SEF Logbook & Project Requirements

Your Logbook

Whether you are a research student or a first-time STEM fair student, a logbook is a crucial part of any research project. It is a detailed account of every phase of your project, from the initial brainstorming to the final research report. The logbook is proof that certain activities occurred at specific times. Here are a few pointers that are easy to follow. They should help keep you organized, and certainly will impress any STEM fair judge. It's a great opportunity to show off all your hard work!

Important Notes:

- Use a hard-bound notebook or composition book (get from any store for ~ $.50)
- USE front of pages only, **do not** write on the backs of pages!
- NEVER use a pencil! Use ink only, BLACK or blue only!
- NEVER erase or use white-out! If mistakes occur, mark it out with ONE neat line.
- NEVER tear a page out of your logbook!
- NEVER re-do something to make it neater. Neatness isn't important. Getting your thoughts and data recorded is the important part.
- NEVER place loose papers in the logbook. They are easily lost.
- EVERY time you do **ANYTHING** relating to your project you should make an entry in your logbook!
- ALWAYS date every entry every time you make research notes or an entry.
- ALWAYS use the metric system when measuring or recording amounts. Example: Use centimeters, milliliters, liters, NOT inches, feet, cups/gallons.

Initial Logbook Set-Up:

- Label the front cover of the composition book with your first and last name.
- Leave the first three pages blank and go to page 4, title page 4 "Table of Contents". Allow pages 4-5 for the table of contents. You will complete the table of contents after all your entries have been made in the logbook.
- After the table of contents, number the remaining pages of the logbook (fronts only!)
- Initial at bottom of each page (cover to cover, fronts only!)

Requirements for Each Project Component

Each project component is a new logbook section. You may wish to identify each section with a tab – this is permissible ☺

1. 1st page: Leave the 1st page blank.
2. Parent Letter: Glue your SIGNED parent letter onto page 2 of your logbook.
3. Timeline: Glue a copy of the STEM timeline onto page 3 of your logbook. It will help keep you on track with due dates.
4. Table of Contents: The next two pages of your logbook are for your TOC, which you can complete as you go or at the end of your project.
5. Background Research (starts on page 6):
   - Include ALL notes taken while researching you topic.
   - In addition to your general background research, answer the following questions: how have others already addressed this topic, what experiments or inventions related to this topic have others already done (what worked, what didn't?), and what area of STEM covers my topic? Students completing an Engineering Project should additionally consider asking: who is the target user or customer, what products already exist, how will the product work, and how will the product be made? You will use this information to write your research report.
   - Record the source of the information IN APA FORMAT for your works cited page. Do this for EVERY website, book, encyclopedia, magazine, or interview that you use for information. Consider conversations where you get information on your topic, even if it's "just" with a teacher, to be an interview and be sure to record it!
   - *A minimum of five sources* is required for this project.
6. Problem Statement: Write the research question in statement form. The problem statement is the entire purpose for doing research and completing you experiment.

- For your scientific experiment, you must have a written hypothesis in the form of an "If, Then" statement.
  - Your Science topic should contain a variable that you can change in your experiment and at least one variable that you can measure. If you can not observe the results of your experiment, you are not doing science!
- Computer Science/Engineering Problem statements must answer "who needs what because why?" and should be written as such: _____ need(s) _____ because _____.

7. Experimental Setup: Include the following in this section:
   - Materials: Make a DETAILED list of all materials you will be using in the experiment. BE SPECIFIC! For example, if you will be watering plants, you should list the EXACT amount of water you will use (GOOD: 500 ml of de-ionized water; BAD: water).
   - Procedures: Write the experimental procedure or design requirements like a NUMBERED step-by-step recipe. A good procedure is so detailed and complete that it lets someone else duplicate your process exactly!
   - For computer science/engineering projects, you must list the requirements for your solution. Your design requirements must include: 1) the problem you intend to solve; 2) how existing products are used and why they fail to address the problem; 3) the target user for your solution; 4) only those things that are absolutely ***needed*** to solve your design problem; 5) evidence that you have the time, money, materials, tools, and knowledge to make it happen; and, 6) resolutions or trade-offs for any conflicts between your requirements. Understand that as your project develops, your requirements may change – this is OKAY! Just be sure to record the changes.
8. Variables (Science Projects Only): Identify the independent variable, the dependent variable, all constants, and the control, if it applies.
9. Solutions (Computer Science/Engineering Projects Only): #1 Rule when creating alternative solutions: **DON'T SETTLE FOR YOUR FIRST IDEA!** Good designers try to generate as many possible solutions as they can before choosing one that they feel is the best. This creative process of developing ideas is called ideation. After ideation, you will select the best solution. Look at whether each possible solution met your design requirements. Consider solutions that did a much better job than others, and reject those that did not meet the requirements.
   Solution Development (Computer Science/Engineering Projects Only): Remember to date every logbook entry!!! Record DETAILED accounts of your efforts to refine and improve your solutions, as well as optimization efforts. You should also include design drawings in your logbook. The purpose of design/engineering drawing is to communicate your ideas to other people in the simplest form possible. Your drawings don't need to be elaborate or fancy. They just need to get your ideas across to others through simple shapes and symbols. For design/engineering drawings, it is always best to start drawing your ideas as thumbnails, small, doodle-like sketches of your ideas. During the ideation and brainstorm phase, you will have tons of ideas that you will want to sketch, so perfection is not important. Once you have decided on a final design concept, go back and find the related sketches from your collection of thumbnails. Draw your final concept on a larger sheet of paper that you can use to present your idea to others. Combine the thumbnails that make up your final design. Be sure to add more detail to your final drawings, such as dials and knobs, all of the separate parts, color, texture, etc.
10. Build a Prototype (Computer Science/Engineering Projects Only): Prototypes can help you to develop the structure, function, and appearance of your solution.
11. Data Collection (Science Projects Only): Remember to date every logbook entry!!! Record the DETAILED observations you make throughout the experiment in this section of your logbook. This includes data collected, what you are doing, AND what you see/smell/hear/feel. Be VERY specific about everything going on in the experiment. **You must conduct at least 3 trials for each variable.**
    Test & Redesign (Computer Science/Engineering Projects Only): The design process involves multiple iterations and redesigns of your final solution. You will likely test your solution, find new problems, make changes, and test new solutions before settling on a final design. Document each test, the results, and the changes you make in your logbook.
12. Results: Include pictures you have taken throughout the experiment, data tables created to organize your data, charts and graphs, and a summary of the data. Make sure to secure any items with tape or glue!
13. Analysis/Conclusions: **Using your data**, discuss the outcome of the experiment. Did your data support or reject your hypothesis? How do you know? Engineering & programming projects should state whether they met their design criteria.
14. Reflections: Summarize and evaluate your experimental procedure, making comments about its success and effectiveness. Suggest changes in the experimental procedure (or design) and/or possibilities for further study.