



COACHES AND TEAM GUIDE

Volunteers are a huge part of what makes 4-H Science of Agriculture Challenge possible. Whether you are a business person, parent, or volunteer, the Science of Agriculture Challenge would not exist without you. We just cannot say it enough – thank you!

We modeled this this Quick Start Guide after FIRST® Lego League® as a guide to help you navigate the complete Science of Ag Challenge season. From recruiting your team members all the way through celebrating at the end of your season, this guide contains suggestions to help you along the way.

Remember though, this is only a guide. The 4-H motto, “Learn by Doing” is just as true for volunteers as it is for 4-H members. Use the guide to help you guide your team, but also enjoy the experience of learning alongside the kids. Don’t forget, this is going to be fun!

ISSUE AND RESPONSE: CHALLENGE OVERVIEW

Issue

Agriculture and ag-biosciences are critically important to finding solutions to key challenges facing the United States, including economic growth, food security, human health and environmental sustainability. However, a U.S. Department of Agriculture survey showed the United States faces a shortage of agricultural scientists. The U.S. is falling dangerously behind other nations in developing its future workforce of agriculturists, scientists, engineers, and technology experts. Young people in America are not prepared with the necessary science, engineering and technology workforce skills to compete in the 21st century. Only 5% of American students get their undergraduate degree in science and engineering compared to 66% of Japanese and 59% of Chinese students. Statistics show that children lose interest in science, technology, engineering and math (STEM) topics as early as third grade.

University Response

As part of K-State Research and Extension, 4-H has made improving science literacy a priority, and is working to develop the next generation of agriculture scientists. 4-H provides hands-on, experiential, inquiry-based learning opportunities that promote excitement and interest in science, and improve science literacy by equipping youth with science knowledge and skills.

Through 4-H, youth:

- Gain exposure to cutting-edge science and technology in agriculture that produces abundant, healthy and economical food.
- See themselves as scientists.
- Explore college and careers in agriculture, science and engineering.

A study of youth development by Tufts University shows that young people who participate in 4-H excel in school and science, and are more likely to pursue a career in science, engineering or computer technology than their peers.

4-H Science of Agriculture Challenge

Kansas 4-H knows that today's youth are tomorrow's agriculture leaders. The new 4-H Science of Agriculture Challenge asks youth to explore and develop science-based solutions to agriculture-related issues they have identified in their communities. Youth teams will work with local partners to explore issues and find solutions to challenges in agronomy, animal husbandry, soil science, Ag business, rural finance, food science and engineering. Participants will then attend a statewide event campus of Kansas State University to present their 4-H Science of Agriculture Challenge projects. They will also connect with representatives from the University and agribusiness community who are eager to meet the next generation of leaders in agriculture and STEM while sharing their job-seeking skills.

Impact

Through "hands on" 4-H agriculture, science, technology, engineering and math learning experiences in the Science of Agriculture Challenge, youth will:

- Get excited about and interested in agriculture and STEM;
- Have a greater understanding and knowledge of food production and its importance in our economy and world;
- Gain 21st Century skills, including technology, health, business and economic literacy, critical thinking, problem solving, initiative and self-direction;
- Consider and connect with agricultural-related studies at the university level; and
- Be exposed to and explore future careers in agriculture.

YOUTH AND ADULT PARTNERSHIP

TEAM MEMBERS

The Science of Agriculture Challenge team may include 3-5 youth, grades 6 through 12. Team members do not have to be current 4-H members, but should be enrolled upon joining the team to be covered under 4-H accident insurance and receive full membership opportunities.

Limiting your team to five members may be difficult, but it provides the optimal small group experience. If you have more than five youth interested in joining a challenge team, consider starting a second team or use a selection process to decide who may participate on your team.

VOLUNTEER OPPORTUNITIES

There are a few key volunteer roles in the Science of Agriculture Challenge: Coaches, Mentors, and Parents. Coaches, mentors, and parents help youth learn new skills or concepts that allow youth to solve the challenge. You might find that a parent of one of the team members also becomes the team coach.

Coach

The role of a Coach is to inspire the team and help them get excited about the science of agriculture. Coaches give teams guidance and provide structure, encouragement, and most of all, a fun experience. They meet regularly with the team and guide them in developing goals and a timeline. The coach serves as the facilitator to help the team complete its work and improve the way team members work together. Coaches guide the process while the youth control the content.

Team members must make all decisions and do all the work. This includes deciding on the issue, researching, choosing an innovative solution, and presenting at the Challenge.

Does this mean you should stand idly by while your team struggles? Absolutely not! Instead of telling the team how to solve a problem, try asking questions like:

- What would happen if...?
- And then...?
- How will that affect...?

Young people become problem solvers by finding solutions themselves. We understand that adults can be just as passionate about SOAR as children, but adults must always remember that the young people come first.



Mentor

A mentor is any person who works with the team in his or her area of expertise for at least one team meeting, but the most effective mentor relationship is one that continues over time. Mentors help expose the team members to potential careers in addition to helping them learn the skills necessary to complete the SOA Challenge. The most important quality for a mentor is someone who enjoys working with young people and wants them to learn.

When recruiting Mentors, consider their ability to work with the SOA age group (grades 6-12). They need to be role models and commit to the values of 4-H youth development. Talk to them about:

- Adapting their knowledge to an appropriate level for the team members;
- The team's goals, the timeline, and structure of the meetings;
- Guiding the team to find the answers to their own questions; and
- The importance of acknowledging all team members, getting everyone to contribute and participate, providing positive feedback, and encouraging responses.

Potential sources for mentors might include:

- Companies in your community. Many companies encourage their employees to volunteer, and some even have formal programs to match volunteers with groups in the community.
- Commodity or agricultural-oriented organizations. Think about Farm Bureau, Farmers Union, commodity groups, agricultural Chambers of Commerce, etc.
- Parents and relatives of your team members.

Parents and Guardians

Parents and guardians may assist the team by serving as a Coach or Mentor if they have the skills, time and interest. They may plan fund-raisers, provide a team meeting space, make travel arrangements or provide refreshments.

THE CHALLENGE

SCIENCE AND ENGINEERING PRACTICES

Teams will use the Eight Science and Engineering Practices as the framework to prepare for the challenge. Teams will need to work through each step and be able to share how the practices were applied to finding a solution to the selected issue. The practices are as follows:

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for science);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating, and communicating information.

IDENTIFY AN ISSUE

A central part of the Science of Agriculture Challenge will be the team's focus on an agricultural related issue in your community. Identifying an issue is an important step in your team's process because it will shape your team's research and solution. Consider these suggestions to engage youth in starting to define an agricultural issue:

- Conduct a survey of public officials and citizens (youth and adults)
- Visit with local agricultural businesspeople. Ask the owner/manager and employees what they see as needs in their business.
- Read local newspapers. Circle the agricultural issues. What stories leave you feeling disturbed or unsettled? What articles make you sad or ashamed? Select and cut out articles that address needs and issues that your team could address.

After asking questions and defining a problem, choose one that would be interesting to solve and that is feasible for your team. Then you're ready to work your way through the remaining seven Science and Engineering Practices.

Here are some examples to get you thinking:

- Engage local agronomists to solve a weed issue using remote-control helicopters for weed scouting.
- Engage local wildlife experts to develop mitigation plans for invasive species in local lakes using aquatic robots.
- Engage a local agribusiness to develop business plans for community food gardens.
- Engage local civic leaders to develop ideas to keep rural communities vital and grow rural tourism.

JUDGING RUBRIC

Science of Agriculture Response Challenge is supported by a rubric, or worksheet, developed to help judges record their feedback. The rubric guides the judges through key criteria that reflect what is most important about the SOAR experience. Rubrics also create a consistent way to differentiate between teams at different levels of achievement. Your team will be assessed as Beginning, Developing, Accomplished, or Exemplary in each category.

The rubric is divided into three categories:

CORE VALUES

Motivation:

- a. Balanced emphasis on all three aspects (core values, project, presentation);
- b. Application of SOAR values and skills outside of the Challenge; and
- c. Imagination and curiosity drive project development.

Teamwork:

- a. Problem solving and decision-making processes help team achieve goals;
- b. Resources used relative to what the team accomplishes; and
- c. Appropriate balance between team responsibility and coach guidance.

Professionalism:

- a. Consideration and appreciation for the contributions of all members;
- b. Team members act and speak with integrity; and
- c. Team competes in the spirit of friendly competition and cooperates with others.

PROJECT

Research:

- a. Clear definition of the problem being studied;
- b. Evidence of partnership with one or more individuals in business related to issue;
- c. Types and number of quality sources cited;
- d. Depth to which the problem was studied and analyzed by the team; and
- e. Extent to which existing solutions were analyzed, including an effort to verify originality of solution.

Strategy and Innovation:

- a. Clear explanation of proposed solution;
- b. Team developed a plan, produced and tested models, selected among alternative, and refined ideas;
- c. Team's solution makes life better;
- d. Team tested their project; and
- e. Consideration of factors for implementation.

PRESENTATION

Group presentation:

- a. Team shared their project before the event;
- b. Imagination used to develop and deliver presentation; and
- c. Message delivery and organization of the presentation.

Presentation/Demonstration Format

Teams need to put a presentation/demonstration together that tells the judges what their problem was and how they utilized the 8 steps in the science and engineering process to address and/or solve their local agricultural issue.

Teams will be assigned a 30 minute time slot for the day(s) of the State Contest:

- 20 minutes for presentation/demonstration where all members of team actively participate.
- 10 minutes for interaction and questions with the judge(s).
- Teams may use visuals that enhance the presentation. These may include posters, objects, models, costumes, slideshows, handouts, PowerPoint presentations and more as long as they are considered safe and not considered dangerous. (If you require clarification or are not sure if your required material is appropriate please contact your local KSRE Agent.)
- Special audio or visual materials need to be identified and shared with the Science of Agriculture Extension Specialist prior to the destination event (LCD screen, laptop, projector, etc.).

Other Requirements

- Live animals are not permitted.
- All presentations should promote or identify 4-H in some way, such as on posters, flags, tablecloth, or mentioned in oral presentation.
- Please note that, while youth may have assistance from other 4-H youth, parents and other adults, they are not allowed to help in any way during the presentation/demonstration. Points will be deducted from the overall score if there is adult participation in a presentation.

AWARDS

Top teams will be recognized. Individuals on the first place team will each receive a \$1,000 scholarship (\$800 if a team of five members); second place team members will each receive \$750 scholarships (\$600 if a team of five members); and third place team members will receive \$500 scholarships (\$400 if a team of five members). Final amount of award will be determined by the final donations and sponsorships secured.

REFLECT ON AND CELEBRATE THE SEASON

Reflection is an essential element of the Experiential Learning Process and should happen throughout the season. Acknowledging and celebrating your team's accomplishments, both individual and collective, is essential. Even if the team didn't reach all its goals, they have accomplished a lot and the members should be proud. Also remember to recognize the contributions of Mentors, Sponsors, Volunteers, and your host site.

FUNDING A SOA TEAM

Some resources will be needed to support a challenge team. Consider the following as you start to build a budget:

- \$X = materials for project
- \$X = bus/van to take team to state contest at Kansas State University
- \$X = Challenge Lodging costs for team
- \$X = Challenge Event Meal costs for team
- \$75 = Team Challenge Registration per youth and coach

Sources of funding may include local agricultural businesses, commodity groups, County 4-H Councils, local 4-H Foundations, etc.

TIPS FOR BEGINNING SOAR TEAMS

From FIRST Lego League Team - The Inventioners, NH, U.S.

1. Remember, you don't have to be an engineer to be a great SOA Coach.
2. Work with team members to come up with goals and rules for your team at the first meeting. A few examples:
 - Respect others' ideas.
 - Help others. If a team member is an expert in animal nutrition, she should be willing to help teach others this skill.
 - Identify ways to encourage each other.
 - It's everybody's job to make sure the whole team participates.
3. Set aside time at the beginning of the first few meetings to learn about each other.
4. Get the team committed to a meeting schedule before the season starts. Members who can't attend meetings make it hard for the whole team.
5. Make sure all parents have roles – even rotating ones (Assistant Coach, snack provider, fundraising lead, and photographer) so that they become invested in the progress of your team.
6. Use good time management. Put events on the calendar as soon as the dates are released. Keep the kids focused on how much time they have to accomplish tasks. This way, everything doesn't pile up just before the Event.
7. Keep it FUN!!! The kids will learn to handle frustrations and deadlines better if the element of fun is in the mix. Coaches and parents will be less tempted to “help” too much if there is an atmosphere that emphasizes the joy of learning and exploring new ideas.

AVAILABLE SUPPORT

K-State Research and Extension and the Department of Kansas 4-H Youth Development is committed to your success and will provide the following support:

- This coaches and Team Guide
- Monthly coach conversations
- Volunteer training on learning environments, welcoming environments, and other positive youth development topics
- Access to content experts
- Training on Eight Science and Engineering Practices

Kansas State University is committed to making its services, activities and programs accessible to all participants. If you have special requirements due to a physical, vision, or hearing disability, contact the Kansas State 4-H Office, 785-532-5800.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

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