

# How Do We Learn Best?

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## Introduction

In order for learning to occur, one must change their original conception (Posner, 1982). Conceptual change is the transition from what is originally thought to what is learned. As Piaget (1968) stated, "Knowledge . . . is a system of transformations that become progressively adequate."

## Purpose

Teaching for conceptual understanding promotes a deeper depth of knowledge as opposed to traditional teaching of memorizing facts and information. The purpose of this research was to increase student conceptual understanding in science. Teaching interventions such as dialogic teaching and group activities were implemented to cultivate student conceptual understanding.

## Connection to Industry

Working at Arizona Public Service (APS), an electric utility company, I was able to experience the importance of conceptual understanding in science, technology, engineering and math (STEM). Seeing, first-hand, the science involved in generating electricity (from solar power to nuclear power) revealed how important it is for skillful employees to have a deep understanding of STEM content.

## Research Questions

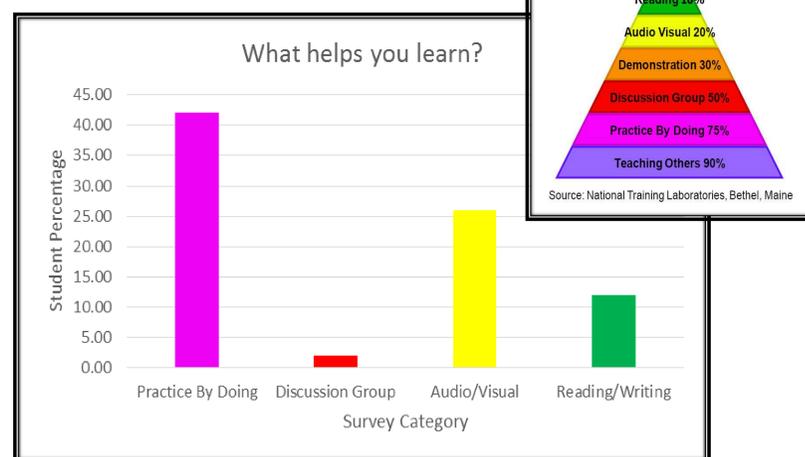
1. In what ways do students learn best?
2. How can I deepen my students' conceptual learning?
3. How do my students view their own learning?

## Investigation

The study consisted of 118 eighth grade general science students. Data collection included teacher observations, audio recordings and surveys about learning. A teacher journal was kept to record student activities and discussions. All data were analyzed through open and thematic coding to identify trends.

## Finding 1

Students indicated they learn best by "doing". Most students mentioned they learned best through hands-on activities or by participating in an activity.



Other than their opinion about talking to others, the student surveys results align with those from the national learning retention rates pyramid (above).

## Finding 2

An effective way for students to gain a conceptual understanding is through dialogic (conversation) teaching. From Teacher Journal:

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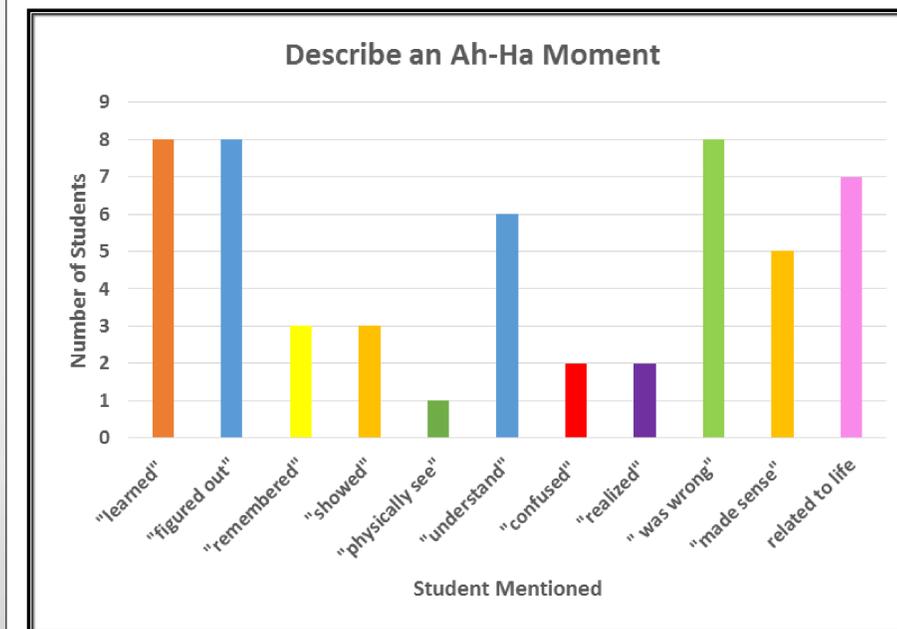
Students needed to separate the pictures (see right) according to being a physical and chemical change (this activity is great for visual and resource students). Most groups of students placed the picture in the correct category. However, there was some disagreement over toast, slicing bread, and eggs cracking versus eggs frying. While walking around during this activity, I heard students say, "But frying an egg is still an egg, it hasn't changed" while others disagreed saying, "yeah, but you can't change the egg back." Further, students seemed to believe that bread and toast were the same thing only that toast is "burnt." This showed me that the students had some misconceptions. Once the students seemed to be at a high "fumbling" point (Hamza and Wickman, 2008), I regrouped the class. I prompted them by saying that there should be an equal amount of pictures in each category and reminded them that a chemical change "cannot be undone" while a physical change is still the same substance only "changed form" to which some of them replied, "ohhh." This indicated to me that their misconceptions were then being challenged or even changed. This would allow for a more fruitful conception.



During this activity, students indicated different conceptions but were able to help each other understand physical and chemical changes through student dialogue.

## Finding 3

Student reflections indicated multiple pathways of gaining conceptual understanding.



Students specified several different avenues for fostering conceptual change moments. There was no single path for learning.

## Implications

This study emphasizes how complex conceptual change and conceptual understanding truly are. Few students indicated they believe they learn through group discussion (F1). However, my teacher journal showed learning through student discussion (F2). Additionally, students indicated a variety of ways to gain conceptual understanding (F3). This implies that students might not be fully aware of their metacognition (thinking about their learning).

## Plan of Action

Going forward, I plan on implementing more dialogic teaching and group activities within my classroom to promote conceptual understanding and prepare my students for the STEM industry.

## References

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