Strategies for Teaching Students of Varied Background

In many courses, a student’s ability to master new material depends strongly on the skills and content knowledge students bring from prerequisite courses and experiences. As instructors, we often struggle to both challenge those students who’ve come in to our courses ready for a real intellectual challenge and reach those students who, because of poor preparation for the course, really struggle with new material. If we could get those poorly prepared “up to speed” it would be easier to support all students to succeed in the course

Establishing Prerequisite Knowledge Requirements

One of the best things we can do for our students is to help them be clear about what prerequisite knowledge is needed as early in the course as possible. These strategies can help students to identify their own areas of weakness and will motivate many to work to be caught up.

1. Identify for yourself what prerequisite knowledge students need. Especially if you’ve taught the course before, you may know which areas of background knowledge are particularly critical

2. Provide students with a list of topics or skills you expect they will bring to the course.

3. Use a knowledge survey to help you and your students identify what they know and what they don’t

   http://serc.carleton.edu/NAGTWorkshops/assess/knowledgesurvey.html

4. Use pretests or “background knowledge probe” activities early in the course

5. Provide students with practice with prerequisite material at the beginning of the course

6. Use low stakes quizzes or other assessments to be sure students know how they are doing in the course

*Note that sometimes the result of a background knowledge probe or other method that reveals what students know and don’t know will cause you to want to alter your teaching plan in response.*

Helping Students to be Prepared

1. Use podcasts or recorded minilectures to help students review important material
2. Link to web-based material that will help students review or reinforce material

3. Use cooperative learning techniques in class
   - Provide challenging problems/tasks for students to complete within a structured group environment

Knowledge Survey

A standard Knowledge Surveys consists of many questions that cover the entire content of a course (or of a prerequisite course). Questions are those that might appear on homework assignments or exams and cover all levels of Bloom’s scale of thinking. (From low-level to high-level cognition, the scale goes from knowledge, comprehension, application, analysis, to synthesis.)

A typical survey may include as many as 200 questions. The key feature of Knowledge Surveys is that students do NOT answer the questions. Instead, they say whether they COULD answer the question and with what degree of confidence. So, students complete the surveys relatively quickly; 200 questions many take 20-30 minutes.

Sample question:

If the reaction below were to occur such that 3.2 g of CH4 were consumed completely, how many grams of carbon dioxide would be produced?

\[
\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}
\]

(A) I know the topic quite well; I can answer this question now
(B) I know the at least 50% of the topic partially, and I know where I can find more information about it. Within 20 minutes, I am confident I can find the complete answer.
(C) I am not confident I can answer the question.

Background Knowledge Probe

*Collect Data:* Before introducing a new topic or major concept, find out what students already know about the topic. Prepare 2-5 open ended questions; be sure not to use unfamiliar terminology. Write the questions on the board or distribute on a handout. Ask students to write 3-4 sentence answers, making sure that students
understand this is not a quiz and will not be graded. In a larger class, this exercise can be done online through a Blackboard quiz.

**Data Analysis:** Scan the responses and divide them into four piles: erroneous background knowledge, no relevant background knowledge, some background knowledge, and significant background knowledge.

**Follow up:** Report your findings to the class and either adjust your lectures accordingly and/or provide students with ideas for how they can supplement their background knowledge. You could also form study groups by numbering the four data analysis groups (1-4, lowest to highest) and forming groups of 3 to 4 students from the various knowledge levels.

**Adaptation:** At end of course, repeat the exercise, then hand back papers and ask students to compare their two responses. It can be motivating for students to realize just how much they've increased their knowledge. It may also motivate some to seek needed help.

**Caution:** Only use this technique if you have the time and inclination to respond to it. If you can't or are unwilling to modify your lectures or syllabus or help students to identify strategies for catching up, you may not want to do this exercise. On the other hand, it may give you vital information on what to spend time on and what to run through quickly.