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THE MECHANICS OF TEACHING

The Teacher as a Rain Dancer

By Jamie Cano

Teaching seemed to have to much magic, mystery. I always felt nervous, even afraid. If I got the steps right for the rain dance, rain came, but I never knew till I was wet whether I was close. I never seemed to have any sense of what a good rain dance looked like." (Elbow, 1998)

Growing up in the southwestern United States, where rain was a rare occurrence, I was always mystified by cultural lore surrounding rain dances. I recall as a youngster, doing some rain dances myself in hopes that a few drops of water would squelch the thirst of the deeply scorned soil. Sometimes I got sprinkled on, sometimes I got wet, and other times I got drenched. Although I did get "wet" several times, whether my rain dances were successful or not, I truly will never know, but psychologically, it was the "right thing to do."

Transferring the analogy of rain dances to teaching, I have also found the act of teaching to be filled with magic and mystery. Overall, I have spent nearly 20 years in a classroom, both high school and university, and I have gotten "wet" often enough to keep me mystified about the rain dances. Watching a class solve a problem and then drawing some meaning from that problem, or watching a student finally "get it," and that light bulb turn on, has been exciting, yet mystifying. It is these "wet" occurrences that keeps me drawn to continue to want to be in the classroom.

Even during those times that I have been drenched, I have found myself wondering what brought the rain. Why does one student make so much progress while another seems to flounder? How can one class come together as a tight-knit community of learners and the next classes never seem to be more than a group of individuals working within a shared space? There has always been a sense of uncertainty surrounding what I do, a feeling of impending doom: one wrong step, a slight miscalculation, and everything could come unraveled.

For much of my career I have focused on the nature of the rain dance. What is it that we as teachers do? How do we structure our lessons, choose our content, and maintain control of the classroom? What order do we give to the day? Which students do we put together in groups? Why? How do we keep everything together? Certainly, these are the "mechanics" of being a teacher! Have you ever asked yourself this question: What is it like to be a teacher?

After observing countless student teachers, novice teachers, and experienced teachers during my career, I am finally beginning to understand how futile it is to mimic the chants and movements of the rain dancer. Even if I could get the steps right, could I bring forth the rain? If I was to create lesson plans as taught in teacher education courses, would every lesson be perfect? If go through all the proper "mechanics" of teaching, will every lesson be perfect? No, for being a rain dancer is so much more than just knowing the dance. Being a teacher is a way of life, a way of orienting the self to the world. So my focus changes from the mechanics of teaching to the nature of "teacher." What does it mean to be a teacher?

One thing that I have learned without question is that to be a teacher is to find a way to live within an environment filled with dilemmas. These dilemmas create an inner tension that is compounded by our expectation that we should be able to "get the steps right" every time. The felt need to do the right thing, to not hinder the growth of the students, and the sometimes overwhelming number of variables create a web of complexity difficult to sort through. Out of any attempt to simplify, to create order out of the seeming chaos emerge only more questions.

What really drives us forward is still the persistent hope that somewhere "out there" is THE answer, THE formula, THE technology, THE research technique that will solve all our problems and meet all our needs. Until we are seriously and equally willing to look within, I am afraid that we will see little beyond what we have already seen. Teachers must "pay attention" to what is going on within themselves as they teach, and teacher education programs need to focus more on the inner worlds of teachers in order for teachers to be able to improve their teaching through a process of self-awareness and critical self-reflection.

Jamie Cano is an Associate Professor at The Ohio State University and is Editor of The Agricultural Education Magazine.

Theme: The Mechanics of Teaching

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E-mail: james.h.smith@ttu.edu.

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Editor

Dr. Jamie Cano, Associate Professor, Department of Human and Community Resource Development, The Ohio State University, 208 Agriculture Administration Building, 2120 Fyffe Road, Columbus, OH, 43210, Phone (614) 292-6321, FAX: (614) 292-7007.
E-mail: cano.1@osu.edu

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Effective Teaching: The Deliberate Act of Planning, Organizing, and Managing a Comprehensive Agriculture Program

By Anna Ball

I am a teacher at heart and there are moments in the classroom when I can hardly hold the joy…teaching is the finest work I know…But at other moments, the classroom is so lifeless, or painful, or confused…that my claim to be a teacher seems a transparent sham.

This statement, by Parker Palmer in, The *Courage to Teach* (1998, p. 1) iterates common feelings on any given day in the life of a teacher. While we as teachers have experienced and have been witness to such moments of glory and defeat in the classroom, Palmer's exclamations of teaching exclude one salient point. Good teaching, while sometimes an act of luck, happenstance, or spontaneous combustion, does not often occur by chance.

Relatedly, good Agriculture programs don't spring forth from the corridors of the career and technical education wings of our high schools by chance. Rather, effective Agriculture teachers, and good secondary Agriculture programs are cultivated through toils of teachers who are reflective practitioners, effective program managers, and careful planners.

The articles in this issue consider the planning, reflection, and organizational aspects of teaching *outside* of the classroom that culminate to effective teaching inside of the classroom, including but not limited to: organizing and managing the comprehensive Agri-science program, preparing for teaching at a conceptual level, preparing for the daily act of classroom teaching, and assessing, reflecting, and improving upon our successes.

Planning Theme 1: Organizing and Managing the Comprehensive Agri-Science Program

Effective teaching in Agri-Science involves much more than being a classroom teacher. As indicated by both the Retallick article and the Pillack and Roberts article in this issue, Agri-science instructors at the secondary level must manage programs, engage learners in the classroom, maintain community partnerships and organize volunteers, supervise entrepreneurial projects and internships, advise, mentor, and coach youth development teams, and engage in professional development to remain current on a rapidly-changing content and pedagogy.

> ...effective Agriculture teachers, and good secondary Agriculture programs are cultivated through toils of teachers who are reflective practitioners, effective program managers, and careful planners.

"Teaching and learning" in Agri-science, unlike any other subject at the secondary level is a model that engages learners in the classroom, in the community, and in society as a whole. Secondary Agri-science teachers, while they understand Agriculture and agricultural education well, are often under-prepared for the realities associated with the planning, organization, and management of the comprehensive Agri-science program.

Planning Theme 2: Preparation for Teaching at the Conceptual Level

Thinking about *what* and *how* we teach, and organizing teaching at a conceptual level is an important and often unnoticed aspect of Agri-science program planning. The articles written by Martens, Hess and Trexler, Myers, and McGregor and McGregor respectively challenge the reader to think about teaching at the conceptual level. More specifically, as Agri-science teachers are we, and how can we be more relevant?

As urban sprawl permeates the countryside, and as fewer individuals work in the production facets of the agricultural industry we must organize content that is conceptually relevant to a diverse group of students in a complex and ever-changing society. Relevance occurs when content is based less upon the production and more upon the consumption aspects of agriculture. Agriculture programs in urban and sub-

urban areas must demonstrate relevance to a diverse student body. Relevance occurs when teaching is meaningful and engages students in Constructivist ways. Finally, Agri-science programs that teach academic subjects, specifically reading, science, and math, in their classrooms are relevant to a larger school system. In era of accountability measures and academic achievement, many career and technical education programs will continue to exist according to their relevance.

Planning Theme 3: Preparing for Classroom Teaching

Preparing to teach on a daily basis can often be overwhelming, particularly for the novice teacher. Anecdotally, lesson preparation often falls to a very low priority list in the lives of busy Agri-science instructors. The articles by Wilson, Robinson and Burris, and Whittington outline the important considerations for success in classroom teaching that is directly linked to lesson preparation. Selecting content, developing learner objectives, writing a lesson plan, and organizing and managing materials and resources all emerge as the sequential structure that is lesson preparation. Central to all of these tasks, however is to begin with the end in mind. One dictionary definition of planning is, "to have a specific aim or purpose". Preparing to teach, or planning is really about asking, what do I want the students to know and be able to do, to what end are my means directed, and how do I get there from here?

Planning Theme 4: Assessing Student Learning and Reflecting on Teaching

The instructional processes of "assessment" and "reflection" could seem to be the culmination or evaluation of a teaching and learning experience rather than a facet of planning or preparation for teaching. Yet, the articles in this issue by Roberts and Harlin, and Hamson demonstrate how both assessment and reflection should be the driving force behind what we do and how we prepare as teachers.

One might ask, if assessment is the driving force behind what I teach, then am I teaching to the test? Yet, if the test is a valid representation of the ways in which we expect students to *perform* or of the products and materials that we expect students to *create* or *develop*, then shouldn't we teach to the test? As teachers assess student learning, they also assess their performance as teachers.

Teacher reflection is a vehicle for teachers to assess, learn about, and ultimately improve upon their teaching. In this manner, reflection occurs before, during, and after teaching, and is a continual process of teacher growth and development.

From organizing a program to teacher reflection, and all of the steps in between, success within the classroom is largely due to the preparation that occurs outside of it. Yogi Berra once said, "you've got to be very careful if you don't know where you're going because you might not get there." "Getting there", with your program and with your teaching depends upon having a clear picture of your path and preparing the roadmap for your journey.

Anna Ball is an Assistant Professor at the University of Illinois, Urbana - Champaign

July - August 2005 Issue

Theme: The Assessment of Teaching

This issue will look at the assessment of student learning such as formal and non-formal sources of assessment and feedback, assessment of teaching including student feedback, self assessment and peer observation, and the philosophy of teaching which reflects assessment of teaching and learning.

Theme Editor: Anissa Wilhelm
North Dakota State University
155 EML Hall
Fargo, ND 58105
Email: anissa_wilhelm@ndsu.edu
Phone: (701) 231-7439

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A Survival Memo for New Agricultural Teachers

By Michaael S. Retallick

INTERNAL MEMO

To: "The New Ag Teacher"

From: "Your Predecessor"

RE: Recommendations for Survival

Congratulations on your new position as the high school agricultural instructor. Since I have been in the position for several years and have learned a great deal through my experiences, I have decided to provide you with a few pieces of advice as you begin your teaching career. There are several things that have guided me as a high school teacher and other things that I have learned during my tenure as a teacher that I wish I would have known when I started. I know that it won't be easy but hopefully this memo will provide you with some additional insight and perspective. Again, congratulations and I wish you the best.

Comprehensive Program

A comprehensive agricultural program is made up of three components: the classroom and laboratory, supervised agricultural experiences (SAE), and the FFA. If you were to review your contract, you will see that you have been hired as the district's agricultural teacher. The teaching responsibility should be your primary focus. SAE supplements your classroom by providing planning, individual learning experiences allowing students to apply what they have learned in class. Similarly, the FFA is an extension of the classroom and SAE by providing leadership opportunities through, among other things, its career development events and recognition through its award system. I challenge you to maintain the balance and perspective as you strive to build a comprehensive program.

Student Engagement and Involvement

Student involvement and commitment is crucial. Students are enrolling in agricultural education courses because they are interested in agriculture and want to learn. Your challenge, as a teacher, is to actively engage all students and provide them with the opportunity to learn and realize success.

Agricultural education has a lot to offer and I challenge you to make opportunities available to students. Provide opportunities for students to make decisions and provide input. This type of involvement will empower students, give them a sense of ownership, and encourage them to develop to their fullest potential. It is also important to stress the service learning and civic responsibility. Community service activities fit well in the program and are excellent opportunities that could not only have positive lifelong impact on students but also a long-term impact on the community!

Partnerships

Partnerships and relationships are an important aspect of an agricultural education program. You don't have to feel like the "Lone Ranger" as the agricultural teacher in the school district and community. Many stakeholders in the community value the high school agricultural program and are committed to its success. These stakeholders include the students, parents, alumni, school administration, school board members, business leaders and others in the community. Many are willing to play a role within the program and are just waiting to be asked.

Partnerships are very beneficial as a new teacher. I remember being overwhelmed by all the responsibilities. Utilize the expertise within your community. Community people are excellent resources as guest speakers in class, employers for SAE projects and job shadowing opportunities, or coaches and judges for career development events. Taking advantage of their expertise and resources not only provides real-world context for your classroom, but also alleviates the stress of trying to accomplish everything on your own.

The teaching responsibility should be your primary focus. SAE supplements your classroom... (and) the FFA is an extension of the classroom and SAE by providing leadership opportunities.

Such involvement, no matter how small, provides the opportunity for the stakeholders to learn about the program, take ownership and develop pride in their local program.

Stakeholders are beneficial when support for educational opportunities, program enhancements, or a defense of the program is needed. Too often when the agriculture teacher approaches the administration and school boards to defend the program or request support, the teacher is looked upon as attempting to self-promote or protect his or her turf. The perception is different when students and community leaders speak on behalf of the program. For that reason alone, it is important to build partnerships within the community and continually communicate with those stakeholders.

Personal and Professional Growth

Teaching agriculture is a profession and, therefore, I challenge you to approach your career as a professional. As a professional, you will be looked upon as a leader and role model both within the classroom and the community. Your leadership, commitment, and communication will go a long way toward gaining credibility and acceptance as a new teacher.

Besides a being a classroom teacher, you must also be a manager. There are numerous responsibilities when you in charge of an agricultural education department and FFA chapter. Organizational skills and the ability to delegate responsibilities will ensure that you can adequately meet all of the obligations. As a manager, I also found it beneficial to maintain a journal or calendar. Documenting everything that I did including topics taught in class, time spend on activities before and after school, weekend commitments, and other pertinent information was a valuable resource when developing annual reports, planning for the upcoming year, and providing perspective on current issues with which I was faced.

Finally, I encourage you to actively participate in professional activities and organizations. I found these opportunities excellent for acquiring resource material for classes and updating curriculum. It is also probably the best means of moral support. I enjoyed hearing other agriculture teachers talk about their programs and the issues they were facing. Often as I was returning home from those activities, I would reflect and realize that I didn't have it so bad after all. I have come to realize that there are many other teachers in our profession that have much larger and more complex issues to deal with than I. Sometimes that is very refreshing!

Give Teaching a Chance

When I started, I really had no idea of the amount of time and energy it would take to coordinate and successfully run an agricultural education program. This task can be very daunting at times. It takes balance and communication; balance between work and family; balance between the three components of a comprehensive agricultural education program; and balance between the responsibilities of an agricultural teacher and other school and community responsibilities.

Most Ag Instructors are notorious for doing things well, being independent, and getting things accomplished. I found that administrators normally recognize these abilities and seek out the agriculture teacher asking him or her to "volunteer" for chaperoning, serve on committees, provide leadership for school activities like the Junior Class Prom, or fill-in as a coach for a vacant coaching spot. I caution you to keep perspective so that you do not get stretched too thin to the point where your program starts to suffer.

Finally, don't lose sight of why you chose to become an agricultural teacher. Perhaps, write it down and refer to it from time to time. This will enable you to keep perspective and, in the short term when you are questioning yourself, not lose sight of why you are an agricultural teacher. There will always be those days when you ask yourself why. But the good days will certainly out weigh the bad. When I think about the impact that that agricultural education program has had on the growth, development, and maturation of students in this program, I still get goosebumps thinking about all those students who I have seen blossom because of their experiences in agricultural education.

In closing, I hope this memo provides you with some additional insight as you prepare to walk into the classroom as the "new teacher" and face similar issues that all of us have faced as beginning teachers. I wish you the very best!!

Michael Retallick is Coordinator of Undergraduate Admissions and Advising, Iowa State University

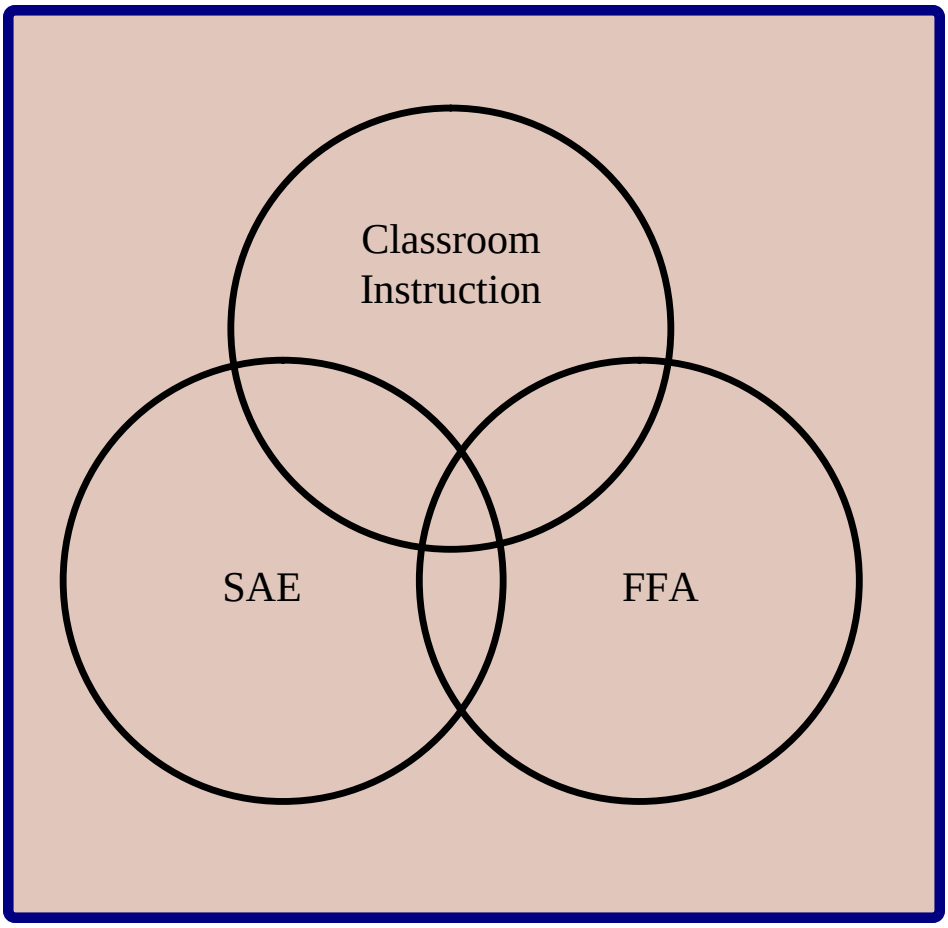
Three Circles: Circus Side Show or a Modern Agricultural Science Program?

By Reagan A. Pillack and T. Grady Roberts

Some say agriculture is fading from society. The number of farms decreases every year and urban encroachment continually challenges many farmers (USDA, 2002). Yet, the world's population continues to rise at an alarming rate. Who will feed all of these people? Where will they live? What will the global economy be like with so many people? Answers to these questions, and many more, can be traced back to agriculture. America needs farmers and ranchers to maintain a safe and secure food supply, forests to supply lumber for homes, and friendly relationships with other countries.

However, each new generation of Americans is further removed from their agrarian roots, which likely means the leaders that emerge from future generations do not understand the values of agriculture and its contribution to the American way of life. Beyond future leaders, many young people are also missing out on meaningful lessons that incorporate history and the future into one topic of discussion - agriculture. There is, however, a solution to this dilemma.

Agricultural science programs in middle and high schools teach students about the importance of agriculture through classroom instruction. It is through these courses that many students are first exposed to horticulture, agricultural mechanics, animal science, and other agricultural content. Beyond agricultural content, these classes also allow young people to learn math and science skills through rich, contextual applications. Technology is pushing our society into realms never before imagined so keeping up with the current trends is imperative. Thus, it is crucial that agricultural science teachers never stop learning about the topics they teach. Staying abreast of technology, math, and science can be as simple as conversing with those subject teachers in one's own high school. By incorporating these concepts into traditional agricultural science classes, students will be able to draw on many skills while solving practical applications. However, teaching middle and high school students the value of agriculture cannot stop in the classroom. The FFA and Supervised Agricultural Experience (SAE) projects play vital roles in enhancing the knowledge of students.



SAEs provide opportunities for young adults to gain career experience, to set goals, and to be recognized for their successes (Phipps & Osborne, 1988). Every student is different, and it is the agricultural science teacher's responsibility to engage each of them in something of interest. The hard part can be matching a student to the appropriate project. From research to entrepreneurship, there truly is something for every student. However, it takes a strong commitment from the teacher and the student as well as cre-

ativity to develop innovative projects together. One strategy for getting students involved is highlighting the incentives that may accompany projects, such as being paid, developing marketable skills, or traveling to the National FFA Convention to compete in the Agriscience Fair. Students appreciate knowing exactly what they will gain from participating in an activity. The more enticing a teacher makes the projects, the more students will want to be involved.

But there are only 24 hours in a day so developing and supervising projects for every student is one of the biggest challenges for teachers. Many agricultural science teachers have found the best solution to this problem is allowing class time for record keeping, research, and other activities appropriately performed at school. By devoting time in the classroom to helping students with their projects, teachers show a dedication to the importance of such activities. It is important to remember that students will only be as enthused and excited as the teacher appears. One of the most rewarding and easiest methods of showing enthusiasm for SAEs is to encourage students to complete proficiency award applications. Showcasing the talents and skills of young people speaks volumes to the pride, confidence, and respect the teacher has for his or her students' success.

The third component of a successful agricultural science program is the FFA (Phipps & Osborne, 1988). While not all students may be enrolled as members, the organization provides countless opportunities for those who partake in Career Development Events, hold an office, or just participate in fundraisers. Through the FFA, students develop a sense of pride for their school and the foundations laid out by our country's founding fathers. Many of the guiding principles date back to philosophies held by George Washington on record keeping, financial stability, and strong leadership.

Career Development Events (CDEs) are a chance for students to further develop those skills learned through classroom instruction and their SAE projects. Public speaking, sales, marketing, and judging are just a few of the areas of expertise that can be applied to contests. These events give students the opportunity to travel and participate in a competitive environment. The FFA also provides students with personal and professional leadership development. By serving as an officer at any level, the student receives firsthand knowledge of program planning, working in teams, and leading a group of people toward a common goal. Communication and time management skills are added bonuses to holding an office. The FFA provides a medium for displaying all of these accomplishments and projects through the various degrees, scholarships, and awards given to students each year. Once a person is recognized for achievements, he or she will be more motivated to participate again.

The future of agriculture does not have to fade into the sunset.

The future of agriculture does not have to fade into the sunset. With the perseverance of dedicated teachers, students will continue to learn the values and morals established through agricultural science classroom instruction, SAEs, and the FFA. Classroom instruction can be expanded into personalized projects, which are then showcased through the FFA. Each component offers life skills for participants and opportunities for much success. Through agricultural awareness, tomorrow's leaders will secure a bright future for our nation and economy.

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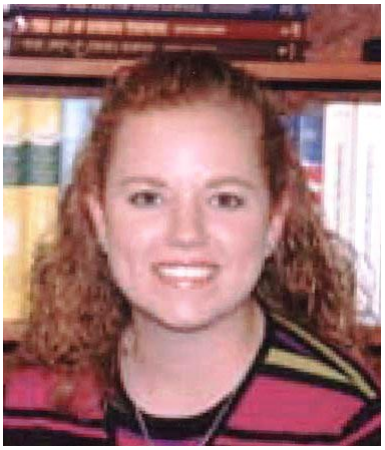

Reagan A. Pillack is a Graduate Student at Texas A&M University

T. Grady Roberts is an Assistant Professor at Texas A&M University

Great Opportunities in Urban Agriculture: Planning for Teaching in Non-Traditional Programs

By Kerry Martens

I attended a regional suburban agricultural education program in Connecticut during high school that changed my life. Prior to that enrollment, I had always liked to work with animals and thought that veterinary medicine would be my chosen career. My goals were limited to that single aspiration until I attended this program. I was not a traditional agriculture student and had no real agricultural experience to speak of at home. None of my extended family had an agrarian background and my experience was limited to the traditional, small family vegetable garden. I was a Boy Scout preparing for my Eagle rank and enjoyed the many things the outdoors offered me, so I decided to apply.

The high school agriculture program was highly selective and required several recommendations. Upon acceptance I was required to have an SAE project and decided to raise and show rabbits making it into a specialty animal production project. Although the project didn't qualify me to compete for any awards to a significant degree, the transferable skills I learned in building our portfolio-based SAE project and the discipline I acquired associated with the record keeping involved in tracking income, expenses, hours, and working within a budget provided me with experience I'll use throughout my career.

The Ag Ed department of my high school became my support area and I felt comfortable there surrounded by students who shared my interests and teachers who recognized my potential. By my senior year I had became FFA president. I led a committee which sent school supplies and agricultural materials to a school in Narok, Kenya and in my first year of college I was awarded the national H.O. Sargent Award for promoting diversity. Over my four years of high school I saw my understanding of an agrarian life broaden.

My Ag Ed classmates and I left this program well prepared to either pursue an ag related career or other career pursuits because we had acquired job skills through hands on learning. We even left high school with solid resumes based on our SAE portfolios. My own career goal had changed. I had seen how my agriculture teachers and the program affected my life and my fellow students and I decided to become an agriculture teacher.

My own experience and personal growth is a testament to the fact that large, suburban agricultural education programs offer great opportunities. Therefore, this past fall I asked to complete my student teaching at an urban agricultural program. I felt I had a lot to offer my students. What I did not realize in September was that working in an urban setting would be a very special challenge.

What I quickly learned was that many of the students were not necessarily interested in agriculture nor were they contemplating careers in agriculture. A significant number had applied to this school because it was safer than the other major traditional city high schools they had to choose from and felt no particular pride in attending the agricultural education program. My students came from a wide variety of inner city middle schools and in many cases were not prepared for the rigors of high school. This is reflected in their reading, writing and math skills. Walls needed to be scaled before these students could fully enjoy the benefits of agricultural education.

Urban students can have a very hard time relating to agriculture since it seems so foreign. Some of them live in very poor areas of the city where even a tiny vegetable garden is unheard of. Often indoor plants are a novelty; some students' homes may have a few window boxes filled with seasonal flowers. There is little grass to tend during the spring and summer months. I had students who did not know what a plant bulb was. Their images of an agrarian world are limited to books or TV.

The experiences of urban students can vary. I had students who had never left their city homes and, therefore, were simply amazed when taken to a park on the outskirts of the city to view the fall foliage. Since urban Ag teachers must seize every opportunity to further educate their students about the environment, this simple trip became an open classroom on how and why leaves change color in the fall. These how and why questions are the heart of agricultural science education. The actual onsite field trip based classes are critical in an urban setting since many of the critical concepts in an agricultural class are new to these students.

One of the teachers I worked with noted that a common question asked by her students was " is there science involved in agriculture?" This is be-

cause the students felt you just put a seed in soil, cover it over, and add water and it will grow. I worked with these students on a project-based class in which each student built an ecosystem out of soda bottles. One of the students noticed the white roots on the side of one of the bottles and thought they were worms asking why they didn't move.

The urban agricultural teacher needs to understand these students cannot necessarily relate to traditional "cows and plows" agriculture.

From a teaching perspective, this question offers a great opportunity because it was the first time this student ever planted a seed and actually saw it grow. A possible Agriscience Fair project in conjunction with the FFA portion of the agricultural class would encourage this student's natural curiosity into a CDE.

It is important to note the conditions students go back to after they leave school. If they are surrounded by concrete buildings and streets, where does agriculture come into their lives? The urban agricultural teacher needs to understand these students cannot necessarily relate to traditional "cows and plows" agriculture. For instance, in a class on ecosystems I used an example of a crack in a sidewalk with a plant beginning to grow up from it. I asked the students if they had ever seen this and questioned them if this was part of an ecosystem.

Also, the urban ag teacher must recognize that parental support may be at a minimum since, for the most part, their parents do not fully understand the career opportunities in present day agriculture especially if they, too, are products of this environment. This is why educating your students and their parents, the community and the city school board about the possibilities for students in the field of agriculture is so important. They must understand how diverse the agricultural industry really is.

It is important for today's urban agricultural teacher to have knowledge regarding the various ag related businesses within the school's community and to network with these businesses so that the students see the various career opportunities available to them. Relationships with area businesses open doors to these students for possible job placement while in high school. They could eventually have a placement SAE that could teach life skills and possibly lead to a job after high school.

Some students may join the program since they want to grow plants or care for animals, but a well defined urban agricultural education program can provide these students with much more. The program must first broaden the students understanding of their own world and the role of agriculture in it. Students must realize when applying to an agricultural program that they are going to be learning skills they can use in the future. They need to realize they will have hands-on experience that will help them when they apply for jobs after high school.

Many of the students in the urban environment do not think about the future at all. They may have performed poorly in Middle School and have low self esteem and little hope of doing better in high school. They may feel that all doors opened to other students are constantly closing for them. This is where the Ag teacher can draw upon these students' interests, correct their misconceptions, and begin a process to improve their self esteem and confidence through positive reinforcement. Many times urban ag students begin working odd jobs before they are employable, receiving very low wages "under the table" to assist in feeding their family.

When they turn 18 they know they will be on their own and do not necessarily see themselves making beyond minimum wage. Here is where we, as agricultural educators, can help these students be successful. We use hands-on teaching techniques in classes that can prove particularly beneficial to a student who has traditionally been a poor performer. If we pursue working relationships with people in local ag industries, we can place students in jobs that will give them skills that will benefit them in the future. There really are great opportunities in urban agriculture programs.

Kerry Marten is a senior in Agriculturtal Science Education at Cornell University

Constructivist Teaching: Developing Constructivist Approaches to the Agricultural Education Class

By Alexander J. Hess and Cary J. Trexler

As practicing teachers, we often don't take time to reflect on our teaching. As a result we often keep doing the same old thing year after year unless something goes wrong. For those who graduated from college more than 15 years ago, you may not be aware of the most current ideas and theories about teaching and learning. Well, at least I wasn't aware of them until I reentered graduate school last year.

To see if your teaching mirrors the most current thinking about how people learn, take a moment to reflect on your teaching style. Write down a few notes about what you do while teaching. After this, turn your welding cap 180 degrees and write down a few words about what you think students do while learning in your class. After you have written about each, talk to a fellow teacher and ask her how she teaches and what her students do while learning. Don't hold back; tell her your ideas as well. Consider this as reinvigorating your quest to look back (reflectively) on your own teaching approach. I did the same exercise not to long ago and found that, when teaching most effectively, I use many of the teaching approaches that focus on my students past experiences and individual understandings, what is currently called the "constructivist approach" to teaching and learning.

The constructivist approach to teaching and learning revolves around the belief that learning is an active process in which learners construct new ideas or concepts based on their current/past knowledge. When learning, a person selects and transforms information, constructs hypotheses, and makes decisions, by tapping into cognitive structures in their mind. Cognitive structure (i.e., schema, mental models) provides meaning and organization to experiences and allows the individual to "go beyond the information given" by tapping into previously constructed cognitive structures (Kearsley, 2004).

The use of constructivist teaching practices may add value to many agriculture classes. This article provides a detailed account of a constructivist teaching approach I used recently in a high school agricultural welding class. It is the same approach I have used in agri-science, agri-business, and horticultural courses. I offer this example as a way to illustrate what a constructivist teaching approach looks like in hopes that the reader might transfer some salient ideas to their particular setting, regardless of the content. This approach is student-centered in four specific ways because it: 1) honors and capitalizes on students previous practical experiences, 2) solicits students thoughts on their observation gained from current and past experiences, 3) provides students with opportunities to express "how come" or "what if", and 4) focuses on students actually testing their answers to the "how come" or "what if" questions and ideas in a practical experience. Throughout this approach there is a focus on the students and what they bring in terms of past experiences, their schema or mental models, and how these mesh with the experiences I provide for them in my shop.

Using a Constructivist Approach in an Agricultural Welding Course

In the beginning of an oxy-acetylene cutting and welding unit, I have a specific lesson related to the controlled use of oxygen and fuel gasses that focuses on the flame needed to produce heat for proper welding and cutting of metal. In a quick oral question, I found that students' past experiences with burning gas fell into one of the following categories; a) a natural gas assisted fireplace, b) a propane barbecue, c) a natural gas cook-top range, or d) a propane torch for soldering copper plumbing fittings. Some students ignited the fuels in the areas mentioned, but most had only seen it done.

> ...learning is an active process...

Next, I cracked the acetylene open at the torch tip of the welding rig. "Stinky cheese!" "Rotten Eggs!" Odorized fuel smell is not very pleasant, but I wanted students to catch a whiff to see if they could recall it in latter discussions. While allowing for the gas to dissipate, students were able to continue describing what the smell reminded them of. After asking one student to use the term "fecal matter" instead of another "inappropriate-for-class" term, I used the striker to light the acetylene and manipulated the torch to set out a large orange flame. Soot

from the carburizing flame lingered in the air and floated down on the class as I asked them if the flame looked like any of the flames they had seen before. I then added oxygen to the point where it could resemble one of the flames they had just described for me.

At this point, the students had a tangible experience that they could relate to their own past experiences while trying to formulate new ideas, both individually and as a group. I wanted them to think about how to manipulate and control gasses to reach a desired flame. I asked them to tell me, "what was needed for them to create a desired flame capable of welding or cutting?" The class told me that the right amount of acetylene and oxygen to create a blue flame was needed. They believed the blue flame was the hottest and that it would be best for welding and cutting metals. I let one of the less vocal students light the torch and manipulate the fuels—as guided by the class members—to a position the group felt was best suited for welding. Next, each student individually "passed" lighting the torch and obtaining the appropriate flame through a peer evaluation process. I then told the class that the next step would be using their flame setting to run puddles across metal, a basic skill needed for gas metal welding. I would demonstrate the proper technique while testing their approved flame setting the next day.

On the second day of this unit, I began with a demonstration of running a bead across the metal using a flame the students felt was appropriate. I gave them multiple opportunities to have me adjust the flame as I modeled appropriate technique. Further satisfied with their desired flame setting, the students were given the opportunity to practice "pushing a puddle" on their own and adjusting the flame. As students rotated through the stations, they evaluated what they produced with others prior to bringing it up for inspection. After peer evaluation, they brought up their metal tabs to discuss with me what they saw as we examined it together. This discussion included a description of the skills they were practicing and any adjustments they made to the flame on the torch. In concert with the student, we co-evaluated the product. If it was less than ideal, the student was asked to make suggestions about how she might improve the next time. This cyclic approach continued throughout each lesson and throughout the unit. To many readers, this may seem like a typical lesson approach, based on the experiential learning theory, this is right. This approach to teaching and learning mirrors Kolb's experiential learning model (Kolb, 1984) which includes having a concrete experience, reflecting back on the experience, developing abstract concepts for the experience and reflection, and then actively experimenting with the new knowledge and ideas.

Reflection on the Constructivist Approach in an Agricultural Welding course

I've tried to provide a glimpse into how I am developing my constructivist approach to teaching in the agriculture classroom. Here is what I've tried to do in my teaching. I actively sought to understand my students' background knowledge about the topic at hand. I used this background as a bridge to connect with the new information I wanted them to learn. Since I understood what they knew, I was better able to tailor my lessons to students' mental schema. Because of the way I tried to structure the class and its experiences, students were able to test the new ideas in new settings against what they already knew. From this new experience, students were able to reconstruct and evaluate these new skills and knowledge sets. This was further enhanced on a continuum of building new concepts for further inquiry and continued testing on each overlapping experience. The approach was directed toward creating an environment where students actively inquired and investigated the world they experienced.

Final Thoughts

I have found that if I constantly and consistently ask questions about my practice and approach my job as being full of opportunity to gain new knowledge, my classroom practice reflects it. So, consider turning that welding cap 180 degrees and reflect upon your teaching style, your approach to teaching, and how your students are learning. How you act (and interact) with students will be the model they emulate. If you want students to be critical thinkers capable of problem solving, model it for them and allow them to practice it. In keeping this desire at the forefront, you will have already begun modeling constructivist's approaches to your teaching.

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Alexander J. Hess is a Graduate Student at the University of California, Davis

Cary J. Trexler is an Assistant Professor at the University of California, Davis

Incorporating Science, Math, and Reading into the Agriculture Classroom: The Role of the Laboratory

By Brian E. Myers

What is the difference between an "Ag Shop" and an "Agricultural Mechanics Laboratory?" Is the "School Farm" the same as the "Agriculture Land Laboratory?" I would suggest that the difference between these is greater than just semantics. It is even more than the physical structure. The difference is in how the facility is used. A "shop" is a facility where the objective is to fix broken equipment. A "laboratory" is a facility where the objective is learning.

Science, math, and reading content permeate our curriculum. The call to incorporate this content is not a call to add new material to our classes, but rather to emphasize the so called "academic" concepts that are really the foundation of what we do in agriculture. As agricultural educators, we often have resources in our laboratory facilities that provide several opportunities for students to gain a more well-grounded understanding of science, math, and reading concepts.

We often refer to the type of instruction that agricultural education provides as being "hands-on." Research on how people learn tells us that hands-on experiences *can* be a powerful learning tool. However, a "hands-on" experience alone does not guarantee learning. To ensure that students learn we must provide "minds-on" experiences that evoke a deep understanding of a concept. This deeper understanding is needed for students to transfer that knowledge to a different situation (Bransford, Brown, & Cocking, 2000). Activities that are both "hands-on" and "minds-on" are ones in which the student is provided a situation in which they apply a concept and explain their thinking in that process.

Using a definition from science education as a starting point (Hofstein & Lunetta, 2003), a quality *agriscience* laboratory activity can be defined as "learning experiences in which students interact with materials and/or models to observe and understand the nature of agriculture and its underlying biological, physical, and social science components." Effective laboratory experiences, whether they be in greenhouse, land, agriscience, or agriculture mechanics laboratories, encourage students to: (1) be highly interactive, (2) think critically, (3) identify and solve a problem utilizing basic science, math, and reading skills, (4) explicitly demonstrate their understanding of the agricultural concept, and (5) communicate their findings and thinking to others.

Research on how people learn tells us that hands-on experiences can be a powerful learning tool.

To develop laboratory activities that meet these standards, agriculture teachers need to adopt some new teaching strategies. This is not a call to completely abandon the teaching of agriculture, but to modify *how* we teach agriculture. This is not a new challenge. In its 1988 report, the National Research Council (NRC) called for the "teaching of science through agriculture" (p.5).

A teaching strategy that is employed by many in science education is inquiry-based instruction. Inquiry-based instruction has many characteristics of the problem solving teaching strategy that has been utilized by agriculture teachers for many years (Parr & Edwards, 2004). The two main criteria of inquiry-based instruction are (1) the investigation of "real-world" problems and (2) that the problem to be investigated, materials, and procedures to find a solution to those problems are developed, at least in part, by the students. Allowing students to be actively engaged in the identification and solution of a problem encourages the "minds-on" activity that is so important to student content knowledge achievement and retention.

Many "cookbook" type laboratory activities are available for teachers to use in their classes. These activities provide step-by-step instructions to the student on how to conduct the activity, and many times what the result should be. In order to make these activities more effective, teachers

should slightly modify the activities so students can become more mentally engaged.

Most cookbook-type laboratory activities can be modified very easily to become more inquiry-based. An example would be removing part or all of the instructions from the activity sheet. The teacher would then work with the students, either in small groups or as an entire class, to develop the procedures to solve the identified problem. Students would be required to recall and utilize their knowledge gained from previous experiences in many of their "academic" courses (science, math, etc), as well as their agriculture classes. They would need to synthesize this information and transfer that knowledge to the current situation.

Getting students to the point where they can do this on their own will not happen overnight. However, by gradually making laboratory activities more investigative (inquiry-based) in nature, and less prescriptive (cookbook-type), students will succeed and grow to enjoy the process (See Figure 1). This success will be in the form of positive academic achievement and also in positive attitudes toward agriscience.

In addition to traditional laboratory instruction, teachers can incorporate academic concepts into activities conducted in the FFA and SAE portions of the agricultural education program. Agriscience SAEs are an outstanding opportunity for students with particular interest in the areas of agriscience research. Within this type of SAE, students could not only work on laboratory projects of their own, but collaborate with other students and teachers as well as agriscience professionals. Working cooperatively with agri-scientists at local universities, or with extension specialists, students not only have the opportunity to enhance their understanding of agriscience, but also gain valuable experience that will assist them in their search for a meaningful career.

An FFA activity that partners nicely with Agriscience SAE programs is the Agriscience Fair. Most state FFA associations sponsor agriscience fairs with the top projects going to the National Agriscience Fair during the National FFA Convention. Many states also have agriscience fair competitions below the state level as well. The keys to developing a quality agriscience fair project are similar to those of quality laboratory activities. Therefore, when teachers include inquiry based laboratory activities in their courses, they are helping prepare students for this competition. Teachers and students can find more information about the agriscience fair and other agriscience award programs on the National FFA Organization website (www.ffa.org).

A key resource found on the FFA website is the *Agriscience Handbook*. This handbook provides students and teachers with excellent suggestions on developing quality agriscience fair projects. The handbook would also be helpful as a resource for students in agriculture courses completing agriscience laboratories.

The integration of science, math, and reading into the agriculture education curriculum is a matter of critical importance that can be completed with only slight modification of the agricultural education content. The difference occurs in the way we teach, not the content that we teach. All of us in agricultural education need to work together to assist our students in gaining a better understanding of how the basic concepts of science, math, and reading apply in their daily lives. We have the resources in our laboratory facilities to teach these concepts within the context of agriculture. It is within this context that many of our students learn best. By only slightly modifying our teaching methods, the potential exists to have a dramatic impact on the academic success of our students.

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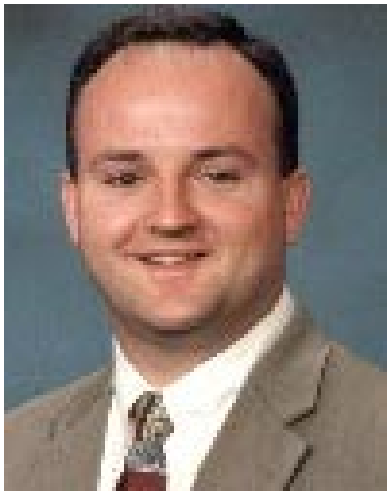
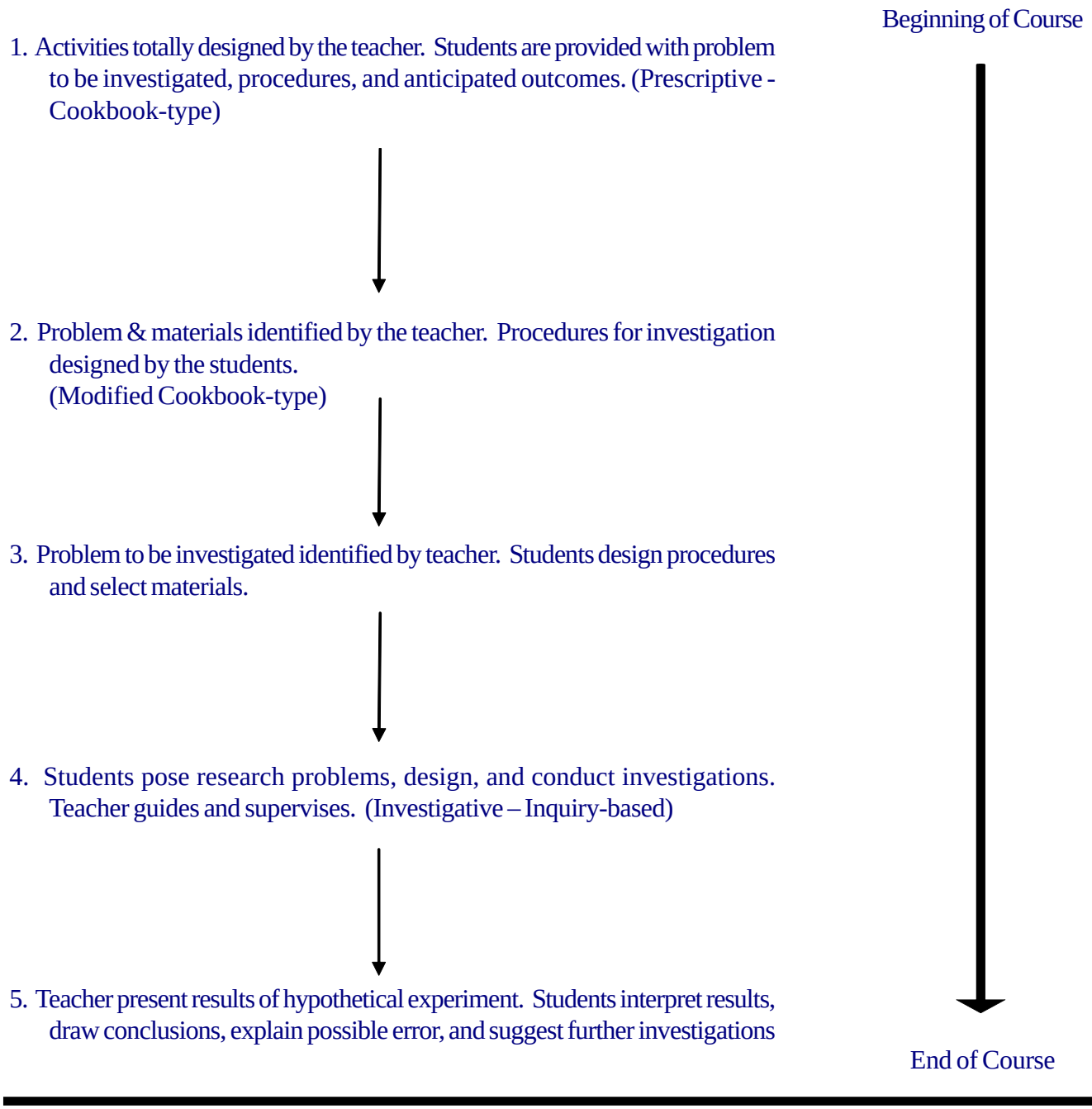


Brian E. Myers is an Assistant Professor at the University of Florida

A Strategy for Integrating Inquiry-Based Laboratory Activities



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The Infusion of Reading Grows Ancillary Literacy: How Good of a Teacher are You?

By Kyle McGregor and Jennifer McGregor

Too often as teachers we are consumed with the mastery of our content and we forget that we are to be effective deliverers of information. The most knowledgeable expert in a content area is truly impotent in the classroom if some basic concepts of effective delivery are not learned. So, are you just a content expert or are you a teacher?

As true teachers we take a holistic approach to developing the skills and knowledge base of our students. Agriculture as a discipline offers innumerable opportunities for teachers to teach not only technical content, but to reinforce core academics as well. Recent legislation has sparked efforts within agricultural education to investigate how we can impact student achievement in mathematics, science and reading. During the 2004 National FFA Convention, numerous teacher workshops were conducted in order to assist agricultural science teachers with the inclusion of mathematics and science concepts into their classrooms. In November of 2004 a national task force was assembled to investigate how reading and literacy efforts can be bolstered in secondary agricultural education. According to President's Bush's proposed budget for FY 2006, many of our jobs may be on the line if we aren't developing the whole student, especially in the areas of mathematics, science and reading.

As mentioned above, national task forces have taken up arms in order to study and develop programs for the support of mathematics, science and reading in agricultural education. Some may ask, "Why reading?" It is almost effortless for most of us to conceive why science and math would be a focus because of the obvious contextual applications, which exist in agriculture, but reading offers a greater challenge. Therein lies a paradox that challenges us to utilize something so simple, so basic as reading!

Unfortunately, when it comes to reading and literacy things aren't as simple as one would assume. Some of the most disturbing statistics in education focus on reading ability and literacy. From the time that a student enters school through graduation they have multiple exposure to topics such as social studies, mathematics, science and English, but for all intensive purposes formalized reading instruction ceases after the third grade, (Moats, 2001). According to a Southern Region Education Board report focusing on the High Schools That Work (HSTW) consortium, only 46% of students in agriculture courses met the pre-established reading goals and 45% of the students indicated that they seldom or never placed importance on writing in their agriculture classes, (Benson, 2004). Reading and literacy are all encompassing segments of all content areas, and for agricultural science teachers, "to implement principles and practices of secondary reading and writing, we must first recognize reading and writing as meaning-making processes that can support our instructional goals, particularly those related to understanding content," (Jacobs, 2002, p. 58).

This article focuses on practical tools that can be utilized by the agricultural science teacher to address many of the concerns listed above. When planning instruction for your classroom or laboratory, the inclusion of reading and other literacy strategies is a simple yet effective means of developing your students through a holistic approach. So, if you are still reading this article, we guess that you are a teacher!

Strategies that Help Students Learn Through Reading:

Many of us probably remember a teacher asking us to turn to a particular page within a text and read a given passage or chapter. How many of you remember the teacher taking time to teach us how to read or utilize strategies that would give us a deeper understanding of what we saw on the page? Students need guidance while reading, simply tossing a book in front of them and asking them to read does not ensure a quality cognitive experience.

Reading in your classroom provides you and your students with many benefits. First and foremost, if students are reading in your class they are honing their reading and writing skills. Reading exercises also develop much of the vocabulary needed in the technical subject areas of agriculture. Third, if a student has never been exposed to a new topic that you are beginning, a simple reading assignment can give he or she a bit of background knowledge that you can rely on to teach new concepts. Finally, having students engage in reading during an agriculture class helps build the problem-solving and critical thinking skills that are so important to our students' success.

Reading for many students can be a daunting task unless they are

taught to be good readers. Good readers self monitor and utilize strategies to aid in their understanding of what is being read. As a teacher you have the ability to guide your students before, during and after reading in order to assist them understand what was read. The following are several quick and easy to use strategies to assist your students while reading.

Pre-Reading Strategies:

K.W.L. Activity – This activity is actually utilized throughout the reading process, but focuses heavily on pre-reading. Before reading on a topic, (i.e.-food processing), students are asked what they, "Know", about the topic and are asked to briefly record their knowledge on the subject. Writing what they know develops their writing skills while activating their prior knowledge. Second, students are asked to develop a list of, "What they would like to know", about the topic. This step helps students to anticipate what is going to be learned. Finally, after reading have the students record what they "Learned" about the topic that they did not know previously. This final step is important because it validates their learning and allows students to reflect on any preconceived notions about the topic that may not have been true.

Give One/Get One – Give One/Get One is a cooperative pre-reading activity, which allows students to pool their knowledge before reading. Much like the KWL Activity, have students develop individual lists of what they know about a particular topic before it is read. Next, have students form cooperative groups in order to share their lists. While in the groups have your students take turns "Giving One" of the things that they know. If other students in the group do not have a particular fact or concept that is given, have them "Get One" by recording these unknown concepts on their own lists. This activity not only develops pre-reading prior knowledge and builds background; it also encourages cooperative learning, builds interest and sets a purpose for reading.

During Reading Strategies:

Stop & Predict – This during reading strategy encourages students to make an educated guess about where the reading is going and helps them to stay engaged during the reading because they know that the teacher will stop them during the reading process to check on their progress. During reading have your students stop at a particular point in a passage. Once the students stop, have them predict what will come next or what the author will discuss. Encourage forward thinking; also, have them reflect on what the author has already discussed. You may have students discuss their predictions orally or have them write and hand them in.

Stop & Connect – One of Rosenshine and Furst's variables of effective teaching is the development of cognitive scaffolding, this strategy aids students in linking the information they are reading to their prior knowledge and past experiences. Just as it sounds, Stop & Connect is very similar to Stop & Predict. During the process of reading have students stop at a particular point in the text. As a group or individually on paper have students link what they are reading to something that they already know, basically creating an analogy. "The process of MIG welding is a lot like applying caulk with a caulk gun." Verbally sharing their analogies along with your guidance will also allow students to develop the understanding of their classmates.

SQ3R (Survey, Question, Read, Recite and Review) - This strategy is utilized throughout the entire reading process, but focuses on the student being cognizant of what he or she is reading while reading. First, have your students Survey the reading, looking at the text and pictures in order to gain familiarity with what will be read. Second, instruct your students to create Questions using all of the reading's titles, headings, subheadings and emphasized text. Next have the students Read the text. After reading, students Recite by returning to the questions that were created in order to ensure that each can be answered correctly. Finally, have your students Review the entire reading. This final step allows students to engage in a metacognitive conversation with themselves about the reading and serves as a bookend to the Survey step. The SQ3R is a very powerful strategy which assists students who are reading expository texts (text books), unfortunately, the SQ3R does not work as well with narrative readings (stories).

After Reading:

Directed Paraphrasing - Directed paraphrasing is commonly used with reading assignments in order to check for comprehension. Before, during, after, or outside of class, ask students to briefly, and in their own words, paraphrase an assigned reading and hand it in. Analyze your student's responses by looking for trends and understanding of the text or article. This method allows you as the teacher to check for misconceptions in students' reading as well as reinforce reading skills. First, assign students a passage to be read inside or outside of class. Casually ask students to paraphrase or summarize the reading in four to five sentences. Finally analyze the summaries and report back to the group concerning their perceptions of what was read. Take time to comment on any trends, missed details, or misconceptions.

One Sentence Summary – This post-reading technique challenges students to answer the questions, "Who

does what to whom, when, where, how, and why?" Before your students read a particular passage and engage in this activity it is important that you do it first. Be sure to give your students at least twice as much time that it took you to complete the task. After reading a particular passage have your students write down, "Who Did/Does What to Whom, When, Where, How and Why?", in relation to the topic. Next your students should create a grammatically correct sentence from their list of answers. This short and simple strategy is excellent for helping students think about what was read, as well as reinforcing writing skills.

Muddiest Point - The muddiest point is an extremely simple strategy that can be utilized for reading or classroom teaching. Muddiest point applied after reading allows students to reflect upon what they may not have fully understood, allows them to learn cooperatively with classmates and gives the teacher feedback on what should be re-taught. Ask students to record on a piece of paper what they felt to be the concept that they might have had trouble understanding in the reading. "What was your muddiest point in the readings?" Have your students form collaborative groups to discuss what confused them the most in the reading. Encourage your students to clarify misconceptions within the groups. Finally, have each group present their muddiest points to the remainder of the class and discuss any clarifications that might have been made. It is very important that you offer your guidance clarification during this final step.

Reading in the Agriscience Laboratory:

The previously mentioned strategies can be utilized with many types of readings, at any time and in all content areas, but are there opportunities, specifically in agriculture, other than the traditional technical text, periodicals and journals? One such place that we may not expect to incorporate reading skill is in our respective laboratories. Our students are engaged in agriculturally based computer, mechanization, greenhouse, crops, animal science and project center laboratories throughout each school year. For many students these laboratory experiences are some of the only things that excite them about school. When designing your laboratory instruction, why not incorporate reading into the learning environment?

Once again, what may seem simple to you may not to your students. Have students review laboratory safety guidelines and read teacher developed laboratory skill sheets before entering the lab. While in the laboratory students may need to reference technical manuals, maintenance bulletins or reference charts. Reading and interpreting repair and instruction manuals can be made pivotal to successfully completing a task. Students may also need to reference veterinary manuals or read instrumentation as part of an assigned laboratory activity.

Remember to keep these small literacy steps in mind when designing your lessons to make a big impact on the reading and writing skills of your students.

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Kyle McGregor is an Assistant Professor at Tarleton State University

Jennifer McGregor is an Assistant Professor at Tarleton State University

Before We Teach: Considerations for Managing the Modern Agri-Science Classroom

By Dave Wilson

How did he/she learn to teach that well?

To the uninformed observer, teachers direct students to a particular lesson and the students go to work. In reality, successful instruction often requires considerable preparation before the teacher even enters the classroom. The large variety of lessons taught in the agriculture classroom requires different types of preparation prior to instruction.

Consideration 1: Developing the Course Outline—How do I decide what to teach?

Before classroom instruction begins, teachers create, develop, or refer to the course outline for a list of lesson topics. The development of a course outline is often a combination of global, national, state, and local topics. In many schools, the course outline changes frequently, with industry trying to present the most modern instruction and technology within the grasp of the school and department.

Consideration 2: Developing the Lesson—Is lesson planning really necessary?

Preparing to teach class varies from teacher to teacher but often follows a similar path. Teachers prepare lesson plans to identify the: (1) lesson title, (2) lesson goals, (3) introduction, (4) presentation, (5) references, and (6) assessment/evaluation procedures. Preparing lessons that engage learners can be another challenge to teachers. Lessons should be relevant to modern career selection. Lessons should be understandable by the students and yet challenge them to use higher-level thinking skills as they develop solutions or complete work to be evaluated. The work a student completes should be evaluated, with scores applied toward the student's final grade. Finally, the student should be aware of the scoring procedure and understand how a grade is determined.

As a side note, many beginning teachers often think they spend an enormous amount of time preparing lessons, while many senior teachers avoid the formal preparation and describe lesson planning as happening in their head. Formal lesson planning provides the many successful teachers with a clear map of how they plan to achieve the lesson objectives and the opportunity to repeat a successful lesson. Time preparing lessons is generally well spent, and lesson files can be updated when needed. Remember, some lessons will be repeated for several years and will not change very much; so a good collection of lessons save time and creates some continuity from year to year.

Consideration 3: Managing the Engaged Learning Environment—My classes are "hands-on", what more preparation do I need?

When teaching a "hands-on" lesson, the teacher preparation includes additional tasks. A large part of this "hands-on" lesson is to have adequate supplies available. Having the tools and supplies organized so students do not waste time acquiring the materials in the lesson is part of preparation. It is easy to spend too much of the class time acquiring the materials for the lesson and not enough time with the learning activity. The time-management factor for "hands-on" activities, if poorly managed, can discourage students. Students should be able to complete the exercise in the time provided; and if extra time is necessary, then the activity should be broken into segments that can be completed in the time allotted. Another important consideration is the blending of academic study with activity lessons.

As students are engaged with an activity, many teachers circulate among the students to observe and ask questions to verify that the students understand what is to be accomplished. Asking students to explain their actions often provides an insight into their understanding of the lesson being taught. Successful teachers schedule their time to visit each student and appraise the student progress toward accomplishing the lesson goals. Successful lesson preparation also anticipates difficulties students may encounter. Anticipating student problems enables the teacher's time to prepare a variety of solutions. The problems students encounter will vary with the student knowledge and skill level. The variety of questions and solutions enables a teacher to make individualized adjustments to instruction and bridge the diversity among students and their ability to learn.

Consideration 4: Selecting and Managing Classroom Resources—How do I keep track of all of this, "stuff"?

For many teachers, selecting classroom resources is difficult, as

there are many variables that influence the selection. Currently, one of the variables to selecting classroom resources; is budget limits. Another is the time needed to locate current classroom resources, the number of classroom resource providers is quite large, and contacts may be difficult to locate. The time required to develop classroom resources can be quite overwhelming.

Many teachers do not have the time to develop individual lesson resources and may be required to select parts of a lesson from multiple sources or use resources that are marginally suitable for the lesson. An example might include using a textbook chapter that contains information that may not be part of a particular lesson. Teachers often use the textbook as an outline for a lesson because it is logical to follow the flow of a prepared resource and interject important information not contained in the resource, rather than developing a new resource to fit the lesson objectives.

Another aspect of preparing to teach is the preparation of the consumable and non-consumable items used during instruction. This is especially true when planning a demonstration or "hands-on" activities. One of the most challenging aspects of preparing a "hands-on" activity is the calculation of the supplies that will be needed. For an experienced teacher, records of past requirements can be used as a benchmark for determining the volume of supplies for a lesson.

Beginning teachers will struggle without the assistance of a mentor or complete access to past records. An example of estimating supplies, for a welding class might require the teacher to determine the volume of consumable supplies including welding electrodes, metal, safety equipment, damage to equipment, etc. Teachers with experience can look back on their records, if they keep records, and determine that 6 pounds of welding electrodes per student were used to create 15 welds that were scored and entered into the grade book.

Keeping records of consumable supplies is important and helps a teacher determine the volume of supplies that will be used during a particular course. Just as important is the inventory of consumable items and their storage. Typically, when ordering consumable supplies, it is wise to include a small percentage of over purchase to cover unknown factors such as damage or to take advantage of ordering in quantity. An example might include ordering a case of floral tape for use in a corsage-manufacturing lesson. Ordering supplies in advance is important and part of good classroom management. As you might imagine, if supplies are to be ordered in advance, then the teacher needs to know what will be taught prior to the ordering period for your school.

Some supplies need to be fresh when they arrive for a planned lesson and will need to be order for delivery just prior to a lesson. Some chemicals used in agricultural lessons are best when used fresh and are ordered for delivery and use at a predetermined time. Teachers are also recommended to keep their lesson planning a little flexible to allow for small hiccups that can occur in shipping or delivery.

Consideration 5: Assessing Student Learning—How do I measure student performance?

Student performance needs to be measured regularly for several reasons, to determine student grades and to provide feedback to the teacher and students. Evaluation can be challenging, as it provides many opportunities to be influenced by factors not included in a lesson. One of the most important principles in evaluation is to create a direct link between the lesson objectives (goals) and the instrument used to evaluate the student. Teachers should develop evaluation procedures that are appropriate to the nature of the lesson. Examples of lesson evaluation include written tests, quizzes, homework, laboratory (including shop and greenhouse) activities performance tests.

Teachers should try to avoid a trap identified as adopting evaluation procedures for the sole purpose of generating student grades, as is part of our public school system. The primary purpose of evaluating individual performance should focus on the growth and development of the individual student. Grades are important, but student success and growth are the real goals of formal instruction and should be incorporated into a lesson.

Am I really prepared to teach?

Developing a system that prepares classroom lessons can be complex and intricate. When teacher inputs are directed with discipline and organization, the procedure for preparing classroom lessons becomes more productive.

The amount of time a teacher spends on a lesson from beginning to completion, preparation through evaluation, is generally rewarded with a measured increase in student learning. The mechanics of preparing for class also reward students and create a higher level of student success. Students are the real focus of lesson preparation and their success should receive top priority.

Dave Wilson is employed at ITCS Instructional Materials at the University of Illinois and has spent over 25 years as an Illinois agriculture teacher

Preparing for Success in the Classroom

By Shane Robinson and Scott Burris

Have you ever walked out of a classroom after the bell only to think of all the things you meant to communicate but didn't? Or better yet, have you ever been in front of a group of students wanting to make an important point, only to become distracted and lose that thought and miss out on a very important teachable moment? Unfortunately, many of us can probably relate to one of these circumstances. So, how can we ensure this doesn't happen to us in the future? The answer lies in proper planning and preparation.

In his book titled, The Power of Positive Teaching, McCormick (1994) stated that, "the quality of teaching will be a direct result of the quality of planning" (p. 73). Simply put, if we are to be effective in the classroom, we have to be effective outside the classroom in our preparation efforts. Good teaching does not start in the middle of a class; rather, it starts well before the students ever arrive. McCormick went on to say that "effective teachers always enter the learning environment with a well thought out written teaching plan" (p. 73).

What is a lesson plan?

What exactly should a lesson plan look like? How much time should be spent on writing a lesson plan? Do lesson plans really make a difference in the overall effectiveness of the instruction? Lesson plans vary in length and depth. They should force the instructor to think about two important criterions of formulating a lesson: the content (what will be taught) and the method (how the content will be taught). Simply put, lesson plans are a "written step-by-step account of what you propose to take place in the classroom" (Hedges, p.6). Many times, instructors reflect on the content they want to teach before the class begins. They often have an agenda laid out in their minds concerning the points they want to make. However, many instructors fail to write their thoughts down in a formal lesson plan. Thus, one important criterion is forgotten: the method for teaching the lesson. Hedges, in his book titled, What Being a Teacher is All About, stated that, "a lesson plan format should enhance the method of teaching chosen to take the students through the learning process" (p. 6).

What should be included in an effective lesson plan?

There are numerous formats and styles of lesson plans. Additionally, there are a number of ways to devise a lesson plan for the unique situations teachers face. However, regardless of any situation, Hedges (p. 7) states that four questions must be addressed. These four questions are: 1.) Where are we now?; 2.) Where are we going?; 3.) What steps do we need to take to get there?; and 4.) How will we know if we have arrived? It is important to assess these questions further.

Where are we now? It is always important to conduct an "audience analysis" of sorts. What do the students already know about the subject prior to the lesson? What knowledge do they bring with them to the classroom? What are their experiences? It is valuable for the instructor to know the abilities and experiences of the students before entering the classroom. Identifying the progress and needs of learners during the planning phase of the lesson will help determine both the content to be taught and the method of delivery. Knowing this allows the teacher to better prepare effective lessons that will promote optimal learning for every student in the class.

Where are we going? It is equally important to the planning process to assess where the class is going, how long the unit will take to teach, and the instructor's expectations of the students. It would be unacceptable to drive to an unknown location without first looking at a map. Why should we expect our students to fully jump on board if we fail to let them know where we are taking them? Effective planning will provide for an opportunity to clearly communicate the learning objectives or expectations of the students. By addressing this issue, clarity is established and students will more fully understand their role in the learning process.

What steps do we need to take to get there? It is vital to the lesson, and the success of the students in the classroom, that proper steps are laid out for achieving the objectives. How will the instructor get from point "A" to "B?" What will the instructor bring to the class, in terms of experience, that will promote and enhance learning? This portion of a plan is where the instructor specifically identifies what to teach and how to teach it. In addition, a solid plan will help organize the supplies and materials necessary to accomplish the learning goals. It is important when addressing this question to think about possible transitions that might be used when making these points to maintain good flow and timing. Perhaps most importantly, an instructional

plan outlines situations for learners to apply what they have learned.

How will we know if we have arrived? At the end of the lesson, it is always important to assess the learning that took place. Did students learn, as a result of the lesson? Did they retain the information intended? Proper instructional planning includes plans to assess student learning. Assessment should not be considered separately from the lesson but as a part of the lesson.

By keeping these four questions in mind, the instructor will address the content needing to be taught, as well as the most effective method for teaching the content. Not taking the time to effectively plan for what will be taught and how it will be presented is a disservice to the students in the classroom. .How lessons are presented is just as important as the content being taught. As educators, we must take advantage of every opportunity to ensure learning is occurring within our pupils. Will you be prepared?

While there is no one perfect way to construct a lesson plan, the use of a template can help to ensure consistency in planning and make efficient use of time. The following lesson planning template is among several planning resources available on the University of Missouri Department of Agricultural Education website (www.aged.missouri.edu/AgEd/resource/instrplan.html).

References

Hedges, L. E. (2000). What being a teacher is all about. Ohio Agricultural Education Curriculum Materials Service, The Ohio State University.

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Shane Robinson is a Graduate Student at the University of Missouri - Columbia

Scott Burris is a Graduate Student at the University of Missouri - Columbia

Instructional Plan	Instructor:	
Course:		
Lesson:		
Estimated Time:		
Objectives:		
Equipment, Supplies, References, and Other Resources:		
Situation:		

Instructor Directions	Content Outline and/or Procedures
Interest Approach	
Closure	
Application	
Evaluation	

Template available at: www.aged.missouri.edu/AgEd/resource/instrplan.html

Writing Objectives in Secondary Agriculture Courses that Challenge Students to Think

By M. Susie Whittington

Imagine embarking on a road trip across the United States to a specified, but unknown to you destination. To further complicate the situation, you are forbidden to take a map or to stop to ask for directions. Obviously, the frustration would quickly become overwhelming and the anxiety of "it all" could cause you to give-up before you really got started.

Students feel the same overwhelming frustration and anxiety when teachers fail to provide objectives, the roadmap, if you will, at the beginning of the class session. And, yes, students can even give-up, during class, when they can't make sense of "it all". When teachers fail to provide objectives at the beginning of class, students have not received the important pre-directional mind set that is necessary for learning. So let's examine those pre-directional objectives, how they effect the cognitive process of students, and, as a side-note, how the cognitive level of those objectives effect our teaching.

We all remember from our undergraduate teaching methodologies classes that the performance component of our instructional objectives must be written using verbs that require action and can be measured. For example, you might recall that the verb "list" clearly reflects action and can, with certainty, be observed for accuracy (measured). In contrast, the verb "understand" is vague; "understand" begs for the answer to, "how can I tell that you understand?". In other words, how do I measure "understand"? Well, teachers probably measure "understand" by asking students to "list", "describe", or "demonstrate"—verbs that are much less vague, and much more action-oriented and measurable. Thus, we as teachers achieve clarity when at the beginning of class, we tell students, "at the end of this class, you will be able to list the compartments of the ruminant digestive system" as opposed to, "at the end of this class you will understand the ruminant digestive system."

With clarity guaranteed through the use of action-measurable verbs, let's begin to stretch the cognitive processing of our students. Once again we begin with writing objectives. This time, however, the action-measurable verbs will be selected specifically for the cognitive level to which students are challenged.

Figure 1 (page 26) shows action-measurable verbs categorized by the cognitive processing required to perform the specified action. Note the headings, Remembering, Processing, Creating, and Evaluating. These categories, developed by Newcomb and Trefz (1987) in consultation with David Krathwohl (Bloom, et al., 1956) were created to simplify Bloom's Taxonomy of the Cognitive Domain from six hierarchical levels to four self-describing categories.

Thus, **Remembering** is equivalent to Bloom's **Knowledge** level; **Processing** is equivalent to Bloom's **Comprehensive**, **Application**, and **Analysis** levels; **Creating** is equivalent to Bloom's **Synthesis** level, while **Evaluating** is equivalent to Bloom's **Evaluation** level. As can be seen in the "Remembering" category, the cognitive process required to accomplish the action is lower level, or rote memorization. For example, "list" (chosen from the Remembering category) requires students' brains to recall information from the lecture and simply "list" that information. "Explain", on the other hand (chosen from the Processing category), requires students' brains to not only "list" the component parts of the concept, but to further examine the relationship of those parts to each other and potentially to their environment.

Let's once again use ruminant digestion as an example. When the teacher states at the beginning of class that by the end of class students will be able to "list the compartments of the ruminant digestive system", as discussed before, students' brains are required simply to recall a previously stated list. However, if the teacher states at the beginning of class that students will be able to "explain the compartments of the ruminant digestive system", students' brains must take-in, retain, process, and restate the previously acquired information. Notice that the lower level "list" objective is naturally embedded within the higher level cognitive "explain" objective.

Thus the teacher will be able to measure the students' ability to list the compartments of the ruminant digestive system because the students will be able to either recall or not recall the names of the compartments as they write their explanations of the compartments' functions. In addition, however, the teacher is able to measure the students' ability to further process the entire system.

Once students are operating at the processing level, cognitively chal-

lenge the students at the creating level. Share with them at the beginning of class that, "at the end of class, you will be able to formulate a theory for what you believe will happen within the ruminant digestive system if the abomasum malfunctions". The students' brains are now working to recall the names of the compartments, the functions of the compartments, the relationship of the compartments to each other within the entire system, the speculation of whether or not a compartment can be bypassed, and the consequences relative to each speculation. Obviously there are differences in the cognitive processing requirements of students' brains as the teacher challenges them from "listing" (remembering) to "explaining" (processing) to "formulating" (creating). More importantly, there are long-term benefits in the learning process by enhancing students' cognitive ability.

I will close with a bit of caution for us as teachers when we begin writing objectives at higher cognitive levels. When we write objectives designed to challenge students at higher cognitive levels, we, as teachers must equally challenge ourselves to **teach** at higher cognitive levels. Let me explain. I'll start with the same lower cognitive level example used previously. At the beginning of class I state, "at the end of class you will be able to list the compartments of the ruminant digestive system". My students can successfully attain that objective if I teach at the same lower cognitive level in the following way: I prepare an overhead transparency that lists the compartments. Next, I show the transparency to the students while verbally stating the names of the compartments. Lastly, I tell students to write the names in their notes. Later I ask students to recall the list on a quiz. As you can see, an objective written at the lower level can be taught at the lower level, and students can achieve the objective. The caution is this: when the objective is written at and stated at a lower cognitive level, but delivered at a higher cognitive level, or when the objective is written at a higher cognitive level, taught at a lower cognitive level, but evaluated at a higher cognitive level, student frustration can become overwhelming to the point of causing students to give-up. Therefore, when I write objectives at higher cognitive levels, I must be ready to plan for and teach the class sessions at the same higher level.

In summary, teachers must, at the beginning of each class session, map the pre-direction and thereby, set the environment for cognitive processing. The pre-direction will be clear when teachers use action-measurable verbs. Furthermore, teachers can cognitively challenge students and themselves by writing objectives at higher cognitive levels and then masterfully delivering the content at the level to which the learning environment was pre-set by the objective. Students **and** teachers benefit from writing objectives at cognitive levels that challenge students to think.

M. Susie Whittington is an Associate Professor of Agricultural Education, The Ohio State University

Figure 1
Vocabulary Useful in Developing Objectives at Various Cognitive Levels

Remembering	Processing		Creating	Evaluating
acquire	analyze	infer	combine	appraise
cite	apply	interpolate	compose	argue
define	associate	interpret	constitute	assess
identify	categorize	outline	construct	conclude
label	change	paraphrase	create	consider
list	choose	point out	derive	decide
name	classify	predict	design	evaluate
recall	compare	prepare	develop	judge
recite	compute	rearrange	devise	standardize
recognize	contrast	relate	document	validate
reproduce	convert	reorder	formulate	weigh
state	deduce	rephrase	integrate	
	demonstrate	represent	modify	
	describe	restate	originate	
	detect	restructure	organize	
	determine	summarize	plan	
	differentiate	transfer	produce	
	discriminate	transform	propose	
	distinguish	translate	reorganize	
	draw	use	revise	
	estimate		rewrite	
	explain		specify	
	extend		synthesize	
	extrapolate		tell	
	generalize		transmit	
	illustrate		write	

Evaluating "Doing to Learn" Activities: Using Performance-Based Assessments

By T. Grady Roberts and Julie F. Harlin

Scenario: Mr. Smith, an agricultural educator with 15 years experience, crafted a very effective integrated activity in his agricultural mechanics class that required students to design and build a project out of wood. The objective of his lesson was for students to apply previously learned skills and procedures during the design and construction process. He allocated two weeks of class time for this activity, which culminated with his students submitting their plans and projects. Mr. Smith gives a written test at the end of every instructional unit, so he chose to evaluate this activity using multiple-choice questions assembled from the text book and previous tests he had given. Given the objective of this activity, was a multiple-choice test the most appropriate method for Mr. Smith to evaluate his students?

Introduction

Agricultural educators are old hands at teaching with experience-based, hands-on activities. However, as indicated in the scenario above, choosing the appropriate method to assess student learning as a result of these activities can be difficult. Although standardized tests are commonplace in schools across the country, they may not always be the most appropriate evaluation tool. When assessing a student's ability to successfully master a skill taught through hands-on, experienced-based methods, performance-based assessment is a more appropriate approach.

Performance-based assessments are "exercises that utilize open-ended response formats, requiring human judges to directly observe or score them" (Chatterji, 2003, p. 200). Newcomb et al. (2004) posited that student performance is assessed using three methods: 1) evaluating the process or procedures used by the student to accomplish a task; 2) evaluating the end-product that resulted from a procedure or process; or 3) evaluating the overall performance of a student. These three methods can be met through the use of five assessment strategies: open-ended questions; behavior-based assessments; interview-based assessments; product-based assessments; and portfolio-based assessments (Chatterji, 2003). Presented below is a synthesis of performance-based assessment according to Newcomb et al. (2004) and Chatterji (2003), with examples specific for agricultural educators.

Method 1: Evaluating the Process or Procedure

Open-ended Questions

Open-ended questions are appropriate to evaluate a procedure or process selected by students. This strategy could be used to assess a student's ability to reason, defend, justify, or explain a process or procedure. When scoring open-ended questions, the instructor should use a rubric that outlines the desired depth and breadth of student answers. From the scenario presented earlier, Mr. Smith could have asked the following open-ended questions on his test to determine the extent that his students understood the processes and procedures:

1. In 3 to 4 paragraphs, explain the process you used to plan and build your project.

2. During your project construction, what tool did you use to cross-cut your boards and why did you choose that tool?

3. Reflect on the construction your project. If you were to do this project again, what two or three things would you do differently and why?

Behavior-based Assessment

Behavior-based assessments are also appropriate for evaluating a process or procedure. This strategy consists of observing students perform the process or procedure. This assessment strategy can occur in the actual environment or in a simulated environment. If a simulated activity is chosen, it is important that it should closely mimic the actual activity. The appropriate method to score a behavior-based assessment is a rubric or checklist that specifically outlines the proper method for the process or procedure. From the scenario presented earlier, Mr. Smith could have employed behavior-based assessments in the following ways:

1. During project construction, observe specific activities undertaken by students to evaluate their ability to perform that procedure.
2. Give students a set of plans and have them estimate the amount of materials they would need.
3. Provide students a piece of lumber and instruct them to cut it to a length of exactly 13.75 inches. While they cut, observe and evaluate the tool(s) selected and the process(s) they

employ.

Interview-based Assessment

An interview-based assessment is similar to assessment with open-ended questions. Though both are suitable for evaluating the student's understanding of a process or procedure, the interview-based assessment is given orally to the student. A benefit of an interview-based assessment is that it allows follow-up and probing questions to truly determine the extent to which students understand the process or procedure. A drawback of this strategy is the time involved to interview all students in a class. As with the other assessments presented, the appropriate method to score an interview-based assessment is with a rubric to determine to what extent the student masters the desired outcomes. From the scenario presented earlier, Mr. Smith could use an interview-based assessment by asking the following questions:

1. Explain the processes you used to plan and build your project?
2. Why did you use the power miter saw instead of the table saw to make your cross-cuts?
3. If you were to repeat this project, what would you do differently? Why?

Method 2: Evaluating the End-Product

Product-based Assessment

Product-based assessment is used to evaluate the end-product or project of a process or procedure. Using this strategy necessitates careful thought into selecting a project that requires students to utilize the procedures that the instructor wishes to evaluate. Scoring a product-based assessment is best done using a rubric that specifies criteria that determine the extent to which students correctly used the procedures in question. From our example earlier, Mr. Smith could use a product-based assessment by using a rubric to evaluate the projects and plans submitted by his students instead of relying on the traditional multiple choice exam.

Method 3: Evaluating Overall Performance

Portfolio-Based Assessment

Portfolio-based assessment provides a multiple source tool for evaluating the overall performance of a student. They are good at capturing the growth and development of a student's abilities and serve as an ongoing tool for assessing student performance. When using portfolio-based assessment, students should be provided with specific guidelines about what to include so that the desired learning outcomes can be assessed. Portfolios are best scored using a rubric. From the scenario presented earlier, Mr. Smith could evaluate his students' performance with portfolios that contained:

1. Detailed plans of the project produced by the student.
2. Complete materials list.
3. Copies of equipment safety tests passed by the student.
4. A journal of what was accomplished each day while working on the project.
5. A check sheet of each tool used by the student.
6. Pictures taken at different points during project construction.

Conclusion

In returning to the scenario presented earlier, a multiple-choice test was not the best method for Mr. Smith to evaluate how well his students could apply previously learned processes and procedures during the design and construction process of a project made out of wood. He could have evaluated how well they understood the processes and procedures with open-ended questions, a behavior-based assessment, or an interview-based assessment. He could have evaluated the end-product using a product-based assessment, or he could have evaluated overall student performance with a rubric-based assessment. Agricultural educators are experts at teaching with experience-based, hands-on activities. Let us make sure we use the most appropriate method to evaluate student performance on these activities.

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T. Grady Roberts is an Assistant Professor at Texas A&M University

Julie F. Harlin is an Assistant Professor at Texas A&M University