

The Scientific Method: A Model for Conducting Scientific Research

1. Defining the Question: This step involves narrowing possible topics and then choosing the question to be the focus of your research. Your question should be specific. You may need to gather more information before you decide on your final question. Ask yourself:

Specifically, what do I want to know? What is the purpose of asking this question? What will the answer tell me? Can this question be answered through research? (Can I describe how I might answer it?) Is it feasible? (Can I do it with the time and equipment available to me?)

2. Forming a Hypothesis/Hypotheses: This step helps you answer the question:

3. Locating Resources/Gathering Information & Materials: This step helps you to become smarter about the topic you are researching and how you can research it. The more information you have, the better research question you can ask. To help you gather information, ask yourself:

4. Planning the Research/Developing Data Collection Methods: This step involves making a very specific plan about how you will conduct your research and collect your data. In the end, your procedure should be clear enough so that someone else could follow it exactly. To plan your research and develop your procedure, ask yourself:

How will I answer my research question/test my hypotheses? What data do I need to collect? How will I collect these data?

What equipment or supplies do I need?

Do I have a reference point (control) with which to compare my data?

To answer my question, do I need to manipulate variables?

How many (samples, sites, tests, etc.) do I need?

What record-keeping techniques (e.g. data sheet, journal) will I use? Are my data collection techniques organized and thorough?

Are there sequential steps to my research? If so, what are they? How will I plan my time?

5. Collecting Data: Be sure that you write down all of the information (data) that could affect the answer to your research question. When you collect the data, ask yourself:

Am I recording all relevant data?

Can I read and understand my notes?

Am I keeping track of what I did at each step?

Am I being objective in my data collection?

6. Organizing & Analyzing the Data: This step gives you the chance to pull together the data you've collected and look at it more closely. Compare and contrast the information you've gathered to see the results of your research. Ask yourself:

How will I organize and summarize the data I've collected?

What do my data show? How should I present my data graphically so that others can see the results clearly? (e.g. bar graphs, tables, pie charts, line graphs, etc.)

Are the results significant? Are there tests I might use to tell me if the results are significant?

7. Interpreting the Data & Drawing Conclusions: In this step, stand back from your data and look at it more critically. Decide what conclusions you can draw. Ask yourself:

What alternative hypotheses might explain these results? Am I considering all relevant data, including extremes or "oddball data" in my analysis? How might my sampling or data collection methods have affected these results?

What answer do my results provide to my original question? How do my results compare to what I expected to happen (my hypothesis)?

What can I conclude from my results? How do my conclusions affect the community or "big picture" (implications)?

8. Communicating the Results: Now it's time to share your work. Ask yourself:

Who is my audience? What is the best way to communicate to my audience? (e.g. written report, oral or poster presentation, video, etc.) What visual aids will help my audience clearly understand this research?

Have I addressed all of the following components of my research in my communication?:

- Introduction to question, purpose of this research and why it is interesting or matters
- Description of methods used to collect data
- Results
- Conclusions
- What questions are raised by my research? How do others respond to my work?

Source:

©*Rural Girls in Science- Meeting the Challenge Through a Comprehensive Approach*
funded by the National Science Foundation Project HRD-94500053
Dr. Angela B. Ginorio, Principal Investigator

Rural Girls in Science Program
rural@u.washington.edu
Imogen Cunningham Hall Box 351380
University of Washington
Seattle, WA 98195 (206) 543-7476 FAX (206)685-4490