

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 tri 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 _____.

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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. Things 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? These are possible times during the school day you could work on the project.
 - Do you have compatible times after school to get together to work on the project?

- 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 http://owl.purdue.edu/owl/research_and_citation/apa_format_and_style_guide/apa_format_and_style_guide_home_page.html 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 at variable and test groups and determine how you will collect data.
 - **Secondary Research Project.** Select 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.
- Two months before the project due date...**
(Weeks 7-8 of the project)
- **Primary Research Project:** Organize and Analyze Data and Draw a Conclusion.

- Timeline**
- One month before the project due date...**
(Weeks 9-10 of the project)
- **Purchase a Tri-Fold Display.** The board should be approximately 36 x 48 inches. Obtain any other art supplies (glue, cardboard, 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.
- 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.

1. **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 student perform better on an exam?
2. **Complete Background Research.** Research the problem you intend to solve. 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 _____.

Name: _____
Project: _____

Primary Research Project Due Dates and Checkpoints

Project Due Date: _____
Project Proposal Due: _____

Without Science
Science Fair Project

Checkpoint #1:
(8 weeks before due date)
☐ Finalize Background Research
☐ Gather Materials
☐ Design the Experiment

Checkpoint #2:
(4 weeks before due date)
☐ Perform the Experiment(s)
☐ Organize Data
☐ Draw a Conclusion

Checkpoint #3:
(2 weeks before due date)

Name: _____
Project: _____

Secondary Research Project Due Dates and Checkpoints

Project Due Date: _____
Project Proposal Due: _____

Checkpoint #1:
(8 weeks before due date)
☐ Finalize Background Research
☐ Select 10 Research Studies

Checkpoint #2:
(4 weeks before due date)
☐ Analyze the Research Studies
☐ Organize Data
☐ Draw a Conclusion

Checkpoint #3:
(2 weeks before due date)

Research Project Proposal Form

Due Date: _____

Project: _____

Group Members: _____

We are conducting a (choose one):
Primary Research Project / Secondary Research Project

The topic of our project is: _____

The problem we are investigating: _____

Write a short paragraph explaining your experimental design. If you are conducting a primary research project, identify your variables and in a few sentences, describe your method. If you are conducting a secondary research project, describe the purpose of your research.

Research Project Proposal Form

Due Date: _____

Project: _____

Group Members: _____

We are conducting a (choose one):
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The topic of our project is: _____

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Research Project Proposal Form

Due Date: _____

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Research Project Proposal Form

Due Date: _____

Project: _____

Group Members: _____

We are conducting a (choose one):
Primary Research Project / Secondary Research Project

The topic of our project is: _____

The problem we are investigating: _____

Write a short paragraph explaining your experimental design. If you are conducting a primary research project, identify your variables and in a few sentences, describe your method. If you are conducting a secondary research project, describe the purpose of your research.

Primary Research Project

4. **Design and perform a controlled experiment.** You must conduct a controlled experiment, manipulating only one variable, or the factor you are testing, at one time. In this section, there are many elements you must identify and describe:

- The materials you will need
- The independent variable, the factor you are going to manipulate or test in your experiment
- The dependent variable, the factor you are measuring
- All other elements of the experiment, the controlled variables, that are kept constant between test groups
- In most experiments, you will need to design a control group and experiment group(s). The experiment group(s) will receive the independent variable and the control group will not. For example, if I am studying the effects of soil pH on tomato plant growth, I would design experimental groups with tomato plants growing in acidic or basic soil. The control group would have tomato plants growing in neutral soil.
- You must determine the sample size. The sample size should be large enough to reduce error and improve the reliability of your experiment but small enough so you can maintain and organize data.
- You must write the step of the experiment with enough detail so that another person could duplicate your experiment with ease.

When engineering a solution to a problem, you will not identify variables, instead, you will build a prototype or model of the solution to the problem. You may have to rebuild and refine your model until you are satisfied with how it solves the problem.

Primary Research Project

5. **Organize and Analyze Data.** The result section should contain raw data. Raw data consist of actual measured values recorded during the experiment. Use tables to present this information. All tables should have descriptive titles, and they should show the units of data entered clearly. The data section should also contain any graphs that are required. This is an effective method for communicating experimental results. All graphs should have descriptive titles. These titles should tell what the graph is intending to show. Each axis of a graph should be labeled with the variable and units. If making a graph by hand, use graph paper and always label graph coordinate lines so that it is easy to see how many units each division represents. Alternatively, you can create a graph using a computer program. A figure legend should accompany all tables and graphs. A figure legend is a brief statement (1-3 sentences) about the general trend of the table or graph.

6. **Conclusion.** This is the interpretation and conclusion of your research project and should include the following:

- What are the major findings of the experiment, what do they mean and how do they relate to the objective/purpose of the experiment?
- How do the major findings relate to your hypothesis?
- 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?
- You should also include any recommendations that you feel would improve the experimental procedure. If you have any further investigations that might be suggested, you should also include them here.

PRIMARY RESEARCH PROJECT ORGANIZER

Use the following tables 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 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?

How do the major findings relate to your hypothesis?

[illegible]

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.

- 1. Choose a research question.** What do you want to discover or answer? Be specific. That information is critical. As 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 adult autism smoking?
- 2. Search for studies.** Sources of information must come from primary research studies. Google Scholar is a great tool to search for primary research studies. 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 most likely can find them in college libraries or public libraries.

Secondary Research Projects

3. **Select or select out 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 keep one or two research studies in mind. Choosing the study 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 affiliated 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 website
Results were performed by graduate students, scientists, or other professionals	Results were performed by political groups or other groups

Secondary Research Project

4. Collect, Summarize and Analyze Information. Once you finalized 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 to determine the experimental design, results/implications/ conclusions and sources or error or bias, taking a lot of time 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 data and information you are expected to draw a conclusion. In a secondary research project, you use the results of the previous experimental research to draw 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 research? 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 there 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 study?
- Do this research study have any limitations?

[illegible]The image shows a portion of a worksheet. At the top, there's a header area with some faint, partially visible text from another page. Below this, the title "SECONDARY RESEARCH PROJECT ORGANIZER" is printed in bold, uppercase letters. Underneath the title, there's a label "Search for Studies:" followed by a series of horizontal lines for writing. The left margin of the page features a blue vertical bar.[illegible][illegible]

Article	Problem Investigated	Experimental Design	Results & Conclusions	Sources of Error & Bias

you review
- Include as
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you analyze
be suggest

SECONDARY RESEARCH PROJECT

Summarizing and Analyzing the Studies

Article	Problem Investigated	Experimental Design	Results/Conclusions

Reference List Student Guide

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ORGANIZER	SECONDARY RESEARCH PROJECT
<p>Agree with each member? Are the</p>	<p>Conclusion: What were major sources of error or bias? Did the outcome of the research studies?</p>
<p>based on the</p>	<p>Do the results of your research change your view of research? What recommendations, if any, do you have to improve the experimental procedure of some or all of the studies? Do you suggest further investigations be</p>

DISPLAY BOX

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

Primary Research Project	Secondary
• Title of Project	• Title of Project
• Group Member Names	• Group Member Names
• Background Research (1-2 paragraphs)	• Summary
• The Problem and Hypothesis	• Tables are an integral part of the research
• Materials and Methods (identify all variables)	• Sources (strongly recommended)
• Tables and/or Graphs (with figure legends)	• Bibliography
• Conclusion	
• Bibliography	

in addition to the display board, you may display experiment, models and/or pictures. You may also use overheads, audio or videotape or computer displays to enhance your presentation.

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Research Project

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DISPLAY BOARD

(Suggested Setup for Primary Research)

Background Research

Title of Your Project Group Members

Tables/Graphs

Figure Legend

Results

Problem Investigated

Conclusions

Hypothesis

DISPLAY BOARD
(Suggested Setup for Secondary & Tertiary Levels)

Title of Your Project Group Members

Research Question

Summary of Results

Tables/Graphs

Figure (largest)

Conclusion

Tables

Figure

Conclusion

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WARD

(Research Project)

Source of Error & Bias

Works Cited

ORAL PRESENTATION

You will be required to give an oral presentation of your project in five minutes. Each member of your team will be responsible for a portion of the project. Preparing an oral presentation will allow the class to learn more about your oral presentation. Consider some of the following tips to help you prepare for the presentation:

- **Share presentation responsibility equally** – one person should present the problem and the hypothesis and the presenter the experimental design, and the presenter the experimental design.
- **Practice, Practice, Practice.** You have your project and your presentation. Rehearse your presentation at least five times. Presentation. Students often underestimate how rehearsing helps you. Practice your presentation.
 - helpful hint: Have each member of your team prepare a portion of the presentation to be presented.
 - helpful hint: Have each member of your team prepare a portion of the presentation to be presented.
 - helpful hint: Have each member of your team prepare a portion of the presentation to be presented.

To improve their presentation skills.

© Department of Education

Science Fair Student Guide

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FINAL CHECK

Congratulations! You've finished your project and it's due, though this checklist is not prepared for the Big Day tomorrow:

- ☐ Your display is finished; all elements are bound. Double-check spelling and grammar.
- ☐ You received approval to bring live items (if applicable).
- ☐ Your group rehearsed your presentation notes/cards, but sure you bring them to the presentation.
- ☐ Assign a member of the group to bring the materials.

Suggestion: Have a parent visit the display to avoid any damage that might occur on a bus.

- ☐ All members of the group have agreed to participate.
- ☐ Suggestion: Bring bags, glue, markers and extra items (lights, etc.) if you think you'll need them.

© Scholastic Teaching Resources

Source: Scholastic Teaching Resources

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KLST

The night before your Science Fair, go through this checklist to make sure your group is prepared for the Big Day tomorrow:

Checklist

- ☐ Your display is finished: all elements on board. Double-check spelling and punctuation. (You received approval to bring live applications.)
- ☐ Your group rehearsed your presentation. (You rehearsed on the night before.)
- ☐ Everyone in the group is aware of the materials they should have ready for the presentation time.
- ☐ Assign a member of the group to be the emcee.

Suggestion: Have a parent drive your group to avoid any parking problems on school on a bus.

- ☐ All members of the group have tags on their display.
- ☐ Suggestions bring extra pens and markers and/or extra copies of the display to place touch-ups are needed.

FINAL CH

With Student For Requirement

Science Fair

© Philadelphia (Kl)

CKLIST

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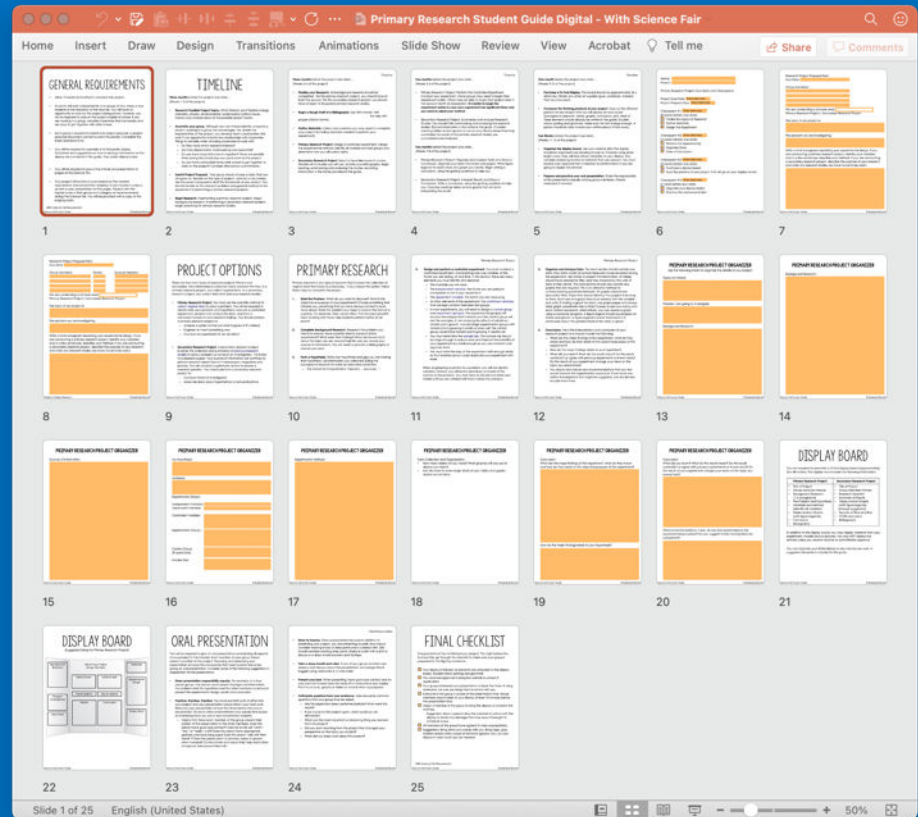
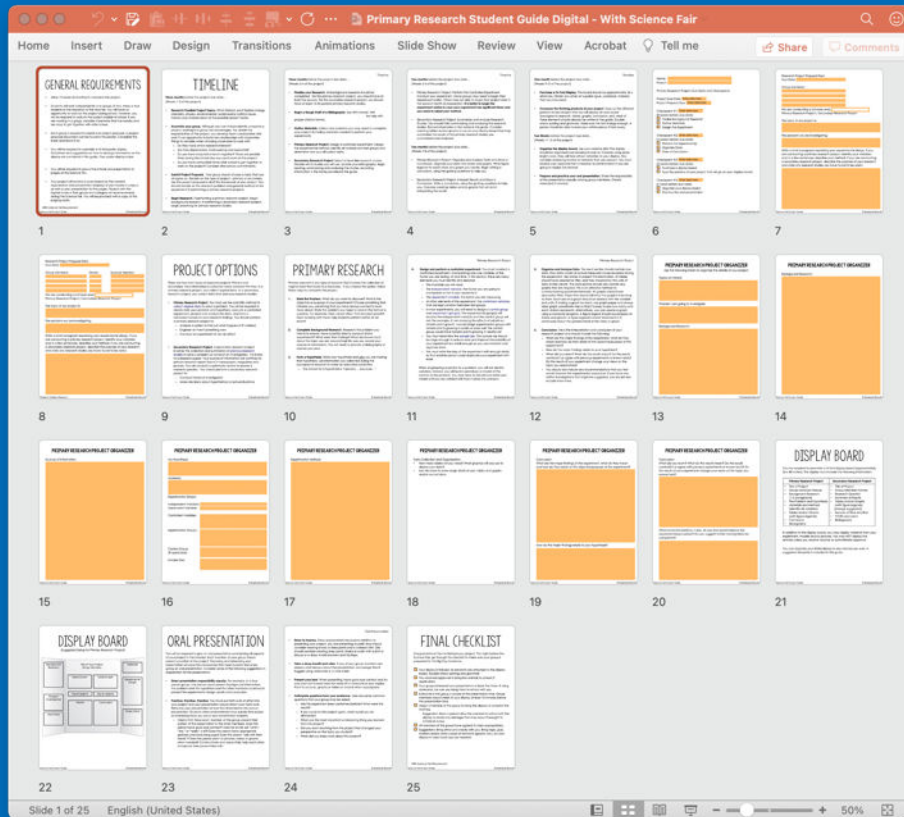
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© Shogun Press Books

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.