Integrating Critical Thinking Skills Into the Classroom

By Anne Buchanan

Introduction

"WHAT IS CRITICAL THINKING?" The term "Critical Thinking" is intimidating! It is often perceived as an esoteric exercise of the mind, an intangible pursuit, reserved for the likes of Socrates, Aristotle and Einstein. However, for me, critical thinking is best defined simply as "what you generate, you know." Only those who can reconceptualize content for themselves have truly learned it.

Critical thinking is not just one more thing you tack on to your Science curriculum. It is the fundamental approach you use to address that curriculum. Critical thinking is disciplined, self-directed thinking. It requires thinking about your thinking while you are thinking in order to make your thinking more clear, more accurate and more defensible. Indeed, scientists do this already every time they use the scientific method. They ask questions, gather and assess relevant information, come to well-reasoned conclusions/solutions, and they communicate effectively when they write up results.

The traits of a good scientist ARE the traits of a well-cultivated critical thinker. The ultimate goal of using critical thinking instruction in a science course is to get students to think like a scientist thinks.

Getting started in Critical Thinking

Early in my teaching career, I happened upon a magazine in the teachers lounge entitled "Critical Thinking: Shaping the Mind of the 21st Century". The first article I encountered addressed the fundamental need for more critical thinking in the classroom. The issues raised by the article were the very same issues I was dealing with in my own classroom. This piqued my interest, so I immediately signed up for a workshop which was advertised in the magazine. At the workshop, I learned how to redesign my existing lessons in order to incorporate critical thinking strategies. The workshop also taught me how to:

- Cover content in such a way that students grasp and retain more
- Engage the students in thinking deeply about the content
- Motivate students to take more responsibility for their own learning
- Teach students to read for themselves, actively and analytically

- Focus on fundamental and powerful concepts with high generalizability as tools for the solutions to real-world problems
- Regularly question students Socratically distinguishing between categories of questions
- Use concrete examples
- Illustrate abstract concepts
- Spell out explicitly the intellectual standards used in grading.

Critical Thinking in the Classroom

Upon my return home, I used the strategies I had learned at the workshop to restructure everything I did in the classroom. I learned that three things must come together in the classroom: One, students must reason (a bridge from their present thinking to the new thinking you are looking for); Two, students must reason about the content (the new way you want them to think); and Three, there must be a "hook" (recognition of studentsí present thinking) so that students will be willing to do the first two. In Richard Paulís words, "When your students are learning well, they are employing the logic of their own thinking as a tool in learning. They are reasoning their way into the logic of the content. They are getting their minds into the logic of a somewhat new system, a somewhat new way of thinking, so you need to give them assignments and design activities that help them to bridge between these two, their old thinking and the new."

My first post-workshop lesson redesign was about bacteria. Instead of the didactic approach I had previously used, I "hooked" the studentsí interest by posing shocking questions that addressed the major concepts I wished to cover such as:

- "Is it better to kiss your girlfriend on the lips or lick her armpit?" (pathogenicity)
- "Why don't you have to plow your way through road kill to get to school?" (decomposition)
- "Where does your breakfast come from?" (nitrogen cycle/primary producers)
- "What do a bottle of wine, cheese and a compost heap have in common?" (fermentation)
- "Bacteria live WHERE?!" (digestion & symbiosis)
- "What do diabetics and bacteria have in common?" (genetic engineering)

I put the students into six groups and assigned each group one of these questions. The group researched their question and presented the answer to the rest of the class. I also taught the students how to reason by using the "Elements of Reason" as a structure for examining the content. I had the students go through each of the elements, determining how that element applied to the situation they had been given. Since the questions they had been asked had already piqued their interest, they were engaged enough to go to some effort to find out the answers. Because they had learned a process for reasoning, they were able to analyze the questions just as a scientist would, and to determine a conclusion based on information, rather than just

their first impression. They discovered it WAS better to lick their girlfriend's armpit, and in the process retained the reason why.

In Summary

Over the years, I have refined this embryonic notion to create a more complete approach that was more suited to ME. I found that I, like the students, do much better when I personally generate the techniques. This clearly is not the only way to do critical thinking, it is simply one of my approaches. Critical thinking has become an integral part of my teaching. I infuse it on three levels: to plan daily lessons and course-wide objectives, by modeling good critical thinking practices in front of my students and by creating activities that foster critical thinking in the students themselves. I make it become second nature.