

# Scientific Research

## Links Among Engineering, Technology, Science, and Society [SCRE.ETS2](#)

- 1 Explore the impact of technology on social, political, or economic systems. [SCRE.ETS2.1](#)
- 2 Describe the dynamic interplay among engineering, technology, and applied science. [SCRE.ETS2.2](#)
- 3 Identify the most appropriate scientific instruments and/or computer programs for different experiments and research, and learn to use, care for, and maintain them, gather data, and analyze results. [SCRE.ETS2.3](#)
- 4 Engage in evidence-based arguments through the scientific method of investigation to understand the effective role that scientific discoveries played in the progression of humankind. [SCRE.ETS2.4](#)

## Applications of Science [SCRE.ETS3](#)

- 1 Research and present information about the history of the development of a scientific theory. Articulate reasons for refinements and/or replacement of this theory over time. [SCRE.ETS3.1](#)
- 2 Engage in argument from evidence supporting the statement that science is tentative. [SCRE.ETS3.2](#)
- 3 Generate questions and engage in discussion regarding the role of ethics in scientific research and in decision making based on scientific information. [SCRE.ETS3.3](#)
- 4 Make observations and ask questions about the natural world. Refine the questions such that they can be answered by way of scientific investigation. [SCRE.ETS3.4](#)
- 5 Use online search engines to find sources of scientific information. Develop, share, and revise criteria for evaluating reliability of sources. [SCRE.ETS3.5](#)
- 6 Obtain and communicate information regarding ethical research practices pertaining to humans and animals as well as information regarding proper permitting agencies and procedures. [SCRE.ETS3.6](#)
- 7 Obtain and present information on research protocols including citation formats (APA, MLA, etc.), plagiarism, and copyright and patent laws. [SCRE.ETS3.7](#)
- 8 Engage in the peer review process by giving and receiving detailed feedback throughout the process of planning and carrying out investigations. [SCRE.ETS3.8](#)

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- 9** Develop a research proposal including the following: a problem statement; purpose of research; significance of research; objectives; literature review (including both primary and secondary sources); materials and methods; detailed budget; data analysis procedures; and, references. Include a list of potential risks associated with the study and a detailed safety plan as appropriate for materials and methods. Revise the proposal based on feedback from teacher and peers. [SCRE.ETS3.9](#)
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- 10** Create a scientific journal and/or lab notebook for recording qualitative and quantitative data. [SCRE.ETS3.10](#)
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- 11** Carry out an original scientific investigation (experiment or study) after having received approval of a revised research proposal. [SCRE.ETS3.11](#)
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- 12** Select and use appropriate statistical procedures (descriptive statistics, t-tests, regression and correlation, chi-square, etc.) to analyze data. Use available calculators, spreadsheets, and statistical software programs. [SCRE.ETS3.12](#)
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- 13** Select and use appropriate data tables, graphs, and diagrams to represent data. Use mathematics and computational thinking to look for patterns in data. [SCRE.ETS3.13](#)
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- 14** Develop a conclusion based on data analysis and cite evidence to support the conclusion. [SCRE.ETS3.14](#)
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- 15** Use data to develop a model. Evaluate the effectiveness of the model by making and testing predictions. [SCRE.ETS3.15](#)
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- 16** Evaluate experimental results and identify possible sources of error or bias in scientific investigations (published research, original research, and research of peers). [SCRE.ETS3.16](#)
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- 17** Write a scientific paper based on original scientific research including the following or equivalent sections: abstract, introduction, literature review, materials and methods, results, conclusions, and literature cited. [SCRE.ETS3.17](#)
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- 18** Prepare and give a presentation based on original scientific research. [SCRE.ETS3.18](#)
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- 19** Prepare a poster based on original scientific research and participate in a poster session. [SCRE.ETS3.19](#)
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- 20** Submit research to scientific agencies as appropriate. [SCRE.ETS3.20](#)