

Student's Guide to a Research Projects

GENERAL REQUIREMENTS

- Allow 12 weeks (3 months) to complete a research project.
- Students will work independently or in groups of two, three or four students at the discretion of the teacher. You will have an opportunity to work on the project during school. However, you will be required to work on the project outside of school. If you are working in a group, consider classmates that live nearby and are easy to get together with after school.
- Each group is required to submit one project proposal. A project proposal document can be found in this packet. Complete the sheet and return it by _____.
- You will be required to assemble a 3x5 fold display. Guidelines and suggestions on how to arrange information on the display are contained in this guide. Your poster display is due _____.
- You will be required to _____.

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TIMELINE

Three months before the project due date... (Weeks 1-2 of the project)

- Research Possible Project Topics.** What interests you? Explore biology, chemistry, physics, environmental, social and/or political issues. Narrow your choices down to five possible project topics.
- Assemble your Group.** Although you can independently complete a project, working in a group has advantages. You divide the responsibilities of the project, you develop team collaboration skills and it's an opportunity to build new relationships with classmates. Think to consider when choosing classmates to work with:
 - Do they have similar research interests?
 - Are they dependable, hard-working and respectful?
 - Do you have study hall or lunch together? There are possible times during the school day you could work on the project.
 - Do you have compatible times after school to get together to _____.

Timeline

Three months before the project due date... (Weeks 3-4 of the project)

- Finalize your Research.** All background research should be completed. For the primary research project, you should have at least five sources. For the secondary research project, you should have at least 15-20 possible primary research studies.
- Begin a Rough Draft of a Bibliography.** Use APA format. Visit https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/ for help with proper citation format.
- Gather Materials.** Collect any materials you may need to complete your project (including materials needed to perform your experiment).
- Primary Research Project.** Design a controlled experiment. Design the experimental method, identify all variable and test groups and determine how you will collect data.
- Secondary Research Project.** Select of at least ten research studies.

Timeline

Two months before the project due date... (Weeks 5-6 of the project)

- Primary Research Project:** Perform the Controlled Experiment. Conduct your experiment. Some groups may need to begin their experiment earlier. Others may be able to begin their project later in the second month of preparation. **It is better to begin the experiment earlier in case your experiment has significant flaws and you need to adjust your method.**
- Secondary Research Project:** Summarize and Analyze Research Studies. You should finish summarizing and analyzing the research studies. Record information in the tables in this guide. Consider creating tables and/or graphs to use on your display board that help summarize the results of the primary research studies you summarized and analyzed.

Timeline

One month before the project due date... (Weeks 9-10 of the project)

- Purchase a 3x5-Fold Display.** The board should be approximately 36 x 48 inches. Obtain any other art supplies (glue, cardstock, markers) that you may need.
- Compose the finishing products of your project.** Type up the different portions of your project that you will display on your board (background research, tables, graphs, conclusion, etc.). Most of these elements should already be written in the guide. Double-check spelling and grammar. Make sure the font is large enough. A person should be able to read your written pieces 3-feet away.

Timeline

Two Weeks before the project due date... (Weeks 11-12 of the project)

- Organize the display board.** Use your creative skills! The display should be organized and pleasing to look at. Consider using some bright colors, they will help attract attention to your display. Also consider displaying models or materials from your project. You must _____.

PROJECT OPTIONS

There are two main types of research projects: Primary and Secondary. How information is collected varies between the two. In a primary research project, you collect original data. In a secondary research project, you collect data from previous research studies.

- Primary Research Project.** You must use the scientific method to collect original data to solve a problem. You will be required to clearly state your problem and hypothesis, execute a controlled experiment, present and analyze the data, and form a conclusion based on your research findings. You should perform a primary research project to:
 - Analyze a system to find out what happens if it's altered
 - Engineer or invent something new
 - Conduct an experiment to test an effect

PRIMARY RESEARCH

Primary research is any type of research that involves the collection of original data that leads to a discovery. If you choose this option, follow these steps to complete the project.

- State the Problem.** What do you want to discover? What is the objective or purpose of your experiment? Choose something that interests you, something that you have always wanted to learn more about. State the problem you hope to solve in the form of a question. For example, Does soil pH affect tomato plant growth? Does studying with music help students perform better on an exam?
- Complete Background Research.** Research the problem you intend to answer. Have scientists tried to conduct similar experiments? What were their findings? What are known facts about the topic you are researching? Be sure you record your source of information. You will need to provide a bibliography of _____.

PRIMARY RESEARCH PROJECT ORGANIZER

Use the following notes to organize the details of your project.

Topics of Interest: _____

Problem I am going to investigate: _____

Background Research: _____

PRIMARY RESEARCH PROJECT ORGANIZER

Background Research: _____

PRIMARY RESEARCH PROJECT ORGANIZER

Sources of Information: _____

PRIMARY RESEARCH PROJECT ORGANIZER

My Hypothesis: _____

Materials: _____

Experimental Design: _____

Independent Variable: _____

Controlled Variables: _____

Experimental Groups: _____

Control Group: (if applicable) _____

Sample Size: _____

- ## Features:
- Includes a printable PDF and 100% editable .docx student guide
 - Helps students plan and pace a primary or secondary research project
 - Provides a place a primary to record research and experiment data
 - Assists with organizing a display and preparing an oral presentation

Student's Guide to a Research Projects

PRIMARY RESEARCH PROJECT ORGANIZER

Experimental Method:

PRIMARY RESEARCH PROJECT ORGANIZER

Data Collection and Organization:

- How many tables will you need? What graph(s) will you use to display your data?
- Use this sheet to draw rough drafts of your tables and graphs and/or record data.

PRIMARY RESEARCH PROJECT ORGANIZER

Conclusion:

What are the major findings of the experiment, what do they mean and how do they relate to the objective/purpose of the experiment?

PRIMARY RESEARCH PROJECT ORGANIZER

Conclusion:

What did you learn? What do the results mean? Do the results contradict or agree with previous experiments or known facts? Do the results of your experiment change your views on the topic you researched?

SECONDARY RESEARCH

For this project, you will develop a research question and perform a systematic review of primary research studies relevant to the research question instead of performing an experiment. If you choose this option, follow these steps to complete the project.

- Choose a research question.** What do you want to discover? Choose a topic that interests you. Similar to a primary research project, state the research question you will answer by reviewing and summarizing findings of previous research studies. For example, What medications and therapies are most effective in helping adults quit smoking?
- Search for studies.** Sources of information must come from primary research articles. Google Scholar is a great tool to search for primary research articles. Many primary research studies are published in journals that are available for free online. However, if you find articles that are not available online, you may need to find them in college libraries or public libraries.

Secondary Research Project

3. **Select at least ten research studies.** Although some scientists will review one hundred or more primary research studies, you should select at least ten relevant studies to your topic and help answer your research question. When choosing the studies you will use, judge the credibility of the study. Consider:
 - in what field is the research study published?
 - who conducted the research?
 - what was the sample size?
 - Did the researchers declare significant sources of error (usually stated in the conclusion or discussion)?
 - is there bias in the study? Is the study published in a journal with extreme or obvious political views? Are the researchers associated with a company that benefits from the results of the study?
 Use this chart to help distinguish between strong and weak research study characteristics:

Features of a Strong Research Study	Features of a Weak Research Study
Published in a reputable scientific journal or magazine	Published in an entertainment magazine, blog or wiki
Research was performed by graduate students, scientists, professional educators or health	Research was performed by political groups or other groups with obvious bias

Secondary Research Project

4. **Collect, Summarize and Analyze Information.** Once you finished the research studies you will use for your project, obtain a hard-copy or electronic copy (PDF) of each research study. You must read through each report, noting the experimental design, result, important conclusions and sources of error or bias, using a table to record the information from each research table is useful in comparing the elements and findings of each study.
5. **Interpret Results and Draw a Conclusion.** In a primary research project, you would use the results of an original experiment to draw a conclusion. In a secondary research project, you use the results from previous experiments to formulate a conclusion. You may have conflicting experimental results... and that's OK! In your conclusion be sure to include the following:
 - What are the major findings of the studies, what do they mean and how do they relate to your research question?
 - Do the results of the research studies contradict or agree with each other? What are the differences and what do they mean? Are the differences significant?
 - What did you learn? Can YOU draw a conclusion based on the findings of these studies?
 - What were major sources of error or bias? Did this influence the outcome of the research studies?
 - Do the results of your research change your views on the topic you need?

SECONDARY RESEARCH PROJECT ORGANIZER

Use the following sheets to organize the details of your project.

Topics of Interest:

SECONDARY RESEARCH PROJECT ORGANIZER

Search for Studies:

SECONDARY RESEARCH PROJECT ORGANIZER

Research Study Selection:

Record Title, Author, Source of Publication, Volume or Issue and Date of Publication for each study used in your project.

- Obtain a hard or electronic copy (PDF) of each publication.

SECONDARY RESEARCH PROJECT ORGANIZER

Summarizing and Analyzing the Studies

Article	Problem Investigated	Experiment Design	Results & Conclusions	Source of Error & Bias

SECONDARY RESEARCH PROJECT ORGANIZER

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Summarizing and Analyzing the Studies

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SECONDARY RESEARCH PROJECT ORGANIZER

Conclusion:

What are the major findings of the studies, what do they mean and how do they relate to your research question?

SECONDARY RESEARCH PROJECT ORGANIZER

Conclusion:

Do the results of the research studies contradict or agree with each other? What are the differences and what do they mean? Are the differences significant?

SECONDARY RESEARCH PROJECT ORGANIZER

Conclusion:

What were major sources of error or bias? Did this influence the outcome of the research studies?

DISPLAY BOARD

You are required to assemble a tri-fold display board (approximately 36 x 48 inches). The display must include the following information:

Primary Research Project	Secondary Research Project
<ul style="list-style-type: none"> Title of Project Group Members Names Background Research (1-2 paragraphs) The Problem and Hypothesis (strongly suggested) Materials and Method (with figure legends) Tables and/or Graphs (with figure legends) Conclusion Bibliography 	<ul style="list-style-type: none"> Title of Project Group Members Names Research Question Summary of Results Tables and/or Graphs (with figure legends) (strongly suggested) Sources of Error and Bias YOUR conclusion Bibliography

In addition to the display board, you may display materials from your experiment, models and/or pictures. You may NOT display live animals unless you receive teacher or administrator approval.

DISPLAY BOARD

(Suggested Setup for Primary Research Project)

DISPLAY BOARD

(Suggested Setup for Secondary Research Project)

ORAL PRESENTATION

You will be required to give an oral presentation summarizing all aspects of your project in five minutes. Each member of your group should present a portion of the project. Preparing and rehearsing your presentation will ease the nervousness that most students feel when giving an oral presentation. Consider some of the following suggestions in preparation for the presentation:

- Share presentation responsibility equally.** For example, in a four-person group, one person could present background information, the problem and the hypothesis and the other members could each present the experimental design, results and conclusion.
- Practice, Practice, Practice.** You have put forth a lot of effort into your project and your presentation should reflect your hard work. Rehearse your presentation at least five times before the actual presentation. Students often underestimate how quickly time passes so rehearsing helps you pace your presentation properly.
 - Helpful Hint: Have each member of the group present their portion of the presentation to the other members. Does the person who good eye contact? Does he or she use "um," "ah," or "really" a lot? Does the person have appropriate gestures and body language? Does the person "talk with their hands"? Does the person point to pictures, tables or graphs when needed? Constructively and respectfully help each other to improve their presentation skills.

ORAL PRESENTATION

Oral Presentation

- Dress to impress.** Dress appropriately because in addition to presenting your project, you are presenting yourself. Boys should consider wearing shorts or dress pants and a collared shirt. Girls should consider wearing dress pants, khakis or a skirt with a shirt or blouse or a dress. Avoid sneakers and flip-flops.
- Take a deep breath and relax.** If any of your group members are anxious and nervous about the presentation, encourage them! Suggest using notecards or a note sheet!
- Present your best.** When presenting, have good eye contact and try your best not to read word-for-word off a notecard or your display board. If you are nervous about the presentation, encourage them! Suggest using notecards or a note sheet!
- Anticipate questions from your audience.** Here are some common questions that your group may be asked:
 - Has this experiment been performed before? What were the results?
 - If you could do this project again, what would you do differently?
 - What was the most important or interesting thing you learned from this project?
 - Did you learn anything from this project that changed your perspective on the topic you studied?
 - What did you enjoy most about this project?

FINAL CHECKLIST

Congratulations! You've finished your project. The night before your project's due, go through this checklist to make sure your group is prepared for the Big Day tomorrow:

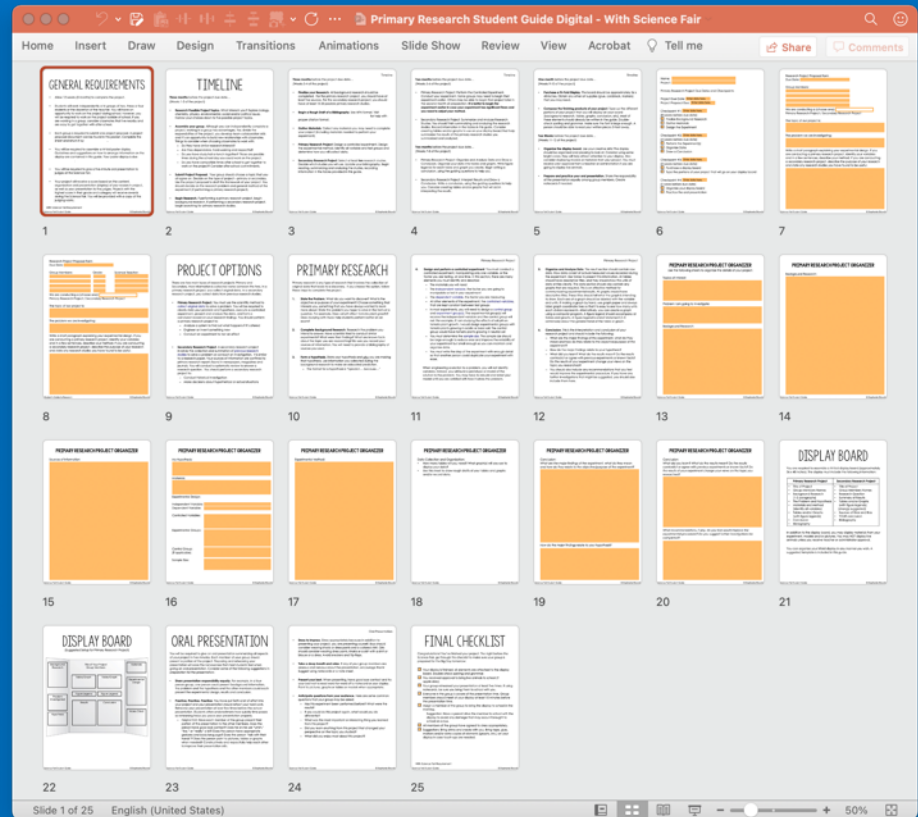
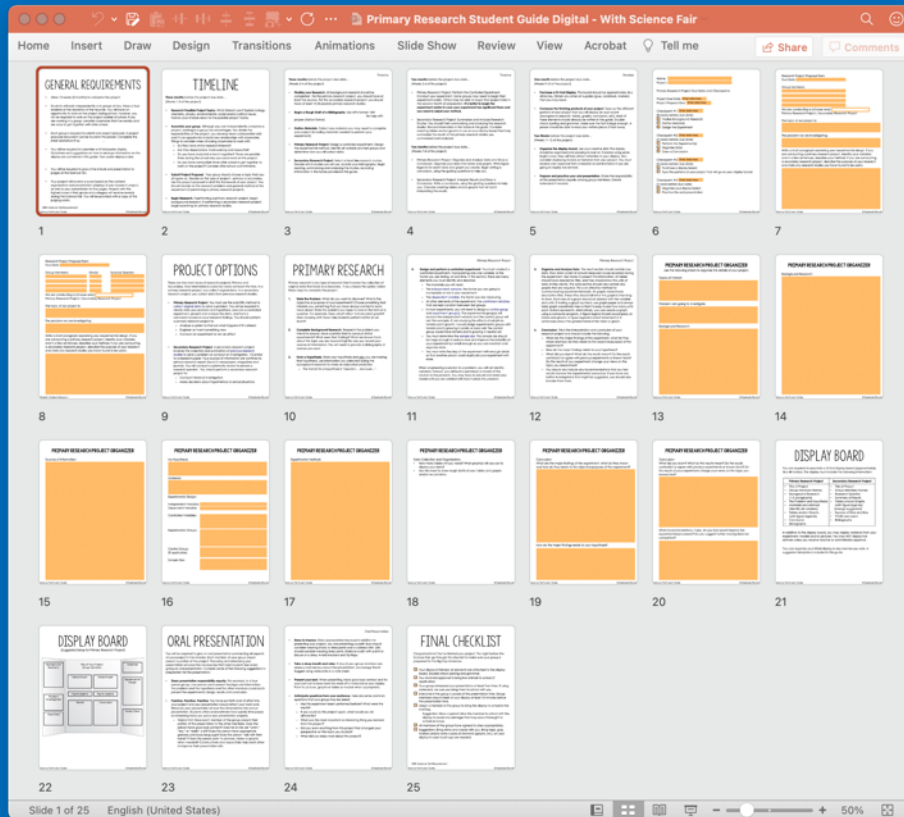
- Your display is finished; all elements are attached to the display board. Double-check spelling and grammar.
- You received approval to bring live animals to school (if applicable).
- Your group rehearsed your presentation at least five times. If using notecards, be sure you bring them to school with you.
- Assign a member of the group to bring the display to school in the morning.
 - Suggestion: Have a parent drive the member to school with the display to avoid any damage that may occur if brought to school on a bus.
- All members of the group have agreed to dress appropriately.
- Suggestions: Bring tape, glue, markers and/or extra copies of elements (graphs, etc.) on your display in case touch-ups are needed.

FINAL CHECKLIST

Congratulations! You've finished your project. The night before the Science Fair, go through this checklist to make sure your group is prepared for the Big Day tomorrow:

- Your display is finished; all elements are attached to the display board. Double-check spelling and grammar.
- You received approval to bring live animals to school (if applicable).
- Your group rehearsed your presentation at least five times. If using notecards, be sure you bring them to school with you.
- Everyone in the group is aware of the presentation time. Group members should meet at your display at least 15 minutes before the presentation time.
- Assign a member of the group to bring the display to school in the morning.
 - Suggestion: Have a parent drive the member to school with the display to avoid any damage that may occur if brought to school on a bus.
- All members of the group have agreed to dress appropriately.
- Suggestions: Bring drinks and snacks with you. Bring tape, glue, markers and/or extra copies of elements (graphs, etc.) on your display in case touch-ups are needed.

DIGITAL STUDENT GUIDES INCLUDED



Features:

- ✓ Fillable slides with areas to write answers to comprehension questions
- ✓ Compatible with Microsoft PP & Google Slides
- ✓ Digital files can be shared with secure platforms like Microsoft Teams, Google Classrooms, Blackboard, Schoology & Canvas

DIGITAL ASSIGNMENTS

In addition to the traditional printable PDF file (key included), this product includes fillable documents that allow students to complete assignments on a computer or tablet. These files were created to work with a variety of online platforms, including Google Classrooms, Microsoft Teams, Schoology, Canvas and Blackboard. These platforms are not absolutely needed to use digital assignments; the files can be distributed via email, Dropbox, Google Drive and other secure file sharing platforms.

Important Notes

- Each digital assignment is saved as its own file.
- Answer keys are removed from the digital assignments.
- Answer keys are included in the traditional PDF file.
- Assignments CANNOT be edited; only fillable areas can be manipulated.

Fillable documents can be used a variety of ways:

- Distribute paper-free assignments as part of regular instruction
- Use to assign at-home work as part of a remote or distance learning plan
- Send work to acutely or chronically absent students
- Support tutoring or at-home instruction for homebound students

How can you distribute and share the files with your students?

- The assignments **CAN** be distributed directly to students through email.
- The assignments **CAN** be distributed or assigned with Google Classrooms, Microsoft Teams, Blackboard, Canvas, Schoology and other like platforms that are password-protected or require a code to enroll.
- The assignments **CAN** be distributed with secure file sharing platforms like Google Drive, OneDrive and DropBox that are password-protected or shared only with students with their email or student account.

DIGITAL ASSIGNMENTS

Fillable slides are optimized for use with Microsoft PowerPoint/Microsoft Teams or Google Slides/Google Classrooms. The slides have embedded questions with text boxes that allow students to answer questions directly in a document. The assignments cannot be edited but the text boxes can be manipulated.

To use with Microsoft Teams:

1. Upload an assignment to your One Drive.
2. Create a new assignment.
3. Add the file as a "resource."
4. Assign to the appropriate class or students.
5. Students will answer the questions in the text boxes.
6. When finished, the students should submit their work to the teacher.

To use with Google Classrooms:

1. Upload the assignment to your Google Drive. Automatically convert the Microsoft file to a Google App file by dragging and dropping the file into your Google Drive. Watch a demonstration of this conversion: <https://safesha.re/psn>
2. Create a new assignment.
3. Add the Google slide to the assignment. Make a copy for each student.
4. Assign to the appropriate class or students.
5. Students will answer the questions directly in the text boxes.
6. When finished, the students submit their work to the teacher.

Important Note

- It is not absolutely necessary to convert the pptx file to a Google slide when working in Google classrooms. Students can open the pptx file with Google slides, complete their work in the text boxes and submit the assignment without converting the file.