DEVELOPING YOUR RESEARCH PROJECT

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The rising STAR of Texas

OVERVIEW

1. Research design

2. Data collection and methods

3. Choosing methods to answer your research questions

4. Research validity

WHAT IS A RESEARCH DESIGN?

The research design provides the overall structure for the research

- the procedures
- the data collected
- and data analyses

Simply put, research design is simply planning what you are going to do and **how**!

Why your research design is important

A good research design will

- Keep the researcher on track
- Explain how the researcher collects data
- Outline every detail of the project

PLANNING A GENERAL APPROACH

- Researchers must demonstrate intellectual diversity to conduct comprehensive and credible investigations.
- Effective research requires the ability to integrate knowledge and perspectives from multiple disciplines rather than focusing on a single area of study.
- Flexibility and adaptability are essential qualities that enable researchers to address complex problems and explore a wide range of research contexts

For example: A soil scientist will need to know about soil components, but they also need to have people skills, knowledge of chemistry, and data collection skills

STEPS TO PLANNING A (GENERAL) RESEARCH DESIGN

1. Identify the problem or question **-**

I want to test if growing cover crops in my field will increase soil biodiversity.

2. Review any existing literature or findings **-**

Current studies show that cover crops can benefit soil health

3. Set your research question(s) -

Will adding more cover crops to a plot of barley increase soil health?

4. Select the study procedures and design -

I design how and what I will plant, irrigation and harvesting schedules, etc.

STEPS TO PLANNING A (GENERAL) RESEARCH DESIGN

5. Select the sample design -

I create a random design where some plots have cover crops and some don't

6. Collect the data -

At the end of the trial, I take soil samples from the plots to test for for biodiversity factors

7. Process and analyze the data -

I **compare the soil test results from the different plots**

8. Write the research report -

I **report whether the cover crop plots resulted in more, less, or the same biodiversity**

STUDENT ACTIVITY

1. Get out a blank sheet of paper
   - We're going to create a research design throughout this lesson, so don't lose this sheet!

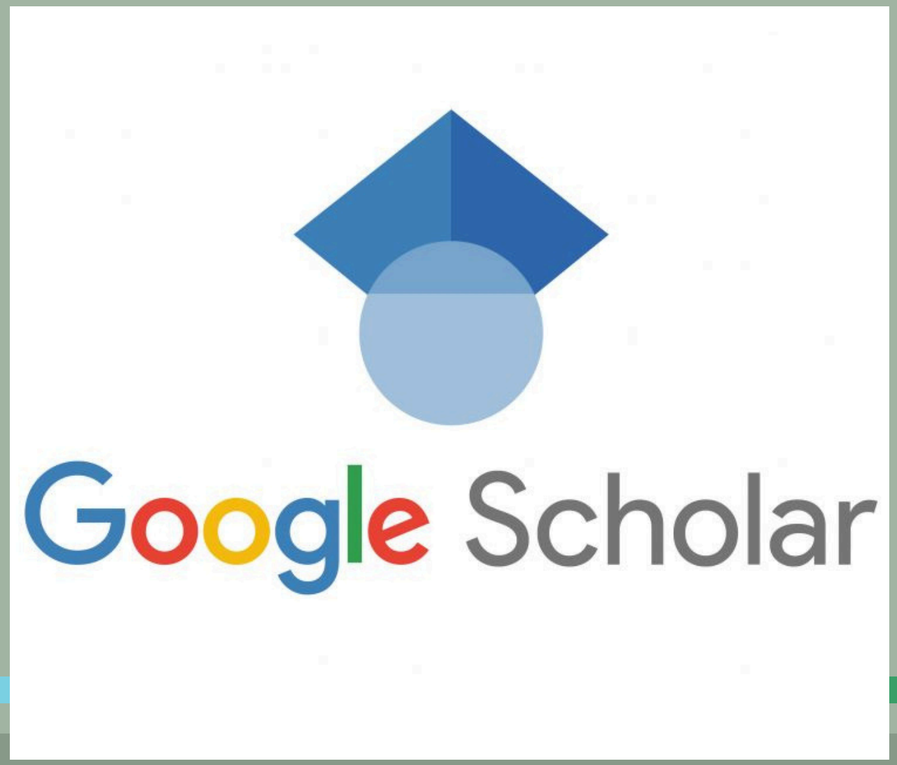
2. Create a section on your paper titled "Research Problem"
   - Write down a potential research problem, state your research question
   - This can be any research problem that you're interested in

LOOKING AT EXISTING LITERATURE

Research that has already been done can help you plan your design

- It's important to only use information from credible sources
  - Google Scholar
  - Science.gov
  - Educational Resources Information Center

- Some resources might give false or bad information
  - Wikipedia
  - Social Media



RESEARCH METHODS

- There are many different types of research methods

- Important ones in agriculture include:
    - Observation
    - Experiments
    - Surveys
    - Field research

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QUANTITATIVE & QUALITATIVE RESEARCH METHODS

- We want to focus on two main types of research
- Both are very important in all fields of research, but they're suitable for different types of data

Quantitative

Qualitative

QUALITATIVE
Research Methods

- Involves collecting and analyzing non-numerical data
- Verbal responses, text, video, or audio
- Meant to understand concepts, opinions, or experiences
- Can also be used with nearly any type of research including:
- Survey research
- Policy research
- Field research

QUALITATIVE Questions

- Do you feel stressed or excited about taking a test?
- When do you usually play videogames and why at that time?
- What is your favorite carnival ride and why?

QUALITATIVE
pros & cons

Cons

- Unreliability
- Subjectivity
- Labor-intensive

Pros

- Flexibility
- Natural settings
- Meaningful insights
- Generation of new ideas

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QUANTITATIVE
Research Methods

- It is focused, has established procedures, and the researcher takes a more detached view
- The data are numerical and usually represent a large population
- Quantitative research helps find trends, averages, and numerical information

QUANTITATIVE Questions

- How many pets do you own and how many of them are female?
- When you grocery shop, how many different fruits do you normally buy?
- If the price of coffee drops, how much do Starbucks sales change?

QUANATITATIVE
pros & cons

- Doesn’t show personal feelings or reasons
- Only looks at numbers, not the story behind them
- Can miss the “why” or deeper meaning

- Easy to repeat and check results
- Can compare results between groups
- Works well with lots of people or data

STUDENT ACTIVITY

1. On your sheet of paper, create another section on your paper titled “Research Design”

   - Write down the research method you might use to answer your research question

   - Explain whether you’re using quantitative or qualitative methods

OVERVIEW

1. Research design

2. Data collection and methods

3. Choosing methods to answer your research questions

4. Research validity

PLANNING FOR DATA COLLECTION

Before you plan your data collection, ask yourself a few questions:

- What kind of data are needed for the research?
- Where are the data located?
- How will the data be collected and by who?
- What data will be considered acceptable data?
- How will the data be interpreted?

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WHAT IS DATA?

- Once we have a research question in mind, we need to start thinking about data!
- Data is information
  - Facts, statistics, numbers
- One important thing about data is that they are rarely permanent
  - Because of this, it's important to do research that finds the most recent and accurate data

WHAT IS DATA COLLECTION?

- A process of gathering and analyzing specific information
- It is important to note that data collection falls under two broad categories: Primary and secondary data collection!
- Data collection can be done in the library, on the internet, in the field, nearly anywhere

Data Collection in Agriculture

Let’s walk through an example where we answer these questions:

A college student conducting research wants to see if adding Black Soldier Fly larvae (high in protein) to sheep feed will increase the sheep’s bodyweight gain.

What kind of data are needed for the research?

- Individual sheep bodyweight
- Amount of fly larva added to the feed
- Amount of feed consumed
- Percentage of fly larvae to add to feed, etc.

Where are existing data located?

- Online resources
  - .edu, .gov, .org
- Previous research articles
  - Peer-reviewed and published
- Sheep farmers, etc.

How will the data be collected?

- Measuring the volume of feed consumed by the sheep every day
- Measuring fly larva portions of the feed
- Weighing the sheep before and after the trial period

What data will be acceptable and how will you interpret it?

- Weight of sheep that consumed at least a predetermined level of feed during the experiment, etc.
- If the sheep have better bodyweight gain from the fly-larva-enhanced feed, then new forms of feed may be able to use fly larva. If the feed does not work, it may not be an option.

STUDENT ACTIVITY

1. On the same sheet of paper from earlier, create a new section titled “Data Collection”

2. Think about which data you would need to collect and analyze for your research problem
   - How will you collect it? Where will you find it?
   - Write down what data you are collecting, what data you are analyzing, how you are going to analyze it

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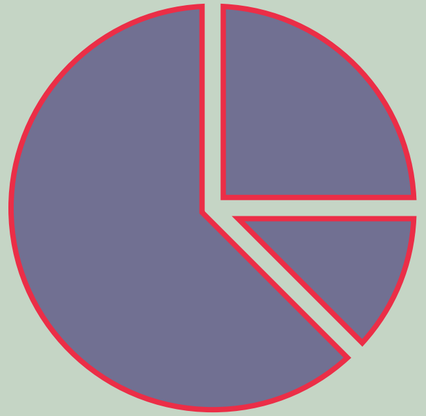
WHAT COMES AFTER DATA COLLECTION?

- Once you determine your method of data collection, you must make sure it is
  - Reliable
  - Credible



- Research design and methods are appropriate for the problem/ question
- Results are accurate and trustworthy
- The researcher's interpretations of the data are plausible

How to Enhance the Credibility of your Research

Triangulation – In triangulation, multiple sources of data are collected with the hope they will all come together to support a specific hypothesis, theory, or conclusion.

ex. Tracy reads three different scientific articles about the polar ice caps melting. They all show the same results, that global warming from climate change is causing the ice to melt.

How to Enhance the Credibility of your Research

A controlled lab study – Research conducted in lab settings can be performed by researchers that can control the environment conditions, measurements, and experimental treatments.

EX. Henry grows all the plants for his trial in the greenhouse so precipitation, wind, temperature, and humidity can all be controlled, minimizing variability. This allows the plants to all receive the same experimental variables.

How to Enhance the Credibility of your Research

Respondent validation – In respondent validation, a researcher takes conclusions back to the participants in a study and asks "Do you agree with my conclusions? Do they make sense based on your own experiences?"

EX. Before Allison sends out her research survey, she creates a small group of people that represent her target population and asks them to take her survey as a trial run. Based off their responses, she can determine if her survey questions are valid.

How to Enhance the Credibility of your Research

Follow-up studies – In some research, follow up studies are designed and performed to specifically eliminate any alternative research conclusions from the original study.

EX. Jared is concerned that his research could be flawed, so he conducts a follow up study where he replicates the research again. Replicating the study allows him to confirm his results or realize they were wrong.

STUDENT ACTIVITY

1. On the same sheet of paper from earlier, create a new section titled “Research Credibility”

2. Explain how you will ensure your data is trustworthy
   - Who will have access to it?
   3. Explain how you would make your research report reliable
      - You might cross-reference with other researchers
      - You might do a follow-up study

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Overview of our Research Project Lesson

- First, we identified our research problem and looked at the existing literature that relates to our research topic
- After that we narrowed down our research question(s) and determine which design we wanted to use
- Next, we collected the data, and made sure our results were reliable and credible
- Our next lesson, we will discuss how to analyze your data and write a research report!

Remember!

All projects are completed one step at a time!

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Lesson 2 Completed!!