

# Texas 4-H SET Abilities – Project Addendum



## Science, Engineering & Technology

### 4-H Science, Engineering & Technology Abilities and Texas 4-H Project Work Associations

Texas 4-H and Youth Development fully embraces 4-H Science, Engineering, and Technology (SET) Programming in the Context of 4-H Youth Development to properly facilitate the development of 4-H SET Abilities in meaningful and significant ways. In the over 100 years of Texas 4-H it is a proven fact that learners learn best when actively engaged - physically, mentally, and emotionally – within non-formal learning settings. Clearly, 4-H is at a turning point in its history with an extraordinary opportunity to reaffirm its legacy as a leader in hands-on non-formal science, engineering, and technology education. Since the 4-H Youth Development Program began in 1902, 4-H youth have been engaged in demonstration projects that bring innovation and understanding of land-grant college and university research to local communities. Understanding and appreciating the role of science, engineering, and technology is even more critical as the needs of our society and its workforce change. Now, more than ever, we must ensure that our nation's youth develop the necessary competencies and abilities for the United States to remain competitive in the 21st century. (4-H SET: A Strategic Framework for Progress, May 2007.) The National 4-H Council goal is to reach one million new 4-H members with SET Projects by 2013 to prepare America's youth to excel in science, engineering, and technology.

Our strategy to implement SET in the forefront of all 4-H project work is to introduce the 4-H SET Abilities, familiarize and use the Abilities terminology to bring about awareness in the 4-H member's project work. Additionally, develop 4-H SET Projects that are purposeful in teaching scientific methodology. 4-H members will become actively engaged in the scientific process of inferring, hypothesizing, measuring, estimating and experimenting to bring meaning to their world. The Abilities will be valuable skills for life-long learning for 4-H members to call upon for problem-solving and decision-making.

4-H SET has 30 Commonly Identified Abilities that a review of literature in the fields of science, engineering, and technology education has shown to be most frequent. Graduating seniors from high school should be familiar and have a good understanding of these abilities in preparation for college level work.

Texas 4-H is beginning our SET efforts with incorporating these Abilities and the vocabulary of science, engineering, and technology into the existing project work of the 4-H members. The process is to first provide a one-page addendum to the 4-H project materials that give the SET Ability and an example of how the project leader could address an associated experiential learning experience to the SET Ability.

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### 4-H Science, Engineering & Technology Abilities and Texas 4-H Project Work Associations

The examples are very broad, so do not assume this is only for one lesson. 4-H SET Abilities occur within all project work, at all levels regardless of age appropriate lessons. The extent of the complexity would depend on the age of the member and the experiential learning experience. The main focus of this first introduction is to bring about an awareness of Science, Engineering, and Technology in Youth Programming. What do we teach to the 4-H member that is directly related to a process grounded in research? Everything! So, we are attempting to bridge the gap between the research-based material we teach in the non-formal education setting with the awareness by our 4-H audiences that they too are experiencing, and doing, SET as they progress through their 4-H project work.

We need 4-H SET Project Addendum sheets for all 4-H projects. If a good fit does not exist for an Ability in a particular project work area, then we will not address that SET Ability (in that project). 4-H SET and the way that young people become aware of the components of the related 4-H project work experiences will enhance their curiosity of science, engineering, or technology, which (we hope) will lead to more American students exploring careers in a field that incorporates these Abilities.

Developing 4-H SET Projects will be targeted at teaching the scientific methodology in solving problems. Teaching not only the technical subject matter, but appropriate processes of scientific methodology to create an engaged group of young people focused on learning and solving problems in the realm of science. An experientially based SET curriculum includes aims, goals and objectives; subject matter; learning experiences and assessment. In addition, three overriding principals are essential:

- Engaging resilient preconceptions (critical that learner preconceptions be identified, confronted, and resolved)
- Organizing knowledge around core concepts (increase the learner's understanding and retention while developing key scientific abilities)
- Supporting self-regulation (provide safe and nurturing environment under the guidance of a trained learning facilitator)

Project curricula developed as a 4-H SET specific learning experience should lead the 4-H member through the scientific process in a designed, organized, age appropriate activities to support the 4-H SET Abilities.

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## Science, Engineering & Technology

### Definitions of SET Abilities

**Build/Construct** — Make by putting materials together.

**Categorize/Order/Classify** — Put objects or events in groups or classes.

**Collaborate** — To work together; applies both to the work of individuals as well as larger groups.

**Collect Data** — Record information in an organized fashion about objects and events that illustrate a specific situation.

**Communicate/Demonstrate** — Any one of several procedures involving various media that transfer information from one person to another.

**Compare/Contrast** — Evaluate similarities and differences.

**Design Solutions** — A written plan, also known as a design brief, that identifies a problem to be solved, its criteria, and its constraints.

**Develop Solutions** — A systematic strategy used to develop many possible solutions to solve a problem or satisfy human needs and wants.

**Draw/Design** — To plan out in systematic, usually graphic form; design a building; design a computer program.

**Evaluate** — The technique of examining and judging data presented.

**Hypothesize** — State a tentative generalization, which is subject to immediate or eventual testing by one or more experiments; to explain a relatively large number of events.

**Invent/Implement Solutions** — The practical application to fulfill a desired purpose.

**Infer** — Explain an observation in terms of one's previous experience.

**Interpret/Analyze/Reason** — Determine the nature and relationship of the parts of the whole. Find a pattern inherent in a collection of data. This process leads to stating a generalization or drawing conclusions. In an experiment, it is the process by which one establishes the relationship between controlled factors and the outcome.

**Measure** — A procedure by which one uses an instrument to estimate a quantitative value associated with some characteristic of an object or event.

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### Definitions of SET Abilities – page 2 of 2

**Model/Graph/Use Numbers** — Devise a scheme or structure that will describe specific real objects or events.

**Observe** — The most basic process of science, in which learners use their senses to obtain information about themselves or the world around them.

**Optimize** — To make the best or most of a condition.

**Organize/Order/Classify** — Put into working order; get together and arrange.

**Plan Investigations** — Use a body of techniques, often referred to as the Scientific Method, for considering phenomena and acquiring knowledge, including the elements of hypothesis development, prediction, and the effects and limits of observation and based on gathering observable, empirical, measurable evidence, subject to the principles of reasoning.

**Predict** — Projecting future observations on the basis of previously known information.

**Problem Solve** — Part of the thinking process considered the most complex of all intellectual functions, that includes problem finding and problem shaping.

**Question** — Raise an uncertainty, doubt, or unsettled issue that may be based on the perception of a discrepancy between what is observed and what is known by the questioner.

**Redesign** — To draw, sketch, or plan again.

**Research a Problem** — An active, diligent, and systematic process of inquiry aimed at discovering, interpreting, and revising facts. Is usually associated with the output of science and the scientific method.

**State a Problem** — The first step in the engineering process focused on assessing/creating the need in order to define the problem to be solved.

**Summarize** — To make a brief statement giving the main points or substance of a matter.

**Test** — To verify or falsify an expectation with an observation, often as part of an experiment within the scientific method.

**Troubleshoot** — A systematic search for the source of a problem so that it can be solved.

**Use Tools** — Manipulate objects, instruments, and materials as a means of furthering a learner's understanding, appreciation, and application of scientific knowledge.

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## Science, Engineering & Technology

### Beef

Build/ Construct Prototype - Build a pen, trim chute; Modify a piece of equipment

Categorize/Order/ Classify - Breed identification/selection for desired result (stockshow)

Collaborate - Work with group to travel to event or workshop organization

Collect Data - Record weights of animal to determine weight breaks for future use

Communicate/Demonstrate - Demonstrations of Showmanship technique

Compare/Contrast - Judge a class of livestock and let choices be known

Design Solutions - Animal health plan for disease prevention or recovery

Develop Solutions - Decide on final weight of animal for competition or harvest and calculate feeding regiment to attain desired result

Draw/ Design - Much like Build/Construct, but more formal from systematic plan

Evaluate - Examine result based on goal or earlier plan

Hypothesize - Heifer's offspring will be more desirable based on sire selection because...

Infer - How to best halter break a breed/animal based on previous experience

Interpret/Analyze/Reason - Calf gained weight quicker than others due to feed schedule

Invent (implement solutions) - Alter misting nozzle with fan to keep animal cooler

Measure - Measuring the height of the calf and weighing at regular times lead to the understanding of frame scoring

Model/ Graph/Use Numbers - Chart animal weight and height measurements

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## Science, Engineering & Technology

**Beef** – page 2 of 2

Observe - Spend time watching (basic to animal health to know animal's characteristics)

Optimize - No electricity, use comb - brush - towel to dry animal in shortest period

Organize/Order/Classify - Arrange weight breaks or breed classes for stockshow

Plan Investigation - Animal keeps getting sick...change one thing at a time until cause is discovered...order of changes based on best guess of known contaminates

Predict - By calculating weight gain, determine final weight of animal at stock show

Problem Solve - What's the problem; Based on experience, how can it be fixed; Are resources available to construct the solution

Question - Any time something is observed, but unknown to the observer; Why does my calf have horns, but the cow and bull do not?

Redesign - First solution did not work, so try it again from a different angle

Research a Problem - If the answer is not known, or can be explained to questioner, then the questioner and instructor look for answer that is understandable

State a Problem - What does questioner really want to know...then the answer can be looked for

Summarize/Relate - How is this information important

Test - Try a solution and observe if the result is what is desired based on expectation

Troubleshoot - Why did something work one time, but not the next

Use Tools - Any manipulation of thought or material to further the understanding or answer questions

# Texas 4-H SET Abilities – Project Addendum



## Science, Engineering & Technology

### CLOTHING & TEXTILES

Build/ Construct Prototype – Create fabric design or texture. Construct a garment.

Categorize/Order/ Classify – Classify fabrics by fiber content.

Collaborate – Work with quilting guild to complete a quilt.

Collect Data – Record price, quality, and construction techniques of 3 similar garments.

Communicate/Demonstrate – Demonstrate sewing techniques.

Compare/Contrast – Color palate selection for a person’s completion, hair, and frame.

Compare the quality of 3 similar garments at 3 different stores.

Design Solutions – Evaluate personal measurement and identify problem areas in ready-made garment or pattern.

Develop Solutions – Create plan to alter a ready-made garment or pattern for best fit.

Draw/Design – Design a new fabric pattern. Design a garment or accessory.

Evaluate – Evaluate seam finishes. Evaluate existing wardrobe.

Hypothesize – Hypothesize what will happen to natural fibers when placed in a flame.

Infer – Explain why the smell of a natural fiber in a flame smells similar to the smell when branding cattle.

Interpret/Analyze/Reason - After completing flame tests determine whether man-made or natural fibers would be better for sleepwear.

Invent (implement solutions) – Velcro, snaps, iron on tape for hems

Measure – Measure quilt pieces. Complete body measurements.

Model/ Graph/Use Numbers – How many outfits can a top/pants be worn with. Create a map of where clothes in your closet were made.

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## Science, Engineering & Technology

### CLOTHING & TEXTILES - PAGE 2 OF 2

Observe – Observe what happens when different fabrics are placed over a flame. (Flame test)  
Observe consumers spending patterns.

Optimize – How many outfits can a top/pants be worn with. Optimize clothing budget by shopping at resale shops, and repurposing items in your closet.

Organize/Order/Classify – Organize existing clothing and accessories by clothing type.

Plan Investigation - Investigate careers in clothing and textiles. Investigate green fabrics on the market.

Predict – Predict how a garment will wear after 1, 5 and 10 washings.

Problem Solve – How can you prevent shrinking during the laundering.

Project – How well will natural fibers vs. synthetic fibers hold up when wet. Does heat sensitive tape perform well enough for hemming garment.

Question – Why are so many clothing items produced outside of the United States?

Redesign – (Fabric and Fashion Design) Recycle an existing garment to create a new piece.

Research a Problem – How can fabric production be changed to be more eco-friendly?

State a Problem – What is the best fabric to be used for..... athletic wear, cold weather.

Summarize/Relate – Summarize garment care techniques.

Test – Test different methods and products to determine the best method to reduce dye bleeding.

Troubleshoot – Find a solution to color fading in ready-made garments.

Use Tools – Learn to thread a sewing machine. Learn to operate a rotary cutter.



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## Science, Engineering & Technology

### Dog

Build/ Construct Prototype - Build a pen, jump or other elements; Modify equipment

Categorize/Order/ Classify - Breed identification/selection for desired result ( dog shows)

Collaborate - Work with group to travel to event or workshop organization

Collect Data - Record weights, shots certification classes for each dog for future use

Communicate/Demonstrate - Demonstrations of Showmanship technique

Compare/Contrast - Judge a class of dogs, drill or costume and let choices be known

Design Solutions - Animal health plan for disease prevention or recovery

Develop Solutions - Decide skill of dog for competition and calculate training and feed regiment to attain desired result

Draw/ Design - Much like Build/Construct, but more formal from systematic plan

Evaluate - Examine result based on goal or earlier plan

Hypothesize - Offspring will be more desirable based on sire selection because...

Infer - How to best train a breed/animal based on previous experience

Interpret/Analyze/Reason - Dog became house broke quicker than others due to training and feeding schedule

Invent (implement solutions) - Alter kennel with fan to keep animal cooler in Texas summer

Measure - Measuring the height of the dog and weighing at regular times lead to the understanding of frame scoring

Model/ Graph/Use Numbers - Chart animal weight and height measurements

# Texas 4-H SET Abilities – Project Addendum



## Science, Engineering & Technology

### Dog – page 2 of 2

Observe - Spend time watching (basic to animal health to know animal's characteristics)

Optimize - No electricity, use comb - brush - towel to dry animal in shortest period

Organize/Order/Classify - Arrange weight breaks or breed classes for dog show

Plan Investigation - Animal keeps getting sick...change one thing at a time until cause is discovered...order of changes based on best guess of known contaminants

Predict - By calculating dog height, determine final agility jump height for dog show

Problem Solve - What's the problem; Based on experience, how can it be fixed; Are resources available to construct the solution

Question - Any time something is observed, but unknown to the observer; Why does my dog have a tail, but the parents do not?

Redesign - First solution did not work, so try it again from a different angle

Research a Problem - If the answer is not known, or can be explained to questioner, then the questioner and instructor look for answer that is understandable

State a Problem - What does questioner really want to know...then the answer can be looked for

Summarize/Relate - How is this information important

Test - Try a solution and observe if the result is what is desired based on expectation

Troubleshoot - Why did something work one time, but not the next

Use Tools - Any manipulation of thought or material to further the understanding or answer questions

# Texas 4-H SET Abilities – Project Addendum



## Science, Engineering & Technology

### Foods & Nutrition

Build/ Construct Prototype – a breakfast meal using at least 3 food groups

Categorize/Order/ Classify- foods according to MyPyramid

Collaborate – with peers to collect foods for local pantry

Collect Data – compare Nutrition Facts panels for frozen pizzas

Communicate/Demonstrate- lead younger children in a physical activity

Compare/Contrast – food items based on unit pricing

Design Solutions – make a nutrition handout that might appeal to a young child

Develop Solutions – redesign a recipe to incorporate lower price ingredients

Draw/ Design – a Nutrition Facts panel

Evaluate – an eating plan based on MyPyramid recommendations

Hypothesize - how physical activity can help maintain your weight

Infer – two consequences of drinking too much soda

Interpret/Analyze/Reason - why certain beverages are higher or lower in natural and added sugars

Invent (implement solutions) - adapt a recipe to make it more nutritious

Measure – serving sizes

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## Science, Engineering & Technology

### Foods & Nutrition – page 2 of 2

Model/ Graph/Use Numbers – select canned soup based on unit pricing

Observe – new food items at the grocery store to identify food trends

Optimize – a grocery list for one week for an elderly adult

Organize/Order/ Classify – foods according to Calcium content

Plan Investigation - into added sugar content of various beverages

Predict – the outcome drinking sweetened beverages by a young child

Problem Solve – design a meal plan for an active teen

Project – how many cups or ounces of food you need to eat from each food group

Question – advertisements for fast foods or high sugar cereals

Redesign – a family meal to include more fruits and vegetables

Research a Problem – identify three nutrients often lacking in teen diets

State a Problem – many teens skip breakfast

Summarize/Relate- a 4H record group regarding food and nutrition projects

Test – a sample recipe on new or different equipment

Troubleshoot- a recipe failure such as muffins that did not raise

Use Tools – use MyPyramid.gov to determine estimation of personal calorie needs

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## Science, Engineering & Technology

### Hair Goat

Build/ Construct Prototype – Build a blocking table, feed trough or mineral feeder or pen

Categorize/Order/ Classify – Examine livestock for fineness of mohair and tag accordingly

Collaborate - Work with angora goat production workshop organization and breed organizations.

Collect Data - Record weights, kid crops, and pounds of mohair sheared for future use.

Communicate/Demonstrate – Demonstration of spinning of mohair

Compare/Contrast – Judge a class of angoras and/or mohair fleeces for quality

Design Solutions - Animal health plan for disease prevention and recovery

Develop Solutions - Determine quality of mohair desired and select proper herd animals to obtain desired result.

Draw/ Design – Design a kidding barn with necessary equipment

Evaluate - Learn processes of mohair grading

Hypothesize – Determine the benefits or negatives of grading mohair for marketing purposes

Infer - How to train a border collie to aid in ranch working of goats.

Interpret/Analyze/Reason - Kids gained weight quicker due to more consumption of a clean water supply

Invent (implement solutions) - – Design waters in shaded areas to keep water cooler for more consumption and gain.

Measure – Maintain records of fiber diameter measurements on mohair to determine production and value

Model/ Graph/Use Numbers - Chart mohair fleece lengths and yields.

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## Science, Engineering & Technology

### Hair Goat – page 2 of 2

Observe – Spend time watching (basic to animal's health to know animals' characteristics)

Optimize - Rotate animals in pastures to decrease internal parasite problems.

Organize/Order/ Classify - Collect and arrange items necessary to prepare an angora goat for a livestock judging event

Plan Investigation – Animal keeps getting sick...change one thing at a time until cause is discovered...order of changes based on best guess of known problem.

Predict - By using accurate records calculate pounds of mohair to be produced and/or number of kids produced

Problem Solve - Establish and discern toxic plant problems and how management can be used to solve the problem

Project – Use recordkeeping to project final kid crop numbers

Question – What are the commercial uses of mohair in industry?

Redesign - Goats will not work properly through a cutting shoot so try a new one with a different design.

Research a Problem - Find ways to limit predator loss

State a Problem - Why are nannies not raising a healthy, high percentage kid crop?

Summarize/Relate - Summarize and study feeding goals from year to year in livestock production

Test – Try various de-wormers for internal parasite control to determine various product effectiveness

Troubleshoot - Observe an unthrifty animal to determine the source of its problem

Use Tools - Practice shearing, washing and spinning of mohair, hoof trimming, horn tipping, vaccinations, etc.

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## Science, Engineering & Technology

### Horse

**Build/ Construct Prototype** - Build a stall or enclosure for your horse to get in out of the weather.  
Build obstacles for a trail class.

**Categorize/Order/Classify** - Evaluate a horse show schedule and sort the various classes into Western or English disciplines.

**Collaborate** - Work with a group of individuals to plan a horsemanship clinic

**Collect Data** - Evaluate the results from the district/state horse show to determine approximately how many individuals you will be competing against.

**Communicate/Demonstrate** - Work with less experienced youth and demonstrate riding techniques.  
Conduct a showmanship clinic. Conduct a clinic on grooming.

**Compare/Contrast** - Evaluate horses on competitive horse judging videos to learn what judges are looking for in horse show classes. Evaluate body conformation on several horses.

**Design Solutions** - Evaluate a horse's physical fitness utilizing heart rate as an indication. Recovery heart rate after exercise is an indication of fitness level.

**Develop Solutions** - Develop a plan to improve the fitness level of your horse. Work with professionals to assist with development of plan.

**Draw/ Design** - Plot a horse's recovery heart rate five minutes after exercise. Repeat f several days.

**Evaluate** - Analyze the recovery heart rate graph.

**Hypothesize** - Based on recovery heart rate data, does this type of exercise improve a horse's fitness level.

**Infer** - Which type of exercise might best increase a horse's fitness level.

**Interpret/Analyze/Reason** - Utilizing data from recovery heart rate testing, evaluate responses and determine if exercise program improved results.

**Invent (Implement solutions)** - If recovery heart rate was not improved in original testing, devise a different exercise program based on previous attempts.

**Measure** - A stethoscope or heart rate monitor may be utilized to determine the heart rate.

**Model/ Graph/Use Numbers** - Utilize times from barrel racing runs to evaluate improvement.

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### Horse – page 2 of 2

Observe - Evaluate horse behavior in solitary horses and group situations.

Optimize - Develop a plan that will make you more efficient while doing barn chores that will allow you more time to spend with your horse.

Organize/Order/Classify - Make an inventory list of your tack and equipment. Classify based on usefulness or longevity.

Plan Investigation - Develop a deworming schedule for your horse.

Predict - Evaluate a specific dewormers active ingredients and determine what type of worm or worms it can eliminate.

Problem Solve - Determine if a horse has a specific worm infestation problem. Identify a specific dewormer that will eliminate that species.

Project - If one type of dewormer is used ever time a horse is treated, that horse may not respond positively to that dewormer in the future.

Question - Why do different dewormers affect certain types of worms?

Redesign - If a plan doesn't achieve desired results, evaluate the approach and develop another method to achieve desired results.

Research a Problem - Some equine diseases are more prevalent in certain geographic areas of the county. If that disease is not prevalent in your area, should you be concerned with vaccinating a horse against the disease?

State a Problem - What is the question? Do you have a problem that needs to be solved? What do you see as a limitation to your horse performance?

Summarize/Relate - How can I use this information to improve the overall wellbeing of my horse?

Test - Implement a new training technique with your horse.

Troubleshoot - Is the new training technique working for your horse? What was the problem and did the new technique address the problem?

Use Tools - Utilize people, new articles, popular press articles to broaden your knowledge base. All of these items will assist you to increase your knowledge and understanding of horses and yourself.



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## Science, Engineering & Technology

### Meat Goats

Build/ Construct Prototype – Build a trimming table, feed trough or mineral feeder or pen

Categorize/Order/Classify – Classify body type to determine breeding of market type

Collaborate – Work with goat production workshop organization, and/or showmanship clinics.

Collect Data – Record weights, kid crops, and rate of daily gain for future use.

Communicate/Demonstrate - Demonstrations of showmanship techniques and goat recipes

Compare/Contrast – Judge a class of meat goats

Design Solutions – Animal health plan for disease prevention and recovery

Develop Solutions – Determine herd goals and select proper herd animals to obtain desired result.

Draw/ Design – Plan, draw and design a goat exercise track that will complement existing pens and/or barn.

Evaluate – Learn processes of meat goat judging

Hypothesize – Develop idea of how to obtain desired result and write down

Infer – How to train a border collie to exercise or aid in ranch working of goats

Interpret/Analyze/Reason – Goats gained weight quicker due to more consumption of a clean water supply

Invent (implement solutions) – Design waters in shaded areas to keep water cooler for more consumption and gain.

Measure – Keep records of weight gain and feed consumption

Model/ Graph/Use Numbers – Chart animal weight and frame size

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### Meat Goats – page 2 of 2

Observe – Observe goats feeding habits for determine the need for separating animals based on rate of gain

Optimize – Rotate animals in pastures to decrease internal parasite problems.

Organize/Order/ Classify – Collect and arrange items necessary to prepare a goat for a livestock judging event

Plan Investigation – Animal keeps getting sick...change one thing at a time until cause is discovered...order of changes based on best guess of known problem.

Predict – By using accurate records calculate pounds of goats in production or at time of a livestock show

Problem Solve – Establish and discern toxic plant problems and how management can be used to solve the problem

Project – Use rate of gains to project final weights of animals

Question – Observe everything about animal behavior, then explore the known facts about why an animal acts or reacts

Redesign – Goats will not work properly through a cutting shoot so try a new one with a different design.

Research a Problem – Find ways to limit predator loss

State a Problem – Why are nannies not raising a healthy, high percentage kid crop?

Summarize/Relate – Summarize and study feeding goals from year to year in livestock project

Test – Try different methods to arrive at livestock show with goats in best condition

Troubleshoot – Observe an unthrifty animal to determine the source of its problem

Use Tools – Practice shearing, washing, hoof trimming, de-horning, vaccinations, etc.

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### Rabbits

Build/ Construct Prototype – Build cages and nest boxes.

Categorize/Order/ Classify – Identify breeds; select for intended purpose – meat, show, companion animal.

Collaborate – Organize rabbit club, workshop, or rabbit show.

Collect Data – Keep detailed records of breeding information including buck, doe, breeding date, nest box date, litter birth date, number born alive, number born dead, number weaned, etc.

Communicate/Demonstrate – Demonstrate showmanship, general rabbit care, or information about breeding program or meat production.

Compare/Contrast – Judge classes of show rabbits or evaluate breeding stock and meat pens.

Design Solutions – Develop rabbit health care plan identifying common ailments and plans for prevention or treatment.

Develop Solutions – Formulate various strategies to handle sanitation concerns and waste disposal.

Draw/ Design – Develop a computer program for record keeping; design rabbit barn maximizing cage and work space for efficiency.

Evaluate – Use standard health checklist procedure to examine each rabbit.

Hypothesize – Careful selection of breeding pairs will result in more desirable offspring.

Infer- Use artificial light to help compensate for seasonal breeding tendencies.

Interpret/Analyze/Reason – Individuals and/or litters will develop faster and maintain better condition in direct relation to proper feeding and watering practices.

Invent (implement solutions) – Develop most practical method to cool rabbits in hot weather.

Measure – Keeping frequent and accurate weight measurement is critical in raising optimum meat pens and fryers.

Model/ Graph/Use Numbers – Chart weights of each litter's individual rabbits from birth to 70 days (meat pen maximum age).

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### **Rabbits – page 2 of 2**

Observe – Watch rabbits carefully to detect problems from illness or environment.

Optimize – Use resources wisely and maintain equipment and supplies carefully.

Organize/Order/Classify – Arrange entries into classes for rabbit show.

Plan Investigation – Use knowledge of desired breed characteristics to plan, develop, and implement breeding program.

Predict – Plan breeding schedule so that meat pen rabbits will be correct age for shows.

Problem Solve – Go Green With Rabbits – Work to make your herd and barn environmentally friendly.

Question – If you notice something different about your rabbit's behavior, be sure to check it out.

Redesign – As herd increases, changes will need to be made – develop new plan for adequate housing.

Research a Problem – Examine a problem such as how to most effectively provide water for rabbits – bottles, crocks, water system, etc.

State a Problem – Identify problem, such as how to tell identical looking litter mates apart.

Summarize/Relate – Use a project record form or MAP to help summarize rabbit project.

Test – Try different methods to solve a problem and obtain the desired result, such as finding the best grooming aids or most effective medications.

Troubleshoot – Look for the source of the problem, such as what is causing a doe to lose her litters – could it be weather, stress, heredity, etc.?

Use Tools – There is a wealth of information available about raising rabbits for meat, show, or fun – utilize it to improve your knowledge and skills.

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### RANGE SCIENCE

Build/ Construct Prototype – Construct a forage sampling plot frame, float cover or branding iron

Categorize/Order/ Classify – Conduct vegetation inventory and classify plants native vs. introduced and by grass, forb or woody

Collaborate – Develop a prescribed burn plan and delegate tasks to each team member e.g. fire boss, torch carriers, etc..

Collect Data – Record cover (soil, plant, litter, rock) at 3 ft. intervals along a 300 ft. transect

Communicate/Demonstrate – Make a poster for children describing Texas rangelands.

Compare/Contrast - Compare bunchgrasses to sodgrasses; Compare different genera of grasses and their distinct characteristics; Which grasses would be palatable? Why?

Design Solutions – How can the current ranch management scenario be modified to meet ranch management goals?

Develop Solutions – Based on brush species, number of plants per acre, other desirable species and location, select chemical or mechanical brush control?

Draw/ Design – make a map of a real or imaginary ranch that includes location of: boundary fences, cross fences, water troughs, water wells, feeders, working pens, range sites and soil types.

Evaluate – Based on forage production and species composition, which pasture is in better condition?

Hypothesize – Light to moderate stocking rates will improve overall range condition because....

Infer – Infer range condition based on current plant abundance and plant species that are present as well as soil surface features like bare ground, physical crusting, and evidence of water erosion; infer livestock diet quality by looking at fecal samples

Interpret/Analyze/Reason – Why is forage production higher in draw sites than on hillslopes?

Invent (implement solutions) – Construct a homemade seed broadcaster that can be mounted on a 4-Wheeler

Measure – Record rainfall at several locations in the county.

Model/ Graph/Use Numbers - Graph rainfall data from “Measure” and write a summary that compares your data to the period of record.

# Texas 4-H SET Abilities – Project Addendum



## Science, Engineering & Technology

### RANGE SCIENCE – PAGE 2 OF 2

Observe – Take a field trip and ask each participant to collect 10 items of the same class e.g. rocks, grasses, insects, twigs, etc. Bring them all together and discuss findings. (this requires members to look closely at their surroundings while searching and then see common and rare features collected across the landscape. This should generate some questions.

Optimize – Can additional classes or species of livestock be added to an operation to utilize forage or browse that is currently not being used? How might rainfall affect these decisions?

Organize/Order/Classify - Rank range condition of 4 small plots on range evaluation contest

Plan Investigation – How can we determine why a specific item collected during ‘Observe’ and ‘Question’ is rare? Is it due to reproductive characteristics, a geologic event, climate, human influence, predation?

Predict – Predict total forage in a pasture based on weight of forage clipped from a frame.

Problem Solve – Can calving season be changed to better utilize available forage and improve forage quality and body condition score of lactating cows?

Question – Related to ‘Observe’, why are the common features present? Where did the rare features come from? Which are more important?

Redesign – Creep feeder designed for calves doesn’t work for your new goat herd? Why? Redesign and modify existing feeder for kid crop.

Research a Problem – Has anyone else researched the same problem? Where? How is there situation same/different? Can you add to their research?

State a Problem – examples might be noxious weeds, soil erosion, brush density, poor grazing distribution. Problems can be identified during ‘Observe’.

Summarize/Relate - Summarize and graph results from ‘Test’.

Test – Select 3 native grass species and purchase from a native seed retailer. Plant them outside the 4-H building, record rainfall and see which species does best (most seedlings, most survivors, tallest survivors, which species produces most seed) under natural rainfall conditions.

Troubleshoot – Cattle are getting sick and it is not a disease. The rancher thinks it is a toxic plant. Based on the symptoms he describes and using the Toxic Plant Handbook as a reference, do you think the sickness is caused by a toxic plant? If so, which one do you think it is? What are the recommended management strategies?

Use Tools - computer spreadsheets, grass clippers, yard tools, welders, cutting torches, libraries (online and local), websites such as web soil survey, and mapping software are some examples of tools incorporated into SET abilities examples listed above.

# Texas 4-H SET Abilities – Project Addendum



## Science, Engineering & Technology

### Sheep

Build/ Construct Prototype – Build a blocking table, feed trough or mineral feeder or pen

Categorize/Order/ Classify – Identify breeds raised for wool and/or meat

Collaborate – Work with sheep production workshop organization, breed organizations, and/or showmanship clinics.

Collect Data – Record weights, lamb crops, and pounds of wool sheared for future use.

Communicate/Demonstrate - Demonstrations of showmanship techniques, wool processing, and lamb recipes

Compare/Contrast – Judge a class of sheep and/or wool fleeces for quality

Design Solutions – Animal health plan for disease prevention and recovery

Develop Solutions – Determine quality of wool desired and select proper herd animals to obtain desired result.

Draw/ Design – Plan, draw and design a lamb exercise track that will complement existing pens and/or barn.

Evaluate – Learn processes of wool grading

Hypothesize – Shearing once a year versus twice a year will be more desirable because...

Infer – How to train a border collie to exercise or aid in ranch working of sheep.

Interpret/Analyze/Reason – Lambs gained weight quicker due to more consumption of a clean water supply

Invent (implement solutions) – Design waters in shaded areas to keep water cooler for more consumption and gain.

Measure – Measure height and length of a lamb to determine the average show weight class to try for

# Texas 4-H SET Abilities – Project Addendum



## Science, Engineering & Technology

### Sheep – page 2 of 2

Model/ Graph/Use Numbers – Chart animal weight and wool fleece lengths and yields

Observe – Observe lambs feeding habits for determine the need for separating animals based on rate of gain

Optimize – Rotate animals in pastures to decrease internal parasite problems.

Organize/Order/ Classify – Collect and arrange items necessary to prepare a lamb or sheep for a livestock judging event

Plan Investigation – Animal keeps getting sick...change one thing at a time until cause is discovered...order of changes based on best guess of known problem.

Predict – By using accurate records calculate pounds of wool to be produced and/or pounds of lamb in production or at time of a livestock show

Problem Solve – Establish and discern toxic plant problems and how management can be used to solve the problem

Project – Use rate of gains to project final weights of animals

Question – Why do some breeds of sheep have to be sheared and some do not?

Redesign – Sheep will not work properly through a cutting shoot so try a new one with a different design.

Research a Problem – Find ways to limit predator loss

State a Problem – Why are ewes not raising a healthy, high percentage lamb crop?

Summarize/Relate – Summarize and study feeding goals from year to year in livestock project

Test – Try different methods to arrive at livestock show with lambs/sheep in best condition

Troubleshoot – Observe an unthrifty animal to determine the source of its problem

Use Tools – Practice shearing, washing and carding of wool, hoof trimming, de-horning, vaccinations, etc.