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Utilizing School Laboratories

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THEME EDITOR COMMENTS

Agricultural Laboratories: A Place for Authentic Hands-on, Minds-on Learning

by Thomas H. Paulsen

"One must learn by doing the thing, for though you think you know it—you have no certainty, until you try." (Sophocles, 400 B.C., as cited in Gentry, 1990, p. 9).

As a beginning agricultural education teacher, I felt confident in my ability to lead students through hands-on learning activities. I was raised on a diversified family farm, where I learned many skills as I helped raise and care for cattle, hogs, and poultry; assisted my father with row crop and forage production; and learned how to operate and repair all types of power machinery and equipment. My high school agricultural education teacher taught me numerous agricultural mechanics skills that I used in my swine and truck garden Supervised Occupational Experience programs. Additionally, my college professors gave me a solid foundation in agricultural mechanics content that I planned to use with the "farm kids" that would be in my agricultural education program.

I quickly learned that the vast majority of my students would not have the same background as me. In fact, most would not come from a farm at all. And many would not have previously experienced a course with a laboratory setting that included practical application of classroom content. Once I started to understand that my students needed to experience agriculture within the context of the courses in which they were enrolled, I placed more importance on embedding quality laboratory experiences in my agricultural education program.

> Teachers must be creative, innovative, and entrepreneurial in developing hands-on, minds-on learning opportunities.

I discovered that it took a lot of planning to prepare experiences for my students that were meaningful, logically connected to course content, and within budget. I soon found myself looking for funding and support to integrate laboratory experiences for my students. With the help of school administrators and an active advisory committee, we were able to find grant funding to build a greenhouse, purchase aquaculture equipment, and develop a business plan for the FFA chapter to rent a land laboratory. We also collaborated with local businesses and community organizations to provide additional laboratory experiences such as landscaping, building riparian buffer strips, and constructing wildlife habitat.

Agricultural laboratories are an integral component of secondary agricultural education programs and can include greenhouses, livestock facilities, mechanics laboratories, land laboratories, aquaculture laboratories, and numerous others (Shoulders & Myers, 2012). Agricultural education teachers use laboratories to develop psychomotor skills (Franklin, 2008), apply classroom theories (Lunetta, Hofstein, & Clough, 2007), engage in scientific inquiry (Thoron, Myers, & Abrams, 2011), and implement the experiential learning process with their students (Boone, 2014).

Regardless of a teacher's primary reason for using laboratories in school-based agricultural education, one thing seems consistent: Laboratories get students out of their seats and authentically engaged in hands-on, minds-on learning. To be successful in this endeavor, teachers must continue to develop their own

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Dr. Thomas H. Paulsen is an Assistant Professor in the Department of Agricultural Education and Studies at Iowa State University and the Theme Editor for the November December issue of The Agricultural Education Magazine.

Due to the number and size of articles submitted for this issue, I did not include the "Editorial" segment. Please enjoy the information on "*Utilizing School Laboratories."* Harry N. Boone, Jr. Editor

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Agricultural Laboratories:... (continued from page 2)

pedagogical knowledge and skills and identify appropriate resources to help their students "interact *intellectually* as well as *physically*, involving hands-on investigation and minds-on reflection" (Hofstein & Lunetta, 2003, p. 49).

In this issue of *The Agriculture Education Magazine*, agricultural education teachers from across the country explain how they use laboratories to engage students in hands-on, minds-on learning. Dave and Christel Fowler share how a collaborative effort between the local FFA alumni affiliate, school district, community college, and private entities provides a facility for hands-on learning. Monty Collins describes how he implements livestock laboratories into his curriculum. Matt Eddy explains how implementing CASE curriculum into his program changed his classroom culture for the better. And Trent Wells describes how he uses multiple laboratories to help students obtain and retain relevant skills.

This issue also highlights laboratory experiences that involve collaboration with university programs. Dr. Ryan Anderson shares how he and his students revitalized a secondary agricultural mechanics laboratory through an "extreme makeover," and Dr. Stephen Edwards describes how university soil science students helped develop a land judging clinic for secondary agricultural education students.

Many agricultural education laboratories provide an additional revenue source for their programs. Rachael Emig explains how her agriculture education program was reestablished with the support of a local nonprofit foundation and land laboratory. Roberta and Ted Manzer share how a plant sale helps grow their horticulture program. Ben Hall describes how his students help provide produce for the school cafeteria. And Sarah Scyphers discusses how her students learn as they raise and sell tilapia.

As agricultural education teachers continue to develop authentic hands-on, minds-on learning opportunities for their students, they will need to be creative, innovative, and entrepreneurial. I hope this issue will give you some ideas for how to use and improve laboratory experiences in your program.

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Students working in the Glidden-Ralston High School agricultural mechanics laboratory. (Photo courtesy of Gary Clark)

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THEME ARTICLE

Extreme Agricultural Mechanics Makeover: A Model for Revitalizing a Laboratory

by Ryan Anderson

Space is typically a hot community in schools. An agricultural mechanics laboratory that goes unused by the agricultural education department will be quickly claimed for the industrial technology department, the custodians, athletics, or even general storage. This problem can accelerate in schools that have a high turnover rate for agricultural education teachers. Once a laboratory has reached a state of disarray, for whatever reason, turning it around can be very time consuming and expensive. Furthermore, if an agricultural laboratory becomes ineffective for instruction, the teacher will need to make the critical decision to use it or lose it. Typically, the schools that have facilities in these conditions are also the schools that do not have the financial resources to fund a complete laboratory makeover.

Enter the Extreme Agricultural Mechanics Makeover: a model to help revitalize a struggling laboratory or jump-start a new one. It's suitable for any laboratory used by the agricultural education department, not just agricultural mechanics.

I created this extreme makeover model from my experience as a beginning teacher and from observations of other beginning teachers over the years. Early in my career, I accepted a teaching position at a school where the agricultural mechanics laboratory had been underutilized for more than a decade. The laboratory had been overrun by school custodians and was packed so full of junk there was only a single aisle accessible. It took more than six weeks for me and my students to clear enough space for the agricultural mechanics class to build two picnic tables. During that time, I had to borrow handsaws and hammers from the industrial technology department because all of the tools in the agricultural education department had disappeared over time. My frustration grew when I noticed that the tools I borrowed all had "agricultural education" engraved into them. My frustration continued to build as I cleaned my way to the welding booths. I discovered that I had four arc welders that actually worked, a box fan for ventilation, and 20 students who all wanted to learn how to weld. I distinctly remember thinking that I would be retired before I would be able to restock the laboratory with the tools I needed to keep my students engaged in hands-on learning.

A decade later, I accepted a faculty position at Iowa State University in 2010. One of my responsibilities was teaching our "methods of teaching agricultural mechanics" course (AGEDS 488). I had inherited a brand new building with almost no tools and equipment. I used my industry contacts to completely outfit my facility with multi-process welders, ventilation systems, cutting torches, small engines, and curriculum materials. I was able to secure approximately $800,000 in donations to jump-start the agricultural mechanics program. I have my students complete a laboratory layout assignment in which they try to maximize available space while maintaining safe work areas.

During my first semester at Iowa State, I served as Mr. Gary Clark's university supervisor while he was student teaching. Upon completion of student teaching, Gary accepted a position with Glidden-Ralston High School in Glidden, Iowa. Gary invited me and my AGEDS 488 class to visit and provide advice on how to jump-start his program. I had my students complete the laboratory layout assignment in conjunction with this visit. When I entered the high school agricultural mechanics laboratory, I had an immediate flashback to when I was a beginning teacher. It was quite apparent that the agricultural mechanics laboratory had not been used to teach agricultural mechanics in quite some time. The facility had been converted into a storage area for what appeared to be everyone but the agricultural education teacher. Major changes were needed in order to revamp the laboratory quickly so Gary did not have to feel like there was no end in sight.

On the drive back to campus, the light bulb went off in my head. Why can't I use my industry connections to help improve not only my university agricultural mechanics laboratory, but also those in Iowa high schools? At the same time, I wanted to add more of a real-life experience to the laboratory layout assignment. That is when I made the connection: If I could train my university students how to develop the skills to revamp an agricultural mechanics laboratory, they would leave my class with the skill set to revamp any agricultural laboratory that they inherit. With those ideas in mind, I worked with our students to develop an application and guidelines to select the winner of the Extreme Agricultural Mechanics Makeover. We wanted to work with a school that couldn't afford a makeover and a beginning teacher who inherited the problem.

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After we selected a winner (Glidden-Ralston High School), the AGEDS 488 students met with the students, teachers, and administration at the winning school to conduct a needs assessment to determine what subject areas were to be covered in the agricultural mechanics courses. Then the AGEDS 488 students worked in groups based on those content areas. Each group explored what tools and equipment would be needed to effectively teach the content for which they were responsible. After developing the tool lists, the groups cross-checked each of the lists for any overlapping tools. I also double-checked the tool lists to ensure that all necessary tools were included. Students then identified at least three different manufacturers for each item and listed contact information for each company. The students also listed the size, quantity, part number, and other pertinent information for each tool in preparation for the requests they were about to make.

The AGEDS 488 students then contacted each vendor to introduce the Extreme Agricultural Mechanics Makeover project. Students introduced themselves, described the purpose of the project, and explained how the vendor could get involved. In hindsight, I should have also worked with my students to develop a script or talking points and practice cold calls prior to contacting vendors. When vendors committed to the project, they shipped the tools and equipment to our university facility. I made arrangements with Des Moines Area Community College to use one of their trailers to store all of the equipment and to transport the trailer on the day of the makeover.

Meanwhile, Gary and his students were transforming their laboratory from an old storage area with accumulated junk to a new facility awaiting new equipment and tools. As part of the makeover, the school district was required to provide $10,000 in matching funds to be used for special projects that would be too taxing for my students to complete. The laboratory had an old gas kiln, and no one knew if the gas lines had been disconnected or capped. Gary used part of the matching funds to remove the kiln and old gas lines to free up more floor space and remove a potential safety hazard. Once the kiln was removed and the laboratory was cleared, Gary was also able to use some of the matching funds to have the floors cleaned, refinished, and sealed. In addition, he purchased paint and supplies to repaint the laboratory and used chain-link fence to build a secure tractor restoration area and tool cage.

High students restoring a farm tractor. (Photo courtesy of Gary Clark)

At this point, we selected a date for the makeover. The AGEDS 488 students contacted each committed vendor to secure any items that had not yet arrived and reached out once more to vendors that had not returned calls or committed to the project. The students also contacted local and state media to inform them of the project and its impact. On the day of the makeover, AGEDS 488 students, faculty members in our department, and members of Iowa State's Colligate FFA organization helped install and place all of the new equipment, tools, textbooks, and curriculum.

It took approximately a year to develop, plan, and implement the Extreme Agricultural Mechanics Makeover. As a result of this project, Glidden-Ralston High School received approximately $100,000 worth of new tools; equipment; and agricultural mechanics and welding textbooks, workbooks, instructor's guides, and curriculum packets. The university students were even able to secure an old tractor for the high school students to restore. Gary did not receive everything he wished for, but he did get enough of a helping hand to jump-start his agricultural mechanics laboratory to the point where he can effectively teach his students.

I would like to thank Gary Clark and the Glidden-Ralston Community School District for allowing the AGEDS 488 students to assist in developing the Agricultural Mechanics Makeover at their school.

Dr. Ryan Anderson is an Assistant Professor in the Department of Agricultural Education and Studies at Iowa State University.

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THEME ARTICLE

Not Your Ordinary Laboratory

by Dave Fowler, Christel Fowler, Dave Tometich, Sam Paul, Ashley Wiebe, & Adam Crews

Leading a heifer. Shearing sheep. Planting corn. Judging livestock. Driving a pig. If those sound like your lesson plans, you might teach in Muscatine, Iowa. The Mcrew

Uscatine Agricultural Education Program has the goal to give every student an opportunity to be successful and develop career skills. Students in the district have the chance to participate in any or all of the following: hands-on laboratory experiences, aquaculture, mechanics, greenhouse production, agronomy production, and livestock production. The community, school district, and supporters have made a tremendous impact on students' educations by helping the agricultural education program provide these laboratory opportunities.

What is MALC?

The Muscatine Agricultural Learning Center (MALC) is an educational facility used by young people and adults from Muscatine and all over the United States for educational programming. Supported by Friends of the Muscatine FFA, Muscatine Community School District (MCSD), Muscatine Community College (MCC), and private entities, it is also leased to the public for expositions, clinics, and a variety of non-agriculutral events. It is overseen by a Board of Directors made up of nine individuals: six from the three entities named above and three area agribusiness people. The MALC opened for use in 2009. The facility is staffed by four agriculture science teachers from MCSD. MALC also hires a few students each year to do chores and other tasks.

The MALC's main purpose is to provide hands-on experience in the field of agricultural science to students who would otherwise be unable to prepare themselves for agricultural careers. Enrollment in the high school program continues to increase, with nearly 400 students enrolled in 2014. The MCSD agricultural education program has added exploratory classes to Central and West Middle Schools. Between 300 and 400 middle school students take these classes each year. MCC has a waiting list of students who want to enroll in their veterinary technician program.

The entrance to the Muscatine Agricultural Learning Center (MALC).

The school population of MCSD is over 50% low income, and many students avail themselves of the opportunity to gain experiences that will prepare them for agricultural careers. Students also learn the importance of continuity and responsibility as they care for crops and animals at the MALC. An example of a hands-on project is the sweet corn plot; students raise and market their crop to the MCSD School Lunch Program and to Hy-Vee, a local grocery store. Students also work with the head of the Seminis Division of Monsanto in their garden projects.

MALC is recognized as one of the top secondary programs in the United States. Professors have visited from as far away as the University of Kentucky and Oregon State University. Numerous high schools have visited in hopes of creating similar opportunities for their students. MALC students are proud to give tours, explain how the facility is integral to their education, and describe how they learn life skills through the program that transfer to any career they may enter. School board member Tom Johanns said, "The scientific and technological advances in agriculture are amazing, but for me, the application of trial and error and common sense have provided the most reward. Ag teachers and their students have a relationship that is more similar to mentor and apprentice. Many aspects of agriculture can not be learned from a book, they have to be experienced."

How MALC Started

The decision to create more hands-on learning opportunities began about 15 years ago. At that time, Muscatine High School served approximately 1,800 students (over 50% low income) with about 160 students enrolled in agriculture classes.

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Students in the agricultural education program ranged from the academic elite to those with alternative learning styles. While our program was quite successful, we faced a striking challenge: 98% of our students were nontraditional. They were highly motivated but lacked production agriculture skills. The agriculture instructors made the following analogy: "Would the district expect to have a winning sports teams without proper facilities for instruction and practice?" The Muscatine FFA Ag Council began to focus on how we could give our young people real-life agriculture experience. Retired agriculture teacher and visionary Dave Fowler said, "The Muscatine Agricultural Learning Center opens doors to careers in agriculture for a diverse population of our students. Thanks to the tireless efforts of the Muscatine High School FFA Ag Council, and community members, the dream became a reality."

The first endeavor into a hands-on laboratory was to raise funds and construct a 2,400-square-foot horticulture lab/greenhouse at a cost of $50,000. After the school board gave permission to raise the funds, our dedicated FFA Ag Council raised the necessary amount in 30 days. Due to the tutelage of Mr. Dave Tometich, the greenhouse initiative has been a financial and instructional success. We've had many state-champion floriculture and horticulture teams and numerous top-five finishes in national FFA career development events. We've also achieved our ultimate goal with many students securing meaningful positions in the workforce.

Following the success of the greenhouse initiative, the next goal was to construct an agricultural learning center to truly delve into hands-on production agriculture. In 2004, with the indomitable FFA Ag Council, our agriculture teachers received permission from the school board to raise funds to build a $3.5 million project. With the generosity of the Muscatine community, both corporate and individual, we were able to purchase 70 acres of land located 7 minutes from the school and construct the facility by 2008. A 28E Agreement was formed among the three entities (Friends of the Muscatine FFA Ag Council, MCSD, and MCC) for ownership and operation of the building.

MALC Today

The MALC consists of a commons, two classrooms, a 14,000-square-foot arena with bleacher seating for 150, a 20-horse stall wing, and a ruminant wing. The instructors; Mr. Dave Tometich, Mr. Sam Paul, Ms. Ashley Wiebe, and Mr. Adam Crews; have varied responsibilities in the operation of the facility. Students plant, manage, and market five acres of vegetable crops and more than 40 acres of row crops and hay. Livestock projects are often donated by area livestock producers; this eliminates a financial hurdle and allows all students to have the opportunity for livestock ownership and responsibility. Students also assist with the many events that are booked

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Dave Fowler is a Retired Agricultural Education Teacher at Muscatine High School, IA.

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THEME ARTICLE

CASE Curriculum Changes Classroom Culture

by Matthew B. Eddy

Since my arrival at Southeast Polk High School in Pleasant Hill, Iowa, I have enjoyed a teaching renaissance. Long gone are the lectures and rinse-and-repeat presentations that I crafted mere hours (sometimes less) before each class. I have no need to caution students about the consequences of failing to complete homework. Now I bask in a classroom culture that promotes learning above memorizing and uses a multitude of labs, robust, experiential learning environments, to reinforce concepts and allow students to pursue learning outcomes.

"How?" you ask. Through my adoption of the CASE curriculum, my classroom culture has completely changed. Not only are students more engaged, they are also expending more of *their* energy in pursuit of *their* education. My energy, which is finite, is now directed toward helping aid their journey.

In the CASE curriculum, students are encouraged to apply the knowledge they gain to a real-world application. I think it's important that teachers use experiential learning to drive home classroom concepts and allow for more robust synthesis of the material. School-based agricultural education programs have been and continue to be the gold standard for how to do this well.

Many benefits were evident when I started conducting labs in my classroom. Students became active knowledge seekers instead of passive vessels waiting to be filled. After an initial adjustment period, students became more reflective and self-supporting. Instead of running to me at the first occurrence of an obstacle, they would stop and ponder possible outcomes and solutions. Creativity began to show through. In fact, I am constantly enthralled with the creativity my students demonstrate. Structured lab situations can be a great catalyst for creativity and I think this may be the primary factor in students' successes as they move into agricultural careers.

About CASE

The CASE project was established to provide a structured sequence of courses, but CASE also serves as a model for elevating the level of rigor and relevance expected for the new vision of agricultural education. Rigor of CASE is validated by the alignment of lessons with national standards for agriculture, science, math, and English language arts. For connection of relevance with student learners, the CASE curriculum highlights the strengths of experiential learning, the heart and soul of agricultural education, by utilizing activity-, project-, and problem-based instructional strategies. (CASE, 2013, Background section, para. 3, 4)

CASE lessons are designed with a concept-based educational model. Students learn these concepts by working through activities, projects, and problems. Each lab includes a daily purpose, procedures, and conclusion questions designed to test a student's grasp of the concepts. Recently, I have begun to move to a standards-based grading system that dovetails nicely with the concepts I am trying to make sure students learn. This ensures that my grades are meaningful representations of student achievement.

The CASE philosophy empowers students to take an active role in their own learning. Each activity, project, and problem prepares students for the next step in the learning process. Activities allow students to start at the same point and end at the same conclusion. Projects encourage students to start with a similar situation but allow them to end with a final product that is unique to each individual. Through problems, students can apply what they know to a variable, complex, and realistic situation. Each lab in the CASE model reinforces the learning concepts of each lesson and allows students to reflect on the outcomes and evaluate their efficacy. Through the conclusion questions, students are able to further assimilate the knowledge they have gained with their previous learning.

From CASE to Real Cows

In 2007, the Southeast Polk Agriculture Department and FFA chapter

Students preparing to pregnancy test an animal at the Animal Learning Center.

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had the opportunity to work with the Animal Learning Center at the Iowa State Fair. A majority of my students (73%) had animal science career aspirations but no practical animal experience. Partnering with the Iowa State Fair would give my students hands-on access to many species in a controlled and supervised environment. I enthusiastically agreed, and students responded by flocking to sign up to work shifts during the fair's 11-day run.

Two years into this project, we were offered another opportunity: Manage the Animal Learning Center's 25-head cow herd year round. Again, we responded with a resounding "YES!" and I added an advanced animal class and summer lab to my curriculum. Students in this class and lab apply their classroom knowledge by managing a real cow–calf herd through a full production cycle.

The summer lab is structured so students can bring a pregnant cow to the fair and follow it through parturition. Students earn internship credit with the local community college, Des Moines Area Community College, by completing more than 120 hours of lab activities during the summer. Students share chore duties, set up the display, and monitor the cows during the 11-day fair. Students can use this lab experience as a springboard into a veterinary science career. Several Southeast Polk alumni who are current vet students credit this experience with solidifying their desire to continue in this field and preparing them to be successful in their studies.

Since my students were already immersed in a laboratory-rich curriculum, working with the Animal Learning Center and cow–calf herd was a natural transition. Students were able to apply their new systems of thinking to a new, constantly changing, real-world situation. I've always summarized CASE as helping students learn to think, and my students' success in the advanced animal science course and lab provide evidence that that's happening.

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Matthew B. Eddy is an Agriculture Instructor / FFA Advisor at Southeast Polk High School, IA.

Not Your Ordinary Laboratory ***(continued from page 8)***

in the arena, which allows them to network with local businesses. The support from the community, businesses, and partners has been second to none and has had a huge impact on students and student achievement. Superintendent Dr. Jerry Riibe added, "The ag department at Muscatine High School is more than a school activity. It represents a community venture to bring added value to our local agribusiness stakeholders and open doors for future vocational options for our students."

The MALC; the FFA greenhouse; and our test plots, gardens, and cropland have given students an opportunity to experience agriculture firsthand. In addition, these laboratory facilities have given students a tremendous chance to expand and house supervised agricultural experience (SAE) projects that interest them and relate to future career choices. High school principal Mike McGrory said, "Our students benefit tremendously not only educationally but as individuals from the many skills they learn and develop throughout their agriculture experience. Lifelong skills such as presentation, portfolio development, time management, and how to effectively work with other individuals are but a few of the skills students develop during their agriculture experience."

So what's it like to be an agriculture student in Muscatine? The eighth grade exploratory students meet once a week at the MALC. A typical day for a high school student might involve working with animals, working with crops, or listening to a presentation by another student about their SAE project or by an agriculture professional. At 3:30 p.m., many students are done for the day. However, some are just getting started. About half of our students use the greenhouse or MALC for some aspect of their SAE project.

Our mission has always been to give all students the knowledge they need to be successful, and put them in situations where they can use that knowledge. Through great support from the community and school, our agricultural education program has done that for many years and will continue to do so for many more.

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THEME ARTICLE

Skill Development and Retention Through Multiple Laboratory Environments

by Trent Wells

Agricultural education programs provide much in terms of skill development for students. According to Phipps, Osborne, Dyer, and Ball (2008), agricultural education experiences, particularly those in laboratory environments, work to increase students' understandings of real-world phenomena through a hands-on approach to learning. These experiences can occur in numerous laboratory environments such as agricultural mechanics facilities, greenhouses, livestock laboratories, land and forest areas, and more. Such educational endeavors can also serve to enrich students' perceptions of the benefits of practical education, all the while granting them new skill sets. At Fayette County High School (FCHS) in Fayette, Alabama, I use a variety of laboratory environments to build upon my students' content knowledge and abilities and appeal to their natural desires for active, hands-on learning.

Students constructed an animal housing area (emphasizing agricultural mechanics education).

Experiential Learning and Psychomotor Skill Acquisition

Kolb (1984) described experiential learning as a critical trait of pragmatic education. This approach is not lost upon agricultural education; rather, our profession has termed this strategy "learning by doing." To capitalize on this concept, we regard psychomotor skill development (i.e., hands-on, minds-on learning) through skills-based education as a prominent goal of the discipline and allow students to practice (and ultimately master) new and unique skill areas, such as electrification, livestock care, and plant propagation. Agricultural education is designed to provide students with knowledge and abilities that are useful beyond high school (Phipps et al., 2008), and laboratory components offer indispensable opportunities for experiential learning.

> Students walk away with a new set of skills gained through high-quality laboratory teaching.

Agricultural Mechanics Laboratory

The primary facility that I use to engage my students year round is the agricultural mechanics laboratory. Perhaps the most common teaching environment in modern agricultural education programs, this is also where the bulk of my year is spent working on projects ranging from building construction to welding to vehicle maintenance. In particular, I use this facility as an opportunity to emphasize the higher-order thinking that occurs within agricultural education.

I feel it is important to highlight the academic instruction that occurs for all content in every environment in which we teach; however, as agricultural mechanics is anecdotally perceived as the "dummy" class, it is principally crucial here. For example, when preparing to construct a storage building for another teacher in the school, my students were required to calculate materials, determine the layout of the building, and frame the structure. They worked through each step mentally and physically and ultimately used their newly acquired knowledge and skills to create a final product for a customer.

I am fortunate that my facility is not limited to woodworking and building construction. I have found great value through the teaching and learning of welding and metalwork-ing. Each of my classes spends time performing basic welding skills, which allows students to explore a high-skill, high-wage career area that many have, in my experience,

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Students perform basic welding skills as they explore high-skill, high-wage careers.

gravitated toward as a result of their experience in agricultural education. When teaching welding, I usually begin by teaching shielded metal arc welding and emphasize the typical content (e.g., bead patterning, electrode traits, etc.) that students need to become novice welders. To provide for adequate skill development, students typically work on each assignment (usually a joint type or other small project) for a 1- or 2-week period, during which they adjust their procedures to meet my standards. This process has allowed my students to develop psychomotor skills that they can (and often do) retain long term. However, agricultural mechanics is not the only arena in which such skills are developed.

Land and Livestock Laboratories

Over the past two school years, my predecessor and I have been working to increase the facilities at FCHS. This work has included construction of animal housing areas (emphasizing agricultural mechanics education), land and pasture management, adding livestock to the campus grounds (for my program, this has included a dairy calf, chickens, a horse, and show sheep), and other needs as they arise. As a result, I have noticed two effects on program development: (a) increased student recruitment, especially of nontraditional students, and (b) expanded course offerings that involve on site live animal work.

These expansions have also created new opportunities for experiential, psychomotor-based development and learning. For example, when we discuss animal husbandry and care, students have opportunities to groom livestock, give vaccinations, physically handle animals, and more. When we work on our land laboratories, students are expected to assist with facility upkeep, including spraying for weeds, constructing and maintaining equipment and animal housing and storage areas, cutting grass, and more. These experiences decrease my workload, teach students new skills, and help create and maintain pride and engagement in the agricultural education program.

Ongoing Program Development

Over the past academic year, we have added welding and woodworking equipment, improved livestock areas through housing additions, and purchased more landscaping equipment to assist with program grounds maintenance. I believe that each of these investments has given my students greater chances for hands-on, minds-on learning that deepens their psychomotor abilities and experiences as an individual. However, I relish the opportunity to expand into an even more diversified program.

I recently constructed a greenhouse facility on the FCHS campus to provide new and expanded opportunities for my students. My priority is to teach horticultural topics through school-based plant sales, which will involve students in agribusiness management, plant growth and care, and customer service as we move into a new agricultural endeavor. This past summer, students assisted with building a new livestock facility (pole barn in a fenced-off acreage) that includes cattle-handling equipment, machinery storage, and space for practical animal management teaching. While it will take time to build up our program's live animal resources, I look forward to meeting the challenge.

The best part of the entire process is involving students who value the effort that is being exerted on their behalf, even though they may not enter a production agriculture career. If nothing else, they walk away with a new set of skills gained through high-quality laboratory teaching.

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Land Labs as a Financial and Educational Resource

by Rachael Emig

Fifty years, 54 acres, 15 people, and persistence brought agricultural education back to the community of Independence, Iowa after the program was discontinued in the 1970s. The reestablished program, which includes an agricultural land lab, is now in its second year. This land lab not only benefits the students, school district, and community, it is also the primary reason the program exists today.

Reestablishing the Program

In the spring of 2011, a group of four community members began to make a strong push for and emphasize the necessity of an agricultural education program. Anticipating the amount of work and dollars that would be involved in such a project, the group formed a corporation: Independence Agricultural Education, Inc. (Indee Ag Ed). This nonprofit corporation was formed solely to seek support and bring agricultural education back to Independence. The original members established by-laws and structured themselves in accordance with standard advisory council requirements. They invited others in the community to represent organizations such as Iowa State University Extension and Outreach, the school board, and local businesses. Males and females were evenly represented.

The farmers of Indee Ag Ed who led the initial push started by going door to door and stopping by all the morning coffee spots in town to seek support for passing the bond issue to construct a new junior–senior high school. They promoted the need to include space to bring agricultural education and FFA back to Independence. They quickly gained support from key community members and other farmers who remembered when FFA was an important part of their high school days. Although the FFA organization has gone through many changes since the 1960s, these proponents knew the benefits students would achieve through FFA as well as instruction in an industry that provides many jobs in their own community.

Indee Ag Ed Department rented 54 acres from the Independence Community School District.

Relationships with nearby agricultural education teachers and school district administrators who had recently added agricultural education programs to their districts were vital in developing a plan to educate the rest of the Independence community. These teachers and administrators gave guidance on what type of courses to teach, extended days, and instructor contract matters. Indee Ag Ed created a campaign called "Planting the Seed" and produced brochures and a Facebook page to attempt to connect with a larger audience. The brochures provided information about financial needs, course descriptions, and a description of each portion of the agricultural education model.

Funded completely through donations by local producers, Indee Ag Ed rented 54 acres from the Independence Community School District. The spring of 2012 was the first growing season and the first source of financial revenue for the program outside of individual donations. Following the 2012 harvest, a local grain elevator volunteered to store the harvested grain and assist in marketing to achieve the largest profit. After all the grain was sold, Indee Ag Ed had a profit of nearly $55,000. The Mustang Foundation is a nonprofit foundation that raises funds to support a variety of projects in the Independence Community School District. An account was created within the Mustang Foundation for the agricultural education program to build funds. From there, the Indee Ag Ed board established a budget to provide evidence that the program could be self-sustaining.

When establishing this budget, the board members included material costs and teacher salary and benefits. They anticipated a decrease in available crop acres to rent because the school district will likely expand into the current space at some point. They also knew the FFA Chapter would be starting from nothing and wanted to provide financial start-up

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Land labs create additional educational opportunities including soil judging.

support. Both of these factors became extremely important in the first year of the program.

At that point, the potential program had verbal support from a large portion of the Independence community,; physical support in 54 acres of crop ground, and financial support. The last piece needed was school board approval. At the January 2012 school board meeting, the board voted unanimously to add agricultural education to the high school curriculum starting in 2013 and the search for an agricultural education teacher could begin.

Maintaining the Program: Partnerships, Promotion, and Planning

Partnerships: Experienced agricultural education teachers know that partnerships are what make a program successful. If your program does not already partner with a local producer or agricultural business, it is a great place to start if you are looking to add or expand a land lab. Sometimes what starts as a single opportunity for a community member to get involved turns into a reliable partnership that creates more opportunities for students to connect classroom learning to real-world ideas and careers.

An example of this is our partnership with an agricultural services company in Independence. At the beginning of our agronomy class, the company agronomist and I put on a day of "crop scouting 101." This partnership is one of the most impactful ways we use our land lab because it provides several types of experiences:

- Class visits
- Hands-on experience
- Student engagement
- Industry application

Walking right outside to our land lab and using a community partnership in the same step is something I try to accomplish.

Indee Ag Ed helped me create a list of more than 200 community members and potential supporters with whom I can communicate and continue to build partnerships. When establishing this type of list, thinking outside the box will create new opportunities. These new supporters receive program newsletters and sponsorship letters in the spring. This approach has been successful for our program; both as a communication tool and a means for gaining financial support.

Promotion: Many programs use a variety of tools to promote their programs. Local newspaper articles and social media posts can be valuable to promoting the benefits and rewards of an agricultural education land lab. For example, to recognize the donations of a local farmer who planted our beans this year, I had a student take pictures while the farmer was in the field and upload them to all of our social media outlets. Doing this gave thanks to that farmer as well as reminded all of our followers of our progress and commitment.

We're now halfway through year two and a major struggle we face is that our program is frequently overlooked because it is not included in the school budget. Students are taking agriculture courses and FFA is visible in the community, but it is important for us to remind the community that we still need their support. Educating the community on the difference between FFA and the agricultural education program is another major goal. Many community members do not understand the separation between these two entities. In the future, this misunderstanding could affect the fundraising needed to sustain the actual program costs. Indee Ag Ed and FFA work together on large

Students performing field work as a part of making operational decisions on their 54 acres of land.

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fundraisers; such as fruit and in the future spring plant sales; to find the best way for both groups to benefit financially.

Planning: Prior to the approval of our program, Indee Ag Ed engaged in significant planning, especially budgeting. To be fiscally responsible and prepared for the future, continued long-term planning is essential and accounts for a majority of our time at quarterly meetings. Discussing the variety of variables that may affect the future of our land lab provides a great teachable moment. Like other producers, we consider market prices, weather conditions, diseases, and urban area expansion, just to name a few.

Using the Land Lab and Looking Ahead

The definition of an agricultural education land lab is loose and adaptable to any place, but in the end, all land labs provide one important thing: experiential learning for students. We know that hands-on learning can exponentially increase student understanding, so we should include such learning whenever possible. If you want to start small or do not currently have access to space, think first about partnerships. For example, explore the possibility of partnering with city organizations to create a community garden. Our program has provided students the opportunity to assist with the small garden at the Buchanan County Health Center in Independence. This garden provides fresh produce for patients and care center residents. Additionally, we have had local cover crop specialists, Extension staff, and Master Gardeners help us with our 2-acre garden. Both of these partnerships would be possible even without our 54-acre land lab.

Why not expand the term "land lab" to encompass an entire community or campus? Our program's horticulture class worked on landscape design and tree diversity in partnership with the Trees Forever organization in Marion, Iowa. Now, students from our program have begun to play a major role in landscaping our newly constructed school. I once met an agricultural education instructor from downtown St. Louis whose main focus was horticulture. Her definition of experiential learning using a land lab included a greenhouse. Her students had great success and were also able to market locally through farmers markets and directly to community members who wanted fresh produce. These examples show how land labs can be customized to the needs of students and the community. To me, this is truly exciting.

Students constructing a greenhouse with a 180 spot hydroponics system.

In our second year, we still have many firsts. We will be operating a greenhouse along with our 2-acre garden. The greenhouse will also house a 180-spot hydroponics system that we hope will provide lettuce for the high school salad bar throughout the school year. Students will be doing more field work and making more operational decisions on our 54 acres of land. Lastly, we will begin to discuss incorporating the agricultural education program into the school district's general fund to offset the loss of acres we will experience in the next 5 to 10 years due to district expansion.

It's become clear that agricultural educators must show the value of their programs to keep them present in a school district. A land lab customized to student, school, and community needs can be a valuable educational and financial resource for any agricultural education program. Ongoing success will require a driven group of people to foster partnerships, publicize impacts, and plan for the future. Because of such efforts, nearly 200 students, almost a third of the total student body, have benefited from agricultural instruction and the land lab at Independence Junior Senior High School. The future possibilities are endless.

Rachael Emig is the Agriculture Education Instructor & FFA Advisor at Independence Junior Senior High School, IA.

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THEME ARTICLE

Livestock Teaching Farms: Students Combine Mind with Muscle

by Monty Collins

Welcome to Pleasantville!

The Pleasantville agricultural education program is located at Pleasantville Community School, an independent school district in Pleasantville, Iowa. This small, rural community (population: 1,700) is approximately 20 miles southeast of Iowa's capital city, Des Moines. It's also known as a "bedroom community" as most families who live and raise their children in Pleasantville choose to travel to Des Moines and other larger cities for employment. Only 10% of Pleasantville FFA members come from a farm where at least one parent farms full-time; an additional 10% come from a farm where both parents work full-time, off-farm jobs and farm part time. The remaining 80% of FFA members live on acreages or in town.

> Students love to learn by doing.

The Pleasantville FFA Livestock Teaching Farm

History: If there's one thing I've learned in 27 years of teaching, it's that students love animals and hands-on activities! After years of teaching animal science via field trips to local livestock farms and animal science businesses with the mindset that "FFA Livestock Farms" were only for high school agricultural education programs in states south of Iowa, I thought, "Enough is enough. It's time to make something happen."

A few years ago, our school district built a new bus barn. The old one is 30 yards away—and right outside my classroom. I talked to a school board member who is a huge supporter of our program about using part of the old bus barn as a place to stall up a cow to calve, a couple of sows to farrow, a few feeder lambs, and maybe some bucket calves once in awhile. I suggested this could help build interest and provide instruction in animal science. Well, did that conversation ever pay off! Not only was he enthused, within a few weeks he offered something even better than the bus barn: a split farmstead (located ½ mile apart) his family was currently leasing. One site would become the "Pleasantville FFA Livestock Teaching Farm" the other the "Pleasantville FFA Poultry Teaching Farm." Our school district now leases the farm, which is just over a mile from our classroom, at $1 per year for 10 years. Insurance is covered through the school district's umbrella coverage. At the same time, we were just starting to organize an FFA alumni chapter. The teaching farm became the perfect project for the alumni to rally around; they pitched in and helped spread enthusiasm throughout our community.

FFA Alumni Chapter Involvement: As one of their first activities, the alumni chapter formed a livestock farm committee. For insurance purposes, the farm is named the "Pleasantville FFA Livestock Teaching Farm," but the alumni chapter assumed responsibility for maintaining the farm, constructing new features, and identifying two "barn moms" who help supervise students. The alumni share a vision of how the teaching farm can positively change lives. They even organize two or three annual workdays for parents, alumni, and students to help with construction projects and clean-up chores.

Farm Description: Students have the opportunity to house many different projects at the teaching farm. Currently, students are allowed to have only meat-type animals at the farm, including market swine, beef, sheep, and goats. However, students enrolled in the animal science course have also cooperatively purchased and calved out beef cows and purchased open heifers, which they later bred and sold in the fall. The livestock farm committee discourages "over the winter" projects due to harsh conditions, but that may change. Horses are currently not allowed because we do not have adequate facilities.

The livestock teaching farm lies on six acres. A 5-acre pasture maintains the beef herd and includes an automatic waterer, a loafing barn that doubles for hay and equipment storage, and feeders. The farm also features a south-facing open barn with four cattle drylot runs that come up into the barn under a lean-to, a cattle-working facility in the barn with a new cattle-working chute, a digital livestock scale, an office/feed/tack room (built by students), and five concrete-floored pens (10 x 10 feet) for market projects that end up at fairs or local meat lockers. A used livestock trailer was donated, and the school district pays the monthly electric and water bills.

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The poultry teaching farm sits on five acres and is located just ½ mile to the south. At that location, alumni, parents, and students have refurbished an older dairy barn to include an indoor pen and outdoor run for 150 pheasants, a pen and outdoor run for 80 quail, and pens for chickens. This location has room to grow in the barn, an additional barn, and another four acres of fenced pasture.

Ag Teacher Overload, Right?: Wrong. The barn mangers ("barn moms" from the FFA alumni chapter) and the alumni livestock committee are awesome! They check projects daily; communicate with students; and coordinate workdays with help from the entire alumni chapter, parents, and students. The livestock committee and barn managers also meet with interested parents and students in January to review opportunities, hand out contracts, discuss feed and project financing options, and answer questions.

Experiential Learning at the Farm

Students enrolled in the animal science course use the teaching farm to gain hands-on, practical experience. Each year students develop and analyze enterprise budgets for a breeding beef project. Students present their budgets and enterprises to a local Iowa State University Beef Extension Specialist for feedback. Students then present their budget to a local bank, obtain financing, sign contracts, and purchase open heifers or bred cows. Students devise chore schedules, feed rations, heat synchronization and A.I. breeding programs. They also work with a local veterinarian to develop an animal health program.

Students are required to maintain a supervised agricultural experience (SAE) project documented with electronic records. In addition to the animal science course students, 13 different individuals owned and cared for livestock and poultry projects at the livestock and poultry teaching farms. Three students raised and marketed 200 pheasants at the poultry farm last year. One student raised, processed, and marketed broiler chickens; another grew out and marketed 100 quail. These projects help support FFA degree advancement, FFA proficiency awards, and career success.

Students are learning and practicing many skills as they do chores: time management, responsibility, work ethic, cooperation, peer training and teaching, industry networking, livestock selection, budgeting, enterprise evaluation, and breeding protocols. But development of psychomotor skills is where a livestock farm can truly shine. This is hands-on learning at its finest. Examples of "doing to learn" on our teaching farm include constructing bulk feed bins, welding gates, weighing feed and animals, washing and grooming livestock, constructing gates, exhibiting livestock, processing poultry, operating a working chute and head-gate, moving cattle according to "flight zones," framing an office/feed room, performing electrical wiring, giving injections, clipping animals, ear tagging, and diagnosing ailments.

Sustaining the Farm: The Power of Partnerships

Several partners support Pleasantville's agricultural education and FFA programs: Pleasantville FFA alumni chapter, Pleasantville Agricultural Education/FFA Program Advisory Committee, and several local and out-of-town businesses. Our program produces and markets three crop test plot parcels totaling 23 acres. Some of the crops may be marketed to the livestock farms in the future.

Our FFA alumni chapter has been instrumental in finding and developing both the livestock and poultry teaching farms. They have raised nearly $62,000 just in the last three years! They also serve as mentors, trainers for FFA career development events, livestock farm barn managers, chaperones, tour sites, and guest speakers.

I'm confident that the teaching farms are sustainable in our community because of the FFA alumni chapter's involvement and their "ownership" in the farm. Also, I'm quite certain we're seeing an increase in enrollment and retention in our agricultural education program due in large part to the teaching farm. Time will tell.

Why should you consider a livestock teaching farm?

Hands-on learning, of course! We all know students love to learn by doing. Livestock teaching farms offer many opportunities to do just that. I believe the foundation of any agricultural education program should be hands-on, entrepreneurship-based, project-based, related to real life, and exploratory in nature. Strong classroom instruction should always be the top priority, and students' educational opportunities should be enhanced by experiential learning through required SAE projects and records. Livestock teaching farms can provide and support all these components of school-based agricultural education.

Monty Collins is the Agricultural Education Instructor at Pleasantville Community High School, IA

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THEME ARTICLE

There's Something "Fishy" Happening at Holston

by Sarah Scyphers

As you stand beside the agriculture buildings at Holston High School in Damascus, Virginia, you hear many noises: heaters for the greenhouses (or fans, depending on the weather), livestock in neighboring fields, and the low hum of aerators at the new aquaculture facility.

Aquaculture Facility

Aquaculture has had a place in the Holston High School agriculture department for more than 15 years. The aquaculture program began in the school greenhouse but later expanded and moved into its own building—a converted storage shed next to the agriculture shop. The agriculture teachers at the time received a grant to purchase all the equipment needed to convert the storage shed into an aquaculture facility. This building housed the aquaculture equipment for eight years.

As a new teacher in the program seven years ago, I was unfamiliar with teaching aquaculture and learned about the subject from my students and the horticulture teacher. After a few years, I realized we needed to invest in a new facility or improve our current one. The building was humid year round, which was starting to create problems with the wooden frame and insulation. We also had to create a sanitary field for every fish harvest, which was becoming an inconvenience.

In the winter of 2010–2011, I learned of a grant available to FFA chapters in southwest and southside Virginia that wanted to begin or expand an alternative agriculture venture. I thought this would be the perfect way to improve both the chapter and our current aquaculture facility. I wrote the grant so we would be able to add a fillet room onto the back of the current facility, with the permission of our maintenance department. I was awarded the grant in the spring of 2011 and was set to start ordering supplies. Then the head of our maintenance department recognized that the planned addition would only be a temporary fix. At this point, we began planning to build a new aquaculture facility with funding from the grant and the school system. We held a ribbon-cutting ceremony for our new 3,000-square-foot aquaculture facility in October 2012.

The new aquaculture facility offers opportunities for students to gain experience working with the public.

Aquaculture Program

Students run the aquaculture program with supervision from teachers. One class deals primarily with raising fish, constructing systems, maintaining environments, harvesting, and marketing. Students in the upper-level agriculture classes installed the tanks and tank plumbing systems in the new facility. These students also check for leaks and repair pipes as needed. On a daily basis, students check water quality in each of the four tanks. Daily tests include pH, nitrite, nitrate, chlorine, and temperature. Performing these tests helps students learn why each factor is important to the tank environment. Students record water quality test results to determine if there are significant changes to the tank environment and whether corrections are needed. During class, students explore the high and low tolerances for each factor and the related signs and symptoms of the fish.

We raise tilapia, a fish native to tropical waters, from 2–3 inches long to market size (3.5-4.0 pounds). We selected tilapia because our facility, which has a recirculating aquaculture system, could provide the required environment. Students learn how to size the fish and sort them according to size so there is less competition in the tanks for food. The students also decide when the fish have reached market weight and are ready to harvest. When constructing the new facility, we built a fillet room to create a sterile environment for filleting and packaging fish. Students learn how to harvest, fillet, and package fish for sale to consumers. They sell the finished product to teachers, school employees, students, parents, and community members.

Aquaculture Education

One of the many benefits of having a facility like this on a small high school campus is the ability to share what is going on with other students and teachers. Holston High School

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has approximately 300 students, and collaboration among teachers is essential to give students an excellent, well-rounded learning experience. Through the aquaculture facility, biology, ecology, and chemistry classes become involved with testing and research. The science classes tour the facility, observe test results, and determine why specific tests are collected. Many times, the science students are enrolled in agriculture classes. The agriculture students have been exposed to the day-to-day procedures and are able to enlighten and inform their science classmates and science teacher about operation of the aquaculture facility. Students in these programs can also assist with agriscience fair projects that investigate aquaculture facility and greenhouse operations.

As part of the agricultural education program, the aquaculture facility also provides many opportunities for FFA student endeavors. The new aquaculture facility has been the primary research facility for two agriscience fair projects. The first project investigated the use of tilapia as a fertilizer source in tobacco beds. The second project researched the use of aquaculture wastewater as an alternative to chemical fertilizers. Both projects were presented at the state level, and the second project advanced to the National FFA Agriscience Fair. Through these research projects, students are exposed to the scientific process and gain a better understanding of chemistry. They develop writing and public speaking skills as they prepare the formal research papers and presentations required for agriscience fair projects. Students also use their time and after-school hours at the aquaculture facility as a part of their supervised agricultural experience (SAE) projects. They can use those hours to apply for Proficiency Awards or as a part of a Star Application. The aquaculture facility provides an alternative to livestock or traditional crop production SAE projects, which may not be feasible or interesting for some students.

Holston High school built a fillet room to create a sterile environment for filleting and packaging fish.

The new aquaculture facility also offers opportunities for students to gain experience working with the public. Students are constantly giving facility tours to school, county, and state officials as well as elementary and middle school students. For older audiences, the students are able to explain how they maintain the facility and produce a consumable product. For younger audiences, the students prepare 5- to 10-minute presentations on the tilapia, how they are raised, and what has to be done to keep them healthy. Students are also in charge of marketing the fish after harvest, informing the public about sales, ensuring product safety, and providing good customer service. These are all great opportunities for high school students to explore and put into words what they have been learning about all year in class and in the facility.

The aquaculture program started as a small endeavor but has become a trademark of the Holston High School agriculture department. Students enjoy taking the aquaculture class and are able to apply what they learn in the aquaculture facility to material in their earth science, biology, chemistry, and ecology classes. Throughout the course, students transition from viewing the facility as just a place where fish are kept to developing pride in the facility and their involvement in it. They understand the hard work that goes into raising the fish, maintaining the environment, and handling other aspects of aquaculture production. In addition, students throughout the agriculture department benefit from the aquaculture facility. It is a place to practice plumbing, engineering, electrical work, and horticulture. The aquaculture facility also allows the career and technical programs at Holston to collaborate with the core programs.

Sarah Scyphers is the Agriculture Instructor and FFA Advisor at Holston High School, VA.

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THEME ARTICLE

School Plant Sales Help Horticulture Program Grow

by Roberta Manzer & Ted Manzer

Solid hands-on activities strengthen any agriculture teacher's arsenal. For programs with a horticulture component, having greenhouse facilities on campus can make the difference between satisfactory student achievement and excellence. At Northeastern High School in Elizabeth City, North Carolina, greenhouse plant sales have helped our program grow from a little over 1,100 square feet under cover to more than 11,000 square feet under cover in 18 years. Profits from the greenhouse operation are reinvested into the program for capital improvements like perimeter fencing, concrete walkways, and a soil bin with a roof and concrete floor.

Northeastern High School changed the direction of its agriculture program in the summer of 1996. A new greenhouse was built the following spring, and growth still has not stopped. What started out as a bedding plant sale has evolved into a comprehensive nursery operation featuring perennials and woody ornamentals. Many of the plants we offer are not typically raised by other local plant businesses. Since many of our students work at these businesses, we have strengthened our reputation with nearby garden centers.

Our agriculture students establish, maintain, and propagate the plant material in their horticulture classes. They also have the opportunity to work directly with customers during the plant sales. Whether or not they choose to be active sellers, students must practice filling out order forms to demonstrate their competence at basic math, container size, and plant identification. Once the students prove they are ready, they can work with real customers in a sales environment. Compliments from patrons boost students' confidence and, in turn, their dedication to the sale. Students take an active role in generating a mailing list for regular customers. In recent years, we have also branched out into electronic media. Students have helped build a Facebook page and increasingly send correspondence through e-mail. Several students are confident enough to write up orders and update lists using iPads.

Northeastern High School students transplanting plants for their greenhouse.

Through plant sales, students gain experience in the operation of a horticultural business. The chance for differential instruction is high as students are able to seek and perform various roles. Some students like the artistic nature of making displays. Other students learn to troubleshoot irrigation and fertilization problems. Because we use a combination of drip and overhead spray irrigation, the students learn how to operate both types. Most of the fertilizer is applied through automated systems, similar to most commercial nurseries and garden centers. For safety and liability reasons, the teachers generally handle all pesticide applications. However, we are confident that students could handle the task if allowed.

All students have the opportunity to work in the greenhouse and nursery operation. Surprisingly, some of the most successful sellers are not the high-achieving students or those who join horticulture teams and win career development events. The greenhouse business gives many students, particularly at-risk kids, a place to belong. Their success often spills over into other classes.

Competitive students achieve better results in horticulture competitions than they would without the facility. All students develop a thorough knowledge of plant identification because we offer many different types of plants for sale to the public. Before students are allowed to sell, they have to identify the plants correctly and know how the plants can be used in the landscape. Also, all students are proud of the plaques covering the classroom walls. They recognize that learning the plants for the sale carried over to success in competition. Even if students were not on a competition team, they still feel part of the success because their efforts during the sale helped fund the cost of sending teams to competitions.

Our expansive greenhouse areas help us teach about the different requirements for different plants. Students learn where certain plants grow

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best, and we work together to manage the space to achieve a balance between plant health and aesthetics. Students discover that a pretty display is not worthwhile if it causes too much stress for the plants. The students are required to learn how to match light and moisture levels for each type of plant that we grow and sell.

Our agriculture program has made a serious effort to connect with our community. The local bonsai and Master Gardener groups hold regular meetings at our facility. They also volunteer to work with our students, and the results are amazing. A few students have gone on to obtain Master Gardener certification and several have become enthralled with the art of bonsai. We regularly have student-made bonsai plants available for sale.

We've also tried to be environmentally friendly by capturing rainwater from our building and collecting it in two large cisterns. Rainwater is more desirable for growing certain crops, such as pansies. Our main water source is very hard and alkaline; it's acceptable for many plants but wrong for others. The rainwater system is helpful for the greenhouse operation, and beneficial as a teaching tool. We can calculate rainfall, control flash flooding of adjacent land, and better determine our water usage.

A well organized display ready for the plant sale.

Roberta Manzer working with students in the greenhouse.

The plant sale business can sometimes be a little overwhelming. Despite our modern systems and automation, we spend an incredible amount of time attending to details. There are just some things students don't see, and we can't expect them to have expertise. The students are learning the nursery and greenhouse craft; they are not experienced horticulturalists. Additionally, teachers must keep track of all money, receipts, and orders. The students do a good job pulling and writing up orders, but it is our responsibility to make sure the books balance. Commissions and deposits must be accounted for daily.

For beginning teachers who want to provide hands-on opportunities for their students, a school greenhouse operation and plant sale is a great way to start. One caution: Do not expect too much too soon. Building a successful business doesn't often happen overnight. We learn from our mistakes just like our students do. Revenue from our operation helps us do our jobs better. This makes coming to work more fun, but sometimes there are crop failures. We teach our students not to be discouraged because life is that way. Running the greenhouse operation along with teaching classes does not make for an easy day with low stress, but the rewards make all the work well worth the effort. Real-life experiences and community connections prepare our students for life after high school. Many will not enter an agricultural career, but building a strong work ethic and a desire to excel is essential for any profession.

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THEME ARTICLE

GAP Certification Takes a School Garden to the Next Level

by Ben Hall

From small containers in kindergarten classrooms used to demonstrate seed germination to small plots on college campuses used to grow vegetables for local food banks, school gardens have become a familiar sight. Educational institutions across the country have begun turning unused space into vegetable gardens. As an agriculture teacher and produce farmer, I am very excited to see the increased interest in fresh, locally grown produce. School gardens provide an excellent tool to teach plant growth and production and help students understand the intricate processes that must occur above and below ground for plants to grow and for food to be produced.

The agriculture department at North Stokes High School in Danbury, North Carolina, is taking the idea of school gardens beyond demonstration to production. Our school garden is essentially a small-scale working farm. We have a 3,500-square-foot production garden and a 600-square-foot hydroponic greenhouse. We also have plans to install a high tunnel on our production garden site to extend our growing season. Because we are able to produce more than what's necessary to satisfy our teaching and school needs, we also focus on commercial production and marketing.

As we began to focus on using what we produce, we wanted to select an opportunity with high visibility so we could also increase student awareness of the project. What better place to reach students than the school cafeteria? Working with the county's Child Nutrition Department, we began planning to get our product into not only the high school cafeteria but also the cafeteria at our feeder middle school. As we looked into participating in the North Carolina Farm-to-School Program, we realized our school garden would need to become GAP certified before we would be allowed to serve our product in our schools.

The USDA developed GAP (Good Agricultural Practices) in 1998 as a way of safeguarding our food supply against microbial contamination. GAP protects consumers from potential harm and protects the land and water resources on our farms by requiring thorough recordkeeping and documentation at all levels of production.

Taking concepts from demonstrations to production with hydroponic tomato plants.

GAP requires irrigation water testing, documentation of any animal manure used in production, and documentation of pesticide applications. A key aspect of GAP is the focus on worker training and sanitation. Many microbial contaminations of fresh produce are traced back to the people who handle the product before it reaches consumers. Accordingly, proper restroom and handwashing facilities are a major component of GAP. Finally, GAP requires traceability along the length of the supply chain, from the farm to the consumer. Traceability codes, which include harvest date, field number, location, and worker identification, allow producers and auditors to accurately track produce at each stage of the process. GAP is more than just farm to fork; it is accountability from seed to fork.

The GAP certification process seemed overwhelming at first. But once we began, we realized many of the requirements were already in place because we are a public school farm. We conduct regular water testing and pest management for the entire school is documented. We document vegetable pest control on our product separately. Restrooms are readily available and cleaned and

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THEME ARTICLE

Land Judging Clinic: A Cooperative Learning Experience

by Stephen W. Edwards

How do you practice land judging without access to a soil pit? You partner with someone who has one! Here's a success story from North Carolina.

The University of Mount Olive (UMO) is one of three postsecondary schools in North Carolina that offer Bachelor of Science degrees in agriculture. Students in all of the agriculture degree programs at UMO are required to take AGE 360: Soil Science. This class is an in-depth study of soils and their uses. The focus on physical, chemical, and biological properties of soils allows students to gain a greater appreciation of this natural resource. A required lab section provides hands-on training for students to better understand properties of the numerous soil types found throughout North Carolina.

Almost half of the students enrolled in the soil science class are agricultural education majors. To help train these students to teach about soils and their properties, one of the lab sessions simulates an FFA land judging contest. The instructor works with a local research farm to establish several soil pits. These pits expose students to working with soil pits while reinforcing instruction about physical, chemical, and biological soil properties and processes. Conducting a mock land judging contest is an additional instructional tool to reinforce the principles of soil classification and determine use class (agricultural or urban) for the soil. As the mock land judging contest begins, students judge the soils according to the contest guidelines. Then the instructor reviews each pit and explains the parameters for the correct answers. The lab is very popular and reinforces many concepts taught in the classroom.

In 2013, the North Carolina FFA Association moved the State Land Judging Career Development Event (CDE) from the spring to the fall. Prior to this change, teams had to qualify for the state event by finishing first, second, or third in a federation contest held in the fall or late winter. When the state event was moved to the fall, it was restructured as an open event; any FFA chapter in North Carolina could send a team. Because federation contests were no longer required for state qualification, most federations stopped holding a local event. This change led to a new dilemma: Without local events, many teams had never seen or worked with a soil pit before the state event.

Students participating in a mock land judging contest as a part of their soil science class.

In the summer of 2013, a local high school agriculture teacher met with UMO faculty to discuss the possibility of cooperating with the university to hold a land judging clinic for secondary agriculture students. A university-hosted mock land judging contest would provide an opportunity for secondary students to work with soil pits prior to the state event.

The UMO soil science instructor contacted the Cherry Research Farm, one of the state research stations operated by the North Carolina Department of Agriculture and Consumer Services. The station superintendent agreed to host the clinic, and two dates (initial date and rain date) were set in October 2013. The secondary agriculture teacher agreed to assist and created slope stakes, field border stakes, and measurement stakes for each pit.

The land judging clinic was conducted to mirror the State FFA Land Judging CDE. Cherry Research Farm staff prepared four soil pits. As in the state competition, soil pits were located in separate fields and included

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Editor's Note: *The National Collegiate Agricultural Education Essay Contest is held in October of each year with participants developing their essays from a topic selected by the host chapter advisor. The essays are presented at the National ATA Conclave. Students had the opportunity to compete in two divisions this year: the traditional Individual Essay division and the Co-Author division (two or more authors).*

Acquiring The Favorite Teacher

by Lacey Jo Peterson

Think back to your favorite teacher as a youth. What made this educator one of the best? Was it the way they talked or the way they got their students engaged? Was it their enthusiasm and encouragement? Maybe you just liked the subject they were teaching. My guess is that it was a mixture of these reasons. For most people in the agricultural field, their favorite teacher was their agricultural educator. But what might have happened if these people who have made a career in agriculture never had an agricultural instructor? Most likely our society would have much fewer agriculturalists. Currently this is a problem; our nation is in great need for agriculture educators. According to a 2011 article in the *Agricultural Education Magazine,* the profession cannot continue its current offerings or expand programs on the small supply of new teachers. This is an issue because the future of our society is dependent on growth in the agricultural field. Fewer agriculture teachers means fewer students becoming career ready for an agricultural profession. Thus, highly qualified agricultural education instructors are in short supply but this issue can be addressed by advocating for the career, providing incentives for agricultural education majors, and giving support to current teachers.

To begin, advocating for agricultural education is the essential first step to creating an adequate supply of instructors. High school and college students should be educated on career opportunities in the field of agricultural education. The National Teach Ag Campaign is leading the way in encouraging students to transform into agricultural educators. They provide many resources for students who are considering a career as an agriculture teacher. But the best way to enlighten students with the joys of teaching is by telling stories. Current agriculture teachers should promote their career to students by sharing their most rewarding moment with the students. They can encourage their students to follow in their footsteps and show them the importance of the job, especially if the student has never considered teaching as a career before.

Additionally, incentives should be provided for agricultural education majors who plan to teach. This would urge college students to major in agricultural education and continue with the program. Monetary contributions to a student's education are one of the best ways to motivate them. College is expensive and any financial support helps, so why not use sources to support agricultural education? Providing scholarships, grants, and loans may greatly help persuade a student towards agricultural education who may be debating majors. Also, having financial help in college will greatly lower the student's stress and this will allow them to concentrate more on classes. Ultimately, this will create better educated and qualified teachers for agriculture students.

Finally, current teachers need moral support. Although it is important to focus on creating more agricultural teachers, we cannot forget our current teachers. According to the National Association of Agricultural Educators, there are around 12,000 agricultural educators in the United States. As a Nation we cannot afford to lose any of the 12,000. They are the foundation of the whole agriculture education program and an essential part to its future. Current teachers are needed to guide agricultural education majors to a successful career, whether that is through practicums, student teaching, or just advice. As an agricultural education major, I look up to the teachers in my future profession and want to learn from them. Teachers that are backed by the students, parents, community, and administration are more likely to succeed and thus their students will succeed. These supporters create strong students, strong programs, and strong teachers of agricultural education. As agricultural teachers it is important that the worth of our program is made clear to students, parents, community members, and the school administra-

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Celebrate and Support Ag: Educators Need More Resources and Pathways to Licensure

by Jaclyn Dingels & Sarah Lee

Every year there are openings for agricultural educators in high schools nationwide that do not get filled. Even if these positions become filled, it is often temporary or by a teacher not licensed to teach agriculture. In fact, the 2013 *Tagged to Teach Ag* National Profile from the National Association of Agricultural Educators (NAAE) states that 146 high school agricultural programs are operating with teachers not licensed to teach agriculture. To have growing and thriving agricultural programs, we need an adequate supply of qualified teachers. Currently, there are not enough agriculture teachers and students suffer as a result. The question is not if, but how, are we going to strengthen current agriculture programs and recruit high quality agriculture teachers? Two important things needed for quality agriculture teachers are recruitment and support. We must increase the number of agricultural education degree programs, enhance options for loan forgiveness, have alternative ways to gain licensure, offer assistance, and celebrate agriculture instructors.

Agricultural education has a place in every school throughout the United States, because everyone needs agriculture. The problem is how to gain enough agriculture teachers to fill those roles. Even if we fill the current open positions for agriculture teachers, NAAE writes that in the next three years 742 agriculture educators will retire across the nation.

There are 105 colleges and universities throughout the country that have some form of agricultural education program. Some states have multiple agricultural education departments to choose from. Texas has 11 higher education institutions, Missouri has six, and Tennessee, Kentucky, and California each have five institutions granting agricultural education degrees. In these states, perspective agriculture educators are able to weigh the size of the program, location, and campus environment in order to decide where they want to attend college. On the other hand, 17 states offer only one agricultural education program; four states have no higher education program for agriculture educators. To recruit more agriculture teachers we must create a place for them to start the process of becoming qualified.

Perspective college or university students oftentimes worry that they cannot afford to attend institutions granting agriculture education degrees. Loan forgiveness programs are a great way to encourage students to enter the profession. The Department of Education offers loan forgiveness for certain subject areas in certain states that have shown a shortage. Therefore, while some states have loan forgiveness for agriculture teachers, some states do not have this opportunity even though there is a clear nationwide shortage of agriculture educators. NAAE should create an agriculture education specific loan forgiveness program so higher education institutions can leverage loan forgiveness programs as a way to recruit more perspective agriculture education teachers.

A way to recruit other non-traditional agriculture teachers is the Community Expert Licensure program. This allows community members with considerable knowledge about agriculture to teach high school agriculture programs while receiving an agriculture education certification. Agriculture professionals that desire a change in careers without having to take a break from a full time job to receive a license greatly benefit from this program. This also offers great support and encouragement to those teachers proving that agricultural education is a worthwhile career.

Support of an agriculture educator and program is as vital as recruiting agriculture instructors. Agriculture instructors not only teach in the classroom, but coach CDEs, advise FFA members, facilitate fundraisers, and so much more! It is incredibly challenging to do everything expected of an agriculture teacher. We must encourage and offer assistance to agriculture educators to keep agriculture teachers motivated and in the profession.

A great way that agriculture teachers are celebrated is the National Teach Ag campaign. This campaign allows agricultural education to stand out and be proud. For university or college agricultural education majors that are approaching student teaching and are about to become certified agriculture instructors, they are comforted by the experience, advice, and feelings of assurance from other agriculture educators. This also celebrates current agriculture teachers and excites high school students about their potential to become an educator.

Strengthening the foundation of agriculture education is key to a successful future for agriculture. With more recruitment and support of cur-

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rent and perspective agriculture education instructors, we can have more agriculture teachers, more agriculture programs, and more students with agricultural education in their lives. Agriculture teachers certainly believe in the future of agriculture and prove it every day.

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Land Judging Clinic:... ***(continued from page 23)***

two piles of soil material: a smaller pile labeled "surface layer" and a larger pile labeled "subsurface layer" (Naderman, 2009, p. 15). Field borders were placed at each site, and two stakes were placed for students to use to determine the slope at each soil pit. Each field also had a sign that listed proposed crops for that particular field so students could recommend proper agricultural land treatments.

The UMO soil science instructor marketed the land judging clinic through emails to the North Carolina FFA listserv and regional coordinators. Because of inclement weather, the clinic was held on the makeup date. There were 61 participants from UMO and six secondary schools in eastern North Carolina. The university students were able to gain field experience that reinforced concepts taught in the classroom. The agricultural education majors learned what was needed to prepare for a land judging contest, which will help them as they enter the teaching profession. The secondary students, many of whom had never seen a soil pit, were able to learn and practice land judging skills in preparation for the state event. The secondary teachers were able to provide a valuable learning experience for their students, and they did not each have to spend significant time preparing a contest at state-level standards. Two of the six high school teams who attended the land judging clinic qualified for the National FFA Soils Career Development Event in Oklahoma. The clinic was a successful teaching and training resource and will be offered again in the fall 2014 semester.

Colleges and universities can help enhance educational opportunities for secondary agriculture programs by inviting secondary teachers and students to engage in laboratory and field experiences. Secondary agriculture teachers are one of the main influences in a student's choice to pursue a degree in agriculture. Helping these secondary teachers provide engaging, hands-on agriculture experiences can, in turn, help postsecondary institutions maintain and grow enrollment in agriculture majors. In addition, these outreach opportunities also allow greater and more efficient use of postsecondary institutions' learning facilities. In the case of the land judging clinic, the same amount of effort was required to create a land judging event for 18 university students as for 61 clinic participants.

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The author thanks the following people for assisting with the land judging clinic: Mrs. Jean Smith, Agriculture Teacher at South Lenoir High School; Mr. Andrew Meier, Research Operations Manager at Cherry Research Farm; and Dr. Sandra Maddox, Director of the Lois G. Britt Agribusiness Center at the University of Mount Olive.

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GAP Certification... *(continued from page 22)*

maintained regularly by our custodial staff. All of these factors gave us a head start on the required documentation.

Though we had some of the GAP requirements in place, we needed additional equipment and training. In 2012, we received funding assistance from a USDA Farm-to-School Planning Grant that enabled us to move forward in this process. Through the grant we were able to purchase work tables; a sink; refrigeration; and boxes for growing, packing, and processing the produce. In addition, we purchased and installed a separate handwashing sink. A training course provided by the North Carolina Cooperative Extension Service brought clarity to the GAP process and highlighted the important relationship between GAP requirements and safe food handling.

GAP is not required in all states to sell in the farm-to-school program, nor is it required to sell to local markets. It can be cost prohibitive for some small-scale producers, but there is an assistance grant available to pay for the audit, which costs $1,000 to $1,500 in North Carolina, depending on location.

Worker sanitation is one of the largest components of GAP. We train our students in safe handling, an often-overlooked practice in school garden programs. There are tons of lesson plans and ideas for integrating a school garden into classroom curriculum. I have looked at several of them. Most describe the science involved, how to integrate writing, how to plan the garden, where to place it, and having water so the kids can wash up AFTER they work in the garden. We need to understand the importance of protecting what we eat as well as how to grow it. Cleanliness needs to be at the beginning of the garden lesson plan.

As we move forward, we hope to develop a marketing plan that will enable us to put our product into local stores and restaurants. Entrepreneurial skills are essential for success in any agricultural enterprise. In future years, our students will develop and implement a marketing plan, develop their own product labels, and solve logistical problems in transporting product to markets.

There are many benefits to school gardens, and hopefully this trend will continue to grow. However, we must be sure to focus on food safety as much as, if not more than, nutrition and plant science. Finally, we need to use school gardens to teach not only self-sufficiency but also entrepreneurial skills. As the market demands locally-grown produce, we have to provide students with skills that can make them successful in the field and in the marketplace. What better place to start than a GAP-certified school garden?

Acquiring The Favorite Teacher *(continued from page 24)*

tors so that they will fully support agricultural education and its growth. This will not only allow for students to be encouraged to teach agriculture by agriculture instructors but also by the school and community. More support and strength equates to more agricultural educators.

Therefore, the shortage of agricultural educators can be ratified by increasing promotion for the career, offering motivations for joining, and showing encouragement for those already involved. Having strong agricultural educators is important to our society's future because they will guide future agriculturalists. Current and future agricultural educators should strive to make a difference in the lives of their students and encourage them in an agricultural career. I hope that my colleagues and I can be the role models that our students remember as their favorite teacher.

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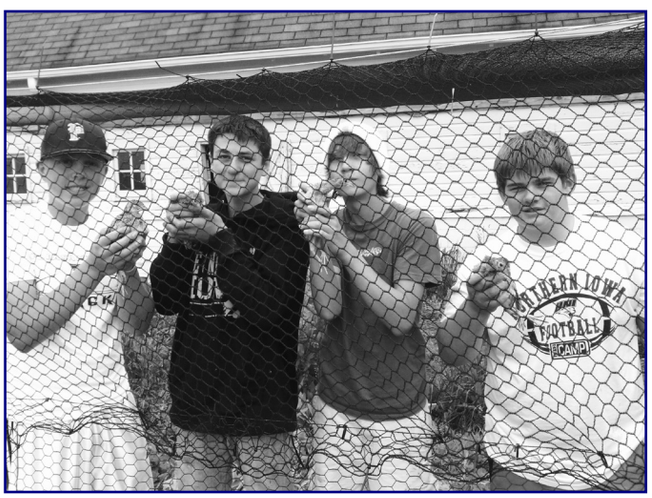
Muscatine Agricultural Learning Center (MALC) (Photo courtesy of Dave Fowler et al.)

Pleasantville Community High School students enjoy a "class beef project" each year. (Photo courtesy of Monty Collins)

Southeast Polk High School students manage a real cow-calf herd. (Photo courtesy of Matthew Eddy)

Northeastern High School students standing in front of one of their greenhouses. (Photo courtesy of Roberta & Ted Manzer)



Pleasantville Community students grow and market pheasants through their Iowa DNR Game Breeders License. (Photo courtesy of Monty Collins)

Muscatine Agricultural Learning Center (MALC) students preparing for equine parts identification. (Photo courtesy of Dave Fowler et al.)