4-H Science & Engineering Fair

SC District Activity Day Participant Packet
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AWARDS

Cloverbuds – participation only
Competitive age divisions of 9-10, 11-13, and 14-18 will be awarded bronze, silver and gold awards at the SC District Activity Day. The 11-13 and 14-18 gold medal winners will receive a $50 cash award. The 9-10 gold medal winner will receive a $25 cash award.

Dear 4-H Science Fair Enthusiast:
This packet is to provide you with information for preparing for the SC District 4-H Science Fair. Please note that the timeline is only a suggestion, to help guide your experience and everyone’s is different! The 4-H Science Fair is patterned after a true science fair, in hopes that we will eventually feed our participants into the NC regional and state science fairs! For that reason, we ask that you complete the Project Form 1A, with a real research plan. As you are doing your research, a log book will help you keep track of your work. Your log book will become your reference when you write your report and create your final display! A bibliography is required so that you will have real resources to support your topic.

There is also a 4-H Science Fair Lessons Packet that you may obtain from your 4-H Agent. You will find this packet very helpful in helping you to answer a few puzzling questions. What is a hypothesis? What are independent and dependent variables? These are just a few questions that the 4-H Science Fair Lessons Packet will help answer.

There will be a few webinars offered to help answer any questions from parents, 4-H’ers and 4-H professionals. But please do not hesitate to call your 4-H Agent or the SC District 4-H Science Fair Coordinator (April Dillon, Lincoln County, 704-736-8458) anytime you have a question!

Good Luck!
TIMELINE
(suggested timeline)

January
Brainstorm project ideas
Students begin review of literature
State problem to research
List materials needed
Form hypothesis

February
Finalize procedures
Have procedures and research plan approved
Begin experiment

March
Have data book checks
Begin analysis of data
Continue to record data and checks
Continue analysis of data
Finish experiment

April
Entry Form 1A and Research Plan Due – May 6, to April Dillon, Lincoln County & your county 4-H Agent
These may be emailed as word or pdf documents to april_dillon@ncsu.edu

Online Registration for District Activity by County 4-H Agent – May 20
Analysis of data
Write conclusions
Design graphs
Finish research paper
Design board

May
District Activity Day – June 4, Hoke County
Required Project Elements

1) Display
2) Log Book
3) Report
4) Bibliography (3 sources for grades 3-8 and 5 sources for grades 9-12)

Required Project Forms

1) Project Form 1A and Research Plan on pages 12-13 (due May 6, 2016)

Send completed Project Form 1A and Research Plan to:

April_Dillon@ncsu.edu

OR

April Dillon
Lincoln County 4-H
Attn: 4HSEF
115 W. Main Street
Lincolnton, NC 28092

For more information or assistance:

April_Dillon@ncsu.edu, Lincoln County

For additional guidelines and rule information:
www.student.societyforscience.org/intel-isef/
http://www.ncsciencefair.org/

For ideas:
www.sciencebuddies.org
Display and Safety

Note: Maximum project sizes include all project materials and supports. If a table is used, it becomes part of the project and may not itself exceed the allowed dimensions nor may the table plus any part of the project exceed the allowed dimensions.

- 108 in. (274 cm) height, 48 in. (122 cm) in width, 30 in. (76 cm) in depth
- Project positioned at the back of and parallel to the booth
- NO living organisms or plants
- NO Taxidermy specimens or parts
- NO human or animal food
- NO human / animal parts or body fluids (ex. Blood, Urine, etc.)
- NO laboratory / household chemicals (including water)
- NO poisons, drugs, controlled substances, hazardous substances or devices
- NO dry ice or other sublimating solids
- NO sharp items (ex. syringes, needles, pipettes, knives, etc.)
- NO flames or highly flammable materials
- NO batteries with open-top cells
- NO awards, medals, business cards, flags, endorsements and/or acknowledgements
- NO photographs or other visual presentations depicting vertebrate animals in surgical techniques, dissections, necropsies, or other lab procedures
- NO active internet or e-mail connections as part of displaying or operating the project
- NO glass or glass objects
- NO lasers (class II, III or IV)
- NO apparatus producing temperatures that will cause physical burns
- NO project involving starvation or dehydration of plants and animals
- NO apparatus deemed unsafe by the Display and Safety Committee, or Fair Director (ex. large vacuum tubes, pressurized tanks, etc.)

The following are allowed within a project display or booth with compliance to the restrictions indicated

- Soil or waste samples (if permanently sealed in acrylic)
- Photographs and / or Visual Depictions if…
  - NO offensive or inappropriate depictions
  - Credit reference present for all unique sources
  - Any photographs of human subjects other than the student participant must be accompanied by appropriately signed consent form(s)
- NOT OPERATIONAL: any apparatus with unshielded belts, pulleys, chains, or moving parts or pinch points.
- UL-listed 3-wire extension cord with appropriate capacity for any electrical loads used by the display (120 or 220 Volt A.C. only)
- For operational displays using electricity there MUST be an accessible, clearly visible on / off switch or other means of disconnect
**Types of Projects**

**Experimental Projects**

Experimental Projects are based on a testable question and includes a hypothesis; materials; procedure; independent, dependent, and control variables; data displayed in the form of a chart or graph; explanation of the results; and a conclusion that answers the question.

Students choosing to complete an Experimental Project should follow the guidelines below. Projects will be accepted based on approval of the project research plan.

Acceptable examples of Experimental Projects: Include any question that is answered by doing an experiment or investigation and includes the control of independent, dependent, and controlled variables; must be testable, gather some form of data, and include graphs and/or charts in the analysis of that data.

**Engineering Projects**

Engineering Projects are based on a defined need and includes background research, design criteria, preliminary designs, construction and testing of a prototype, iterative redesign and retesting, and graphic and descriptive presentation of the results.

Students choosing to complete an Engineering Project should follow the guidelines below. Projects will be accepted based on approval of the project research plan.

Acceptable examples of Engineering Projects: Include any defined need that supports the creation of a problem statement, hypothesized solution to the defined need, method for design of solution, creation of engineering concept, testing and evaluation of engineered concept, gathering of relevant testing data, analysis of testing data and resulting conclusions with further proposed action.
# Student Checklist of Judging Criteria

Students: When your Science Fair Project is finished, use this checklist to make sure your project is complete and you have everything you need on your backboard.

Read each bullet in the bold categories below. Check YES or NO for each bullet, based on your project. Then, go back and fix the areas on your project where you checked NO.

<table>
<thead>
<tr>
<th>Category</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Appearance and Organization</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Is my project arranged in a step-by-step order?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Are all the parts clearly labeled? (Problem, Hypothesis, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Do I have a title?</td>
<td></td>
<td></td>
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<tr>
<td>- Is it neat and organized?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Is my name on my project?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. Question/Problem Formulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Did I state the problem or question?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Is it a testable problem or question that supports the gathering of data?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C. Hypothesis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Does my hypothesis state a possible outcome of the experiment and tell why I think it will happen that way?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Did I base my prediction on research?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Is my hypothesis stated in the form of an “if... then” statement?</td>
<td></td>
<td></td>
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<tr>
<td><strong>D. Procedure: Written Procedure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Did I list the materials and equipment I used with specific amounts, including units (SI or Metric)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Did I list all steps of the procedure in detail, clearly and in sequential order?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Can someone repeat my experiment exactly as I have by just referencing my procedures?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E. Materials and Procedure: Experimental Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Did I test it three or more times (multiple trials) or use a large enough sample size (observational projects) to support the hypothesis?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Was I careful to control conditions so that something unexpected didn’t affect the results (dependent variables)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Are the independent and dependent variables, observational factors, and/or design factors clearly identified?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
F. Data Collection and Representation
  • Does the data show that I did the experiment or observation carefully? _____ _____
  • Is the data displayed in an appropriate way such as graphs, charts, drawings, photographs, etc? _____ _____

G. Data: Written Explanation
  • Does my explanation summarize and analyze the data? _____ _____
  • Does my explanation describe patterns and trends in the data? _____ _____
  • Does my explanation interpret my charts, graphs, and other visual organization tools? _____ _____

H. Appropriate Conclusion
  • Does my conclusion reflect the data? _____ _____
  • Does my conclusion talk about my Hypothesis? _____ _____
  • Does my conclusion state whether or not my hypothesis was supported or not supported? _____ _____
  • Does my conclusion address my original scientific question? _____ _____

I. Research Paper & Log Book
  • Does my research paper address the validity of my original hypothesis? _____ _____
  • Does my research paper summarize all of my project related research? _____ _____
  • Does my Log Book include organized notes and details supporting all stages of research and project design? _____ _____
  • Did I use 3 or more references to support my experiment? _____ _____
  • Is my research paper evenly supported by a variety of references? _____ _____

J. Understanding of Experiment
  • Can I clearly explain the procedure and results of this experiment to someone who does not know about it? _____ _____
  • Can I connect this experiment to real-world application? _____ _____
  • Can I effectively explain the scientific and/or engineering concepts involved with my research? _____ _____

K. Application of Experiment
  • Can I suggest another experiment that I could do if I wanted to find out more about this topic? _____ _____
### Sample Science Fair Interview Questions

#### Overall Appearance

1. Who helped you with your project?  
2. What was your favorite part of the science project process?  
3. How did you decide how to organize your information on the display board?  
4. How long did it take for you to complete the project?

#### Question

1. How did you decide on the question that you wanted to investigate?  
2. Is this topic something that you’ve always been interested in finding out more about?  
3. Did your question allow you to complete an investigation to gather data?

#### Hypothesis

1. What did you predict the outcome of your investigation would be?  
2. What resources did you use to gather information about your project before you started your investigation?  
3. When you finished gathering information from your resources, did you have to adjust your hypothesis at all?

#### Materials/Procedures

**Written Procedure**

1. Have you listed the exact amount of each material used so that someone else could complete your investigation? Did you use metric or customary units?  
2. Have you listed the procedure in an organized, step-by-step order?  
3. Why do you think it’s important to have the procedure listed in a step-by-step order?

**Experimental Design**

1. How many times did you repeat your investigation?  
2. Why do you think it’s important to repeat an investigation more than once?  
3. What was the independent variable in your investigation? What was the dependent variable?  
4. How were you able to control all the variables except the one you were changing?  
5. If you were to complete this investigation 3 more times, what would you think would be the outcome of the investigation?
### Results and Graphic Representation

1. How did you decide which kind of graph to use to display your data?
2. Could you have used a different type of graph to show the results of your investigation?
3. Have you included and labeled all of the necessary parts of your graph?
4. Does the information on your graph accurately show the information you collected?

### Results: Written Explanation

1. How does your chart/graph show the results of your investigation trials?
2. Have you included information from all of the trials or did you graph the mean of the sets of data?
3. Does the information in your written explanation reflect the results of your investigation trials?

### Conclusion

1. Did your investigation have the results that you predicted?
2. Does your conclusion state if your hypothesis was supported or not supported?
3. What did you learn as a result of completing the investigations for this SET fair project?

### Interview: Understanding

1. If you had to do this SET fair project again, what would you have done differently?
2. What suggestions would you give to someone who was interested in completing your investigation?

### Interview: Application

1. How would what you learned in this investigation be useful in solving a real problem?
2. Can you think of an occupation that would benefit from the information that you gained as a result of this investigation?
3. As you were completing your investigation, did you think of other questions that you would like to find answers to in future investigations?
### 4-H Science Fair Judging Rubric

**Creative Ability** (score each from 0-6)

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>The questions asked are student-initiated and original</td>
<td></td>
</tr>
<tr>
<td>The approach to solving the problem is creative</td>
<td></td>
</tr>
<tr>
<td>Equipment is creatively used or had to be made/modified</td>
<td></td>
</tr>
<tr>
<td>Interpretation of the data shows creative and original thinking by student</td>
<td></td>
</tr>
<tr>
<td>Student has understanding of project implications beyond their research</td>
<td></td>
</tr>
</tbody>
</table>

Total Possible Points /30

**Scientific Thought** (score each from 0-6)

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear and unambiguous statement of problem</td>
<td></td>
</tr>
<tr>
<td>Clearly defined procedural plan for obtaining a solution</td>
<td></td>
</tr>
<tr>
<td>Variables clearly recognized and defined; proper controls used correctly</td>
<td></td>
</tr>
<tr>
<td>Data adequately supports student’s conclusions; limitations recognized</td>
<td></td>
</tr>
<tr>
<td>Student understands project’s ties to other research</td>
<td></td>
</tr>
<tr>
<td>Scientific literature cited, not just popular literature (i.e. newspapers, web)</td>
<td></td>
</tr>
</tbody>
</table>

Total Possible Points /30

**Thoroughness** (score each from 0-3)

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original question was completely addressed</td>
<td></td>
</tr>
<tr>
<td>Conclusions are based on repeated observations (not single experiments)</td>
<td></td>
</tr>
<tr>
<td>Project notes / lab notebook are complete</td>
<td></td>
</tr>
<tr>
<td>Student is aware of alternate approaches or theories</td>
<td></td>
</tr>
<tr>
<td>Student spent an appropriate amount of time on the project</td>
<td></td>
</tr>
</tbody>
</table>

Total Possible Points /15

**Skill** (score each from 0-5)

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data was obtained &amp; analyzed appropriately by student</td>
<td></td>
</tr>
<tr>
<td>Student worked largely independently</td>
<td></td>
</tr>
<tr>
<td>Student has required skills &amp; understanding to continue research on own</td>
<td></td>
</tr>
</tbody>
</table>

Total Possible Points /15

**Clarity** (score each from 0-2)

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear discussion of project (not a memorized speech)</td>
<td></td>
</tr>
<tr>
<td>Written material/poster reflects understanding of research project</td>
<td></td>
</tr>
<tr>
<td>Data and results are presented clearly</td>
<td></td>
</tr>
<tr>
<td>Presentation is forthright</td>
<td></td>
</tr>
<tr>
<td>Student designed and created poster largely independently</td>
<td></td>
</tr>
</tbody>
</table>

Total Possible Points /10

Maximum Total: 100

Adapted from Region 6A Science Fair, Horizons Unlimited, Salisbury, NC
Student Checklist (1A)
Due May 6 to County 4-H Agent and April Dillon, Lincoln County 4-H

This form is required for ALL projects.

1) a. Student/Team Leader: __________________________ Grade: __________________________
   Email: __________________________ Phone: __________________________
   b. Team Member: __________________________ c. Team Member: __________________________

2) Title of Project: ___________________________________________________________

3) School: __________________________ School Phone: __________________________
   School Address: __________________________

4) Adult Sponsor: __________________________ Phone/Email: __________________________

5) Is this a continuation from a previous year? ☐ Yes ☐ No
   If Yes:
   a) Attach the previous year’s ☐ Abstract and ☐ Research Plan
   b) Explain how this project is new and different from previous years on ☐ Continuation/Research Progression Form 7

6) This year’s laboratory experiment/data collection: (must be stated (mm/dd/yy))
   Start Date: __________________________ End Date: __________________________

7) Where will you conduct your experimentation? (check all that apply)
   ☐ Research Institution ☐ School ☐ Field ☐ Home ☐ Other: __________________________

8) List name and address of all non-school work site(s):
   Name: __________________________
   Address: __________________________
   Phone: __________________________

9) Complete a Research Plan following the Research Plan instructions and attach to this form.

10) An abstract is required for all projects after experimentation.

Research Plan Instructions
A complete research plan is required and must accompany Checklist for Student (1A)
The Research Plan/Project Summary is a succinct detailing of the rationale, research question(s), methodology, and risk assessment of your research project and should be completed before the start of your experimentation. Any changes you make to your study should be added to the final document.
The research plan for ALL projects should include the following:
a. What is the RATIONALE for your project? Include a brief synopsis of the background that supports your research problem and explain why this research is important scientifically and if applicable, explain any societal impact of your research.
b. State your HYPOTHESIS(ES), RESEARCH QUESTION(S), ENGINEERING GOAL(S), EXPECTED OUTCOMES. How is this based on the rationale described above?
c. Describe in detail your RESEARCH METHODS AND CONCLUSIONS.
   • Procedures: Detail all procedures and experimental design including methods for data collection. Describe only your project. Do not include work done by mentor or others.
   • Risk and Safety: Identify any potential risks and safety precautions needed.
   • Data Analysis: Describe the procedures you will use to analyze the data/results that answer research questions or hypotheses.
d. Bibliography: List at least five (5) major references (e.g. science journal articles, books, internet sites) from your literature review. If you plan to use vertebrate animals, one of these references must be an animal care reference.

Items 1–4 below are subject-specific guidelines for additional items to be included in your research plan/project summary as applicable.

1. Human participants research:
   • Participants. Describe who will participate in your study (age range, gender, racial/ethnic composition). Identify any vulnerable populations (minors, pregnant women, prisoners, mentally disabled or economically disadvantaged).
   • Recruitment. Where will you find your participants? How will they be invited to participate?
   • Methods. What will participants be asked to do? Will you use any surveys, questionnaires or tests? What is the frequency and length of time involved for each subject?
   • Risk Assessment
     ◊ Risks. What are the risks or potential discomforts (physical, psychological, time involved, social, legal, etc.) to participants? How will you minimize the risks?
     ◊ Benefits. List any benefits to society or each participant.
   • Protection of Privacy. Will any identifiable information (e.g., names, telephone numbers, birth dates, email addresses) be collected? Will data be confidential or anonymous? If anonymous, describe how the data will be collected anonymously. If not anonymous, what procedures are in place for safeguarding confidentiality? Where will the data be stored? Who will have access to the data? What will you do with the data at the end of the study?
   • Informed Consent Process. Describe how you will inform participants about the purpose of the study, what they will be asked to do, that their participation is voluntary and they have the right to stop at any time.

2. Vertebrate animal research:
   • Briefly discuss potential ALTERNATIVES to vertebrate animal use and present a detailed justification for use of vertebrate animals
   • Explain potential impact or contribution this research may have
   • Detail all procedures to be used
     ◊ Include methods used to minimize potential discomfort, distress, pain and injury to the animals during the course of experimentation
     ◊ Detailed chemical concentrations and drug dosages
     ◊ Detail animal numbers, species, strain, sex, age, source, etc.
     ◊ Include justification of the numbers planned for the research
   • Describe housing and oversight of daily care
   • Discuss disposition of the animals at the termination of the study

3. Potentially hazardous biological agents research:
   • Describe Biosafety Level Assessment process and resultant BSL determination
   • Give source of agent, source of specific cell line, etc.
   • Detail safety precautions
   • Discuss methods of disposal

4. Hazardous chemicals, activities & devices:
   • Describe Risk Assessment process and results
   • Detail chemical concentrations and drug dosages
   • Describe safety precautions and procedures to minimize risk
   • Discuss methods of disposal