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# Integrating Upper Level Content with Introductory Material for Better Learning, with an Example from Mineralogy

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2009 Portland GSA Annual Meeting (18-21 October 2009)

**Paper No. 279-2**

**Presentation Time:** 1:45 PM-2:00 PM

## **INTEGRATING UPPER LEVEL CONTENT WITH INTRODUCTORY MATERIAL FOR BETTER LEARNING, WITH AN EXAMPLE FROM MINERALOGY**

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At the start of upper-level courses, many students have difficulty with advanced material that requires a base knowledge of essential concepts in geology and supporting disciplines, along with critical thinking skills. Two of the trends among students we have noted are difficulty in 1) recalling introductory course material and connecting it to deeper content, and 2) integrating concepts from supporting courses.

We advocate incorporating a broadening concept review into upper level courses using in-class group activities, pre-tests, or questionnaires that require students to recall and apply previously obtained content. Problems in student understanding are exposed, allowing the instructor to fill gaps, correct misconceptions, and offer clarity. Emphasis is on mastery of introductory material needed to acquire advanced concepts that follow. The use of probing questions and problems also exposes introductory knowledge as inadequate without higher level content and skills. The goal is to introduce students to the idea that their current understanding is too simplistic. They begin to analyze their knowledge base for areas where it can be advanced and are challenged to engage novel ideas.

Mineralogy is commonly an early course in the geoscience curriculum that progresses through classes of minerals based on anionic groups. Students are required to have mastery of basic concepts from two separate disciplines, as well as an ability to integrate that knowledge. However, intro geology courses focus on physical processes, with little reference to chemical concepts. Intro chemistry courses focus on gases, liquid solutions, electronic structure, and chemical reactions, with little reference to inorganic solids. As such, they are not easily integrated in students' minds. It is no wonder that mineralogy is often a "weed-out" course, driving some students to abandon geology as a major and career. We propose mineralogy be taught within the context of the rock cycle, supplying a common thread as minerals are taught in their common geological occurrence and serving as a scaffold upon which new knowledge is built. This approach allows for linkage to previously learned geology content, better understanding of how minerals are produced by geologic processes, and better understanding of common mineral associations.

[2009 Portland GSA Annual Meeting \(18-21 October 2009\)](#)

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Session No. 279

[What Can We Do to Help Our Students Become Better Learners? Fostering the Development of Metacognition and Self-Regulation II](#)

Oregon Convention Center: C124  
1:30 PM-5:30 PM, Wednesday, 21 October 2009

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