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Envisioning the Future of SBAE

My Hopes for the Future of SBAE

by Dr. Gaea Hock

I am celebrating my 20th year as an agricultural educator this school year. Twenty years!

There have been many changes in those 20 years. Not to age myself, but I didn't have a cell phone until the semester I went to student teach. I didn't have internet at my home the entire six years I was in the high school classroom. I had a laptop cart that I had to check out of the library for classroom use and still did most of my assignments on paper. My high school students were starting to have cell phones, but they were not as common as today. Fast forward to today, my (almost) three-year-old can run the Roku remote better than my husband and my daughter (almost seven) loves to make videos using her iPad.

One of the key reasons we landed in the community we currently reside in was due to the reputation of their agricultural education program – especially the FFA chapter. Over the years I have shifted my appreciation from winning awards at FFA competitions, to the many community service events and career preparation programs hosted by FFA chapters across the state and nation.

When I envision the future of SBAE, I imagine what it will look like when my children reach the age to take classes in the agricultural education program, participate in FFA, and set goals for their SAE(s). My husband and I frequently talk about their future regarding the types of livestock they will show - it is really a ploy to support my husband's habit of buying cattle – and events they will participate in. I wonder how soon I should start working with my daughter to memorize the FFA Creed and if I will be able to chaperone a trip to National FFA Convention. I have big dreams for their future with SBAE!

My daughter has about seven more years before she can take an ag class with my son following shortly after. What do I hope they experience while part of the program? (And yes, I realize they may choose not to participate, but we will cross that bridge later).

I hope they enter a classroom ripe with educational technologies that enhance the learning experience, rather than distract from it. I hope they learn how agriculture is deeply connected to math, science, economics, social studies, and other core academic areas. I hope they participate in service events that meet the needs of all communities making up our school district, state, and nation. I hope they learn about global agriculture, environmental impacts of farming practices, and communicating the importance of agriculture to all audiences. I hope they find a passion in agriculture and can grow their skills through a successful SAE. Finally, I hope they learn just how much this profession works to instill work ethic, leadership skills, and respect in each student.

For these hopes to become reality, we must look to the future, ask complicated questions, and be open to innovation. Each semester I reflect on the lec-

> "Learn from yesterday, live for today, hope for tomorrow. The important thing is not to stop questioning."
>
> – Albert Einstein

Corabel posing for a picture with a few of her cows.

(LEFT) Jasper loves spending time with the calves.
(RIGHT) The Hock kids are always ready for a pasture ride.

tures, assignments, and experiences in my college classes. Are they preparing future educators to meet the demands of their potential classrooms/learning environments? Am I helping them learn skills and develop talents to meet the unknown needs of their professional lives?

Our agricultural education programs continue to expand and adapt to the changing demographics in our communities. As a teacher educator, it is important for me to stay in touch with the middle and secondary classrooms to better train future educators. I work to do this through multiple experiences in the fall and by visiting student teaching interns in the spring. Professional development conferences hosted by NAAE, state and regional ag teacher associations, commodity groups, Extension personnel, departments of agriculture, and other agriculture groups are excellent ways to stay up to date while also considering what the future may hold.

Articles in this issue encompass a variety of ideas, thoughts, challenges, and issues for us to consider as we address future needs. Also contained in this issue are the ATA Essay winners who represent the next generation of agricultural educators. As you read, please consider where you believe school based agricultural education will be in the future and what you can do to help us get there.

Things have changed during my twenty years as an agricultural educator. I know they will continue to change, but I am excited to help meet the needs of future generations of agriculturalists (especially the two Hock kids).

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Envisioning the Future of SBAE

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The Future of SBAE: Oh… the Possibilities

by Dr. Jay Solomonson

As I am sitting here writing this article, patiently waiting for the TV host to announce my numbers for the Powerball® drawing, I can't help but think about how my life is going to change when I inevitably win this $1.5 billion jackpot tonight. Maybe I'll start by purchasing that perfect, picturesque farmhouse with the wraparound porch I have always wanted, or possibly that new pickup truck I've had my eye on. Heck, maybe I'll decide that I want my name on one of the buildings on the college campus where I work. The possibilities would be endless with that type of money.

Now, I know the odds of me winning the grand prize tonight are approximately 1 in 292.2 million, but as Lloyd Christmas exclaimed in the movie Dumb and Dumber, "so you're telling me there's a chance?" Just like dreaming about winning the lottery and thinking about how my life would change, I have always enjoyed visualizing what the future may hold for those of us in school-based agricultural education (SBAE).

Being a twenty year plus veteran of SBAE I have had the opportunity to see first-hand the evolution of our profession. I got to witness the transformation of our agricultural courses from the Ag I, II, III, IV model to specialty courses such as Food Science, Precision Agriculture, and Agricultural Systems Technology, to now a phenomenal national curriculum available with CASE. I have seen FFA programming grow beyond our traditional CDEs and proficiency awards and diversify these areas to ensure more opportunities for students with differing agricultural backgrounds. Even the Supervised Agricultural Experience (SAE) component of our model has evolved and expanded with the SAE for All initiative now being implemented nationwide. The only real consistency I have seen throughout my career is that SBAE is constantly changing.

> Imagine what SBAE could look like if we got EVERYONE at the table to provide a vision of the best possible future for our teachers and students.

Now I realize that most people oppose change for a variety of reasons. By nature, people are creatures of habit. We like routines and things that are familiar to us. Adversely, change is meant to bring something different, and that uncertainty can often be scary. Many may also show resistance because of the loss of control and additional work required to implement such changes. Often though, change is positive and necessary to move forward in our personal and professional lives. This makes me wonder, what should the future of agricultural education look like and what changes would be necessary to positively impact our future SBAE students?

This issue of The Agricultural Education Magazine is all about where leaders of our profession envision the future of SBAE and what changes are needed to make that a reality. Many authors in this issue wrote on emerging agricultural technologies (robotics, precision agriculture, drones, digital agriculture, virtual reality, etc.) and how those will influence what we teach in our future classrooms. Some focused on how to preserve our history, while others decided to look ahead and predict what SBAE could and SHOULD look like in the future to be a more inclusive profession. What I enjoyed most when reading these articles were the unique approaches and different perspectives the authors took to share their visions of the future of SBAE. I feel that allowing all potential stakeholders an opportunity to provide input is exactly what we need to move forward as a profession and cause positive change. Imagine what SBAE could look like if we got EVERYONE at the table to provide a vision of the best possible future for our teachers and students. Oh… the possibilities.

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A Glitch in the Matrix and What the Heck is a Gigawatt?

by Dr. Christopher Clemons, Dr. Jason McKibben, & Dr. James Lindner

When I was eleven years old, I immediately loved Spielberg's now classic, "Back to the Future." Beyond the engaging characters and idealistic 1950s dramatizations, the fictional idea of time travel was mesmerizing. We learned a DeLorean was practical, breeding pine trees was an obsession, gigawatts were real, and plutonium was not found in every corner drug store. Through movies and literature, we imagine, dream, and shape a narrative landscape grounded in characterizations provided to us by authors and screenwriters. Science-fiction can set the stage for our imaginations to conceive what should have been, what is, and what will be. Ultimately, we "look beyond our years" and imagine how our lives, careers, family, and interests establish the legacy we leave behind.

More than 20 years ago, when I was an undergraduate agricultural education student, an assignment asked me to prognosticate the future of education, specifically agricultural education in public schools. The internet was gaining speed, email was exciting, cell phones and their plans had something called roll-over minutes, and PowerPoint was groundbreaking. Organized by groups we discussed the importance of integrating science concepts (long before the acronym of STEM) into our agriculture courses. We imagined lessons where students would be able to visit farms, laboratories, and other agricultural interests without leaving the classroom. We reveled in the idea that our grade books would become much easier using computer programs and "writing" antiquated lesson plans would only be accomplished by "veteran" teachers. We were the future generation! Who needed paper, pencils, and protractors? We had computers that talked to each other and the often-feared busy signal when dialing internet service providers.

While writing this article I was curious how agricultural education scholars pontificated about agricultural and educational changes in the 21st century. While the Y2K glitch never materialized, the adoption of classroom technology, enhanced curricula, student assessment, and teacher development were highly accurate. Some of the first writings appeared throughout the sixties and early seventies from a variety of academicians interested in the future of student management, supervised agricultural experiences, classroom instruction, and the role of agricultural education in the school and community. Byram (1960) reported that the future of agricultural education would focus strongly on narrowing the "knowledge gap" between current agricultural research, farming trends, and the burden classroom teachers experience as they hold (and communicate) a vast amount of knowledge in a complex field of study. He further described a system of short courses addressing specific curricula to be studied quickly. The courses would be designed to teach educators new research or procedures in agricultural mechanics and sciences. Through his, and others' vision of continued teacher education, the professional development and in-service model we use today was realized. Ironically, Byram's manuscript was a short course on developing a long-term instructional model solidly embedded in our conferences, conventions, meetings, and professional certification programs.

Visionaries in our field predicted the advancement of agricultural education beyond the instruction of farming techniques (Byram, 1960) to include a broader array of agricultural curricula. The expansion of agricultural education courses introduced a larger student audience to the variety of agriculture careers and job opportunities (Juergenson, 1961) previously limited to students interested in returning to the family farm. As a result of curricula expansion, the diversity of student interest in agriculture topics grew. Deems (1961) recommended agriculture education teachers establish professional relationships with their students to better understand their lived experiences and home life. Through Deems recommendations, agricultural education teachers pride themselves on knowing students, their parents, and communities.

During this time of curricula growth, Juergenson (1961) and Deems (1961) were strongly advocating updates to teaching materials and facilities. Their belief was to encourage imagination and creativity in all facets of coursework and to reevaluate traditional assessment practices. Deems (1961) shared his experience of assessing student performance in an agriculture mechanics class in the late 1920s. At the time, the student had conceived an idea for a mechanical ditch digger. Deems detailed the student acquiring the materials, transformed metals, new drive arrangement calculations, and assembling procedures. The student failed the course due to a lack of completion. Deems further stated that a decade later

a large factory opened in the community building ditch diggers using many of the same design principles as his former student. As a high school teacher, Deems reflected on his failed performance as a teacher to not see that creativity and imagination are just as powerful as the completed project. We must ask ourselves if we value the process or the product with greater reverence. These experiences highlight the overused vernacular "non-traditional assessment" when agricultural education teachers have been assessing student performance in multiple modalities for over 100 years.

So, where will agricultural education reside in 10, 25, or 50 years? Will we reinvent the values of our programs, react to changing educational and political environments, or expand the definition of being an agriculturalist? As the field moves through time, agricultural education should be cognizant of proactive decisions instead of reactive policies. With little surprise, our profession is changing. Students, parents, communities, and teacher education programs possess vastly different expectations than 10, 20, and 30 years ago. How will we heed the tenets of our values, while adapting and elevating agricultural education, to fulfill our mission to prepare future agriculturalists ready to enter an ever-changing and technologically advanced workplace? For example, during the early 1990s, the field experienced a drastic paradigm shift between agricultural mechanics and science-based agriculture curricula. Both fields are vital to the development of the holistic student. Too often we move the pendulum to the extremes: too far away from agricultural mechanics which incorporate a wide variety of interdisciplinary skills to agriscience education programs integrating invaluable knowledge and skills in chemistry, biology, and mathematics. Our society is as diverse as it is populated, so developing future professionals skilled in a variety of careers is paramount to our continued success. What is the proactive next step to ensure the vitality and success of future generations?

> We must ask ourselves if we value the process or the product with greater reverence.

As was true in Deems' class, the future of agricultural education is in the minds of our kids in classrooms around the world. Are we going to be brave enough or not blinded enough to see the opportunity for what it is? Will we reinvent the values of our programs, react to changing educational and political environments, or expand the definition of being an agriculturalist? During my career, I have witnessed the transition from Ag I, II, III, and IV to content specific course titles, numerous curriculum initiatives, the continued teacher shortage, and the adoption of the National FFA Organization from the Future Farmers of America. Where will agriculture education be in 50 years? I imagine most of us will be retired. What will remain after we leave the classroom is a profession born of initiative, forged in progressive change, and willing to break the mold of a future not yet written.

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A New Ordinary World for Agricultural Education

by Dr. Stephen Edwards

Simon LeBon of Duran Duran wrote some poignant lyrics that can be applied to the history of Agricultural Education in the United States:

Where is the life that I recognize?
(Gone away)
But I won't cry for yesterday
There's an ordinary world
Somehow I have to find
And as I try to make my way
To the ordinary world
I will learn to survive

While Duran Duran turned Ordinary World into a massive hit that revitalized their career as a band, what are we doing in agricultural education to address our continued relevance?

The world has drastically changed in many ways in the past century, yet many of the reasons for passing the Smith-Hughes Act still exist today. Those of us in the industry know there is a continued need for school-based agricultural education programs, but how should our programs change to survive in what has become our new ordinary world?

What is the life that we recognize as agriculture teachers?

Agricultural education was funded by the federal government as a direct response to the needs of the United States to provide a ready food source to support the war effort during World War I. We know that agricultural education existed before the Smith-Hughes Act (Moore, 2019), but the Smith-Hughes Act defined the role of agricultural educators within the United States. Agricultural schools had to "provide for directed or supervised agriculture, either on a farm provided by the school or on other farms for at least six months per year" (National Society for Vocational Education, 1917, p. 12). Besides direct emphasis on supervised agriculture, the Smith-Hughes Act also required states to train teachers, supervisors, and directors who had "adequate vocational experience" or who would "acquire such experience or contact as a part of their training" (p. 28). Also, Agricultural Education was defined as training for "occupations connected with the tillage of the soil, the care of domestic animals and other productive work on the farm (p. 36)." The Smith-Hughes Act was created in an environment where a majority of the American population lived in rural areas. According to the 1910 Census, 49,348,883 people lived in rural areas compared to 42,623,383 people that lived in urban areas. Our "Ordinary World" of Agricultural Education was defined for us as having available farms, fully trained teachers, and a focus on preparing people for production agriculture jobs in a nation where the majority of people lived in rural areas.

What is our new ordinary world?

The demographics of rural areas have changed in the United States in the last century. The population of the United States has more than tripled to a total population of 331,449,281 (US Census Bureau, 2022), however, only 19.3% of the national population currently lives in rural areas (America Counts Staff, 2017). This rural population lives in 97% of the country, as the other 81.7% of the population lives on 3% of the available land in the United States. Because most Americans live in urban areas, the American Farm Bureau (2022) estimates that the majority of the American population is at least three generations removed from the farm. As agricultural educators, we have to recognize that the majority of our potential students and our potential employees in the agricultural industry do not have personal experience in food, fiber, and natural resources production before entering our classrooms. We cannot continue to design our programs based on the assumption that our students, their parents, or their grandparents have direct experience or possibly any experience with agriculture.

Besides the lack of available farm experiences for our students, we also have a national teacher shortage in agricultural education. In the most recent National Agricultural Education Supply & Demand Study, there were 1,680 new hires in the profession, with a turnover rate of 12.6%. While many of these turnovers were explained by teachers switching schools and by new teacher education graduates entering the profession, many of our beginning teachers would not classify as "fully trained" by the original definition provided in the Smith-Hughes Act. Alternative licensure accounted for 18.3% of our new teachers nationwide. Additionally, there were 9% where the licensure status was unknown, 4.5% of agricultural educators who were non-licensed, and 2% that were listed as other licensure. Adding these four numbers together shows us that a little over a third

of the new hires nationwide in agricultural education are not coming into the profession through a traditional training program. Other problems are also shown to us through the teacher supply and demand study. As of September 15, 2021, there were 85 open positions nationwide and another 60 positions were lost at School-Based Agricultural Education programs. Our teacher educator programs are also unable to meet the current gap in employment. Without focused recruitment efforts, it would be difficult to increase retention rates as the profession is at an all-time high with 75% of program completers entering the classroom (Smith, Foster, & Lawver, 2022).

Production agriculture careers are important to ensure our national sovereignty, but less than 2% of the American population lives and works on a farm or ranch (American Farm Bureau, 2022). American agriculture is a victim of its success; we produce so much food that American consumers throw away about 25% of the food items they purchase for at-home consumption. Another 40% of all food raised in the United States is never eaten. When the average American farmer can claim to feed 166 other people, we have a situation where we cannot strictly focus our agricultural education programs on production agriculture as we would narrow ourselves to a very small part of the population. Instead of just production agriculture, a better look at the industry is the impact of the combined agriculture, food, and related industries. The combined industry employs 10.3 % of the national population and has a total economic output of $1.055 trillion for the United States economy (USDA, 2022). The combined industry is where we need to encourage our students to pursue careers as agriculture is extremely important to the national economy.

How will we learn to survive?

The Smith-Hughes Act tried to provide federal support for agricultural education programs. Agricultural education programs were supposed to have farms or access to farms. These programs were supposed to employ teachers who were adequately trained in their vocational areas. The programs were also supposed to prepare students for production agriculture jobs or other directly related areas. We need to address three main areas in order to survive (and thrive) as agricultural educators.

> We cannot continue to design our programs based on the assumption that our students, their parents, or their grandparents have direct experience or possibly any experience with agriculture.

First, it is more important than ever to have on-campus facilities for our students. Most of our students do not have direct experiences on the farm, so our programs have to provide the facilities to make agriculture come alive. It is still important for us to have access to up-to-date facilities in our School Based Agricultural Education programs. Facilities were never provided for in the Smith-Hughes Act or today's Perkins Funding. Local communities and state educational agencies need to provide the structures that make vocational education possible. If agricultural education is to remain vital in the United States, teachers and students need current facilities so program graduates are prepared to enter the agricultural industry. Local communities and state educational associations need to see that investment in facilities will lead to an improvement in the job and career aspects of the community-at-large over some time.

Second, we as agricultural educators can celebrate that we are at an all-time high percentage-wise with agricultural education graduates entering the profession, but teacher preparation programs nationwide are not meeting the current employment demands required by schools and school districts. If we are going to solve the teacher shortage, several options need to be pursued. A first option is to encourage state general assemblies to eliminate some of the artificial licensing requirements for teachers. These requirements are usually paid for out of pocket by education majors and they can discourage students from pursuing a career in the classroom. Another option is to provide incentives for new teachers to enter the classroom. Opportunities such as student loan forgiveness that is directly tied to teaching can assist students with sticking with educational careers. A third option is to provide incentives for experienced teachers to stay in the classroom. School-based agricultural education programs are the gateway for employees in the agricultural sector of our economy. The agricultural industry needs to consider providing monetary incentives for people to enter and stay in the classroom. While these teachers will not work for the employer, they are key to the recruitment of new professionals

Finally, most jobs in the agricultural industry are not in production agriculture. It is important to teach our current stu-

dents who are directly involved in farming, but our programs need to be designed to help prepare all of our students for areas within agriculture. One key option that is available to all teachers is the use of the SAE for All materials that are provided by The Council (n.d.). When the SAE for All materials are used, students will have the chance to explore career options in depth. The SAE for All resources provide teachers with the tools to help coach students to pursue a career area of interest. The materials provide students the chance to engage in meaningful career preparation while they are enrolled in the school-based agricultural education program. SAE for All gives teachers an option to personalize the SAE experience based on the career interest of all students.

Agricultural Education has changed, but if we provide investment in facilities and materials, an investment in our teacher training efforts, and an investment in focused career training, we can not only survive but thrive in our "New Ordinary World."

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Interdisciplinary Career and Technical Programs of Study in Secondary Agricultural Education

by Dr. Chaney Mosley

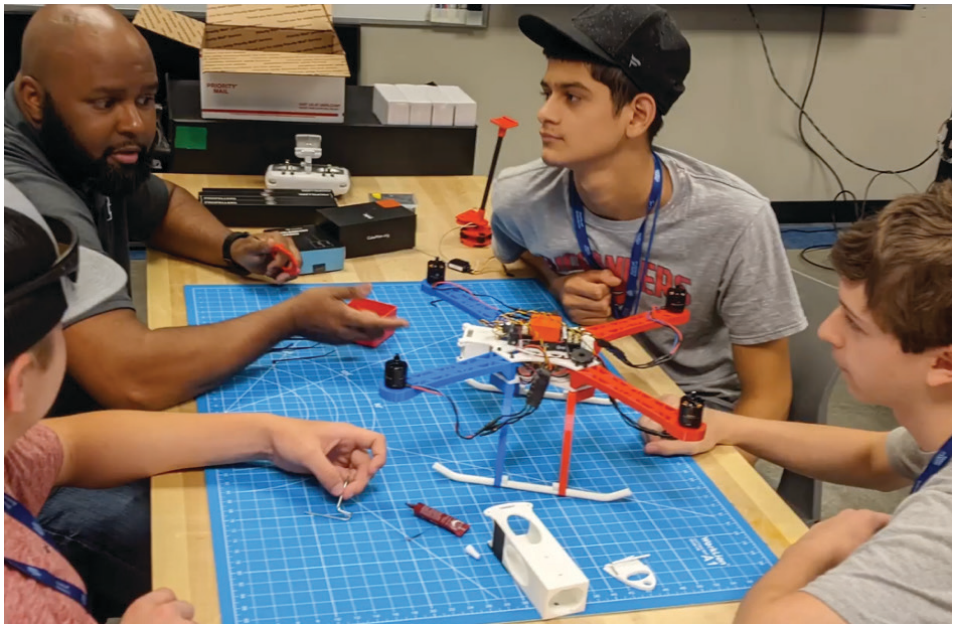
More than a few years ago, 2006 to be exact, I traveled to Mexico with a group of others from the industry to learn about agricultural production and marketing in Latin America. Aside from grafting coffee plants, planting potatoes, and visiting with Dr. Norman Borlaug, much of what I learned was from stories shared by other participants. One story, in particular, stands out in my mind.

Upon graduating from college, a woman from Kansas aspired to work in the Big Apple. Armed with a degree in marketing, she flew to New York City for an interview with an advertising firm. As part of the interview, the employer described a current client, a dairy, for whom they were building a campaign. After receiving background information, she was escorted to a room with prototypes of marketing products – television commercial storyboards, print advertisements, and billboard signage, among others. Her task was to review the draft materials and recommend one change that would offer the greatest enhancement to the promotion. The catch, though, was that she only had 30 minutes. As anxiety rose, knowing this was a make or break situation in the interview, she mentally prepped for what she might find. With 25 minutes left on the clock, she returned to the interview room. The executive asked if everything was okay and she informed him she was ready to give her presentation. He laughed, questioning her certainty, and assembled the rest of the team. Before starting, he explained no other candidate had spent less than the full amount of allotted time. Her presentation was short and to the point: to improve the entire campaign, change the one image that was consistent across all materials – the cow. She clarified the animal shown was a beef cow, not a dairy cow, and spent the bulk of her time educating the urbanites about the difference. She asked if the client had seen any draft products – they had not. She likely saved that campaign. It was a bold move that resulted in a job offer.

To be clear, it wasn't her business acumen or risk-taking pivot that served her well. Rather, it was the combination of agriculture courses she took in high school and marketing coursework in college that gave her an advantage over the competition.

Programs of Study

The current model of high school career and technical education directs students into focused career pathways or programs of study under the umbrella of career clusters. Ideally, a student deemed a concentrator at graduation would have completed at least three of the four courses. In the Agriculture, Food, and Natural Resources (AFNR) career cluster, programs of study titles vary by state; however, common threads are animal/veterinary science, agricultural mechanics; horticulture/plant science; environmental natural resources, agricultural business and marketing, and food science, among others. State education agencies



Campers at MTSU's Digital Agriculture Camp receiving advice on finishing their drone from Assistant Daryl Hickman, UAS Lab Coordinator in the Aerospace Department.

promote approved programs of study with related courses in a chronological sequence (9th grade – 12th grade). Occasionally, a program of study may articulate additional courses that could be used to complete the pathway in tandem with or in lieu of one of the four courses in the prescribed sequence. Rarely, though, do these other courses fall outside the instruction of an AFNR teacher. Herein lies the problem.

It is unlikely the woman described in the opening story would have secured her dream job had she not taken both agriculture and marketing courses. And while she did take both, it required attending college to do that. Many AFNR students do not attend college. Without exposure to other career areas, their post-secondary plans become limited in scope and, ultimately, students who choose immediate entry into the workforce after high school could miss out on opportunities due to lack of awareness of both jobs and personal career interests.

Not all Ag is Ag

As a career cluster, agriculture is unique. Our industry employs folks from other career areas such as engineering, law enforcement, information technology, healthcare, hospitality and tourism, finance, transportation and distribution, and construction, among others. I suspect if we looked across all states, we might find snippets of these career areas sprinkled throughout standards in an attempt to be all things to agriculture. However, aside from the small sample of teachers who may actually have content expertise in computer programming, aviation, or journalism, for example, most of us are experts in general agriculture (with a preference and stronger acumen for plants, animals, business, mechanics, or another subject we might teach). So, it's prudent to ask ourselves if we are performing a disservice to our students, and the industry, when we discourage them from taking other career and technical courses because it might mean their schedule doesn't allow them to enroll in agriculture.

We can't be *all things* without *some things* suffering. For example, unmanned aircraft systems (UAS), or drones, are frequently used in agriculture. Over the last decade, existing AFNR course standards have incorporated drone technology and, in some states, new AFNR courses, solely dedicated to drones, have been developed. After reviewing standards from a few states, I realized the bulk of these standards focus on aviation – rules and regulations, pilot licensing, flight and maintenance – not on their application in agriculture. Would it make sense for these courses to, instead, exist under the leadership of an aerospace/aviation instructor?

Interdisciplinary Programs of Study

As we consider the future of agricultural education, I'd like to propose the possibility of interdisciplinary programs of study in AFNR. Consider the following possible, but not exhaustive, interdisciplinary programs of study:

- *Agricultural Engineering* – FFA and TSA
- *Agricultural Law and Public Safety* – FFA, Skills USA and Mock Trial
- *Agricultural Hospitality & Tourism* – FFA and FCCLA

Table 1. Hypothetical interdisciplinary AFNR programs of study and course sequence.

Program of Study	9th Grade Ag Course	10th Grade CTE Course	11th Grade Ag Course	12th Grade CTE Course
Agricultural Engineering	Agriscience	Principles of Engineering	Agricultural Mechanics	Engineering Design
Agricultural Law and Public Safety	Agriscience	Intro to Criminal Justice	Natural Resource Management	Pre-Law
Agricultural Hospitality & Tourism	Agriscience	Intro to Hospitality & Tourism	Food Science	Event Planning & Management
Agricultural Education and Training	Agriscience	Fundamentals of Education	Principles of Food Production	Teaching as a Profession
Agricultural Marketing	Agriscience	Intro to Business & Marketing	Farm & Agribusiness Management	Advertising & Public Relations
Agricultural Finance	Agriscience	Intro to Finance	Agricultural Business	Banking & Finance

- *Agricultural Education and Training* – FFA and Educators Rising
- *Agricultural Marketing* – FFA and DECA
- *Agricultural Finance* – FFA and FBLA or BPA

In these examples, a student might take two courses in each CTE area (the second marked by italics). Further, students would have expanded access to multiple extracurricular opportunities through additional career and technical student organizations and competitive events. Moreover, imagine how different the postsecondary plans for students who experience a combination of career and technical coursework might be with such enhanced career exploration.

> Students who choose immediate entry into the workforce after high school could miss out on opportunities due to lack of awareness of both jobs and personal career interests.

Would it work?

There are numerous examples of successful related efforts in both formal and nonformal settings, though widespread adoption has not occurred. For example, this past summer Middle Tennessee State University hosted a group of high school students for a three-week, residential digital agriculture summer camp. Participating students were from secondary AFNR, engineering, and information technology (IT) career and technical programs; not all were enrolled in high school agriculture. The camp instructors were experts from data science, aerospace, and precision agriculture. In the camp, students programmed drones to autonomously fly over crop fields and collect data that was organized in a spreadsheet, analyzed and used to recommend on-farm practices that would decrease inputs while increasing yield. The integration of CTE disciplines enabled students to become problem solvers while developing skills that could be useful in their homes and communities. At the end of camp, interest in postsecondary education and careers for all three areas of focus (agriculture, aerospace, and data science) had increased.

Another example was found in Alabama State Department of Education's (2022) AFNR courses. *Career Clusters Exploration through Agriscience* is a course that, as the title suggests, introduces students to how agriculture relates to other career clusters. The purpose of the course is to help students make more informed career decisions by being exposed to a variety of career opportunities. Those teaching the course are encouraged to make accommodations aligned with community interests and local resources – in other words, local and regional employment opportunities.

What's the holdup?

Change is hard. Some of us have shared enthusiasm and others frustration when a CDE or LDE rule is altered; when a course is no longer approved in our state; when official dress requirements and expectations are changed. All of us have found adapting to change difficult at some point. I think, perhaps, most resistance to adopting an interdisciplinary program of study approach would relate to FFA.

Article V., Section B. of the National FFA Organization's Constitution (2019) indicates to be eligible for and retention of membership, a student must "be enrolled in at least one agricultural education course during the school year and/or follow a planned course of study" (p. 2). So, if a student completed agriculture in the 9th grade and then took a computer programming course in 10th grade because they were interested in learning to develop apps that would benefit agriculture, technically, they would be ineligible for membership in FFA, right? Unless, that is, *the planned course of study* was interdisciplinary. I've observed some states have an SAE course (not requiring in-person instruction) that allows students to stay enrolled when an agriculture course doesn't fit into their schedule because of band, an advanced placement course, or any other scheduling conflict. Why not also let students take another CTE course, if it is part of an articulated program of study, and allow it to meet FFA membership requirements as well?

Beyond membership, I suspect some would frown at the prospect of not seeing students regularly and how that might interfere with FFA involvement. However, that already happens in many schools across the country due to block scheduling. And, I've witnessed numerous advisors maintain relationships with students through after school involvement such as competition practice, meetings, and other activities. When considering a new approach to school-based agricultural education, it's easy for us to quickly say "we can't do that"; what would happen if, instead, we more frequently asked "how can we do that?"

How can we do that?

Structurally changing AFNR programs of study to provide room for an interdisciplinary approach cannot happen overnight. Such changes would likely require altering FFA membership requirements, state program of

study requirements, or even our collective understanding of what does and does not qualify as agricultural education. Hopefully, when we think about the future of agricultural education, we are at least making decisions, taking stances, and doing things in the best interest of students and not adults. As a parent of three, I often assume I know better than and what is best for my kids. My seven-year old recently proved me wrong when questioning the structural design of a staircase coming off our deck to the porch below. He plainly asked, "Why didn't you make the stairs go to the porch and the backyard?" Of course, he was just looking for a faster, easier way to get to the lawn. My husband (a residential contractor) and I locked eyes and laughed. I then asked him, "Why didn't we?" As teachers, we sometimes fall victim to the same approach. We think we know what's best for students, but if we can get into a habit of asking them, instead of assuming, we might find they, too, would be interested in taking another CTE course to enhance their learning and postsecondary preparation. For the record, the steps now also lead to the back yard.

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Translating SAE into Work-Based Learning Serves to Elevate Agricultural Education as a Premier CTE Program

by Dr. Michael S. Retallick & Mathew Eddy

In the next 25 years, agricultural education will be recognized widely for its ability to prepare all students for the world of work. Policymakers, educational leaders, and teachers, especially our CTE brothers and sisters, will be trying to create the "magic sauce" known in the School-Based Agricultural Education (SBAE) realm as Supervised Agricultural Experience (SAE). This isn't because of anything new in agricultural education or some revolutionary discovery. It's because we have figured out how to translate what we do into terminology and data that align with mainstream education and policy.

One of the challenges agricultural education has always faced is using a lexicon that doesn't always align or resonate with external stakeholders and leaders. Ask anyone who has been a part of SBAE, trained as an agriculture teacher, or taught SBAE and they can tell you about SAE. Talk to school administrators, school board members, fellow CTE teachers, state and national education leaders and policymakers and they will undoubtedly have no idea what SAE is nor appreciate the value it provides those in agricultural education.

> Inclusiveness means equitable access and involvement and the foundational SAE is an equitable SAE.

One large step toward this vision is the evolution of the concept known as SAE for All (The National Council for Agricultural Education, 2017). The SAE Student Roadmap in SAE for All provides an inclusive framework where all students can explore careers, develop skills for careers and college along with establishing a foundation for personal financial management and planning (Figure 1). Inclusiveness means equitable access and involvement and the foundational SAE is an equitable SAE. It also aligns with the principles of Work-Based Learning (WBL) by allowing students to explore the foundations for workplace skills like safety and teamwork within the broad world of agriculture. Designed to be developmental, Foundational

Figure 1.
Foundational Elements of SAE for All.
The National Council for Agricultural Education, 2017

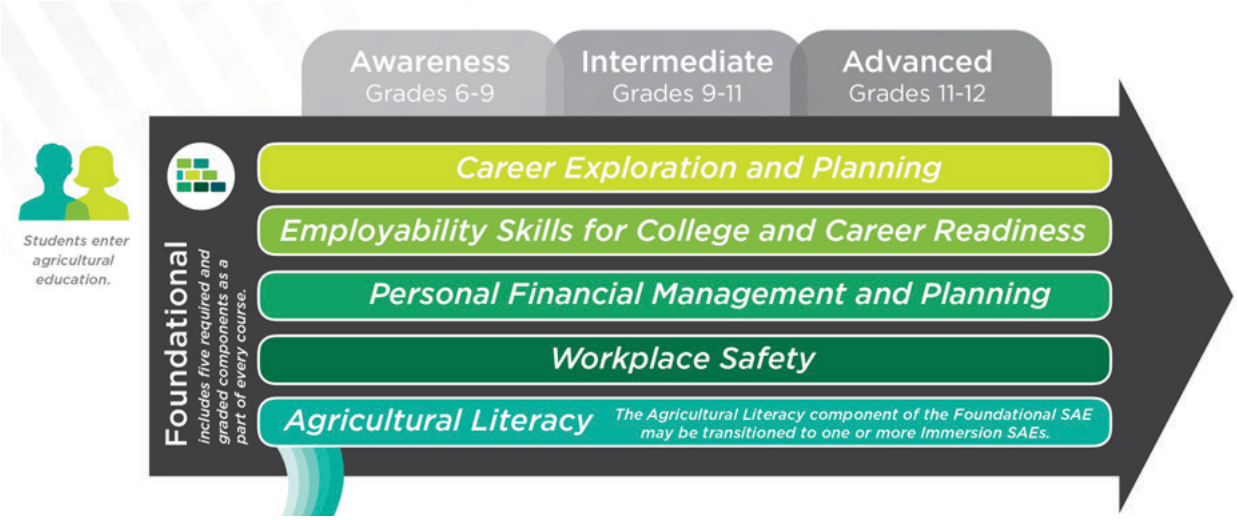
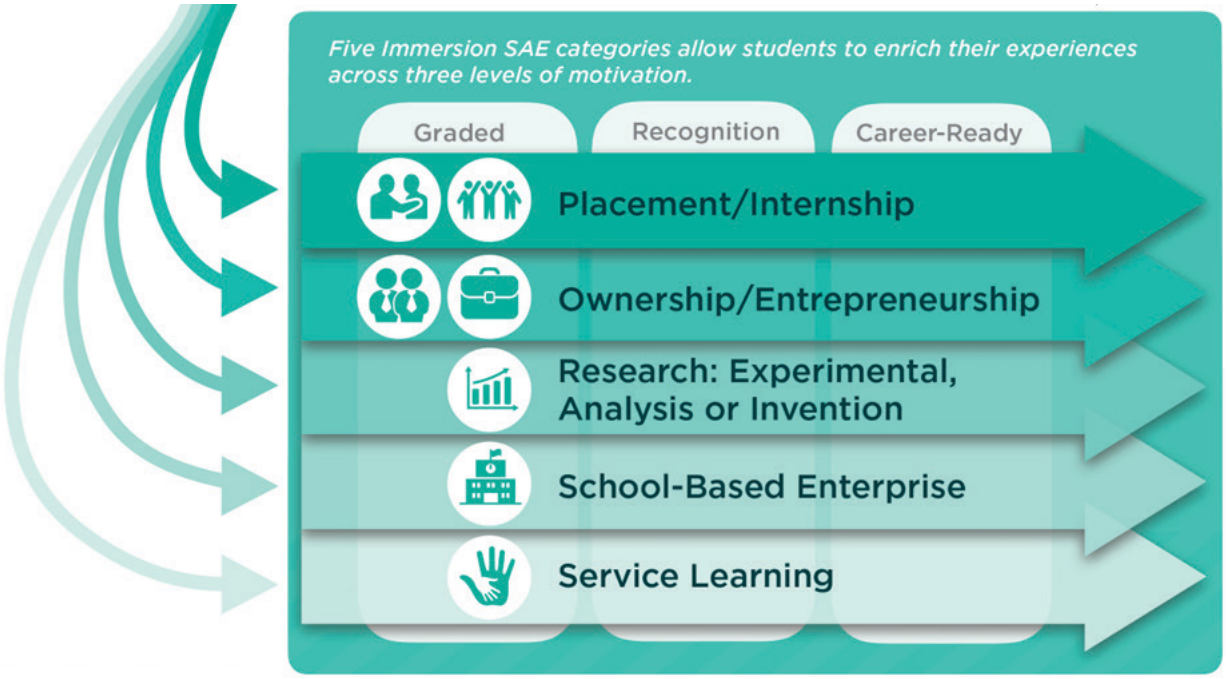


Figure 2. Immersion SAE Categories. The National Council for Agricultural Education, 2017



SAEs allow new students to initially build awareness and later grow to advanced stages (i.e., Immersion SAEs) as they continue their educational journey.

As much as the foundational SAE is inclusive, the immersion SAE is specialized and individualized (Figure 2). Students have the opportunity to immerse themselves into a broad range of agricultural experiences based on their individual interests resulting from their career exploration and planning in the foundational SAE. There is the opportunity for students to earn a grade and recognition for the learning that takes place and their ability to document through recordkeeping.

The SAE Student Roadmap is the first step in translating what we do in agricultural education into mainstream education lingo. Terms like employability skills, career exploration, financial management and planning, career-readiness, service learning, research, entrepreneurship, and internship are words that align with education leaders' and policymakers' WBL efforts to address our societal need for a well-prepared workforce. And most importantly, this framework isn't built for only those students with the resources, opportunities, and privilege. It's designed for and available to Every Student, Every Class, Every Day!

The next step to secure this vision is the profession's commitment to an inclusive agricultural education model where we are 'All in for Agricultural Education' (Figure 3). To have career and college-ready students who are ready to be lifelong learners, all students should have classroom instruction, WBL via SAE, and leadership and career development via FFA. A single circle model communicates internally and externally that all three components of agricultural education are offered to ALL students. This approach is truly integral and, unlike the three-circle model we see today, does not send the message that any of the three components of SBAE are separate and could be minimized or eliminated by the local program. A local SBAE program is not complete without all three components.

So, in 25 years, some in the profession will be wondering what is different. They will argue we are still offering the same comprehensive SBAE program we were in 2020. The difference will be employers, educational leaders, and policymakers will have a greater appreciation of SBAE because we ultimately figured out how to translate what we do into a mainstream lexicon.

We've always had great stories but in 25 years we will have impactful data analytics to go with those stories. Annual as well as longitudinal data like number and types of skills developed, hours and dollars invested, the value of SAE based on return on investment by students, school district, taxpayers, employers, etc. will have a significant impact on all involved. And, our students, programs, and communities will benefit in ways we didn't anticipate like increased high school student retention and graduation rates, employment advantages, greater understanding of math, science and English after being applied in a contextual project, greater entrepreneurial capacity and efficacy, and rural economic development.

Another factor leading to stakeholder appreciation is the integral and inclusive nature of SBAE. Integral in the sense that we offer the three components of the SBAE Model and inclusive in that ALL agricultural education

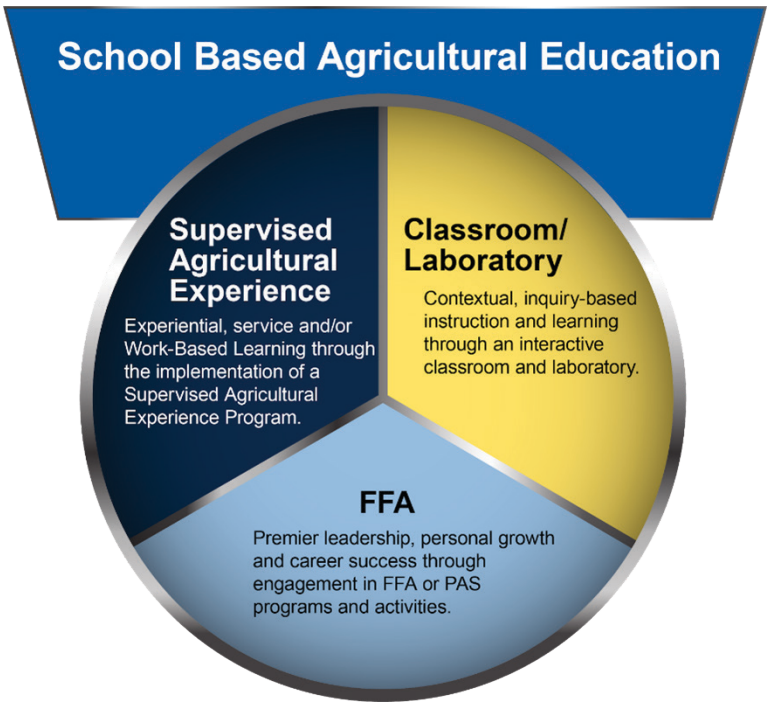


Figure 3.
All In for Agricultural Education SBAE Model
Iowa Department of Education, n.d.

students receive training from all three components of the model in the local program. Integral allows for access to funding from general fund dollars (public purpose) for all SBAE and determining public purpose is easier when all students are impacted. When we offer the complete model to all students, there is little question that the needed resources meet public purpose and are fundable via general fund dollars just like books or curricular supplies. When this happens, things like management software to track and document the involvement and skill development of every student can be paid (and perhaps explicitly funded through a state-level budget line item) through the general fund.

In summary, quite often we hear agriculture teachers and leaders say "we've been doing this for years" when new initiatives come along, like WBL. The statement may have a lot of truth to it. It's not educational leaders' and policymakers' fault for not knowing; it is ours for not translating our work or documenting our impact using data in a manner that they can relate or utilize. Over the next 25 years, we will have the analytics and opportunity to communicate to external stakeholders the impact of the SBAE program, especially the impact of SAE for All. Our success will lead to increased funding and resources, serving as a model program for all of CTE, and local, state, and federal policy that elevates our programming and better prepares all students for a lifetime of learning and entry into the world of work.

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The Future of School-Based Agricultural Education - Strengthening Communities through Collaboration with Cooperative Extension

by Dr. Karen Vines, Alison Jones, & Andy Seibel

An emphasis on education in rural communities led to the passage of the 1914 Smith-Lever and 1917 Smith-Hughes acts. Both acts were sponsored by Hoke Smith of Georgia and intended to improve rural communities and agricultural productivity. In addition, the two acts contribute significantly to youth development through 4-H and FFA programs.

The Smith-Lever act provided nonformal education, targeting rural families, through development of the Cooperative Extension Service. This act provided rural families access to research-based developments in agricultural production, food preservation and safety, farm management, and led to the development of agricultural leadership programs. Cooperative Extension programming led to the development of 4-H in order to demonstrate new ways of doing things for potential adoption by other members of the community. Youth in 4-H programs traditionally are aged 9 to 19, although many programs also include clover buds, aged 5 to 8 years. Funding primarily supports agents or educators, specialists and administrators through a mixture of state, local, and federal funds. The program makes extensive use of subject matter and organizational support volunteers. Programs are provided in schools and in communities through 4-H clubs. Programs focus on increasing subject matter, leadership skills, and civic engagement.

The Smith-Hughes Act provided formal education, providing pre-service education for future agricultural teachers to be sent to teach at the high school level in rural communities. In this way, youth in rural communities were taught skills that could be used on the farm with an expectation that these youth would seek a vocation in agriculture. Programs originally focused on high school youth but in some cases did incorporate middle school as well. Funding was allotted to states to develop secondary vocational education. This was the basis for the development of many departments of agricultural education in land grant universities. Funds were also provided at the local level to support educational delivery. The Carl Perkins Vocational Education Act of 1984 supported this by providing funds for purchase of equipment. Resources are traditionally provided by the school system or volunteers and agricultural organizations within the community. Year-round opportunities are provided through participation of youth in FFA organizations that emphasize agricultural knowledge and leadership development. The FFA Alumni and Supporters organization provides membership opportunities for people to participate in local and national organizations which provide support of programs and serve in advisory and fundraising capacity.

In some cases, 4-H and FFA programs are seen as competitive. However, Dr. Curtis Absher, retired beef extension specialist and administrator from the University of Kentucky, highlights that participating in both organizations was beneficial to him through his academic and professional career:

> *When I was a freshman in high school, my high school principal advised that I drop 4-H activities and concentrate my efforts on FFA programs. Had I followed that well-intended advice many life development opportunities would have been lost. At that time, I had already become deeply involved in 4-H beef projects and livestock judging. I was attracted to FFA because my goal at that point in life was to be a farmer or a farm manager. I valued the farm shop learning Vocational Agriculture provided and the instruction and practice in leadership and parliamentary procedures but felt the hands-on training associated with 4-H gave me technical training that I would have missed otherwise. I benefited from both. I was elected to positions of leadership in both 4-H and FFA as well as in other organizations as a result of FFA. FFA gave me training in parliamentary procedures that I would not have gotten anywhere else. I was in most offices of the FFA , including president. I was vice pres-*

ident of my junior class in high school and campaign manager of the president of the senior class. I was also president of the 4-H All Stars and president of Block and Bridle at Virginia Tech. I thank my training in FFA for giving me the skills to do this. 4-H livestock definitely influenced my career choices. Through 4-H, I won top place at a National 4-H livestock judging contest, successfully pursued 3 degrees in animal science and spent 6 months through the International Farm Youth Exchange in India.

> By holding 4-H and FFA events together, students gain access to expertise within the extension network and thus broaden the reach of the land-grant mission.

The benefits of collaboration between 4-H and FFA programs extend beyond the participants. 4-H agents and agriculture teachers often share the same target audience and some of the same long-term objectives for their students. Collaboration reduces program duplication, provides support for program professionals within the community, and expands agricultural programming to meet community needs. This approach has been formalized in Virginia since 2015 when the FFA program began reporting to the Director of Virginia Cooperative Extension.

With the combined efforts of both organizations, agents and teachers are able to provide meaningful opportunities to students that foster growth in areas related to leadership, career development, and citizenship. At the state level, specialists within 4-H and FFA coordinate contests with a shared curriculum, such as Land Judging, Cattle Working and Lawn Tractor Operators. With the same preparatory resources, leaders are able to set the student up for success knowing that state level contests will be prepared and delivered with uniform standards and content. Additionally, state leaders are able to identify areas of mutual interest and create professional development opportunities for teachers and agents, minimizing duplication and increasing synergy within our similar networks. By holding 4-H and FFA events together, students gain access to expertise within the extension network and thus broaden the reach of the land-grant mission.

Locally, FFA advisors and 4-H agents, along with volunteers, alumni and other stakeholders, work together to implement their shared interest in Positive Youth Development and the progression of the agricultural industry. In Rockingham, Virginia's number one county for agricultural production, youth engage in both FFA and 4-H where there is collective support. One prime example is a tenured Agricultural Education teacher who also serves as a volunteer 4-H club leader. In other instances, content taught in the agricultural classroom and enhanced by FFA career development events is also further developed through 4-H activities and events. This form of leadership in practice, focused on the next generation, benefits youth through a deepened sense of community support.

Alison Jones, a former Agricultural Education teacher, saw benefits to collaboration with the local Cooperative Extension program. Through Extension curriculum and support, Alison was able to implement units on embryology, vermiculture, and aquaculture as a component of her broader curriculum. She also worked with the local Extension office to plan and implement a county-wide Ag Day for all 5th graders. With the help of the local agriculture agent, Alison was able to take Fisheries and Wildlife Classes to Virginia Tech's Kentland Farm to learn more about stream water quality, wildlife conservation, and environmental protection in the agricultural setting. In her time in the classroom, Extension was Alison's go-to resource for research-based information and to gain access to a network of subject matter experts.

There are numerous benefits associated with collaboration between 4-H and FFA at the local and state levels to create stronger agricultural education programs. While these organizations have strong relationships in many communities and states, we suggest the following approaches for increasing collaboration.

- While we have emphasized collaboration as a result of shared reporting lines at the state level, there are also benefits to beginning the process of building relationships at local levels. See the 4-H or FFA instructor as someone who has similar goals and works with some of the same audiences. Consider where each can contribute expertise and resources. Think about how to connect 4-H Volunteers and FFA Alumni and Supporters to support a combined program. Often, FFA has facilities that 4-H may benefit from using. 4-H has subject matter specialists in their Land Grant networks who can help keep subject matter content current and relevant. In addition, funds support agricultural education program interaction

and curriculum review with agriculture industry leaders which can be beneficial to 4-H. FFA and 4-H youth working in agricultural subject matter areas can serve as teen leaders to assist in training 4-H youth.

– Consider starting by deciding to combine an individual contest or activity and then build on that experience. This can reduce duplication and time required for leadership in both programs. It also expands the opportunity for more youth to participate who may have been limited based on an individual leader's capacity. An additional benefit to streamlining contests and activities is the ability to engage local, community experts and supporters as coaches, mentors, and subject matter experts in a way that values their time and maximizes their effort.

– Consider areas of development where FFA and 4-H as well as Cooperative Extension as a whole can contribute to developing new programs or solutions. One example is urban agriculture. How can 4-H and FFA work together to address food security and agricultural awareness and support in urban communities, building both programs and relationships in the process? How can facilities be used to support community education that Cooperative Extension may be providing? Can facilities or equipment be made available to assist agricultural producers in new and continuing ventures?

While recommending collaboration, we encourage both 4-H and FFA to celebrate differences between the two organizations, while working together to strengthen what is provided for local communities. Educate members and volunteers, so that they better understand the differences and similarities in a way that fosters embracing and valuing both. Look at collaboration as an opportunity to expand reach and support for the programs both individually and collectively.

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Our Future: Thinking Critically About Diversity, Inclusion, and Belonging

by Dr. Lucas Maxwell

"I believe in the future of agriculture, with a faith born not of words but of deeds" (National FFA Organization, n.d.). These powerful words have served as a part of the FFA Creed that has guided many in school-based agricultural education (SBAE) for more than 90 years. I am a product of agriculture. I consider myself lucky to have had the opportunity to grow up on a family farm, where although my mother worked off the farm, the primary source of income for the family came from farming. I am also a product of SBAE. Time spent in the secondary agricultural education classroom coupled with experiences through the National FFA Organization is where I began to discover myself, my values, and my passion. Collectively, my experiences growing up in agriculture and participating in SBAE lead me down a path that, to date, has provided me with innumerable opportunities to learn, grow, evolve, and challenge myself.

I share this brief background because there is no doubt that my history with and experiences in SBAE have shaped my views about the discipline's future. In preparation, I read or reread several journal articles and essays trying to decide how to frame this article. In his essay, *The Future of Agricultural Education, A View From the Bleachers*, Swanson (1991) indicates he is writing from the point of view of a "friendly, internal critic" (p. 2). As you read on, please know that this is how I am viewing the thoughts that follow regarding my belief that the future of SBAE hinges on our willingness to critically examine our efforts related to diversity, inclusion, and belonging.

When I was a graduate student at the University of Missouri, I had the opportunity to work with several faculty members in the College of Education teacher development program. Required reading for one course was The Miniature Guide to Critical Thinking Concepts and Tools (Paul & Elder, 2001). I am embarrassed by the fact that it took me nearly a decade to appreciate the power contained within this small, appropriately named document. While I cannot offer an adequate synopsis here, an important takeaway regarding critical thinking has helped me to further frame this essay. "Much of our thinking, left to itself, is biased, distorted, partial, uninformed or downright prejudiced" (Paul & Elder, 2021, p. 2). While this statement may seem blunt, I believe SBAE struggles to reach its true potential because, collectively, we struggle to think critically about who we are as a discipline and how we might improve in the future. Perhaps the acceptance of this as reality is the first step to cultivating the intellectual skills and intellectual traits required to think critically about the future of SBAE.

While Paul and Elder (2001) list several essential intellectual traits (and their antithesis), I believe four have the potential to have the biggest impact on the future of SBAE: (a) intellectual courage vs. intellectual cowardice, (b) intellectual empathy vs intellectual narrow-mindedness, (c) intellectual autonomy vs intellectual conformity, and (d) intellectual perseverance vs intellectual laziness. These four traits must be further developed and consistently deployed by each of us involved in SBAE if we hope to create a future for the discipline that builds off of our history and strengths, while preparing us for the issues we will face moving forward.

First, do we as individuals and as a collective discipline, possess the intellectual courage to confront topics and issues that we have not seriously considered because they elicit strong negative emotions within us? Are we willing to acknowledge and confront our egocentrism, "the unfortunate fact that humans do not naturally consider the rights and needs of others" (Paul & Elder, 2021, p. 21)? Second, having acknowledged our inherent egocentrism, are we willing to make the effort to understand others genuinely and fully by seeking to put ourselves in their place? Will we address occasions where we have "gotten it wrong" in the past, regardless of traditions or the long-held conviction that we were right? Third, will we exercise our intellectual autonomy and advocate for our true values and beliefs rather than being bound by the dominant, sociocentric thinking that results in the "uncritical tendency to internalize group norms and beliefs, take on group identities, and act as we are expected to act without the least sense that what we are doing might reasonably be questioned" (Paul & Elder, 2021, p. 22)? And finally, will we have the intellectual perseverance to struggle with questions and issues over the long term, despite opposition, roadblocks, and uncritical adherence to tradition in order to achieve our full potential?

With all these questions in mind, I believe the most critical area of focus for the future of SBAE must be centered on the issues of diversity, inclusion, and

belonging. SBAE is, at its core, a people-focused discipline. While we may teach and work in the context of agriculture, ultimately, it is our students who provide us with the opportunity to do what we do. I firmly believe that many of the most important issues we face as a nation and world are issues that must be addressed by agriculture. How will we feed a growing population? How will we clothe a growing population? How will we fuel a growing population? In my mind, the answers to these questions will be found by those of us working in the global agriculture, food, fiber, and natural resources sector. But if we hope to find the best answers, we must work to ensure that there is a place for everyone at the table. We must do more to address issues that have plagued our industry and SBAE education for decades. We must not only envision, but must create a future where all students, regardless of race, ethnicity, or background are welcomed to our classrooms and are able to be their authentic selves without fear of judgment. SBAE must become more culturally responsive, and we must create culturally inclusive classrooms.

In early 2020, I attended the "Three Circle Summit: A Balanced Three Component Instructional Model for School-Based Agricultural Education'' in Indianapolis, Indiana. During a presentation by Dr. Roger Cleveland (2020), his definitions of diversity, being invited to the party, inclusion, being asked to dance, and belonging, dancing like nobody's watching, caused me to critically reflect on my own history in SBAE. This reflection put a spotlight on some inconvenient truths that I had been previously unwilling to accept. While diversity existed in my SBAE classroom, I can say with certainty that every student did not feel invited to the party. Further, while efforts were made to "ask students to dance," it was always to MY music and MY dance. As a result, I can only imagine how many students struggled to find a sense of belonging.

I am now in my 11th year as a teacher educator, and I continue to work to develop my critical thinking skills and to further hone the essential intellectual traits that are necessary to achieve not just higher order thinking but highest order thinking. Highest order thinking is thinking that is explicitly reflective, routinely critical, and consistently fair (Paul & Elder, 2001). When facilitating discussion with my preservice teachers, I work to create a space where we can courageously tackle topics and issues that, sadly, I once avoided. I challenge myself to identify and acknowledge my own bias and then consider its impact on how I perceive SBAE. In doing so, I hope that I model for my students the importance of empathy, coupled with the fortitude to challenge the status quo, rather than conform to the seemingly dominant viewpoint.

According to Cleveland (2020) being culturally responsive is "the ability to learn from and relate respectfully with people of your own culture as well as those from other cultures It means being effective in a different cultural context" (slides 20 & 21). In my view, the first step to addressing this issue is to work to develop and effectively deploy the intellectual traits discussed earlier in this article. When we do this, we will have the foundation to create inclusive classrooms where "students and staff alike recognize, appreciate and capitalize on diversity so as to enrich the overall learning experience" (Cleveland, 2020, slide 22).

As I stated earlier, I believe in the future of agriculture. Our industry has always recognized and embraced the power of diversity when it comes to plant and animal genetics, soil health, crop rotation, etc. While there are certainly examples of excellence, I believe, on the whole, SBAE has failed to embrace that same respect for human diversity. Having said that, I believe that a growing number of students, teachers, and leaders in SBAE are accepting the challenge to confront this issue. While I have made strides personally, I still have much room for growth and development. It is no doubt hard work, but it is work that if we have the intellectual perseverance to take on, we will be poised to address the challenging issues we face and the future of SBAE will indeed be bright, because of our deeds.

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Envisioning More Love in Agricultural Science Education

by Caleb Hickman

> "Love is an action, never simply a feeling"
> – bell hooks

The renowned bell hooks discusses the concept of *love* in her works and explains how *love* cannot simply be a feeling but must be an action. Society seems to over-utilize the term *love*. It appears that people *love* everything. I am also guilty of this, but we need to stop overusing the term *love* because of its impact on education and the students we serve.

As a first-year teacher implementing their new ideas into his classroom, I quickly realize how students' feelings impact their ability to engage in schoolwork. There are varying opinions on how teachers should start the school year, but I firmly believe that teachers must Maslow before they can Bloom. This means that teachers must meet Maslow's Hierarchy of Needs before teachers can utilize Bloom's Learning Hierarchy to teach standards. Figure 1 explains this concept. It is imperative that in the future, agricultural educators must use resources to enhance Maslow's by developing the right level of Bloom's in one's teaching objectives.

The figure explains how basic needs affiliate with Maslow's Hierarchy of Needs and align with Bloom's lowest level. Teachers who want their students to achieve a higher level of thinking must support students through Maslow's Hierarchy of Needs. Through this process, more children will obtain greatness in agricultural education.

The Current State of Teaching

If one scrolls through social media, they will see their teacher friends say that they *love* their students. But one must wonder, what does this *love* look like in the classroom? Which students does a teacher truly *love*? Research shows that teachers favor the students that share similar traits as themselves (Komarraju, 2013). One must ask themselves, does that teacher only *love* the students they relate to?

Here is where I come into play, how can we *love* all our students in agricultural education? Growing up, I was always told that I was a lot, loud, and too much for people to handle. As a child, I thought something was wrong with me, but it was simply my personality. The teachers who truly *loved* me valued who I was as a person. They respected that I was different, and I felt I had a place in their classroom. Honestly, that

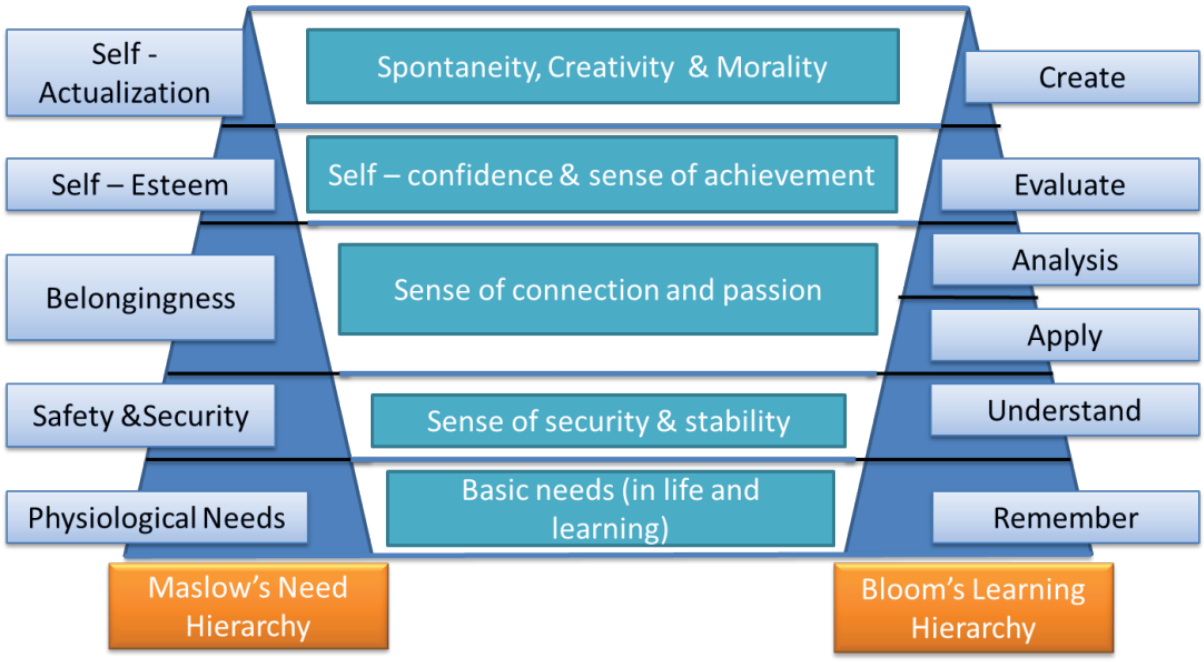

Figure 1. Maslow's Hierarchy of Needs vs. Bloom's Learning Hierarchy. Note. https://inspiringlearners.co.in/2017/04/19/blooms-hierarchy-vis-a-vis-maslows-hierarchy/

is why I became an educator. As a middle and high school agriculture instructor, I allow all my students' personalities to shine.

Most of the teaching profession is comprised of cis-gendered, white, men and women (Mitten et al., 2018). I also identify as a cis-gendered white male, but it is time to advocate for others to join our profession. Work is being done to help the advancements of agricultural education, but we must listen to the populations that are not becoming agricultural educators. The key term in that last sentence is listen. Listening is an act of *love*. When people were telling me that I was *a lot*, I started changing my personality in high school and college. I started shutting down, but that did not mean that I did not pay attention to the world around me. I listened more than ever before. I analyzed the world around me, and I tried to understand why people were trying to silence me.

I challenge agricultural educators to see how we can recruit underrepresented populations into our classrooms. I cannot provide one with a checklist on how to obtain this, but I would encourage one to expand their world. Try something new, explore, and listen. Listen to what others are saying.

The Next Fifty Years

I teach in the great state of Ohio. More specifically, I teach on the cusp of Appalachia in the central region of the state. I grew up thirty minutes down the road. Needless to say, I *love* my community.

I am not the only one who *loves* it. Ohio is home to numerous corporations that employ hundreds of thousands of people. Intel, the tech company, is building a plant in my school district. Intel is investing $20 billion into this project. While I was helping FFA members at the fair, Intel had a booth and explained what they were looking for in high school graduates. The company is looking for young people who have a two-year Associates degree in engineering or mechanics.

> We must Maslow before we can Bloom.

Knowing this information, I must adapt. The next fifty years for me is preparing students who want to work in industry. Intel's technology is state of the art, and it is exciting to see what they bring to the community. However, I will need to teach students more mechanics and technology systems. For me to *love* my students, I must help them be prepared for these jobs.

Concurrently, Intel is bringing families across the world to help start this plant. The demographics of my small town may change. Meaning that I must *love* every child for who they are as a person. I am thankful for my time spent at the University of Kentucky to prepare me to meet every need of each child. Children deserve to be seen for who they are, and in my agricultural classroom, they will have a voice.

Final Remarks

As I wrote this proposal for this magazine issue, I knew the exact direction I wanted to take it, but my thoughts changed as I started my first teaching job. *Love* is not a simple concept. On the other hand, teaching is not an easy profession. We become educators because we *love* what we do, but I am asking that we *love* others who do not look or identify the same as ourselves.

I am thankful to have role models in my life to help me understand multiculturalism. To researchers in agricultural education, I ask that we continue to ask the challenging questions and try to provide educators with more guidance on this topic. Advancing the demographics of agricultural education must occur to sustain the growing population. Students must see representation in their classes.

To my fellow agricultural educators teaching K-12, I understand there is not enough time in the day, but we must continue to adapt to the ever-changing climate of our communities. We must Maslow before we can Bloom.

Love intentionally is what I ask of the reader. I know that I need to understand the word *love* myself, but I know that we share a *love* of teaching and agriculture.

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Reframing School-Based Agricultural Education Teacher Needs to Preserve Long-Term Program Success

by Kayla Marsh, Emily Sewell, & Dr. Christopher Eck

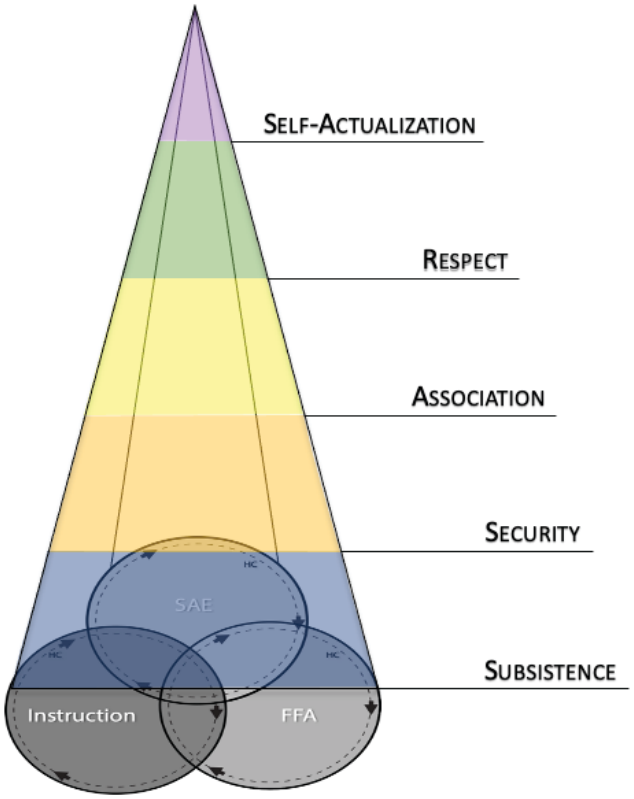
Agricultural education teachers wear a multitude of hats ranging from counselor to volunteer coordinator and public relations manager to accountant, in addition to the job they are paid to do - teach (Terry & Briers, 2010). The workload and stress of ag teachers has increased with the job responsibilities and is further exacerbated by the recent Covid-19 pandemics' convoluted and changing policies, which amplifies the social, emotional, and mental stress seen as a global mental health crisis. An apparent need exists to support teachers through these stressful times, yet many recurring needs have been studied for more than three decades. Program management, public relations, SAE development and supervision, technology, and behavior management are all critical aspects of an agriculture teachers' roles and responsibilities for maintaining a complete program. As teachers continue to feel the overwhelming stresses associated with their program management, it is time we stop viewing the well-being of our teachers socially, emotionally and mentally as taboo; rather, as we look into the future, a more humanistic and proactive approach is needed to evaluate teachers' emotional well-being.

When taking a step back to view the entire profession, job satisfaction and career retention among teachers is directly impacted by the needs of teachers. How will we continue to educate about agriculture if we are facing a continual shortage of highly qualified and passionate agricultural educators? It is critical that we begin identifying solutions and applying practices that minimize stress and burnout, but also build a community where teachers can identify a sense of connectivity and increase self-efficacy. The question becomes, how can we do this? Two schools of thought present viable solutions: Building connectivity and a community of inquiry which both present complementary concepts to teacher satisfaction and professional growth. Connectivity is the community of support which is observed through professional relationships locally and across the state as well as access to usable curricular resources. Similarly, a community of inquiry mimics the three-component model of agricultural education where technical content knowledge and skills, ability to share knowledge through methods, tools and engagement, and community relationships interact to develop and sustain teachers.

> Essentially, we must determine how to build capacity in content knowledge and teaching resources while supporting our teachers mentally and emotionally.

Essentially, we must determine how to build capacity in content knowledge and teaching resources while supporting our teachers mentally and emotionally. The advice in this article is based on previous research recommendations for developing healthy boundaries, managing stressors, promoting work-life balance, and advocating for self-care yet practical applications or tools that meet these recommendations are lacking. **So, how do you effectively set boundaries without causing massive revolts?** First, we must understand that in order to secure the future of the profession a shift to purposeful action is needed to better understand the depth and root of an agriculture teachers' needs and turn recommendations into practice. Second, convince ag teachers to put themselves first and consider *the Conceptual Model of Support for School-Based Agricultural Education Teachers* as a guide for gauging personal status. Ultimately agriculture teachers cannot pour from an empty cup, nor can they model healthy balance and build students' capacity for success when they themselves are depleted.

To have a more human lens of agriculture teachers' needs, *the Conceptual Model of Support for School-Based Agricultural Education Teachers* was developed using Maslow's Hierarchy of Needs (Maslow, 1943). Combining



A Model for Support The Conceptual Model of Support for School-Based Agricultural Education teachers.

the hierarchy of needs with the three-circle model for Agricultural Education better depicts the levels of needs of agriculture teachers as they maintain and manage a complete 21st century program. In addition, teachers are limited by their personal, professional, and technical skills at each of these need levels. The development of skills, attitudes, and tools to build the teacher's capacity is required to satisfy and move to the next level within the hierarchy. Ultimately, one must be able to understand the levels in order to identify and meet their needs. Looking forward to the next 50 years, this model for support has the potential to meet the following levels as described.

Subsistence represents needs for agriculture teachers related to survival as an individual and component of the three-component model, such as mental, physical and emotional health, pedagogy, professional development, work-life balance, boundaries, rest and nutrition.

Security represents needs related to safety as an individual, within the three-component model, and as a professional, such as, wage, planning time, curriculum, paperwork, benefits, grading, retirement, resources to support programs, and technical skills training.

Association represents the need for belonging within social groups as an individual, professional, school community, and surrounding community, such as relationships with teachers, students, families, community supporters and administration and connection with mentors, and belonging with other agriculture teachers.

Respect represents the need to be respected within those associations and communities based on the teacher's self-efficacy, performance, and service. The teacher now has the capacity to participate in the school or professional community as an active member, committee member, leadership role, or mentor to others in an area of expertise.

Self-Actualization is the pinnacle of the needs hierarchy representing that teachers have developed the skills and capacity to be successful and are able to reflect, evaluate and achieve the goals they set for themselves, personally and professionally, and for their complete 21st century programs.

Recent research suggests many agriculture teachers currently align within the subsistence and security levels of need (Doss et al., 2021; Marsh et al., 2022) which should raise concern for the individuals and profession as a whole. Until we meet teachers' needs where they are, our professional development efforts will continue to result in little chance of improving job satisfaction and retention within the profession. So how will we, as a profession, guide and support these efforts?

1. Establish and Evaluate Healthy Boundaries

   Prioritize activities that promote wellness, including exercise, rest, balanced nutrition, and social activities—these activities are essential for maintaining physical, mental, and emotional health, life balance, aligning priorities, and coping with stress. Establishing healthy habits and routines can protect your time, reduce anxiety, and promote a well-rounded life. It's okay to say NO. Defending your personal needs is critical for taking the first steps to establishing healthy boundaries and meeting individual *Subsistence* and *Security* needs represented in the Model of Support.

2. Identify your professional needs

   Professional growth can provide the skills and tools to meet classroom and 21st century program needs. These needs range in depth

and span each aspect of the three-component model. Challenges like content knowledge, technical skills, pedagogy, SAE implementation, classroom management, and technology can limit our ability and confidence in practice as a professional. Developing skills to overcome these challenges can reduce stress but identifying those needs and the level of support is sometimes hard to define. Use the Model of Support to reflect on your personal and professional needs to strategically develop skills to support your individual needs.

3. Strategies to recognize and reduce burnout

   Symptoms of burnout can range from extreme stress, self-doubt, fatigue, loss of motivation, feeling of hopelessness, detachment, defeat, decrease in satisfaction, sadness, insomnia, irritability, and anger that, if unaddressed, can lead to serious health implications. Identifying what symptoms of burnout look like for you is critical to know when to realign your priorities.

4. Plan for managing stress

   There are seasons of the year where chances of burnout are higher– CDEs, SAEs, applications, and livestock shows are all times of high demand and stress on the agriculture teacher and their program. In these seasons, purposefully plan time to reflect, relax, move, rest, and engage with your people. While these recommendations seem simple, they can provide the mental, physical, and emotional break needed to regain motivation and promote overall well-being. Professionally burnout can result in self-doubt and isolation where purposeful professional development can support growth, provide skills, and promote relationships to mitigate the symptoms. While developing healthy coping habits can mitigate stress and burnout, additional strategies like a support group meeting and working with a professional may be beneficial. If you feel that stress and anxiety are impacting your mental, physical, and emotional well-being, work to develop a plan that meets your individual needs.

Moving towards the continual discussion within and throughout the profession on the local, state and national level, we have the opportunity to keep this conversation at the forefront of our personal and professional development as teachers. It is our responsibility as teacher educators, state staff, and teacher supporters to encourage and foster these conversations with our agricultural education teachers who are consumed with teaching agriculture and supporting their students in the field. It is imperative that you as the educator reflect upon your current personal and professional roles and the balance that may or may not exist within those roles. After reflection, it is important to reframe how you manage your time, delegate your responsibilities, and make time for yourself to preserve your long-term success as an effective agricultural education teacher.

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Maintaining a Legacy Within School-Based Agricultural Education Programs

by Dr. Christopher Eck & Dr. Dale Layfield

The National FFA Organization holds an archive at Indiana University-Purdue University Indianapolis (IUPUI) Library, which "contains correspondence, minutes, newsletter, publications, reports, audio cassettes, video cassettes, and photographs" (IUPUI, 2019, para. 2) dating back to 1916. Unfortunately, state and local agricultural education and FFA archives vary state to state and program by program. As the National FFA Organization, along with state and local FFA chapters near the 100th anniversary of organization, it is essential for school-based agricultural education (SBAE) teachers to maintain a digital archive to preserve their program's legacy. Based on recent research (McCannon et al., 2022), the top five archival skills for SBAE *teachers are digitizing collections, preserving digital collections, storing, displaying, and sharing artifacts, selecting proper file formats for digitizing collections, and preserving photographs*. These skills are vital in the preservation of chapter artifacts such as, FFA jackets, printed photographs, chapter paraphernalia, banquet programs, FFA chapter meeting minutes, film slides, photograph negatives, or audio/video tapes of FFA chapter activities.

As an SBAE teacher, determining the best practices for preserving your program's legacy is pivotal. To accomplish this task, one must first consider the preservation of existing artifacts, collection of future artifacts, the establishment of a digital archive, and the preservation of that digital collection.

Preserving Existing Artifacts

A South Carolina SBAE teacher tells a story about a high school principal who was taking wheelbarrows full of old FFA plaques and related materials to the dumpster. In Wisconsin, retired agriculture teacher, David Laatsch, is an avid collector of all things FFA. Laatsch is also concerned about the loss of the FFA memorabilia, reflecting "As time goes on, the next generation has no idea the significance of these items. My fear is that the items get pitched in the trash. If a scrap gold buyer finds a 10K gold award pin on an estate sale, it gets melted down and is lost forever!" (Wisconsin State Farmer, 2017, para. 13).

> When scanning photos and slides/negatives for archival purposes, use the .tiff/.tif file format instead of the .jpeg/.jpg file format.

Such activity would make any agriculture teacher furious. Preservation and archival of historical records and artifacts of local agricultural education programs/FFA chapters should follow a protocol to ensure important historical documents are maintained. Some recommended steps in determining what files/artifacts should be preserved include 1) Does the artifact aid in definition/understanding of the SBAE program/FFA chapter? 2) Would this artifact be of interest to future students/FFA members? 3) Is this artifact related/referenced by other items that will be maintained? If any of these questions are answered with a "yes," it is recommended the program/FFA chapter retain this artifact. For those artifacts that will be maintained, it is important that an FFA Historian or Secretary develop an inventory of all artifacts/existing records (Guidelines for Student Organization Records, 2021).

Once a complete inventory of all records is taken, it is important to determine the safest storage for the artifacts. Is there a designated "historical" location in your classroom/lab available? Have you discussed options to house materials in the school's library/archival spaces? Before storage, determine if the artifacts need "preservation" or "conservation." Preservation refers to the process where efforts are made to minimize chemical and physical deterioration of artifacts (Note, 2019).

Vintage FFA jackets are highly popular artifacts at FFA chapters across the nation. Preservation of memorable FFA jackets (i.e., Sweetheart, Area/Regional Officer, State FFA Officer, National FFA Officer, Chapter member who becomes notable/famous) can be accomplished by preserving them in a shadow box to be displayed in the classroom, school, or community. Shadow boxes can be purchased with 98% ultraviolet ray protection to avoid fading from sun and other damaging light.

For years, FFA chapters across the U.S. maintained photographs, print-based artifacts and

news media in FFA scrapbooks. Countless states or regions in states sponsor FFA scrapbook competitions, so a variety of unintended archives exist. However, older photographs and other paper-based artifacts have definite shelf lives, so preservation through digital archives and recommended techniques is highly recommended. Use of flatbed scanners and document cameras will offer the opportunity to preserve not only print-based media, but slide and photo negatives (see Establishing a Digital Archive in this article). The Library of Congress provides in-depth details about the many factors that lead to the deterioration of photos in its article "Care, Handling and Storage of Photographs" and recommendations for prevention at https://www.loc.gov/preservation/care/photolea.html

Collecting Future Artifacts

When collecting future artifacts, a proactive approach is strongly recommended. First, if possible, save an extra of all items for direct archiving, avoiding handling to minimize natural oils in skin that can damage quality. Understanding some of the common causes of deterioration will extend the quality and life of artifacts, including fluctuating temperatures and humidity levels, frequent exposure to light, storage in acidic conditions including adhesive or magnetic albums, storage in folded, creased, or rolled conditions, lamination and improper labeling. Use of archival quality storage containers, which are more common now, is also suggested. Consulting an archivist at a local university or museum for additional practices would provide additional techniques to be proactive (Note, 2019).

Establishing a Digital Archive

Another role for the FFA Chapter Historian or Secretary could be to scan historic documents, photos, slides and negatives. Flatbed scanners (equipped with technology for scanning film media (slides and negatives) are highly recommended as they provide multi-purpose functions and high-resolution images from several media formats.

When scanning photos and slides/negatives for archival purposes, use the .tiff/.tif file format instead of the .jpeg/.jpg file format. The .tiff file format is a lossless file format, which means that when a scan is saved in this manner, the file keeps all of the image that was scanned. In contrast, a .jpeg is a lossy format, which means that this file format throws out some of the scanned information to make the file size smaller. If you take the time to scan something, make the master file of .tif to make it worth your time.

Another factor to consider when scanning images is the resolution, which is measured in pixels. The more pixels you include in your scans, the better the detail in the photos. When scanning a .tif file of a photo for archive purposes, set the resolution at 600

(LEFT) Shadowboxes can be customized, like this one with recycled barnwood, as long as the glass has UV protection, which improves the life of the jacket.
(RIGHT) Some flatbed scanners come equipped with a transparency unit and film holders for scanning negatives and slides from vintage images

ppi (pixels per inch). When scanning the slide and negative film, scan at a resolution of 3,000 ppi. Although these settings create larger files, this creates a master image that fairly represents the original image.

Preserving Digital Collections

Countless hours of work can be spent preserving chapter images, documents and other artifacts as digital images. Preservation Week, a website by the American Library Association, recommends important concepts in preserving digital collections to avoid data losses of hours of work.

> Establish a backup system so your computer files are copied on a regular basis to another form of media. You can transfer files to a flash drive or CD, but those media may be obsolescent and useless in a few years. An external hard drive is the best and most convenient choice. Make more than one copy of your digital files and store copies in different physical locations (Caring for Books and Paper, 2015, para. 2).

Additionally, Preservation Week encourages those creating digital archives to use tagging with descriptive keywords (also known as metadata) to allow easier searching of the digital files (Caring for Books and Paper, 2015). The Artwork Archive's "How to Add Metadata to Your Image Files" webpage refers to metadata as "data about data" (How to Add Metadata to Your Image Files, n.d., para. 2). Visit this link on the Artwork Archive's website to learn steps in creating metadata on Apple or Windows computers — https://www.artworkarchive.com/blog/how-to-add-metadata-to-your-image-files

Whether you are a first-year teacher or a veteran with 25 or more years of experience, you must consider how you will preserve the legacy of your program. Ultimately, it is one of your many hats as an SBAE teacher to preserve institutional knowledge, artifacts, and chapter history to maintain the legacy of your program for many generations to come. The best practices provided in this article serve as a starting point to accomplish this goal.

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Reading the Gauges: Thoughts on the Future of Agricultural Mechanics

by Dr. Tyler Granberry & Dr. Trent Wells

Teaching and learning agricultural mechanics occupy a historical and traditional (and in many communities, a very consequential) role in Agricultural Education programs across the United States (Burris et al., 2005). From troubleshooting small gas engines to fabricating steel fire pit projects, teaching agricultural mechanics has customarily provided opportunities for students to apply both technical and academic skill sets to solve problems (Parr et al., 2006). Agricultural mechanics is broad and includes topics that are often quite familiar to teachers and students, such as welding and metal fabrication, agricultural power and machinery, structures construction, and electricity (Wells & Hainline, 2021).

In recent years, preparing students for the new and emerging college and career opportunities of the 21st century has meant that teachers have had to expand their agricultural mechanics knowledge and skills. For example, the increasing use of computer-aided design (CAD) software and computer numerical control (CNC) plasma cutters in industry settings have resulted in such technologies being acquired for (and hopefully used in) many Agricultural Education programs. Thus, teachers have likewise had to learn how to use such innovations to effectively and efficiently support their programs' work to maximize the return on investment for their students.

While we can imagine that a teacher who began their career in 1990 may very well have not foreseen such technologies coming to Agricultural Education programs during their lifetime, the reality is that progress is often rapid, impactful, and inevitable. Change can be especially impactful for those who are unprepared for it. We anticipate that as our world and economy evolve, so will the teaching and learning of agricultural mechanics. Our students deserve to be as prepared as possible for current and future challenges and opportunities they will encounter. Please permit us the opportunity to "read the gauges" and lay out a potential vision of what the teaching and learning of agricultural mechanics may encompass in the coming years.

> A primary concern for teachers of agricultural mechanics is addressing the skills gap for new employees entering today's workforce.

Technical Skills

A primary concern for teachers of agricultural mechanics is addressing the skills gap for new employees entering today's workforce. To address the issue adequately, however, we must first identify that employers in fields aligned with applied agricultural engineering and agricultural mechanics are seeking employees with blended and diverse skill sets. Those blends are often a combination of skills related to a specific industry or type of equipment and skills based on employability or *soft skills*. Although possessing suitable technical skills is often at the forefront of their concerns, communication skills, the ability to work as part of a team, and computer literacy are frequently identified by employers as important qualities for their new hires (Alston et al., 2018).

Gaining insight into the skill sets required for high-wage, high-demand jobs can seem daunting for teachers. However, an increasing number of industries are forming educational partnerships and creating Industry-based Credentials (IBC) that students may work towards, increasing their likelihood of meeting the needs of those employers. Many teachers are aware of the current push at both the state and federal levels toward IBC; however, if these credentials are carefully researched and implemented, they can mean much more than points on a report. Welding, construction-based skills, equipment repair and maintenance, and many others are high-demand skills represented by IBC options available to students. Additionally, students interested in pursuing careers that require a four-year degree in Agricultural Systems Technology or Agricultural Engineering need to enter post-secondary institutions armed with a strong knowledge of the applied academic concepts that underlie those fields.

Equipment and Technology

Teachers preparing students for the skills needed to move into modern agricultural careers will need to facilitate learning using modern equipment. Precision agriculture technologies have become standard practice in many production agriculture settings. Although the equipment and underlying technologies are complex and often proprietary to specific manufacturers, a fundamental understanding of these systems is increasingly important for students interested in agriculture. Global Positioning Systems (GPS) and Geographic Information Systems (GIS) are excellent entry points for introducing students to precision agriculture (Hendrix et al., 2022). Similarly, as Unmanned Aerial Vehicles (UAV), also known as drones, are increasing in agricultural settings, so is the need to introduce students to how and why they are used (King et al., 2019).

Regarding mechanical developments in agricultural products processing, robotics has been a prominent area of growth in recent years. From sensor-based sorting devices to small robots that move potted plants within large nurseries, robotic equipment has become integrated into how agricultural products make it to consumers. Like precision agriculture technologies, the complexity of agricultural robotics systems may make teachers feel like they are out of reach. However, small, cost-effective kits that demonstrate sensors and electronic controls are available online. These kits can provide students with a basic understanding of how electronic control systems operate.

Innovations in agricultural fabrication have also boomed in recent years. CAD software is nothing new to those in industry settings, but recent developments in the ease of use and reduced costs have made CAD much more accessible to students who are designing projects for agricultural mechanics classes. For those interested in integrating CAD into their courses, Autodesk's Fusion 360 is a great place to begin 3D modeling, as it is free for educational purposes and is now accessible via Chromebooks. For those primarily interested in industry-standard software, Autodesk's AutoCAD is also free for educational purposes and is frequently used by engineers and manufacturers who use CNC technology. Further, CNC technology is another innovation that has an established place in industry but has more recently become accessible to Agricultural Education teachers. Small-scale 3D printers or CNC wood router tables can serve as relatively low-cost means of introducing students to this type of technology. However, teachers who instruct students in agricultural equipment and facilities fabrication courses may find that

CNC plasma cutting tables serve as excellent additions to their programs if they have available laboratory space and funding.

For programs that emphasize welding in agricultural mechanics courses, multi-process welders that can utilize SMAW, GMAW, FCAW, and GTAW processes are rapidly gaining popularity for their ability to maximize the *bang-for-your-buck*. Because of the versatility of multi-process welding machines, students can have increased opportunities for hands-on, experiential learning in a myriad of diversified welding techniques. Currently, multi-process welding machines are available from all major manufacturers with a wide range of options and price points. Beyond metalworking, agricultural power systems are also seeing new advancements entering the educational realm. Compact diesel and battery-electric equipment are both gaining popularity, as are electronic fuel injection (EFI) systems for small gasoline engines, particularly within the landscaping industry. With popularity, however, comes a need to educate students on the principles of operation behind those systems and their maintenance and basic repair. Other forms of power systems that are gaining traction in the agricultural industry are renewable energy systems. Of the current renewable energy systems, solar, wind, and biofuel systems are among the most applicable to modern agriculture. Although wind energy may be difficult to address beyond the fundamental principles of operation, solar and biofuel systems can be demonstrated in a school-based laboratory setting, especially as materials and components needed to facilitate those labs have become more accessible over time.

Instructional Approaches

Preparing to meet the needs of both students and industry goes beyond having technical knowledge and equipment. Teachers of agricultural mechanics must prepare to integrate new, diverse teaching methods to meet the variable learning styles of their students. Although abruptly pushed into the spotlight due to the COVID-19 pandemic, remote and online teaching practices are most likely here to stay as part of a regular educational setting. The experiential skill development associated with agricultural mechanics can be challenging to facilitate via an electronic format; however, online learning systems like Miller OpenBook and iCEV have demonstrated the ability to deliver foundational knowledge to students via remote or online instruction. Similarly, through immersive technology such as virtual reality (VR) and augmented reality (AR) systems, students can practice agricultural mechanics skills in safe, controlled environments that provide active feedback as they work (Wells & Miller, 2020). Despite a perception of high cost, technology such as VR headsets and welding simulators are rapidly becoming more accessible and may become more commonly used in Agricultural Education programs in the coming years.

New and exciting approaches to teaching agricultural mechanics are also on the rise. The Curriculum for Agricultural Science Education (CASE) currently offers curriculum and training for three courses (i.e., CASE Agricultural Power and Technology [APT], CASE Mechanical Systems in Agriculture [MSA], and CASE Technical Applications in Agriculture [TAA]) that focus on heavy academic concept integration and exploration via agricultural mechanics concepts (Wells et al., 2021). Additionally, several curricula have been developed with the help of industry partnerships to better prepare students with the necessary skills they will need to work in agricultural mechanics-related fields. Regardless of the specific choice of curriculum, teachers of agricultural mechanics need to be prepared to deliver hands-on learning experiences emphasizing academic concept integration and exploration. Additionally, project-based learning and teaching methods that promote student-led problem-solving will benefit students' overall development in preparation for a wide range of career opportunities.

Summary

We hope that our insights on the future directions of the skills, equipment, and instructional approaches for teaching agricultural mechanics are helpful as you make long-term plans for your program and students. The advancements we have discussed may seem daunting to some, especially when reading about them all at once. However, keep in mind these critical points: (1) Good teaching is good teaching, and no amount of new technology or equipment can outweigh the foundations of high-quality education. (2) Next, remember that you can't change everything at one time. This point is especially pertinent to early-career teachers; focus on an area of development for teaching agricultural mechanics within your program and build up from there. (3) Finally, understand that with innovation comes a learning process before you can fully integrate the new skill, concept, or tool into your classroom or laboratory. Teacher educators, veteran teachers, and industry educational specialists across the country are aware of the need for innovative agricultural mechanics professional development and are striving to facilitate training that will help you create meaningful learning experiences for your students. In closing, focus on delivering high-quality education in agricultural mechanics and always keep an eye on the horizon for the great things to come.

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Envisioning the Future of SBAE Through Virtual Reality Engagement and How It Can Be Used in the Classroom

by Dr. Justin Pulley & Dr. Dee Jepsen

Educational technology is constantly evolving to provide teachers easier ways to deliver content, engage and motivate students, and provide experiences students would not be able to experience otherwise. Thanks to the COVID pandemic, the world had to shift from an in-person style of teaching to digital versions, and while we have mostly returned back to normal, there are still some elements that remain.

One specific technology that has been available for decades, but has finally become affordable for the average consumer is virtual reality. The foundation of Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) are based on an artificial and digital environment provided by a computer or head mounted device (HMD) in which a user's actions determine what happens in the environment.

This article discusses the technology in a manner educators can take towards introducing VR into their programs or curriculum. The article draws on experiences of a tractor and machinery safety program pilot tested in Ohio, but expands the knowledge towards VR technology that has been available in many contexts in recent years.

Engage and Motivate Students

Students are constantly bombarded by new technology, inside and outside of the classroom. Many are familiar with VR environments through gaming software and the film industry. The classroom setting should be no exception for this type of experience.

When VR welding first appeared at trade shows, stock shows, and conventions, students thought this was the coolest thing around to learn new skills. And likewise, educators also wanted this experience for their classrooms. Now with HMD's, everyone can have their own personal VR technology.

Teachers who have used this technology in their classes report the increased participation and collaboration from their normally quiet and reserved students. These students were described as the more reserved students who had prior gaming experience, and when they saw their classmates struggle with the technology, they jumped up to help. The VR technology enables tech-savvy students to find a way to contribute to the learning environment based on their previous gaming experience. So, teachers appreciated the opportunity to not only engage the outgoing students, but also the more reserved ones. Teachers who taught a tractor VR program noted that a sense of competitiveness came out amongst students. They went as far as to have a score keeper on the white board tracking which driver was doing better on the obstacle course.

Easier to Deliver Content or Content Delivery

The level of immersion that VR provides can assist in content delivery, especially if it is an abstract topic that students struggle to grasp. There are several concepts and theories such as engine operation and principles of electricity, that are discussed in course content that students cannot visualize. By finding experiences that create and visualize these theories, VR can aid in the retention of content with a hands-on feeling.

This technology can also assist in distance education situations. A VR course allows students to participate in class without being physically present. By joining a virtual live stream, remote students feel as if they are present and sitting in the class. The "metaverse," which is being advertised as a virtual space for people to gather, is a great example of how students can come together as a class in a virtual environment.

Provide Unique Experiences

One of the larger benefits of VR is the ability to provide an experience students may not normally be able to encounter. For example, teachers used a VR tractor operation experience to introduce students to a topic many might not explore. This is mainly because their school environment did not have access to a tractor for students to use, or they were more urban and city focused programs without space or opportunity to address tractors in their curriculum. The pilot test found students had positive user experiences with tractor operation regardless of their prior knowledge. Some students were able to associate their learning with compact tractors that are used in their landscape or horticultural programs.

Through VR, there are a wide range of experiences that can

be explored. Popular VR training ranges from aircraft simulations, surgery preparation, driving simulations, equipment operation, and virtual field trips. Experiences that promote new skill development and teach safety concepts are the most common use of this technology.

Affordability

Due to the costly nature of VR it has often been overlooked for use in educational settings until recently. The Meta Quest, formerly Oculus Quest, is an example of how affordable this technology has become. The Quest headsets cost approximately $400; and while this still may be pricey for some programs, there are other options such as the Google Cardboard or Samsung Gear VR headset which are estimated at $15-$150.

Funding sources can come from the federal, state or local levels. Verizon Fios provides a grant related to digital inclusion and the acquisition of technology. The U.S. Department of Education provides access to grants for schools to acquire technology for student learning. Funding may look different at the local level; schools can acquire funding through various sources including civic organizations and private businesses. There are other opportunities for schools to apply for funding that can aid with the integration of technology; ClassVR is one example. This company provides curriculum aligned content, installation and professional development for the teacher, but also has the ability to create and upload custom content. They also provide emergency relief funding for eligible classrooms to obtain VR technology.

Steps to Take for Integration

Through our work with teachers we have identified three main factors that affect the integration of VR. These factors are: addressing student performance, reducing technology barriers, and ensuring students have a positive user experience.

To address student performance, the technology should have a purpose behind its use. Teachers struggled to keep their students motivated when they gave the equipment to them and said “Here, try this out.” Teachers should make sure that VR aligns with the curriculum content standards and students understand the educational purpose.

Technology barriers and user experience are highly associated factors for a VR experience. Technology issues related to Wi-Fi connections and casting were the biggest detractors teachers identified from using VR in their classroom. There were times where teachers needed to see what the students were doing inside the headset so they could guide them through the experience. These situations were best alleviated when teachers could cast to a classroom screen. Teachers needed to understand both the equipment and the VR experience prior to introducing it to the students. By running through the experience first, teachers were able to assist the students as needed. User experience relies on a combination of factors to ensure the user has the best overall experience. It needs to look good, have a good flow of content, be immersive, and make them want to use it again.

Educators who are interested in integrating VR into their program should consider these steps.

1. Explore the content area to introduce in a VR environment. There are many different experiences out there, some are more gamified and some are more training centered. Find what works for your curriculum and your program. If desired, there are programs available for you to create your own content based on your needs.
2. Find the funding. Funding might be one of the biggest barriers for programs to acquire technology like VR. Exploring grants on the federal, state, and local level can provide the funding you need to get into VR.

Tarleton State University students look on and explore the Safe Tractor Operation VR experience while Dr. Pulley explains the instructions and use of the technology.”

3. Create a relationship with your IT departments. If you do not already have a relationship with your IT department, do it now. As with all technology, you will no doubt run into issues. Most headsets have Wi-Fi capability and will need access to the Internet, need applications installed, or updates occasionally. So, ensuring that you have that relationship with IT will be important.
4. Align the experiences with your curriculum. Some of the biggest issues are students not taking VR experiences seriously. By connecting the VR experience to the curriculum, it ensures you and the students understand the purpose of the technology. And this ultimately ensure VR is valued as an educational tool.
5. Practice, practice, practice. Even if you are a technology wiz, run through how to operate the equipment and how to complete the experience. The more you know how the equipment and the experience operates, the better you will be able to guide and answer their questions, because there will be questions.
6. Allow for plenty of time. Some experiences will take time for students to complete and not all students will acclimate to the technology as quickly as others. Students who have prior gaming experience will take to it quickly, but the students who have a lot of real-world experience in the content area may struggle at first. So, ensure there is plenty of time built into the lesson plan.

Virtual reality technology can provide a learning space with multiple benefits such as higher engagement, unique experiences, and immersive environments to assist in content delivery. While new technology may be intimidating for some teachers or administrators, it can be exciting for students to learn in a virtual environment. One of the teachers who piloted the tractor VR in their classroom said, "I think, overall, it was a positive experience. I think anytime that you add a novel experience like this, because kids don't always get to use virtual reality, and especially in the classroom. I think that brings a level of excitement for anyone because it is something different." Hopefully this article inspires teachers to explore the different educational technology available, and how it provides students with unique learning opportunities in a twenty-first century classroom.

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For more information about the implementing the tractor and machinery VR program mentioned in the article, please reach out to the authors.

Additional agricultural safety curriculum is available at a national clearinghouse at Safety in Agriculture for Youth.

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Precision, Digital, and/or Smart Agriculture – Where Are We?

by Kwabena Bayity & Dr. Don Edgar

Globalization and increasing populations have caused an increased demand on agricultural production. To achieve sustainable production in agriculture in the future, it is forecasted that producers should adopt technological tools. This begs the question, how do current and future producers adopt technological innovations into present and future practices to impact the needs of society?

Recently, innovative farming methods such as precision, digital and smart farming are being implemented in agriculture production. Producers, marketers, and consumers who play vital roles in the food value chain should have knowledge and understanding in the use of technologies to ensure efficient use of resources for agricultural production. How do we aid in the adoption and utilization of these tools? How do we increase the understanding of these technologies for future producers?

Initially, one of the technologies impacting production was precision agriculture. Precision agriculture is farm management practices to enhance efficiency, profitability, and sustainable environments using technologies. Modern technologies such as satellite imagery or field mapping are used in precision farming to improve crop quality. Producers use these technologies to increase food production and apply agricultural inputs in a precise way that was not done before.

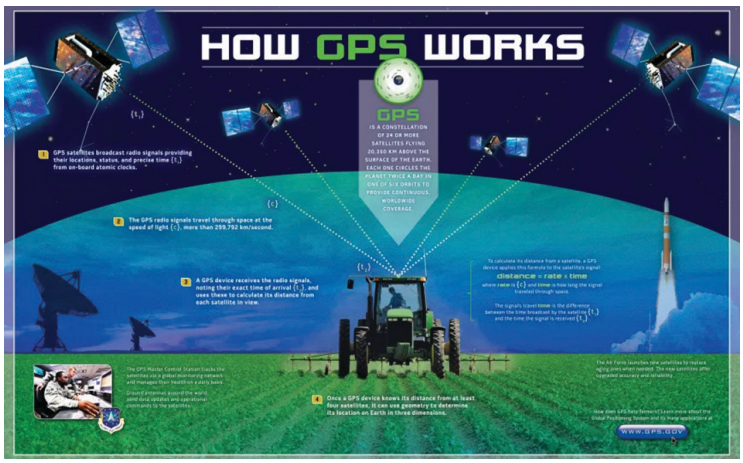
As technological capabilities have increased, farming moved from precision agriculture into the digital realm. Digital agriculture is where technologies are used to collect, analyze, and interpret data collected on production activities. Digital information collected on soil, crop and weather patterns forms the bases for digital agriculture. Producers have access to real time data, which enables producers to make informed and appropriate decisions across the agri-food system.

Recently, technology has allowed agricultural production to move towards smart farming. Smart farming is where information and communication tools and technologies are integrated to increase crop production. Smart farming integrates precision farm management practices with digital agricultural data allowing producers to make informed decisions with multiple sources of information. These integrated information systems can even be controlled through a handheld device such as a smartphone.

Precision Agriculture

The use of precision agriculture as an integral part of the modern farming practices has given producers the ability to control farming activities to enhance productivity and profitability. Precision agriculture has been integrated and implemented into agricultural practices by combining Global Positioning System (GPS) and Geographic Information Systems (GIS).

These technologies enable producers to collect data with accurate position information which leads to improved decision-making processes across the agri-food system. As an example, a producer can gain GPS locations of undesirable plants in a field and use that location to apply herbicides only at those specific locations. GIS based applications in precision agriculture are used to create and analyze visual images of multiple collected data on farms



to make informed decisions on farming activities. For example, GIS based applications use color stamps such as red, yellow, and green to provide information on crop health. These tools enable producers to accurately measure, map and manage any variations on the farm to improve productivity, profitability, and reduce environmental impacts.

> Digital agriculture is where technologies are used to collect, analyze, and interpret data collected on production activities.

Digital Agriculture

Digital agriculture involves the use of electronic tools and devices such as remote sensors, communication networks, and Unmanned Aircraft Systems (UAS) or drones. Digital agricultural data collected, summarized, and analyzed enables producers to make informed and efficient decisions.

Examples of these new emerging electronic tools in digital agriculture include:

- Remote sensors can be on satellites or mounted on UASs to collect data by detecting the energy that is reflected from the field. These sensors used in farming are known as ag-sensors. These sensors provide data which assist producers to monitor and optimize crops by adapting to changes in the environment conditions.
- Communication networks are interconnected networks used to generate, analyze and share information for the purpose of reaching mutual understanding. Digital technologies such radio, television, Smartphones, GIS etc., enables producers to store, manage, and analyze real time data about field production and resources in an efficient manner.
- Unmanned Aircraft Systems are air vehicles and associated equipment that do not carry a human operator, but instead are remotely piloted or fly autonomously. This tool enables producers to survey their lands, perform field analysis, and generate real time data. They also allow producers to monitor how far along crops are in their respective growth periods.
- Robotics Machinery are any automatically operated tools that perform functions like human beings. These robotic machines help producers in sowing, chemical application, irrigation and weeding the field. Autonomous robotic vehicles equipped with high-resolution cameras help to monitor crops and plant growth.

Smart Agriculture

Smart farming is a management concept that focuses on all agricultural activities that aim to increase efficiency and productivity. Smart farming integrates and implements connected devices and innovative technologies across the agri-food system to increase the quality and quantity of agricultural production. Smart farming has been an integral part of modern farming activities using smart sensors, cameras, and internet-based devices in agriculture production operations.

These internet-based technologies such as smart agriculture sensors, data analytics and telecommunication devices enable producers to enhance productivity and make informed decisions. As an example, producers can use

sensors and internet-based smart devices such as mobile phones to gather volumes of important data on crop quality and growth in real time. These internet-based devices provide critical data such as temperature, humidity, moisture, and precipitation, which helps producers make decisions on optimal planting practices. With the help of smart devices and sensors, several agricultural practices can be performed at the same time across the production chain, including fertilization, pest and disease control, and irrigation.

Conclusions

In the 21st century, producers must adopt the potential of smart agricultural technologies in production activities to enhance productivity and efficiency. These smart agricultural technologies have brought huge benefits to agriculture and are becoming the revolution to modern farming in recent days. Smart technologies can enhance competitiveness and sustainability in agriculture production. The integration of these internet-based devices has improved the lives and farming activities of producers as they can now conveniently gather and interpret meaningful data in the moment. With the ever-growing population, the demand for more food and a sustainable environment is increasing. Meeting those demands with the maximum efficiency is essential, and as a result the agricultural industry is bound to integrate and invest in agricultural technologies.

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Are Drones in Your Student's Future?

by Richard McPherson & Dr. Edward Franklin

Do you have students interested in flying drones? Perhaps you have chapter members who fly drones for fun, or engage in drone racing? Ever consider drones as a potential Supervised Agricultural Experience (SAE) leading to an agricultural career? This exciting technology is growing in popularity and there are multiple opportunities for our students to fly drones for both fun and profit! Are all drones the same? As an instructor, where do you start in terms of introducing your students to drone technology and applications for agriculture and other fields? In this article, we will present types of drones, drone systems, drone operation safety, who can fly drones, career opportunities, costs of drone systems and sources for curriculum and training.

What's in a Name?

What is the difference between a drone, a UAV and a UAS? These names are often used interchangeably to refer to unmanned aircraft; however, there are some differences to be made. The most frequent name being used to refer to an unmanned aircraft is a drone. The terms UAV and drone are now essentially used interchangeably. According to the FAA, a UAV or drone is an aircraft without an onboard human pilot, controlled either autonomously or by remote control. Another term, sUAV is used to identify "small" UAVs ("s" meaning small) that weigh less than 55 pounds. All drone operation in our national airspace is overseen by the Federal Aviation Administration (FAA). This requires all drones be registered. The exception is those that weigh 0.55 pounds or less (under 250 grams) and are flown exclusively under the "*Exception for Recreational Flyers*" clause. To register a drone, the owner or operator must be 13 years of age or older, a U.S. citizen or legal permanent resident. For foreign operators, the FAA will consider the certificate to be issued to be a recognition of ownership rather than a certificate of U.S. aircraft registration. The cost to register a drone is $5.00. An individual registration number is assigned to the drone and must be displayed on the drone. The online site for registering a drone is at the FAA DroneZone.

> The terms UAV and drone are now essentially used interchangeably.

The FAA classifies the operation of drones in two categories: recreational, and commercial.

- **Recreational** - This applies to flights that are purely for fun or recreational. Approximately 539,000 registered drones are recreational. This makes up approximately 63 percent of all registered drones in the U.S.
- **Commercial** - To earn compensation for operating a drone, the user must be able to show proof of completion of Part 107 Certification. Commercial drones registered with the FAA numbered almost 315,000. The number of remote pilots certified is 280,418. Women remote pilots number nearly 19,400. This is about 7.6% of all remote pilots.

TRUST Exam

According to the FAA, all recreational flyers must pass an aeronautical knowledge and safety test and provide proof of passage if asked by law enforcement or FAA personnel. In 2021, the FAA introduced *The Recreational UAS Safety Test (TRUST)* to meet this requirement. The test is available online and there is no cost to take the exam. There is no limit to the number of attempts to take the exam. At the successful completion of the exam, a certificate is produced. Students can download, print out, and carry their certificate when they fly their drone. The exam covers topics in four areas: requirements for flying drones; drone operation; community-based safety organizations; and getting to know your drone. Each section includes a knowledge check.

Part 107 Certification

A drone weighing 55 pounds or under and flown for work or business under the FAA's Part 107 is considered commercial operation. To become an FAA-certified drone pilot you must pass a knowledge exam. A student should review the knowledge exam study materials provided by the FAA. Obtain a FAA Tracking Number (FTN) prior to registering for the exam. The student will schedule to take the exam at a FAA-approved knowledge testing center. Upon successful completion of the exam, the student will file a FAA Form 8710-13 to complete the process to obtain the Remote Pilot Certificate.

Types of Drones

Basically, there are two types of drones used in agriculture. Fixed-wing craft and multi-rotor craft. Fixed wing drones look like traditional aircraft with large wingspans. They are designed to fly long distances at higher rates of speed. They are used for land

surveying, mining, environmental management, construction, and community service projects. They cover large amounts of area on battery charges and perform well when experiencing increasing wind speeds. They are used for mapping (taking pictures) of large areas of land in short periods of time. They require open space for take off and landing. Multi-rotor craft operate very much like a helicopter. These craft take advantage of taking off and landing from very little space. They can hover and rotate, turning in different directions. Typically operated at slower speeds, they are ideal for flying small area mapping and inspection missions. Typically operated at slower speeds, covering smaller areas. In air flight times and wind resistance is lower than fixed-wing craft. Multi-rotor craft are used in urban settings as well as rural areas, and are available in multiple sizes with four rotors, six rotors and eight rotors. Large units can carry heavier payloads such as liquid storage tanks and spray systems for aerial applications of liquids used in agriculture.

How AFNR Career Pathways Utilize Drones

Inspections of any structure have a danger factor when completed by a person. Drones have the capability to fly into hard-to-reach places, hover, and take photos and live video of the site for evaluation. Drones are frequently being used to inspect fence lines, grain elevators, irrigation and water management, and structures. They are also being used to monitor crop health and efficiencies, weeds and pest control management, and herd health. In addition, drones are being used for stand counts for germination rates, inventory, financing and insurance of crops, equipment, livestock, and buildings. They are also used to create topographical, cut/fill, and slope maps. A drone's payload (cameras, sensors, and telemetry equipment) can collect a range of data that can produce highly accurate 2D and 3D maps with extremely high resolution. Typically, using dedicated software, the UAV flies in a back-and-forth pattern autonomously over the area to be mapped. The camera and sensors point down to capture data at regular intervals to create overlapping images of the area. The images are then stitched together to create a high-resolution composite. Both farmers and ranchers have successfully utilized this application.

Why a Career as a Drone Pilot?

There is a growing demand for certified drone pilots. One projection states the need to fill 100,000 positions by 2025. Salaries are competitive ranging from $35,000 to $160,000, depending on skill-level, experience, and geographic location. Pilots can work for an organization or be self-employed. Drone pilots must enjoy working with technology, working outdoors and with members of a team. Some positions provide opportunities for travel. To become a commercial drone pilot, the individual must be at least 16 years of age, be able to read, speak, write, and understand English. The applicant will be in a mental and physical condition to safely operate a drone and must pass the initial Part 107 aeronautical exam. A student should have strong communication skills, robust problem-solving abilities, excellent electronic and mechanical skills, expertise in multitasking and keen attention to detail.

Helpful Websites for More Information about Drones, Training, and Careers

- https://faadronezone.gov
- https://womenanddrones.com
- https://uavcoach.com/
- https://dji.com
- https://www.farmitude.org
- https://icevonline.com

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Envisioning the Future of SBAE in the Year 2050

by Emma Metzger

Have you ever seen videos of those old commercials where the narrator describes what people think the futuristic world of technology will look like? For example, in a *History Channel* flashback video of a 1967 commercial titled, "The 1960s Idea of 'The Home of 1999,'" what's shown is what people in the 1960s were expecting family households to look like by the year 1999. Among the predictions made was one where students would be able to learn at home on the family computer with teaching programs that allowed them to learn at their own pace. Seeing as online learning didn't become commonplace until the last few years by necessity, the people of the 1960s may have had more faith in humanity's speed of progression than it deserved. However, with the comparatively advanced technology now available in the 2020s, coupled with new and improved research methods, more accurate attempts can be made of what education, specifically school-based agriculture education, will look like in the next thirty years.

Over time, factors affecting education will involve evolutions in classroom life, advancing technology, and newly developing agricultural processes. Each of these factors stands to alter every component of agriculture education, meaning supervised agricultural experiences (SAEs,) FFA, and classroom instruction. With that, in order to make as accurate of a prediction as possible, one must look at this three-circle model and make projections of how it will be impacted by the continual changes of the world.

Considering how different agriculture was thirty years ago, it's safe to assume that it will be quite different thirty years from today. Naturally, SAEs will be altered with it. Researchers for Oxford Academic state that "[m]eeting food demand while maintaining functioning ecosystems will require a recalibrated [sustainable intensification] strategy, in which up-to-date production goals are coupled with quantitative environmental targets (Hunter, 2017)." The solution to this dire need might very well be technology.

As the world changes, technology becomes more relied upon and it will be necessary not only in keeping up with the growing production demand, but in the wide expanse of agricultural workforces as well. "AI will mature in time, like all technologies, while society's demands are likely to escalate (Halal, 2016, p. 87)." As such, student SAEs will likely become more technologically based. That doesn't necessarily mean that the supervision will be technology based like how classes had to become for a while. Rather, the agricultural experiences themselves will be technology based. For example, students with SAEs in food production may use their phones and computers to determine when the time to harvest is. Currently, an engineer named Manuela Zude-Sasse is working to make this possible by "...attaching sensors to apples to detect their size, and levels of the pigment's chlorophyll and anthocyanin. The data are fed into an algorithm to calculate developmental stage, and, when the time is ripe for picking, growers are alerted by smartphone (King, 2017)." If this research takes off, then by the year 2050, food production SAEs could include students demonstrating proficiency in the use of these kinds of systems.

Another component of SBAE that would see major changes as time goes on is FFA. Technology will likely play a major role in Career Development Events (CDEs). These transitions have already begun in CDEs such as Job Interview, which has a telephone interview category. This could advance further in other events like the Agronomy CDE. Scientists and engineers are working to design drones for crop fields that are "able to collect data from the invisible parts of the electromagnetic spectrum that could allow farmers to pinpoint a fungal disease, for example, before it becomes established (King, 2017)." Technology like this could make the equipment ID and written test portion of the Agronomy CDE look completely different.

Lastly, classroom instruction would see a shift. Assuming that schools don't go completely online by 2050, schools will still likely make the "implementation of a customized curriculum... possible (Parasmal, 2022)." In SBAE, this could mean teaching students how to utilize software custom to each agricultural career individuals aspire to work in. It would be a complete change from the one-size-fits-all education method currently adopted.

Whatever changes for SBAE the future holds, it will look quite different. SAEs could be majorly technological, FFA would use more advanced technology in CDEs and LDEs, and classroom instruction could be customized to each individual student. Only

time will tell how accurate these researched predictions are, and what it all means for school-based agricultural education.

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The Future of SBAE: What will School-Based Agricultural Education Look Like in 2050?

by Josie Kurtz & Logan Peters

In a world of progress, agriculture is always claimed to fall behind. In a stigma of traditionalism, agriculture is known for conservative beliefs and failure to keep pace with other professions. Yet, as agriculture and its education move through the twenty-first century, progress is being achieved. In the year 2050, school-based agricultural education will embrace a larger diverse demographic composition, possess an increased emphasis on multi-generational disciplines in curriculum, and will maintain haptic learning practices.

A more diverse demographic composition will be welcomed within school-based agricultural education. This diversity will encompass multiple domains, primarily between urban vs. rural backgrounds and minorities. As stated by Brown and Schafft (2019), rural areas are being increasingly urbanized; this trend will continue throughout the century. This will lead to an increase of students with non-traditional agriculture backgrounds intermixed with those with traditional agricultural experiences; we are already seeing this begin in today's school-based agricultural education classrooms. Furthermore, there is an increase of marginalized groups within agriculture seen between the three USDA Censuses of Agriculture from 2007 (2017), 2012 (2017), and 2017 (2017). The percentage of all farms each group holds has risen over the past fifteen years. Due to this incorporation of diversity within school-based agricultural education, the practice will continue beyond its current statements of acceptance of diversity, equity, and inclusion concepts by educating these concepts within classrooms (Tubbs, 2015). School-based agricultural education will centrally standardize the education of these concepts to learners alongside the occupational standards being presented. This standardization represents an embrace for the more diverse demographic composition expected within school-based agricultural education by 2050.

Concurrently, school-based agricultural education will more heavily emphasize multi-generational disciplines in curriculum. Multi-generational disciplines are the areas of focus needed to promote stability and future progress for society, which includes environmental sustainability, progress towards quality of life for all humans, and efficiency in production. Externalities on the environment are altering regular climate factors into threatening ones, such as droughts and wildfires, flooding, and abnormally severe weather– the number of these externalities are rising (Ghasemi et al., 2021). Furthermore, we face countries remaining in the first stages of the Demographic Transition Model (Brown & Schafft, 2019) and a lack of food access to many (Cable et al., 2021). These issues are mostly unstandardized within school-based agricultural education. Education in these areas are still volatile. These will become standardized over the next twenty-eight years due to the necessity of education in these areas, since change cannot be made without the proper knowledge. Also, technological advances are exponentially increasing, and the diffusion of information surrounding them is expected to increase within school-based agricultural education and the industry itself (Huang & Zheng, 2018). There will continue to be an increase in education surrounding efficiency in production through this. These multi-generational disciplines are just now finding themselves in school-based agricultural education classrooms mostly unstandardized, and a heavier emphasis will be placed on them by 2050.

School-based agricultural education classrooms, on the other hand, will not disclude haptic learning. There is belief in an increase of technology use within general education classrooms which will bleed into school-based agricultural education classrooms, removing the haptic learning which is commonly emphasized as a cornerstone of today's agricultural education (Ulukol, B., 2022). Although there is a national shortage of agricultural educators which may allow technology to benefit agriculture classrooms (Smith et al., 2022), allowing schools to have school-based agricultural education opportunities which may otherwise not occur due to this shortage, school-based agricultural education within classrooms with agricultural educators will not fully commit to this technology. The Three Circle Model outlined by the National Association of Agricultural Educators (2022) emphasizes an application of learned material in agriculturally-related contexts. Haptic learning is a cornerstone of agricultural education; it is a strong belief amongst agricultural educators

and implicates technology use in school-based agricultural education will not impede on the amount of tactile learning which usually occurs within them.

Predicting the future of professions is an inexact practice and opinions may differ, not only about the most appropriate analytical approaches but also about the logic of the conclusions. However, there are trends in current school-based agricultural education which suggest these adjustments will occur. Agriculture is progressing with the world, and school-based agricultural education will reflect this. In the year 2050, school-based agricultural education will embrace a larger diverse demographic composition, possess an increased emphasis on multi-generational disciplines in curriculum, and will maintain haptic learning practices.

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