ABSTRACT

We are investigating knowledge retention between lower level introductory courses in the Materials Science and Engineering (MSE) department and upper level junior and senior classes. It is an ongoing problem that students do not recollect material between MSE 170 (Introduction to Materials Science) and MSE 362 (Mechanical Behavior of Materials). Our goal is to identify any factors that contribute to this and to adjust the teaching methods and/or curricula for these classes.

Our main tool for identifying trends is the Materials Concept Inventory (MCI), a thirty question test of basic concepts, developed at Arizona State University by Steven Krause. Students take the MCI at the start and end of each quarter. In the 2004-2005 academic year, all four MSE 170 instructors administered the MCI and a large amount of raw data has been gathered. The MCI was also given to the Spring 2005 MSE 362 class. We are awash with data, and our main challenge at this point is to organize and analyze the data into useful packets.

Contributing Factors

A Starting Point: MSE 170 varies in teaching style and class emphasis:
- Professor A specializes advanced structural materials.
- Professor B specializes in materials and processing.
- Professor C specializes in biomaterials.
- Professor D specializes in thin film electronic materials.

An Issue: The time between MSE 170 and MSE 362 varies

Some Early Results

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The Materials Concept Inventory

The MCI is a thirty question test that probes for misconceptions students might have entering the class. We modified the multiple choice test to ask for the students’ level of confidence. Krause, S., Dacker, J.C. and Griffin, R. (2003). "Using a Materials Concept Inventory to Assess Conceptual Gain in Introductory Materials Engineering Courses" Proc. Of 33rd ASEE/IEEE Front. in Ed. Conf. T307-11.

Each question is then sorted into four categories:
1) Level of Difficulty: Easy, Moderate and Difficult
2) Type of Knowledge: Intuitive, Common, Specific
3) Time to Answer: Declarative (true), Think, Prerender
4) Time in 170: Not Covered, Covered, Emphasized

Sample Questions

This question is: Easy, Common, Declarative and Not covered in 170

- Taken from 131 responses before MSE 170
- Taken from 107 responses after MSE 170

The Answer is e; Ni can exist as a solid, liquid or gas.

This question is: Moderate, Specific, Think and Covered in 170

- Taken from 130 responses before MSE 170
- Taken from 103 responses after MSE 170

The answer is d. Copper's atomic level defects move more easily.

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