

Activity
10

Entropy, Revisited

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Context: In- class; Thermodynamics

Keywords: conceptual knowledge, group activity, essays

Student Activity Time: 50 minute class period

After completing the entropy unit in thermodynamics, students reflect on their knowledge and develop a definition for a non-engineer.

Introducing the Reflection Activity

Thermodynamics can be a challenging course for many students, and often those challenges are related to conceptual misunderstandings of the fundamental principles of the subject. An educator used the group activity “Making Sense of Entropy” to prompt students to reflect on their understanding of entropy as the course progressed. The purpose of this activity was to assist students in communicating their understanding of entropy and to support them in overcoming misconceptions of the topic that may have evolved.

After completing a few units related to entropy and other topics such as enthalpy, exergy, and other topics, the educator used a full class session to complete this activity. First, the educator discussed the necessity of a clear, operational definition of entropy to ensure a mastery of thermodynamics. The educator separated the students into groups of 3-4 and distributed the first activity. Students were to reflect on the meaning of entropy and discuss the textbook definition provided. Within groups, students established criteria for a layperson’s working definition of entropy. Each group developed and reviewed their definition and reported out to the class.

After each group reported their definition for entropy, the educator then introduced the second activity. Individually, students wrote a one page explanation of the lessons learned and insights gained from the group activity. Students wrote their impressions in class, and submitted them to the educator at the end of the class. The educator graded each response for accuracy and completeness. Many of the student individual essays demonstrated an enhanced understanding of entropy and clear communication of corrected misconceptions. After completing this activity, students were better prepared to discuss entropy and apply the concept throughout the course.

Recreating the Reflection Activity

| Description |
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| 1 Separate students into groups of 3-4. |
| 2 Distribute the Part 1 handout for the assignment and give students 20 minutes to complete. |
| 3 Facilitate a class report out and discussion of the group findings. |
| 4 Distribute the Part 2 handout and give students 15 minutes to write an essay of their reactions to part 1. |
| 5 Collect, grade, and return students’ essays. |

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CONTENT**

10.1 Making Sense of Entropy – Part 1

10.2 Making Sense of Entropy – Part 2

In the words of the Educator: Tips and Inspiration

Purposefully select when you do this activity. When I did this activity it was after students read the associated chapters, did the homework and even taken the test. The students should have a working understanding of the concept before they do this activity. It also helps when this is introduced after other properties and principles are introduced in the course. When students have to differentiate between entropy and other concepts and are faltering it is a good time to do an activity like this.

Focus on the “non-engineer’s” definition. All of the students can give back the equation, especially since they had some problem solving experience when the activity is done. They know the Clausius inequality and how to throw numbers at the equation. Asking for the working definition requires students to negotiate what they know and don’t know among each other before developing a definition. That process is where the students introduce, correct, and revise their misconceptions about entropy that extend beyond the formula. Some groups report out pieces of the textbook as well, and I send them back to try again. They have to make entropy clear for someone who has never opened the textbook or knows anything about engineering.

What was the inspiration for the reflection activity? Thermodynamics can be an intimidating course and students learn many different relationships, including the second law of thermodynamics. After we covered the unit on the second law of thermodynamics, I gave a quiz on the unit and it was clear that the students didn’t understand how entropy works. In conversation in class, it was also clear that students did not have a clear conceptual understanding of entropy and how it differentiates from other principles. Students love equations, and on this particular quiz, a variety of equations, relationships and laws were being applied, but the context was wrong. I had the feeling they were throwing numbers at an equation and they didn’t know what they were doing or why. Before moving on, I really wanted them to develop a solid understanding of the concept of entropy, so that’s why I developed this activity.