



Why Aren't They Getting It?

What everyone can learn from teaching science

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It's not unusual to hear the lament, "Why aren't they getting it?" from science faculty. This muttering is most likely to be heard when examinations or laboratory activities are being graded.

Of all the subjects taught in college, the sciences have the lowest student retention rates and overall class grades. In addition, interest in taking college science courses is diminishing in the United States. More and more American students are avoiding upper-level science courses and science careers. Why?

Unfortunately, there are many factors contributing to the decline in science performance by college students. Many of the variables are well beyond the control of college faculty. For example, it's difficult to change academic perceptions and general feelings about pursuing scarce, modestly paying science jobs. However, there are some simple ways to improve student attentiveness, interest, and performance in college science classes. The teaching strategies provided below are accepted by the science education community and have ample research supporting their effectiveness.



Mix It Up

People tend to teach the same way they were taught in the classes they favored. Traditionally, science classes were conducted using factual lectures

and strictly directed activities. Little was done to vary instruction. Many students do not fair well in an instructor-centered, low-visual learning environment. Some students prefer visual learning cues to verbal presentations. In addition, some students learn by interacting with the information using mental exercises or physical activities. It is possible to tune in to all student learning styles by presenting the information redundantly using several different teaching methods. A lecture on atomic structure should be supplemented by audiovisual displays and a brief classroom problem-solving activity pertaining to the relationship between subatomic particles and elemental properties.

Conduct Learning Quick-Checks

Break up the class time into learning sessions and assessment moments. Provide a brief assessment after each 30 minutes of a session or after each major concept presented. The assessment should be quick and rehearsed, asking individual students to recall and apply at least three main points of what they learned. Then follow it with a hand vote or other feedback that lets the student know if he or she came up with the correct answers.

Use Concrete Examples

Science lessons are more comprehensible when smattered with real-world examples relevant to the students. Regular newspapers and magazines are excellent sources of everyday issues pertaining to scientific findings. Plus, *Popular Science*, *Science News*, *Scientific American*, and a search of science news sources on the Web provide dozens of tidbits related to all aspects of science.

Students are interested in timely science matters such as air quality, cancer therapy, computer technology, earthquakes, global climate change, nanotechnology, stem cells, volcanoes, and water pollution.

Add Processing Time to Increase Retention

Take a break between main topics or themes. Students need time to absorb recently learned information before tackling another new set of concepts. Use an activity that makes the information stick in the mind of the student by giving automatic memory, procedural memory, and semantic memory cues.

Automatic memory allows students to use the facts they learned to interpret observations. Procedural memory guides students through the reasoning processes needed to solve problems with the facts and concepts learned. Semantic memory uses images or symbols to understand information. An exercise for reinforcing learning in these three memory modes may merely involve having a small team of students produce a visual representation of a concept. For example, have them draw a picture of what electrical resistance would look like in a hot wire versus a cold wire.

End with a Summary and Study Questions

Tell the students the main point you want them to know at the end of the session. Write or project the concepts in an abbreviated outline. If possible use images along with the text.

Then, give students some hints on how to study the concepts or tell them the types of questions you expect them to answer. It is very beneficial to provide them with a small set of sample questions that they can take home.

Reinforce Learning with Web Assignments

Give short take-home assignments. Students are more likely to use the Internet than any other resource when searching for information about a topic. Plus, they favor using this medium of learning. After each major concept give a short take-home question requiring students to consult website resources. Have them provide you with the key words they used to do their search and a brief evaluation of the websites they referenced; encourage them to appraise the accuracy and reliability

of the sites. It's important that students are taught to recognize credible Internet sources of information.

Do Not Undo Learning

Learning can be compromised when students are bothered or turned off by certain classroom situations. Try not to force students to participate. Some students like to work alone or are fearful of being asked to answer questions involuntarily. This discomfort may lead to decreased attendance or stress that reduces concentration.

Give students time to think through what they've learned. A constant volley of facts produces a hypnosis that prevents any further comprehension. Avoid pop quizzes. They truly do not improve learning and may reduce class retention.

Make the students feel like you are happy to be there and happy to have them there. Say things like, "I hope you are as excited as I am about what we are covering today," or, "You may find this information useful for your lives," or, "If you are a business major, you may be interested in knowing how this applies to your studies."

These simple hints will improve learning and retention in the classes and programs where these practices are used.

References

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