

# The Problem Statement\*

The goal of this activity is for you to learn to articulate a problem statement that defines a research project. A clear problem statement will lead you more readily to a solid project. Not only should it identify the gap in knowledge that is addressed by a study, but it should also include enough context and background information to make your audience understand the value of the project. By taking the time to organize your thoughts in this way, you will learn which information you will need to collect, and you will appreciate the possibilities of different perspectives about the problem.

In this activity, work as a group. You will be given three news articles on research that has been done. For each article, generate a problem statement that describes the project. You will turn in one assignment for the group - so discuss with each other the parts you have identified and try to arrive at a consensus. Once you have identified the elements, organize their salient features into a concise paragraph that will be given to your teacher.

Elements to Identify	
Focus of Research	
Purpose of Research	
Variables Counted or Observed	
Context	
Value	
Resources Used	

**Problem Statement:**

\*This activity was inspired by: "Lesson 4: Big Idea 1: Question and Explore, Developing and Revising Research Questions." *2021 Student Workbook*, pp 25-32. PDF, College Board, 2021.

### Teacher Notes:

For this lesson, I look through periodicals such as *Science News for Students* or *Scientific American* to find example articles of current research that may interest students. Below are three examples I pulled from my *Scientific American* digital subscription. I completed the assignment for each article as I would imagine the students would do. Certainly, there are a range of good responses to this assignment, which can vary from what I have written.

Riis Williams, "After Brewing Beer, Yeast Can Help Recycle Metals from E-Waste," *Scientific American* volume 330 (6), June 2024, p. 21.

<b>Elements to Identify</b>	
Focus of Research	<b>Metals lost in electronic waste</b>
Purpose of Research	This study addresses a way to isolate and collect metals from electronic using yeast.
Variables Counted or Observed	Brewer's yeast was added to aqueous solutions of various metals and the uptake of metals was monitored.
Context	Techniques for recovering these metals are energy intensive & toxic. The quantity of e-waste is increasing each year.
Value	An eco-friendly way of extracting metals from e-waste is needed
Resources Used	Aqueous solutions of $\text{Al}^{3+}$ , $\text{Cu}^{2+}$ , $\text{Ni}^{2+}$ , $\text{Zn}^{2+}$ and Brewer's Yeast, acid bath, used circuit boards

### Problem Statement:

**A lot of metals are lost in electronic waste.** Present-day techniques for recovering these metals are energy intensive and toxic to the environment. The quantity of electronic waste is increasing each year, so an eco-friendly way of extracting metals from this waste is needed. This study addresses a way to isolate and collect metals from electronics. Brewer's yeast was added to aqueous solutions of various metals and the uptake of metals was monitored.

### Research Question:

Can Brewer's yeast be used to recover metals lost to electronic waste?

BJ Casey & Heidi Meyer, "Treating the Anxious Teen," *Scientific American* volume 330 (6), June 2024, p. 48.

<b>Elements to Identify</b>	
Focus of Research	<b>Extinction of fear memory in adolescents</b>
Purpose of Research	This study investigates treatment options for adolescent anxiety that target the amygdala & the hippocampus
Variables Counted or Observed	Volunteers were exposed to neutral & stressful stimuli after which their ability to extinguish their reaction to the neutral stimulus was measured
Context	Anxiety disorders are a common mental health concern for adolescents, yet they remain largely undertreated
Value	Treatment options that connect with brain development need to be explored
Resources Used	Different aged volunteers, two stimuli, measure sweat gland activity

**Problem Statement:**

Anxiety disorders are the most common mental health concern for adolescents. Their prevalence has risen dramatically and yet they are largely undertreated. **The connection between fear memory and its extinction for adolescents** is not understood. Anxiety disorders in teens are not responsive to CBT, the standard treatment that works well for adults and young children. A possible reason for the lack of effective treatments is that the connection between brain development and therapy has not been explored adequately. This study investigates treatment options that target the amygdala and the hippocampus, two areas of the brain that are well-developed in adolescents. Volunteers were exposed to neutral & stressful stimuli after which their ability to extinguish their reaction to the neutral stimulus was measured.

**Research Question:**

Can adolescents learn to extinguish their reaction to a stressful stimulus following therapy aimed at the amygdala and/or hippocampus?

Allison Parshall, "Microplastics Have Now Been Found in Testicles. How Bad is That?" *Scientific American* May 22, 2024.

<https://www.scientificamerican.com/article/are-the-microplastics-found-in-testicles-a-health-danger/> (accessed May 27, 2024)

<b>Elements to Identify</b>	
Focus of Research	<b>Microplastics found in human and dog tissue</b>
Purpose of Research	This study addresses the extent of human and dog exposure to microplastics by sampling tissue from organs
Variables Counted or Observed	Tissues from human and dog testicles were tested for microplastics; sperm was counted in the dog testicles
Context	Plastic production is rising, exposing humans to more plastic fragments (microplastics); chemicals added to plastics may lead to a variety of health-related problems.
Significance or Value	Some of these chemicals are thought to be endocrine disruptors which can impact reproductive health as well as the health of a developing child
Resources Used	Tissue from human and dog testicles; lab analysis

**Problem Statement:**

**Microplastics are showing up in human organs.** Plastic production is rising, exposing humans to plastic fragments (microplastics). In addition, chemicals added to plastics may lead to a variety of health-related problems. In fact, some of these chemicals are thought to be endocrine disruptors which can impact reproductive health as well as the health of a developing child. This study addresses the extent of human exposure to microplastics by collecting samples of human tissue and looking for evidence of microplastics. Tissues from human testicles were tested for microplastics.

**Research Question:**

What microplastics are present in tissues collected from human and dog testicles?