on projects. Large's students use Evernote as part of their regular class routine. He appreciates the tool for providing students with an online backup of class work done on the computer and for archiving their materials by creating a searchable database should they need that information for another project or for study purposes.

The Partnership for 21st Century Skills (2009) identified the need to prepare students to be effective consumers and contributors in a media soaked world. As much as schools try to block their use, social media can have powerful applications in the classroom. Creative teachers across the country have successfully used tools like facebook, Twitter, and ning to teach students skills valuable to being responsible members of the digital community. Chapter officers at Atwater High School in California have created a rich program outreach through their agriculture department website (http://www.atwaterffa.org/). Jason Larison, agriculture teacher at Holton High School in Kansas, created a "Techie e-Moment" where students use their smart phones to research consumer preferences related to issues in his food science unit. Danny Silva, agriculture teacher at LeGrand High School in California, uses Twitter regularly to engage in professional development conversations with teachers and techies around the world. He implements new discoveries into his teaching where applicable and shares successes with colleagues to help make their work easier. As more is learned about the value of social media, agriculture teachers will continue to demonstrate how they are helping their students to stay 21st Century ready.

Everything Old is New Again!

Student apathy is an issue teachers battle daily. The lack of motivation is often displayed as passive student participation, a lack of learner accountability, and skewed perceptions among students as to their responsibility in the classroom. Teachers can diffuse student apathy by caring about students' general well-being, communicating high expectations, creating a safe, respectful classroom environment and displaying competence in their teaching, (Thompson, 2008). Amazingly enough, each of these issues can be accomplished through a well-crafted lesson plan, for which there is no substitute.

Virtually every teacher has grown tired of hearing the advantages of lesson planning, however, the fact so many try to "wing it" shows the need for a refresher. The classroom is a varied environment with the overarching goal of facilitating quality learning for all. However, with so many different people converging in one location "winging it" is not an option. A quality lesson plan is the first line of defense to ensure the needs of all learners are met, the state learning standards and objectives are accomplished and the classroom environment is effectively managed. Regardless of the template or style used, most successful lesson plan formats contain the following: (1) the state academic standard being addressed, (2) the learning outcome or objective expected from students, (3) key terminology students must be able to use and a plan for integrating it into their vocabulary, (4) an interest approach to motivate learners, (5) any content or skills to be addressed, (6) opportunities for content/skill application, (7) an assessment of the content/skills including regular checks for understanding and (8) a closure to review new information and bring the

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Creative Teaching Strategies for Your Toolbox

by Misty D. Lambert and Jonathan J. Velez

When it comes to creative teaching approaches, it seems that we are always looking for practical teaching activities to address the very real classroom issues that we face. Whether it is the student that talks too much, the students that don't talk at all, or simply figuring out ways to begin and end a lesson, as agricultural educators we are always looking for helpful hints. In this article we have sought to capture a few practical strategies to engage with students and increase student engagement.

1. What are some tips for getting a lesson started?

a. Chalk talk – This activity can occur at the chalk/whiteboard, but if you are like me, the board is covered in announcements and reminders. Use a large piece of roll paper and markers. Write a question. For example, "What do you want to know about beef cattle" or "What would you want to tell Congress if they asked why agriculture is important" or "So what?" Then, without talking, students can write answers or questions. They can also connect to someone else's comment simply by drawing a connecting line. The teacher can stand back and watch or write and respond as well. Long silences can be expected as students respond when they feel moved.(Adapted for the NSRF by Marilyn Wentworth; originally developed by Hilton Smith)

b. Popcorn - Popcorn is a quick and engaging way to start a lesson. Provide each student a sticky note as they enter the classroom. Once the class is ready to begin, ask the students to provide their thoughts on an issue, term, or concept related to the lesson. Have the students record their thoughts on their sticky note and when they are done recording, have them come up and place the sticky note on the board. Let the students know that, like popcorn, some of them will quickly pop with an idea and others may take more time. Once all the students have popped, you can then review student answers/comments or have a few volunteers physically categorize the responses on the board. This is an excellent way to solicit input and determine the classes thoughts on a given issue, term or concept.

c. Cranium – Modeled after the board game Cranium, students are asked to model, act, draw, or sing/hum/nursery rhyme. For example, if the class is getting ready to start a unit on leadership, ask the students to model/act/draw or sing what leadership is to them. If you are afraid they will all choose the same medium, assign them. Keep a stack of cards (Draw it! Act it out! Model it! Sing it!) to make assigning random and easy. Modeling can be done with clay, Play-Doh or even pipe cleaners-Be creative! Cranium is also good for reviewing.

2. How can I get them to talk?

a. Think-Pair-Share - This cooperative learning strategy is a simple three-step process to encourage students to talk. First, ask the students to think about the question posed. Then, after allowing some think time, ask the students to pair up and share their thoughts with a partner. As a final step, students can share their responses with larger groups of students or the entire class.

b. Think – Pair – Square - A modification of Think-Pair-Share is the Think-Pair-Square. After the student thinks individually and converses with a partner, you can pair them up with another pair. This conversation between four students allows them to expand ideas or compare answers before sharing with the whole class, creating more conversation.

c. Challenge my thinking - After sharing a challenging idea, issue or concept, give the students one minute to think of both pros and cons for the issue. Then pair them up in groups of two and ask one member to share either a pro or a con. The listening member of the group is quiet while the other student shares. After the first student is done sharing, the listening member is then required to respond using the opposite perspective. This is an excellent way to encourage sharing, debate, and critical thinking regarding agricultural topics.

d. In-Out - Have the students take out a piece of paper and respond to a lesson related topic or question. Ask them to formulate a response and generate at least one question which they feel needs to be addressed. Ask the students to leave their names off the papers. Once all students have formulated a response, collect the papers, randomize them, and pass them back out. Have the students verbally share the thoughts and questions of some of their peers.

This removes the embarrassment of asking a personal question as the students can now ask a question on behalf of their anonymous peers.

3. What are some strategies for reviewing the lesson?

a. Word Web - This is an excellent cooperative learning activity which is fun and engaging for the students. Provide the students with a large piece of poster paper. Ask them to identify the core concept, frame it within a rectangle, and place it in the center of the paper. Then have them identify main concepts and place them around the core concept. The main concepts should be bordered in ovals. Then allow the students a free-for-all to add minor concepts which support the main concepts. At the end, the students are left with a hierarchical graphic depiction of the key words or concepts associated with the lesson.

b. Incorporating food - There are a 1,000 ways to use food in the classroom. Here are just a few examples:

- Use sugar cookies and colored icing to make a color wheel when teaching floral design. Given only primary colors, students have to mix icing colors to create the secondary and tertiary colors.
- Have students use licorice and Mike-and-Ike candies to model mitosis or meiosis.
- When talking biotechnology and enzymes, have students make bread.
- During fruit sale time, have students use a marker on an orange to indicate the percentage of the world that is useful for food production. Then, let them peel and eat.
- Use licorice to model/build different animal handling facilities
- Use Oreos, pudding, worms, and brownies to create soil profiles

c. Muddy Point - Sometimes at the end of a lesson the students are shy about asking questions. More often than not, students are not interested in asking questions as they would rather leave early or start talking with their peers. When you think about it, asking for questions at the end of the lesson may not accurately reflect the true questions that students have. Here is one idea to help gather student questions and encourage participation.

Give each student a 3 x 5 card. At the end of the lesson ask them to write down their muddiest point. This could be an area of the content that was confusing or simply a question. Collect the responses and then address them as your lesson conclusion. One variation is to use the response cards as introductory material for the next lesson, or use the cards as "exit slips."

4. What about the student who answers everything?

a. "The Talking Cow" – One of our student teachers this term had a talkative group of middle school students and, in response, he instituted "the talking cow." This was a squishy cow which, when held, allowed the students the chance to speak. If a student did not have "the talking cow" they could not talk. The cow has a "home" at the front of the class and when the cow is at home, students can all talk – like during desk work or group time.

b. Red/Green cards – To make polling the students or reviewing easier and to create whole group involvement, give each student a red card and a green card which can be used to silently answer true/false or A/B questions. It can also be used in voting. The red side means no or false while the green side means yes or true.

c. "Park it" - If you have a chatty bunch of students, you can create a place for them to "park" those questions or comments that can derail your lesson. Give them each a post-it note or note card and when they think of something they want to share or need to clarify, have them write it down. You can use breaks in the lesson or review time at the end to handle these questions without sidetracking the group.

d. Ball of Knowledge - Sometimes it is important to encourage all students to talk and spread the wealth a bit. One strategy is to purchase a small, soft ball such as a Koosh ball or a hacky sack and use the ball to encourage questions or comments. I like to call it the "ball of knowledge" and often initially model the process. Toss the ball to a student and they can add information to the lesson, share an idea, or ask a question. Once they have shared, they need to pass the ball of knowledge (underhand is a good suggestion) to another classmate. That classmate then adds their own input or answers the first student's question. You can continue this for as long as the student input is relevant or until the bell rings. This is a great flexible activity which gets everyone talking and interacting. Students pay close atten-

tion as the ball may be passed to them next.

This article is intended to provide a few helpful hints clustered around some typical classroom challenges. We encourage you to risk boldly and try one of these engagement strategies. Your students will appreciate your effort and have fun; and in the meantime, you might find yourself thinking of some more creative adaptations to these activities. If you find some of these strategies successful, incorporate them and share them with other agriculture instructors. Together we will work to make our classes fun, filled with passion for agriculture, and intellectually engaging for the bright minds sitting in front of us.

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Do You Google?...(Continued from page 13)

simple tweaks this is easily possible). For more information on Google Calendar and how-to's, see the links at the end of this article.

Google Docs are three web based applications that come with Google Apps. They are Documents, Spreadsheets, and Presentations. These tools come close to being full-fledged desktop applications but have some significant advantages. With Google Docs you have the ability to have multiple people working on the same document at the same time. This allows students and/or teachers to collaborate on a document, spreadsheet, or presentation without having to break it up into multiple files. All of the files also have the ability to become web pages that can be shared to edit or view with a single individual, a whole group or publicly with the world.

Spreadsheets in Google Apps also have a great added feature: the ability to collect information through a form. The forms are very easily created, like most other Google Docs, and can be sent to individuals to fill out through emails, embedding them on a website, or using their own URL to become a simple website themselves. Use a form to collect data from FFA members, find out what food parents are bringing to the potluck or even use a form to create an application for an FFA award. With some simple formulas applied to the spreadsheet of the form you can even use a form to create a self grading online test. For more information on Google Docs, see the links at the end of this article.

The last tool I am going to talk about is Google Sites. Sites allows you to easily create an FFA website, a class website, or turn your students to Sites to build an online presentation, lab right up, or presentation board that they can share with you, other students, their parents and even the world. Sites have the ability with a few clicks to add one of your Documents, Spreadsheets, Presentations, or Calendars on to your website. A novice user will have no problem building a website and experienced users will be amazed at what you can do with a Google Site.

With the ability to use pre-made templates, users can also have a site ready to go in a few clicks and just need to add their own content. My students are always amazed when I tell them tomorrow we are going to build our own websites instead of making a PowerPoint or poster for a project. Kids love the idea that they are making something that could possibly be viewed by anyone. This is great for the idea of an authentic audience. When students know that what they are creating has a large potential audience they are more likely to put in a great amount of effort. At our school we are using Google Sites to build ePortfolios with our students. They start their portfolios as a freshman and continue working on them until they are seniors when they use them as part of their exit interviews. For more information on Google Sites, see the links at the end of this article.

Links

http://edutraining.googleapps.com/

http://sites.google.com/site/gtaresources/Home

http://eduguide.googleapps.com

http://iteachag.com

Want to Build a Triple Crown Program? Let Your Students Have the Reins

by Nicholas R. Brown

As a new agricultural education instructor at my own Alma mater, my goal was to build a Triple Crown program. I wanted to create a balanced agricultural education department that excelled in classroom and laboratory instruction, incorporated innovative Supervised Agricultural Experiences (SAE) and featured a premier FFA chapter. My goals were clear, I was full of energy and ambition, but, at the same time, I often found myself overwhelmed with the challenge of fitting in with other teachers at my high school. How was I going to accomplish my goals and still practice those traditional instructional techniques that were the norm with my colleagues? How was I going to lecture five hours a day, prepare quizzes, give students homework and model the teaching techniques I knew my high school English teacher was using in the building next door?

Every day when I went to my classroom, I carried with me a knot in the pit of my stomach. I faced the challenge of knowing what I wanted to do, but fearing that it was wrong. For a whole semester, I used behaviorism, a teacher focused learning theory, which is based on delivering tangible, scientific facts to students, when I taught. I was well-equipped with classroom technology skills, lecture skills, and sound pedagogy. But as a behavioral teacher, I suffered, and I felt my students did not learn all I wanted them to learn. On those days that I employed constructivism (Doolittle & Camp, 1999), a student-centered teaching and learning theory, that allowed my students to work individually, complete team projects, plan FFA activities, and develop their SAEs, I felt guilt because I knew that other teachers would think that I had not performed my duties for the day.

Yet in spite of my guilt, my gut told me that my students were not enrolled in agriculture education classes because they wanted to listen to great lectures and take detailed notes to prepare for an occasional quiz or exam. Rather, I was convinced that my students were enrolled in agricultural education to escape the behavioral teaching techniques they experienced in their core academic subjects. My students were looking for classes that allowed them the freedom to create their own learning environments and experience personal growth. In 1999, Doolittle and Camp argued that career and technical education instructional goals must change: we not only needed to teach our students basic job skills, but we also were responsible for teaching our students to be higher-order thinkers who could solve problems and collaborate with other professionals. I recognized this need, and worked to design the Triple Crown Approach, a teaching system that systematically incorporated behavioral teaching methods, constructivist techniques, and an assessment component that provided for academic accountability.

A Brief Hindsight

During my ten years of agricultural education experience, I have observed that teachers struggle with identifying the student outcomes of agricultural education. Are we developing students who will complete our programs and directly enter the agricultural industry, or are we developing students who will seek higher education and develop careers that may or may not be involved with agriculture?

In 2009, Roberts and Ball argued that agricultural education actually produces two student products. With the first product, agricultural educators train students to go into the world and act as free thinkers. These student products of agricultural education develop careers that may move into and out of the agricultural industry. They take with them a valuable basic understanding of agriculture that will serve them for a lifetime, and they make valuable contributions to innumerable facets of the national and global economy. With the second product, our programs produce the people necessary to create a vibrant agricultural industry in the United States of America. They are solid contributors to our nation's gross domestic product (Roberts & Ball, 2009).

Preparing for the Triple Crown

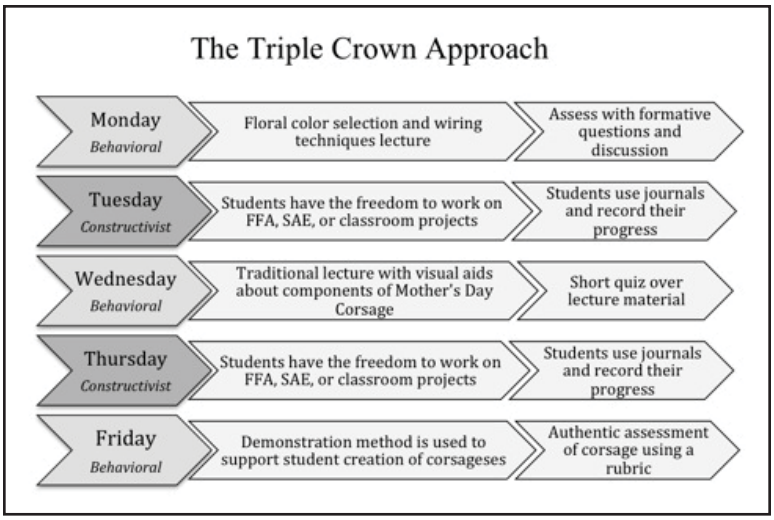
Unfortunately, in 2002, I did not have the vantage point of Roberts and Ball. So, on those days that my students were not engaged in traditional assignments, such as taking quizzes or completing homework, I had no way in which to assess their learning and record grades for them. Without an assessment tool, there was no way to justify the time invested in these exercises. However, I knew from my own experiences as a high school agricultural education student, and my observations as a teacher, that there was great value in constructivist learning environments. As a classroom observer, I could see the students were applying the principles they had learned during the behavioral teaching sessions. I was pleased to

see that they were applying that learning to real world problems and starting to develop higher order thinking skills. My students were learning to think critically, think creatively, and assign educated judgments. This was what I had been working toward; if I could find a method to hold everyone accountable, we were on the way to the Triple Crown.

The Road to a Triple Crown

After one semester devoted primarily to behavioral teaching methods, I developed a systematic teaching technique that organized the school week so that students experienced both behavioral and constructivist teaching and learning methods. Instruction included traditional lectures, hands-on activities, practical applications, laboratory work, Supervised Agricultural Experiences, motivational games, and FFA components such as Career Development Event practices and project planning meetings. Classroom instruction changed daily throughout the week, shifting from more traditional methods (behavioral) to individualized study (constructivist) on alternate days. Mondays, Wednesdays, and Fridays were filled with structured classroom activities such as lecture, PowerPoint presentations, textbook activities, and motivational games. Tuesdays and Thursdays were devoted to individualized study and journaling. Such diversity allowed students to take the reins and own their own education. They learned individually and in teams, honed their public-speaking skills, prepared for Career Development Events, and recorded their personal learning experiences. The graded individualized study journals served as a living record of students' progression through a broad range of agricultural curricula and career development-based learning experiences.

Capturing the Triple Crown



A thoroughbred can only win the Triple Crown by winning the Kentucky Derby, Preakness Stakes, and Belmont Stakes. Like horse racing's Triple Crown, a high quality agricultural education program focuses on three well-developed components: classroom and laboratory instruction, Supervised Agriculture Experiences, and FFA chapter development. The systematic teaching practice that I developed and utilized as a high school agricultural education teacher afforded me the opportunity to continuously improve all three components of my program. By incorporating these methodologies in the classroom, I could ensure that all of my students experienced all three components of agricultural education, regardless of their ability or willingness to participate in activities outside the classroom or after school.

By incorporating both behavioral and constructivist techniques in classroom and laboratory instruction, average student grades significantly improved. More than 50 students achieved the required state competency test score to earn a Career Passport from the Oklahoma Department of Career Tech. The academic freedom generated by embracing both the behavioral and constructivist theories provided the opportunity to more closely link classroom education to SAE and FFA competitive events.

My high school served an affluent suburban community with limited agricultural influences. Therefore, SAEs were primarily conducted at school facilities. Students used individualized study days to conduct research, develop small entrepreneurial enterprises utilizing program laboratories, or collaborate with other students with well-developed projects as an exploratory SAE. All students maintained accurate SAE records and were required to apply for at least one chapter level FFA proficiency award annually.

The growth experienced in the FFA Chapter further exemplifies the importance of all three components in a Triple Crown program. In order for one component to excel, all three components must be valued. Thanks to the Triple Crown approach, the FFA chapter achieved recognition at the local, state and national levels in chapter planning, career development events, national chapter award, and state and American FFA degree recipients.

Over a five-year period, students who participated in this Triple Crown program became well-rounded individuals who knew how to think critically and take control of their own learning experiences. While they might not necessarily plan to pursue a career linked to agriculture, they had learned many solid career skills. As

they moved out of the program and on to the next step in their educational journey, I found that I could quite confidently hand them the reins and expect them to win.

References

Carpintero, H. (2004). Watson's Behaviorism: A comparison of the two editions. *History of Psychology, 7*(2), 183-202. doi: 10.1037/1093-4510.7.2.183

Doolittle, P. E., & Camp, W. G. (1999). Constructivism: The career and technical education perspective. *Journal of Vocational and Technical Education, 16*(1).

Roberts, T. G. & Ball, A. L. (2009). Secondary agricultural science as content and context for teaching. *Journal of Agricultural Education, 50*(1), 81-91. doi: 10.5032/jae.2009.01081

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A Future-Proofing Plan ***(continued from page 18)***

lesson full-circle. While every lesson plan will have some variation, every class meeting should have a formal lesson plan.

In addition to lesson planning, relevance is one of the greatest weapons a teacher has in the fight against student apathy. Because students view their school's curriculum as boring and having no application to their lives, students tune out and fail to complete quality work. Relevance creates the felt-need necessary to sell the curriculum to the students, building their desire to learn. Many teachers can easily weave relevance throughout their lessons, but for others the LifeKnowledge curriculum can help. LifeKnowledge has divided the FFA mission into its pieces of premier leadership, personal growth and career success by attaching sixteen precepts the agriculture industry indicated were behaviors they desired in prospective employees. Within each precept are a number of signs of success indicating mastery. For example, teachers who integrate LifeKnowledge into their technical agriculture lessons also teach life lessons like decision making which can be displayed through problem solving and making ethical choices.

In order to consider LifeKnowledge integration during lesson plan development, open a free account on the FFA Learn page (http://ffa.learn.com). There, teachers can access a library of over 257 LifeKnowledge lessons and the all-important integration idea tool. Choose a subject area, the unit area and a specific topic or concept to view the suggested integration ideas. Perhaps the class is on general horticulture and the lesson is on plant parts. By using the integration tool, relevance can be addressed by making the parallel between students in an organization and the parts of a plant; each must be responsible and accountable in order for each to operate effectively. Although students may not see the importance of knowing the parts of a plant, they can certainly appreciate the fact that a well-functioning team generates successful outcomes while an ineffective team fails often.

The 21st century is an exciting time to be a teacher and a learner. More than use of the latest trends, students crave teachers who are willing to risk for their growth. Teachers demonstrating their commitment to student success both in the classroom and for the future will find their classrooms teeming with bright, talented, dedicated learners. By challenging ourselves to reach beyond what is currently done, to what we are capable of doing, we can prepare our students effectively today for the unknown of tomorrow's careers. It is possible to future-proof our profession!

References

Hassel, H., & Lourey, J. (2005). The dea(r)th of student responsibility. *College Teaching, 53*(1), 2-13.

International Education Advisory Board (2008). *Learning in the 21st century: Teaching today's students on their terms.* Retrieved March 10, 2011, from www.certiport.com/Portal/Common/.../IEAB_Whitepaper040808.pdf

Partnership for 21st Century Skills. (2009, December). *Framework for 21st century learning.* Retrieved March 10, 2011, from http://www.p21.org/route21/index.php?option=com_content&view=article&id=5&Itemid=2

Thompson, G. (2008). Beneath the apathy. *Educational Leadership, 65(*6), 50-54.

A Course to Develop Agriscience Teachers

by Thomas Dormody, Peter Skelton. Amy Pint, and Kim O'Byrne

As in other states, New Mexico's public education department places great emphasis on academic achievement, going so far as to tie students' academic achievement to school-level accreditation. The state's agricultural education teachers are expected to enhance academic performance in their students. With this in mind, we wanted to ensure that our agricultural education graduates from New Mexico State University were adept at teaching the science in agriculture when they take a teaching position.

Facilities and Resources

When a new agricultural science building (Skeen Hall) was constructed on New Mexico State University's campus, laboratory space became available next to the Department of Agricultural and Extension Education in Gerald Thomas Hall. We approached our dean and he agreed to remodel the laboratory space into an agriscience methods laboratory.

The definition of agriscience: "the application of scientific principles and new technologies to agriculture" (Cooper & Burton, 2002, p. 6), suggests to teachers what agriscience students should learn. The primary source of scientific principles to be covered in agriscience classes is the same for agriscience and science teachers: the state's science content standards and benchmarks. Technologies are chosen to teach these scientific principles, while solving problems tied to the state's agriculture, food, and natural resources (ANFR) content standards and benchmarks. With these rules in mind, we identified the units we needed to teach in the laboratory and the equipment and supplies we needed to purchase for these units using college and Carl D. Perkins funds. Attention then turned to designing and teaching an agriscience methods course.

"Agriscience Laboratory Applications"

We first taught AXED 485 "Agriscience Laboratory Applications," in 2003. The course was designed to cover the following methods-related content:

- Scientific principles and technologies applied to ANFR problems,
- How to crosswalk the state science and ANFR content standards and benchmarks covered in agriscience lessons,
- Types of agriscience student projects, such as experiments, demonstrations of scientific principles, descriptions of scientific phenomena, and classifications of observations,
- FFA opportunities for agriscience students and teachers such as the FFA Agriscience Fair and Agriscience Teacher of the Year,
- Whole-class and modular agriscience teaching methods,
- Sources of agriscience curriculum and instructional resources, and
- Agriscience laboratory safety.

The content above and units representing animal, plant, technical, and natural resource/environmental systems career pathways (Office of Vocational and Adult Education, USDE, 2002) were integrated into the following course outline:

- Course Overview: Basics of agriscience, conducting an experiment, other agriscience projects, agriscience award and recognition programs, and agriscience curriculum and instructional resources,
- Hydroponic, Aquaculture, Aquaponics, and Indoor Gardening Systems,
- Teaching with Wisconsin Fast Pl ants,
- Tissue Culturing of African Vio-

Memorial Middle School students and teachers enjoyed making compost and worm columns.

lets,

- Teaching with Bottle Biology,
- Soil, Water, and Plant Tissue Testing,
- Insect Collecting and Identification,
- Animal Anatomy and Physiology: Fetal Pig Dissection,
- DNA Extraction from Plant Material and Electrophoresis of Fish Proteins,
- Light and Electron Microscopy,
- Field Trip to Observe an Agriscience Class at Mayfield High School, Las Cruces,
- Teaching Agriscience Lessons to Mayfield High School Students in Our Lab,
- Memorial Middle School Agriscience Field Day (MMSAFD), and
- MMSAFD Debriefing, Laboratory Clean-Up, and Course Evaluation.

Since the course's inception, scientists with backgrounds in aquaculture; plant genetic engineering; tissue culturing; soil, water, and plant tissue testing; entomology; animal science; and microscopy have served as eager and exceptional resource people in many of the labs. Our concept of an "agriscience teaching laboratory" grew quickly to include utilizing some of their well-equipped laboratories too.

Laboratory safety practices were integrated into every laboratory where safety was a concern. Students learned how to facilitate student learning during whole-class agriscience activities such as "Bottle Biology" (Ingram, 2003) where teachers have enough resources for every student in the class to be working on the same or similar applications at the same time. They also learned how to facilitate learning in a modular agriscience laboratory where cooperative learning teams of students rotate between different work stations applying various technologies to agricultural and natural resource contexts. This year's students were evaluated on the basis of developing two lesson plans for their Mayfield High School and Memorial Middle School agriscience lessons, presenting these two lessons, completing five laboratory reports, and participating in the 10 laboratory units and two field trips listed in the course outline.

Mayfield High School Agriscience Lessons

An addition to the course this year was a field trip to the Mayfield High School (Las Cruces, NM) agriscience program to observe a modular lesson on veterinary medicine. Our college students were grouped with high school students to rotate between the following modules: single person and team animal CPR, critical wound care, animal restraint for care, taking pulse rates and body temperatures, species and breed identification (based on gestation periods, terminology of young, and other clues), and a veterinary medical terminology game.

Seventy Mayfield High students (including a number of inclusion students) then visited our agriscience lab to receive instruction from the AXED 485 students on soil texture analysis, constructing self-watering plant growth containers for conducing an experiment, and the properties of a polymer used in agriculture. The visiting students were also treated to a tour of the lab so our college students could share what they were learning in AXED 485.

Memorial Middle School Agriscience Field Day

Another addition to the class this year was traveling to Las Vegas, New Mexico to participate in an agriscience field day for seventh grade life sciences students at Memorial Middle School. The school houses the Memorial Middle School Agricultural Extension and Education Center (MMSAEEC), a New Mexico State University Cooperative Extension Service administered youth science center emphasizing participatory learning and experiential education (Skelton & Dormody, 2009). "A basic premise of the MMSAEEC mission is to develop a teaching and learning model of excellence for agriculture and natural resource sciences that complements in-class instruction by providing context to content through hands-on learning opportunities" (p. 26). The center meets public education needs and challenges by engaging 6th through 8th grade students in STEM learning. We decided to add another dimension to AXED 485 and the MMSAEEC model by coordinating an agriscience field day featuring our AXED 485 students teaching the MMS students at the center. The fact that 89% of Memorial Middle School's students are Hispanic, 66% are economically disadvantaged, and 27% have special needs gave our students experience in teaching a diverse audience.

Four learning modules were selected to teach at the fair: Soil testing for pH and texture, water testing for dissolved oxygen and nitrates, making compost and worm columns, and setting up a plant growth experiment manipulating different media and utilizing self-watering indoor gardens made out of two-liter soda bottles. Pairs of AXED students developed the lesson plan for their module following a standard lesson plan template presented in class. They practiced their module, assembled supplies and materials, and then got

to teach the module twice a period for five periods to groups of three to seven students, depending on class size.

The college student/middle school student and teacher interactions, and the hands-on and outdoor/greenhouse modules made the MMS agriscience fair a huge success. The impacts of the MMS agriscience fair as a learning experience were captured by Don Pace, who reported on the fair for the Las Vegas OPTIC. In the article, MMS science teacher Roberta Montaña stated, "Having these university students is wonderful for them and us. They get the opportunity to see what it's really like to teach." AXED 485 student Yvonne Diaz agreed, "I'm really excited about working in this kind of environment, I can't wait to become a teacher. I'm not only teaching, I am also definitely learning a lot. I don't come from a rural area, so I'm learning a lot from my classes, and especially from the kids." Seventh grade student Jose Maestas proclaimed, "I learned how to adjust soil pH, and different textures of the quality, and how that pertains to planting. I also learned how to plant self-watering gardens. This is my favorite class" (Pace, 2010, A2).

The day after the fair, we were able to tour the Wind River Ranch with ranch scientist Dr. Brian Miller. The tour took us to various ecological sites on the property to observe erosion control and riparian habitat improvement projects. Before we returned to Las Cruces, the class visited New Mexico State University's Mora Research Center to learn from its Director, Dr. John Harrington, about its conservation nursery program and research programs in Christmas trees, forest biology and ecology, and forestation.

Final Notes

Student evaluations have indicated that "Agriscience Laboratory Applications" increased their knowledge and was interesting. They liked the variety of labs and resource people, the hands-on activities, field trips, opportunities to teach, and the examples of how they could use what they had learned as teachers. Next year, we hope to add a second day to the Memorial Middle School Agriscience Field Day to get our students involved in a field trip with the seventh grade life sciences students to interact with government agency professionals at an ecological site. The college students will assist the students assigned to them in learning techniques for riparian habitat assessment, forest management, and wildlife monitoring. We're looking forward to teaching this course again.

References

Cooper, E.L. & Burton, L.D. (2002). *Agriscience: Fundamentals & Applications* (3rd Ed.). Albany, NY: Delmar.

Ingram, M. (2003). *Bottle biology* (2nd Ed.). Dubuque, IA: Kendall/Hunt Publishing Company.

Office of Vocational and Adult Education. United States Department of Education. (2002). *Career clusters-focusing education on the future: Preparing for career success in agriculture, food and natural resources.* Retrieved from http://www.careerclusters.org.

Pace, D. (2010. May 5-6). *NMSU students help local youths.* Las Vegas OPTIC, pp. A1-A2, A5.

Skelton, P., & Dormody, T. (2009). Adding context to content: The Memorial Middle School Agricultural Science Center model. *The Agricultural Education Magazine, 81*(5), 26-28.

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