TRI-COUNTY
STEM FAIR
Manual

February 12 - 14, 2024

Lenawee Intermediate School District

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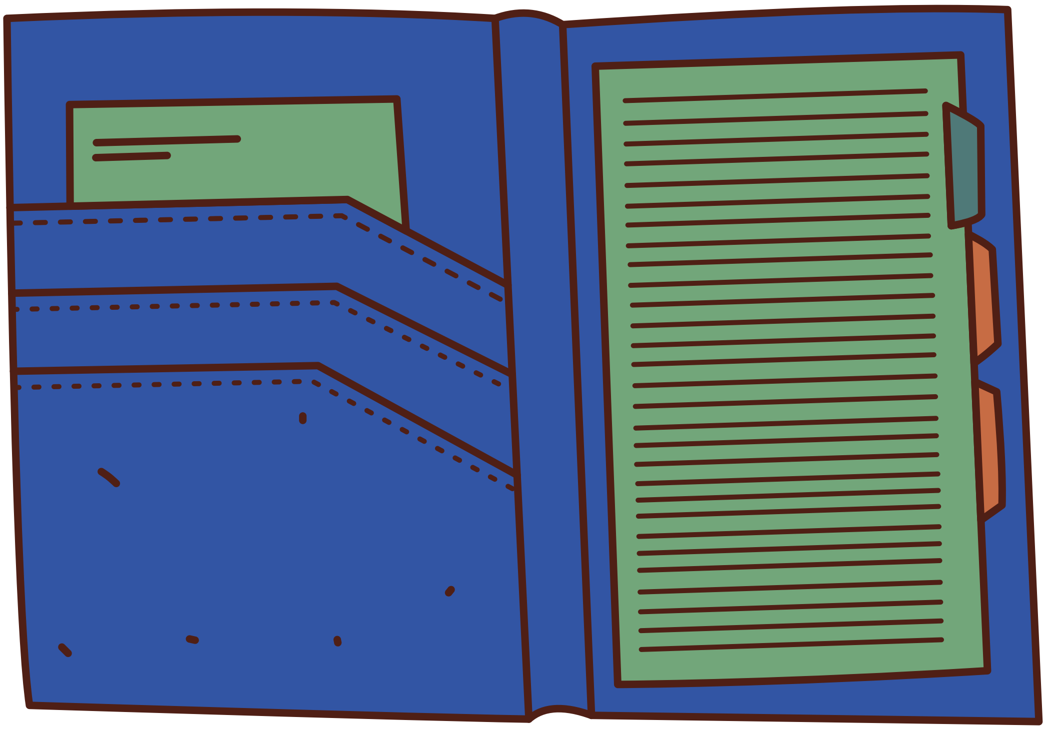

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The Tri-County STEM Fair is presented by the Lenawee Intermediate School District in partnership with Adrian College.

Lenawee Intermediate School District

Important Dates

Student Deadlines:

- Registration is due by Friday, January 12, 2024.
- The Tri-County STEM Fair project set up will be on Monday, February 12, 2024, from 2:00 -5:15 PM in the Adrian College Tobias Center.

Judging:

- **Division Judges**: Orientation and dinner will be on Monday, February 12, 2024, from 4:45 - 5:30 PM. Judging will then occur from 5:30 - 9:00 PM. The project room will be closed to the public during this time.
- **Sponsor Judges:** This judging will take place from 6:30 - 8:30 PM on Monday, February 12, 2024, and from 9:00 AM - 2:00 PM on Tuesday, February 13, 2024, in the Adrian College Tobias Center.

Public Viewing in the Adrian College Tobias Center

- Tuesday, February 13, 2024 from 9:00 AM - 7:00 PM
- Wednesday, February 14, 2024 from 9:00 AM - 2:15 PM

Awards Assembly:

- The 2024 Tri-County STEM Fair Awards Assembly will take place on Wednesday, February 14 in the Adrian College Dawson Auditorium from 1:00 - 2:00 PM.

Project Removal:

- STEM Fair projects must be removed by 2:30 p.m. on Wednesday, February 14, 2024. Any projects not removed by this time will be discarded.

Maps of Adrian College's Campus

- Printable PDF Map
- Accessible Adrian College Map

Classification Description

Division I

- 5th - 8th Grades
- Categories include:
  - Life Science
  - Physical Science
  - Technology and Engineering
  - Social Science
  - Team Projects

Division II

- 9th-12th Grades
- Categories include:
  - Life Science
  - Physical Science
  - Technology and Engineering
  - Social Science
  - Team Projects

Description of Categories

- **Life Science** - plants, animals, environment, food
- **Physical Science** - Inorganic Chemistry, Astronomy, Physics
- **Technology and Engineering** - Applying to solve a problem, building/designing a prototype
- **Social Science** - Psychology, Sociology, Economics
- **Teams Projects** consist of a study conducted by a team consisting of 2- 3 participants.

STEM Fair Awards

Place awards will be given for every division within each of their categories.

1st Place - Gold medal, certificate, and $100.

2nd Place - Silver medal, certificate, and $75.

3rd Place - Bronze medal, certificate, and $50.

4th Place - A ribbon and a certificate.

5th Place - A ribbon and a certificate.

6th Place -A ribbon and a certificate.

7th Place -A ribbon and a certificate.

Company or Sponsor Awards may include certificates of excellence, educational scholarships, gift certificates, cash, books, supplies, and more. Students are eligible to win sponsor awards in all categories and divisions.

Rules

1. Projects must adhere to all Federal, State, and local laws. Learn more about the science rules regarding human subjects, recombinant DNA, controlled substances, hazardous substances, non-human vertebrate animals, human and animal tissue, and pathogenic agents.
2. Projects that involve human subjects, non-human vertebrate animals, pathogenic agents, controlled substances, recombinant DNA, or human or animal tissue, require approval from the Science Fair Committee before the project begins. Contact the Coordinator.
3. All work must be done by the student. Adults may supply materials, advice, and consultation.
4. Plagiarism will result in disqualification. All material obtained from outside sources must be referenced.
5. The project may have begun anytime between January 2023 and February 2024. A previously investigated topic may continue under investigation, but data previously displayed must be treated as research. New data that is generated should be displayed and analyzed.
6. All students entered must be in 5th – 12th grade and attend a school or home school in Hillsdale, Lenawee, or Monroe counties at the time of the fair.
7. Students are only allowed to enter one project.
8. Exhibits may not display student names and/or student faces. Entries containing such images should be blocked out or covered.
9. No project may use consumable alcohol, tobacco, or illegally obtained narcotics.
10. Anything that could be considered hazardous or dangerous is prohibited, including, but not limited to:
    a. Live animals; poisonous plants.
    b. Human/animal parts or bodily fluids.
    c. Pathogenic microbial agents (bacteria, fungi).
    d. Needles, syringes, razor blades, sharp items.
    e. Devices such as firearms, weapons, ammunition, and re-loading devices.
    f. Drugs, medications, vitamins g. Flames or flammable materials.
11. The STEM Fair Committee reserves the right of refusal of an exhibit which it deems unsafe or unsuitable for project exhibition.

Any person who has a question about a project's compliance to these rules should contact the STEM Fair coordinator.

How do I prepare for the STEM fair?

Deciding on a Project:
Your project should be related to an area of STEM (science, technology, engineering, mathematics). It should be focused on answering a driving question or on providing a solution to a problem. This question or problem will drive the project and your learning throughout the project. The goal of participating in the STEM Fair is that your understanding of related concepts will strengthen, and that it will leave you with further questions or ideas about where to go next. Whether you choose to move forward in the area of science, technology, engineering, or mathematics, a similar process will be utilized. This will include communicating the driving question or problem to be solved, background information and research, a hypothesis, the process used to find an answer or to develop a solution, a conclusion with evidence and reasoning, real world application, and next steps or questions that developed through the project.

Driving Question or Problem to be Solved:
Your project should focus on answering a question or solving a problem. The driving question or problem to be solved should be something that you will need to do some work around to find an appropriate response. It should not be something that a Google search can provide an answer to. The goal is not to find the perfect answer or solution, rather it is to engage in an experience that deepens your understanding of the subject.

Hypothesis:
The hypothesis includes your proposed explanation. It is the starting point for driving your project direction, and it is based on the information you already have. Your hypothesis may turn out to be correct, or you may find that your results do not match your initial thinking. Either way, you should include your thinking around this in your conclusion. The hypothesis should include why you think something will happen and include the reason why you think this will happen. One example is making a statement: If ___, then ___ will happen, because ___.

Research:
As you begin to search for an answer to the driving question or for the solution to a problem, you will need to take time to look at the information that is already available. A variety of sources should be used to gather information to deepen your understanding of the topic. Your research should be presented as a report that includes why your topic is important and relevant, any background information to help the reader better understand the concept and ideas, as well as possible explanations for your question or problem. All sources should be referenced throughout your report, and a list of sources used should be included at the end. The research paper may be typed or handwritten legibly.

Process:
The process used to answer your question or find a solution may look a few different ways, though the content of each will be similar. You may choose to follow a Scientific Method, an Engineering Design Process, or something similar. Whichever process you utilize, it is important to include the materials and methods used so that the project could be replicated from the information provided. The process should include a list of materials used, the method or process used to collect data, and the data collected, such as observations and numerical data. The process should be listed in an organized manner that would make sense to any reader, for example, using subheadings or an outline type format.

Results:
The results should clearly show what happened during your experiment or problem-solving process. This should be communicated through well labeled graphs, labeled observations, photographs, or a similar means that details what happened. All variables should be clearly stated.

Conclusion:
The conclusion provides an analysis of the data and shares the results of the project. Was the hypothesis supported or not supported? What evidence backs this? It is not enough to simply list the results. Data and observations should be analyzed. Your learning from this experience should be clearly evident.

Tri-County STEM Fair SEP Rubric

SEP's	Absent	Not Yet	Approaches Expectations	Meets Expectations	Advanced
Point Scale	**0**	**1, 2, 3**	**4, 5, 6**	**7, 8**	**9, 10**
Asking Questions and Defining Problems	Not Present	• Ask general, imprecise questions that require greater specificity to be testable. • Identifies dependent and independent variables with unclear predicted relationships. • Identifies inappropriate control(s) (if applicable) and/or inappropriate model(s). • Defines a problem or design statement that partially matches the intent of the problem or the constraints.	• Ask testable questions that require sufficient and relevant evidence to answer. • Identifies predicted relationships between dependent and independent variables with minor errors. • Identifies control(s) (if applicable) OR relationships in the relevant model(s) with minor errors or omissions. • Defines a problem or design statement that matches the intent of the problem and identifies constraints.	• Ask precise, testable questions that require sufficient and relevant evidence to answer. • Discusses predicted relationships between dependent and independent variables. • Identifies appropriate control(s) (if applicable) relationships in the relevant model(s). • Defines a problem and explains specific design elements necessary for a suitable design (e.g., fit to the problem, addresses the constraints, etc.).	• Ask precise, testable questions that require sufficient and relevant evidence to answer and evaluates the testability of the questions. • Discusses predicted relationships, including quantitative relationships, between dependent and independent variables and appropriate controls (if applicable). • Thoroughly explains the predicted relationships in the relevant model(s). • Defines a problem precisely and thoroughly explains why specific design elements are necessary for a suitable design (e.g., fit to the problem, addresses the constraints, etc.)
Developing and Using Models	Not Present	• Designs and explains a model that generates data to support explanations, predict phenomena, analyze systems, and/or solve problems. Design or explanation of the model includes major errors or omissions. • Uses or tests the model and identifies the limitations OR accuracy of the model (with minor errors or omissions) to support explanations, predict phenomena, analyze systems, or solve problems. • Explanation or evaluation of the model includes major errors or omissions.	• Designs and explains a model that generates data to support explanations, predict phenomena, analyze systems, and/or solve problems. Design or explanation of the model includes minor errors or omissions. • Uses or test the model and evaluates the accuracy and limitations of the model to support explanations, predict phenomena, analyze systems, or solve problems. • Explanation or evaluation of model includes minor errors or omissions.	• Designs and explains a model that generates data to support explanations, predict phenomena, analyze systems, and/or solve problems. • Uses or tests the model and evaluates the accuracy and limitations of the model to support explanations, predict phenomena, analyze systems, or solve problems. • Makes recommendations to revise the model.	• Designs, explains and evaluates a model to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems. • Uses or tests two different models of the same proposed tool, process, mechanism or system. • Evaluates the accuracy and limitations of the two different models in order to select a model that best fits the evidence or design criteria.

Based on [Northern Virgina Community College NOVA's SEP Rubric]

Analyzing and Interpreting Data	Not Present	• Attempts to analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to identify patterns, to make scientific claims, or to determine an optimal design solution. Asnalyss or explanation includes major errors or omissions. • Identifies the limitations of the data analysis (e.g., measurement error, sample selection) with incomplete or inaccurate elements.	• Analyzes and explains data using tools, technologies, and/or models (e.g., computational, mathematical) in order to identify patterns, to make reasonable scientific claims, or to determine an optimal design solution. Analysis or explanation includes minor errors or omissions. • Identifies the limitations of the data analysis (e.g., measurement error, sample selection)	• Analyzes and explains data using tools, technologies, and/or models (e.g., computational, mathematical) in order to identify patterns, to make reasonable and supported scientific claims, or to determine an optimal design solution. • Evaluates the limitations of the data analysis (e.g., measurement error, sample selection) and identifies some implications for the findings.	• Analyzes and evaluates data using tools, technologies, and/or models (e.g., computational, mathematical) in order to identify patterns, to make reasonable and well-supported scientific claims, or to determine an optimal design solution. • Thoroughly evaluates the limitations of data analysis (e.g., measurement error, sample selection) and provides a detailed explanation of the implications on the findings.
Using Mathematics and Computational Thinking	Not Present	• Identifies mathematical concepts or methods (e.g., ratio, rate, percent, basic operations, algebra, and functions) relevant to scientific questions or engineering problems, but applies them with major errors or omissions.	• Applies appropriate mathematical concepts or methods (e.g., ratio, rate, percent, basic operations, algebra, and functions) relevant to scientific questions or engineering problems, but applies them with minor errors or omissions.	• Accurately applies appropriate mathematical concepts and methods (e.g., ratio, rate, percent, basic operations, algebra, and functions) to answer scientific questions or engineering problems.	• Accurately applies appropriate mathematical concepts and methods (e.g., ratio, rate, percent, basic operations, algebra, and functions) to represent and solve scientific questions or engineering problems and explains whether the answer "makes sense".
Engaging in Argument from Evidence	Not Present	• The student is able to present arguments on disciplinary content, which are unfocused or unsupported with evidence. • The student is able to communicate some procedures but lacks the details needed for others to replicate.	• The student is able to present arguments on disciplinary content, which are logical and focused, but lack evidence that supports the argument. • The student is able to provide step-by-step procedures that lack the detail needed for others to replicate.	• The student is able to present arguments on disciplinary content that are logical, focused and supported with sufficient and relevant evidence. • The student is able to provide step-by-step procedures that are precise and detailed enough so that others can replicate them and (possibly) produce the same results).	• The student is able to present arguments on disciplinary content that are logical, focused and supported with sufficient and relevant data. Interpretation of the data makes insightful connections to other contents or disciplines, or draws relevant conclusions to real world applications or problems.
Obtaining, Evaluating, and Communicating Information	Not Present	• When conducting independent research, relies on one or two relevant sources without evaluating their credibility. • The student is able to communicate with some clarity but concepts may be inaccurate or inappropriate as related to the task, purpose or audience.	• When conducting independent research, selects a limited number of relevant scientific sources and evaluates their credibility minimally. • The student is able to communicate in a way that is clear and coherent, but the organization and style may not be appropriate to the task, purpose or audience.	• When conducting independent research, selects multiples relevant scientific sources, and evaluates the evidence and credibility of each source. • The student communicates in a way that is clear and coherent, and in which the development, organization and style are appropriate to task, purpose and audience.	• When conducting independent research, selects multiple relevant, high-quality scientific sources representing a variety of viewpoints, and thoroughly evaluates the evidence and credibility of each source. • The student communicates in a way that is clear and coherent, and in which the development, organization and style are appropriate to the task, purpose and audience.

Based on [Northern Virgina Community College NOVA's SEP Rubric]

SEP's	Absent	Not Yet	Approaches Expectations	Meets Expectations	Advanced
Point Scale	**0**	**11, 12, 13**	**14, 15, 16**	**17, 18**	**19, 20**
Planning and Carrying Out Investigations	Not Present	• Designs an investigation that will produce relevant data but with minimal detail about the variables. • Includes incomplete description of data collection procedures that impede replication. • Describes general evidence to be used to answer the question(s) with minimal detail. • Uses appropriate scientific methods and collects multiple trials (if appropriate) of relevant data but the data is not consistent within a reasonable range.	• Designs and investigation identifying variables (dependent, independent, and controls). • Includes data collections procedures that are mostly replicable. • Identifies tools/instrument and type of measurements that will produce relevant data and/or evidence to answer the question(s). • Uses appropriate scientific methods and collects multiple trials (if appropriate) of relevant data consistent within a reasonable range.	• Designs an investigation identifying and explaining the variables (dependent, independent, and controls). • Includes sufficiently detailed description of replicable data collection procedures. • Describes tools/instrument and type of measurements that will produce relevant data and/or evidence to answer the question(s). • Uses appropriate scientific methods and systematically collects multiples trials (if appropriate) of relevant data consistent within a reasonable range. • Evaluates the consistency (precision) of the data	• Designs and evaluates an investigation identifying and explaining the variables (dependent, independent, and controls) • Identifies possible confounding variables. • Includes thorough description of replicable data collection procedures. • Justifies the selection of the tools/instrument and type of measurements that will produce relevant data and/or evidence to answer the question(s). • Uses appropriate scientific methods and systematically collects multiple trials (if appropriate) of relevant data consistent within a narrow range. • Evaluates the consistency (precision) of the data as well as the appropriateness of the data collection procedures.
Constructing Explanations and Designing Solutions	Not Present	• Proposes a design plan and description that misses one or more important aspects of the criteria, constraints, OR intent of the problem. • Uses inaccurate or irrelevant evidence (data or scientific knowledge) to explain how the design addresses the problem/constraints OR identifies an impractical redesign without explanation or supporting evidence.	• Proposes a design plan and provides a general description that addresses the criteria, constraints, or intent of the problem. • Uses minimal relevant evidence (data or scientific knowledge) to explain how the design addresses the problem/constraints OR identifies a potential redesign with limited explanation and supporting evidence.	• Proposes a design plan with a detailed explanation that completely addresses the criteria, constraints, and intent of the problem. • Uses relevant and adequate amounts of evidence (data or scientific knowledge) to explain how the design addresses the problem/constraints AND uses the evidence to explain an appropriate redesign of the original model or prototype.	• Proposes a design plan and evaluates the suitability of the design to address the criteria, constraints, AND intent of the problem. • Uses detailed and multiple sources of evidence (data or scientific knowledge) to evaluate how well the design addresses the problem as well as constraints AND provides a detailed rationale with supporting data for the appropriate redesign of the original model or prototype.

*The judges selected for the STEM Fair include local science professionals, teachers, college professors, college students, and community members. Each judge will score in his or her area of specialty. Any person who has a child entered, or who assisted a student with a project, will not be judging in that division/category.

Based on Northern Virgina Community College NOVA's SEP Rubric