

The Agriculture Mechanics Laboratory – Safety and Capacities

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Abstract

The agricultural mechanics laboratory, that is a part of the agricultural science and technology instructional program in Texas public schools, has over the years become a key component of the instructional program. Four classes, as outlined in the Texas Essential Knowledge and Skills (TEKS) that focus on mechanical skills and include: Principles of Agricultural, Food, and Natural Resources, Agricultural Mechanics and Metal Technologies, Agricultural Facilities Design and Fabrication and Agricultural Power Systems.

Most agricultural mechanics laboratories are used 4 to 5 class periods per day sometimes with more than one class at a time meeting in the facility. The questions that arises is how safe are the labs and are they equipped to handle the classes and number of students in each class.

This study was a preliminary study conducted as a part of the AGD 581 Methods of Teaching Agriculture in the Public School. Six graduate students visited 11 high schools and compiled data in the following areas: foot candles of light available, hours of use per day, and safety equipment, etc. The results will be shared with the participants.

Introduction

As a part of the class assignment for AGD 581, Methods of Teaching Agriculture in the Public School, six graduate students spent time traveling to eleven high schools, Areas VI and IX, to gather information about the agricultural mechanics laboratories at those particular schools.

The graduate students gathered information that would better prepare them to manage a agricultural mechanics laboratory in a teaching situation, especially in the area of laboratory safety. The graduate students had several meetings to determine the items to include in the overview of shop safety. The following objective was developed:

Objectives

The objective of this study was to: determine if safety issues related to light intensity, paint rooms, line of sight, number of students enrolled per class, shop cleanliness, ventilation, and other safety equipment existed within the agricultural mechanics laboratories that were examined.



Materials and Methods

Six graduate students enrolled in AGD 581 visited 11 high schools' agricultural mechanics laboratories in FFA areas VI and IX to determine the extent to which safety issues existed such as: efficient lighting, number of students per lab, paint room accessibility, safety equipment, safety lanes, line of sight, shop cleanliness, and safety exams. To ensure that all researchers would be observing the same factors, the survey used to record the findings was developed prior to data collection.

Students in pairs visited 11 laboratories during the fall semester of 2014. To determine the footcandles light intensity a handheld footcandle meter was placed in a central location at work height on the table top in the shop area with all overhead doors down and all the lights on. The type of lighting source was also observed. Safety equipment observed included fire extinguishers, eyewash stations, fire alarm systems, shower stations, and traffic lanes. Line of sight was determined by entering the teacher's office and observing whether or not students could be clearly seen from the office when students were in the shop area. The number of students enrolled in each class was determined from the teacher's role sheets. The measure cleanliness was somewhat subjective. Researchers were instructed to observe such things as clutter on the floor, tools not put up, or unsafe storage practices.

Results

School	Cleanliness	Paint Room	Number of Students	Safety Test Required	Can you see from the office	Type of Lighting	Foot Candles	Hrs/Day of Use	Safety Equipment	Ventilation
1	Clean and organized, it's a new shop	Yes, in a separate building	20, but prefers 15 at a time	Yes 100 % passing	Can see from the shop, but not the classroom	Flourescent and Natural light from the bay doors		5 classes each day and each class is 47 minutes long	3 fire extinguishers, eyewash station, shower station, and fire alarm system in the office that calls the principal, super intendent, and fire department	Fans were up high at the ceiling and they also had 3 bay doors open to allow the smoke to escape
2	Clean and organized	No	15	Yes	can see 100% of floor space	High intensity LED lights	175	8am - 3:40pm	3 extinguishers, alarm, no eye wash or shower	2 Large fans at each end
3	Clean and organized, but had hay in the shop	No	15 is ideal, but 18 in the class	Yes, 100% or test corrections	Cannot see anything from the office	Flourescent	16	4-5 hours	4 fire extinguishers, eyewash, sink, every arc welder has its own shut off. No light switches at the back door, fuse panel does not lock, drop plugs do not work, no lanes	Vent hoods that don't work, but also have wall vents
4	Not very clean or organized	No	27, 5 classes, 1 teacher	Yes	100% visibility from office	flourescent	75	8am - 430pm	Alarm and 5 extinguishers, eyewash and shower	Vents for individual welding booths and slit vents on roof
5	Messy and disorganized	No	20 max in shop	Yes 90% passing	Cannot see shop, but there is a surveillance camera	flourescent	30	two 55 minute classes	4 fire extinguishers	Three fans up high-two on back (west) wall and one on the side (south)
6	Very organized	No	15 max in shop	Yes, 100%	Yes you can see from office into shop and classroom, but would prefer all glass	flourescent	10	6 hours/day	5 fire extinguishers, no eyewash or shower, and only one working sink	Three fans up high
7	Not very clean or organized	No	15	Yes	Yes, there is an office window that faces the shop	Flourescent	16	5 hours of use/day	1 Fire extinguisher, a sink you could was your eyes in, and a fire alarm	One large chicken house fan at the end of the building that pulled air out
8	Fairly clean, very organized but cluttered at same time.	no	15 - 20 at a time. Depends on which class is present.	yes	Can't see hardly any of the shop when inside the classroom. Shop is built in a "horseshoe" design. Poorly built.	Flourescent	80	6 hrs a day.	3 fire extinguishers in shop. No eye wash, no traffic lanes,	5 exhaust fans at the top of the walls above welding booths. Also 3 roll up garage doors to help with ventilation.
9	Very clean and organized	no	15 - 20 students	yes	yes can see entire shop from classroom and office.	Flourescent	40	5-7 hrs a day	4 fire extinguishers in shop. No eye wash, a few traffic lanes, safety glasses cabinet.	2 exhaust fans. 4 roll up garage doors to help with ventilation.
10	extremely clean and very organized.	no paint room	15	yes 100% accuracy	yes can see whole shop	Flourescent lighting and natural lighting from roll up doors.	35	3 hrs a day	a few traffic lanes, 4 fire exinguishers.	2 small ventilation fans above the shop in the storage area
11	Clean, fairly organized.	Yes, converted old lab into an impromptu paint room.	Largest class has 25 students	Yes	Yes, classroom and office have large windows facing the shop.	Flourescent	30	8 hrs per day	2 fire extinguishers, traffic lanes, no eye wash	1 central vent with 2 smaller ones on either side. 2 roll up garage doors.
Totals							46.0909			

Results

Square footage is of the various agricultural mechanics labs range from 3000ft² to as much as 12,000ft². All lighting sources with the exception of one lab were flourescent and natural light. One facility had LED high-intensity lights as their light source with natural light as well. Footcandles ranged from 175, with LED lights, to as little as 16 footcandles. The Illuminating Engineering Society (IES) lists 100 footcandles as the recommended requirement for the school laboratory work. All schools with the exception of one had 3 to 5 fire extinguishers readily accessible; one school only had one. Four of the school districts had some form of traffic lanes marked in the laboratory. Only two schools indicated that they had a paint room. Both of these rooms were converted to paint rooms from some other original use. Eight of the 11 shop areas have a clear line of sight from the office into the shop. One school had security cameras. 100% of the schools indicated that students were required to take and pass a safety exam before they were allowed to work in the shop. Eight of the 11 agricultural mechanics labs were considered to be clean and well organized by the researchers. All facilities had ventilation fans on the ceiling or on the wall which pulled smoke and fumes up past the welder's face.



Summary

In summary, all schools had some safety issues that needed to be resolved. One of the most glaring issues is the lack of a paint rooms that meet industry standards. Also lighting needs to be addressed so that students working in the lab have ample light to see their work surface. An average of fifteen students in the shop area at a time is a safe and workable number. Twenty-seven students in the shop at one time is a dangerous situation which could lead to accidents even with good supervision. Every school required students to pass the safety test before entering into the agricultural labs, but not all schools had proper safety equipment. At least two of the schools did not have water in the shop area so students did not have access to emergency showers or eye wash stations and eight of the schools did not have traffic lanes painted on the floors for safety.

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