

**TABLE 1**

**Codebook for students’ perspectives about how writing assignments enhance conceptual understanding.**

<b>Theme 1: Conceptual Understanding:</b> refers to students’ construction of meaning for the knowledge in a given unit	
<b>Code</b>	<b>Example</b>
1. Application of concepts to real settings	The writing samples greatly helped in terms of learning how to apply and use various concepts. For me being able to look at a concept at a slower pace, instead of just trying to memorize a bunch of facts, helps greatly in my learning of the material.
2. Develop critical thinking	Each writing sample after the first one helped me to better understand the topics because it uses visuals and hands-on learning. Then it allowed me to critically think about the subjects to explain them and apply them to real-life situations.
3. Elaborate explanations of concepts	These writing samples have helped me to understand these topics because almost all of them had hands-on interactive models. By using these models, I was able to clearly see the concepts that I was supposed to be explaining. They also helped me because they made me have to explain the concept, which further expanded my understanding.
4. Enhancing knowledge through visualization	These [writing assignments] were helpful in giving me a visual representation on how these different laws acted. It is hard to just learn through PowerPoint so these assignments help in really hitting home the concept.
5. Fostering to generate self-conclusions	These four writing samples helped me understand the topics because they allow me to conclude for myself if they helped me remember and learn the concepts easily.

**TABLE 2**

**Codebook for students’ perspectives on how writing assignments enhance understanding of arguments.**

<b>Theme 2: Understanding of Arguments:</b> refers to students’ understanding of the elements of an argument to describe a scientific idea and learn how to construct persuasive arguments based on evidence	
<b>Code</b>	<b>Example</b>
1. What is a claim	Before these writing activities I did not know what a claim was or how to write one. I learned that the claim should only be a sentence; it is the thesis statement of the argument.
2. What is evidence	Evidence is what data and reasoning can support your claim.
3. How to write a scientific argument	These four writing activities helped me on how to write the scientific argument essays. It made me think more and made my essay more persuasive.
4. Understanding how to interpret data as evidence	These activities helped me understand the main elements of argumentation because I had to define what each one was and give a real example from the experiments I performed. Evidence is data + reasoning. Evidence supports my claim.

**TABLE 3**

**Codebook for students’ perspectives on writing assignments and their relevance to future careers.**

<b>Theme 3: Relevance to Careers:</b> refers to how students apply their argumentation understanding to a wider range of situations and future careers	
<b>Code</b>	<b>Example</b>
1. Improve communication skills	Any form of writing is a form of communication, so in a way this helped me better my communication skills.
2. Elaborate about diagnosis and treatment	Writing arguments are important to my career because when dealing with a patient I will have to explain my reasoning behind how I handled certain situations. For example, explaining how I came to the solution I did and why I recommended a certain medication or care plan.
3. Connect to real-world situations	Science is a very broad and important topic because science is found all around us and explains things that take place within our everyday life, and this is why we, as humans, need to have verified data and evidence that support each theory or claim made about the phenomena that take place around us.
4. Important to all careers	Being able to explain one’s thinking and observations and do so backing it up with evidence and data are important in all fields and careers.