Learning Objectives:

1. Students will understand similarities between steel manufacturing and chocolate production
2. Students will distinguish the differences between solidification and heat treatments such as annealing or tempering
3. Students will evaluate the quality of chocolate processing for different brands and types based on taste, texture, and fracture properties

Topics covered:

- Lecture
    1. Steel manufacturing
    2. Solidification
    3. Heat treatments
    4. Polymorphs of chocolate
- Lab
    1. Testing
    2. How processing can affect the final product/consumer interaction

Estimated Time for Activity:
Lecture: 20-30 minutes
Lab: 20-30 minutes

Supplies Needed:

- Lecture
    - Computer with Powerpoint
    - Projector
    - Optional: iClicker/Polling software
- Lab
    - Gloves if students want to keep their hands clean
    - Paper plates
    - Sandwich ziplock bages
    - Chocolate
        * (see example Lindt white chocolate)

    * Hershey Milk chocolate
    * (see example Ghirardelli Milk chocolate)
    * (see example Scharffen Berger Milk chocolate)
    * Hershey Dark chocolate
    * (see example Ghirardelli Dark chocolate)
    * (see example Scharffen Berger Dark chocolate)

Recommended Prior Knowledge:

- Familiarity with heat treatments of chocolate
  - Polymorph behavior
  - Relationship between chocolate tempering and final melting temperature / "snap" of chocolate
- Basic understanding of material fracture
  - Ductile vs brittle fracture
  - Which is expected out of chocolate

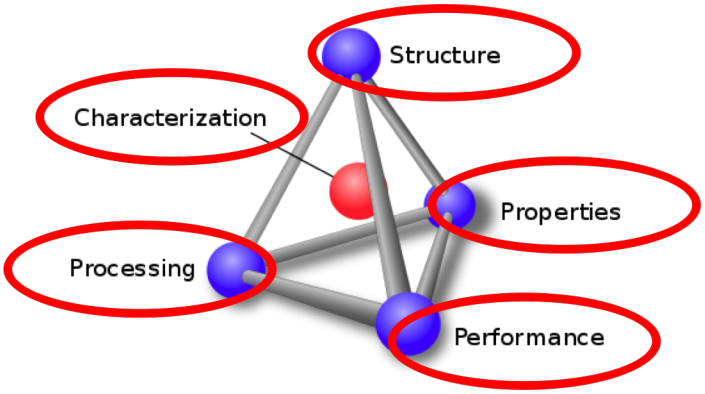
Recommended Prior Knowledge for Students:

- Be able to distinguish white, milk, and dark chocolate by sight (and taste if able to eat)

Discussion Points for Instructors:

- Compare and contrast the process of steel production with chocolate production.
- Why are some types of chocolate more expensive than others?

Aspects of Materials Science Tetrahedron Covered in Module:



Complimentary Modules

- Casting
- Fracture

Files Needed

- Chocolate Lecture (PPT or pdf)
- Chocolate Lecture Notes
- Chocolate Lab Handout - Student
- Chocolate Lab Handout - Instructor

For K-12 Instructors:

Assessment Ideas

- Utilize a word cloud through PollEverywhere – ask "What was the most interesting thing you learned?"
- Have students compare/contrast steel production and chocolate production.