



# Peer-Assisted Team Research: A Model for Early Research Experiences

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Most STEM educators agree about the many benefits that result from students' involvement in undergraduate research (UGR). However, on many campuses, there are more students who would benefit from UGR than there are opportunities in faculty labs. This is particularly a challenge for students in their first years of college, before they have completed many STEM courses. The irony is UGR might actually benefit these students the most, increasing retention in STEM and in college. Persistence in STEM is a particular concern for women and under-represented minorities. We propose that PATR resolves some of these issues.

## Introduction

- **Endocrine Disruption** – Students study the effects of endocrine disruptors on the gonadosomatic index of guppies (*p. reticulata*).
- **Science of Junk Food** – Students quantify lipid, carbohydrate and salt contents of processed foods, determine error of reporting on food labels and design sweetness taste preference studies.
- **Blue Light & Sleep Patterns** – Students investigate how increases in blue and white light affect circadian rhythms, sleep patterns task focus.
- **Investigating Action Potentials** – Students investigate how neuronal activity in cockroaches is affected by stimuli such as different sounds, oxygen level, and MSG, a neurotransmitter.

## The PATR Model

### Background:

In the PATR method, 1st and 2nd year students learn about the key components of the research process by doing hands-on innovative exploration of interdisciplinary research topics. Teams of students complete a series of structured experiences to scaffold an understanding of the research process in a team setting. Under the supervision of trained peer research leaders, teams design and run their own studies, analyze their data and draw conclusions. Because the emphasis is on the research process and scientific reasoning, rather than on producing cutting-edge results, minimal equipment is needed for students to “feel like scientists”, an important component of STEM retention and choosing a STEM career.

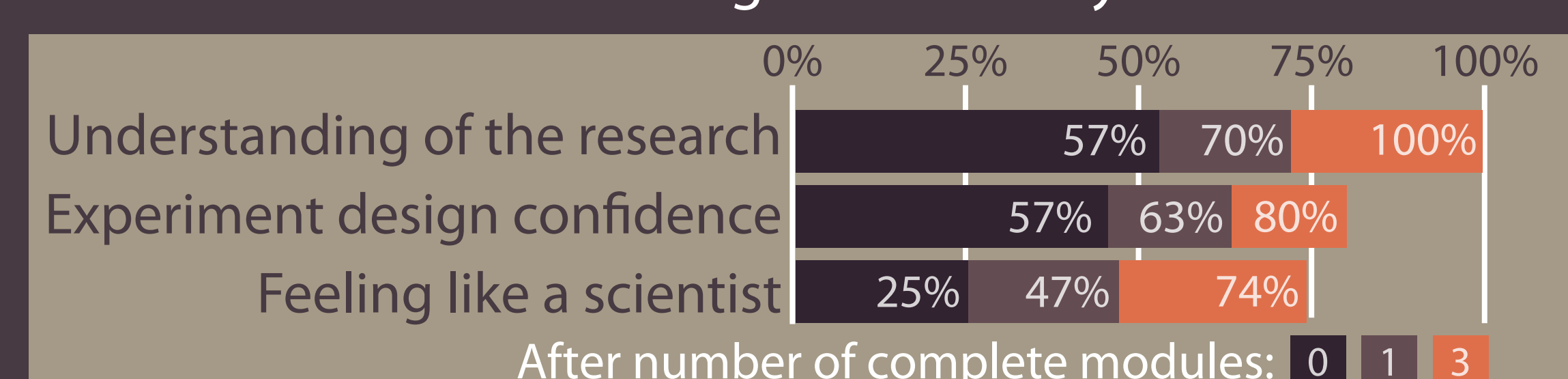
### The components of a module are:

- A real-world, cutting-edge, socially-relevant issue or topic described in the popular media
- A professional article on the same topic that students read using the C.R.E.A.T.E. method that helps make the scientific article more approachable.
- A relatively-open ended set of experiments, requiring a set of clearly-defined research skills.
- A discussion component based on “3 steps forward”, encouraging consideration of broader applications or implications of the research in the real world.

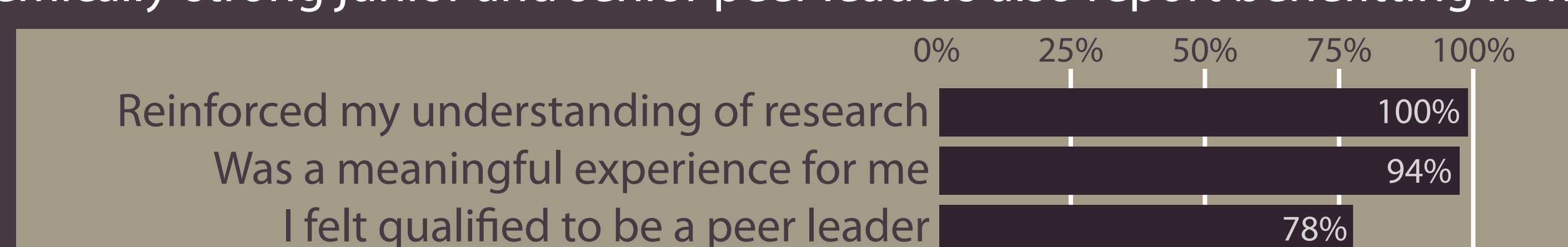
## Year One PATR Topics

## Results

About 50 1<sup>st</sup> and 2<sup>nd</sup> year students have done PATR modules on a voluntary basis, similar to a science club. They report the modules are good training to build confidence and credentials for moving into a faculty research lab.



Academically-strong junior and senior peer leaders also report benefitting from PATR.



## Year Two PATR Topics

- **Caffeine and Energy Drinks** – Students design an experiment to quantify the caffeine in different energy drinks, compared with the amount on the labels and survey when and how college students ingest caffeine.
- **Experimental Multicellularity Evolution** – Students design a study to encourage unicellular brewer's yeast (*s. cerevisiae*) to evolve into multicellular snowflake yeast.
- **Power of Walking Behavior** – Students design psychometric studies to investigate how various walking styles affect cortisol and testosterone levels.
- **Cortisol/Stress** – students investigate the effects of social stress on salivary cortisol levels.