

Writing a Research Question

Research questions have the following format:

How does A affect the B of C?

A: independent variable (what you will change)

B: dependent variable (what you will measure)

C: The subject of your experiment (what you will be experimenting on)

Example of a Research Question

Suppose you are interested in what affects the quality of the water in an aquarium...

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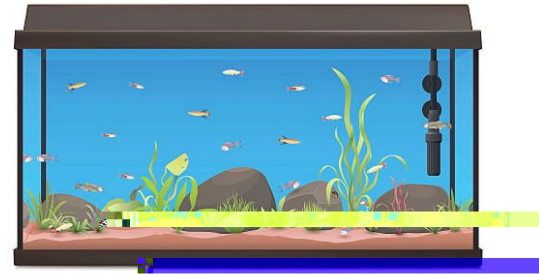


Example of a Research Question

Suppose you are interested in what affects the quality of the water in an aquarium ...

A: independent variable (what you will change)

What can we change about the quality of water?



Example of a Research Question

Suppose you are interested in what affects the quality of the water in an aquarium ...

B: dependent variable (what you will measure)

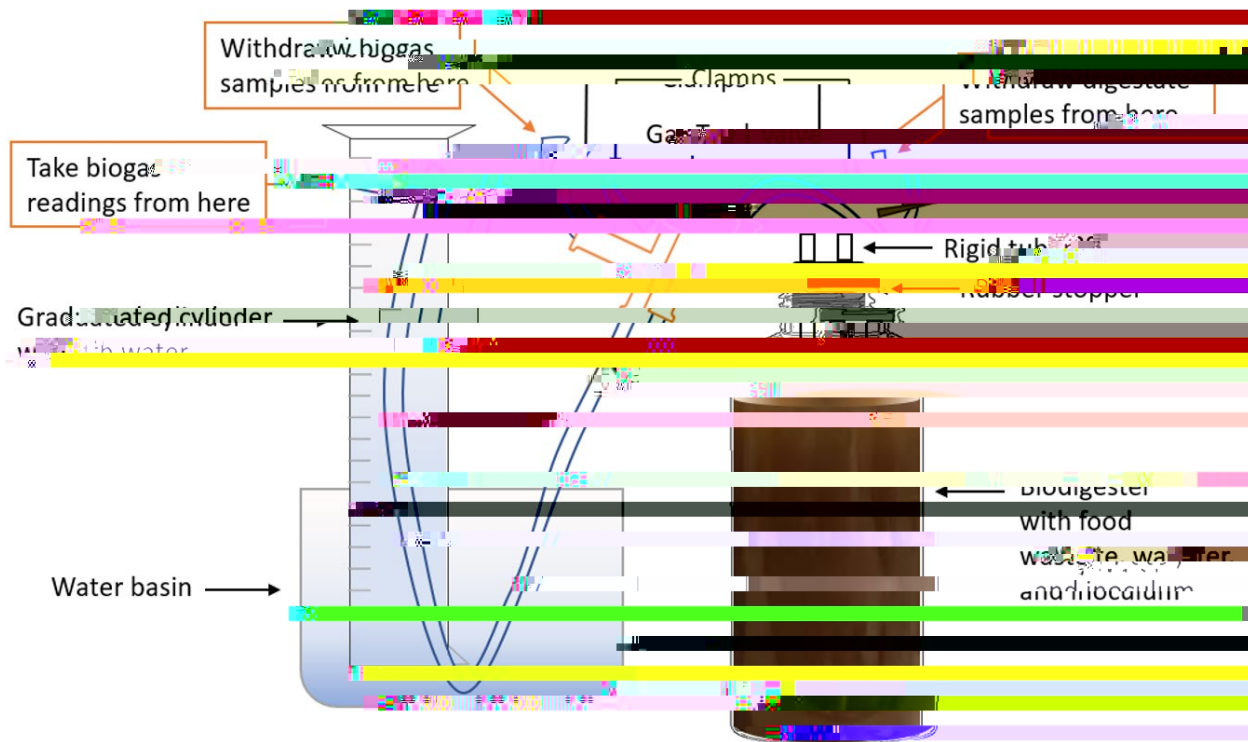
What kinds of data can we observe and record about the fish tank?



Example of a Research Question



Remember the model biodigester?



What variables affect the biodigester?

Remember the elements of the model biodigester:

- A biodigester containing:
 - Feedstock (a mixture of organic waste)
 - Inoculum (microorganisms consuming the feedstock)
 - Water
- A gas collection system, where we measure:
 - How much biogas is produced
 - How much of the biogas is methane

Independent
variables

```
graph TD; IV[Independent variables] --> F[Feedstock]; IV --> I[Inoculum]; IV --> W[Water];
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Dependent
variables

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graph TD; DV[Dependent variables] --> B[How much biogas is produced]; DV --> M[How much of the biogas is methane];
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Writing a Research Question

Using the biodigester:

How does A affect the B of C?

A: independent variable (what you will change)

B: dependent variable (what you will measure)

Writing a Research Question

Possible independent variables:

- Temperature and changes in temperature over the day
- pH, or the level of acidity in the solution
- How much water is in the solution
- How much food and inoculum are in the solution
- What kind of inoculum or manure is used



What others can you think of?

Writing a Research Question

Possible dependent variables:

- pH, or the level of acidity in the solution
- Biogas production
- Methane content of the biogas

What others can you think of?



Writing a Research Question

Write at least one research question about the biodigester using this format:

“How does _____ affect the _____ of the biodigester?”

Then answer these questions:

1. How would you set up the experiment to answer your question?
2. What will remain constant? What will you change?
3. What measurements will you make?