The Study of Teaching Critical Thinking within an AP Biology Class

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“Let us put our minds together and see what life we can make for our children”

Sitting Bull 1877

- This presentation is given most humbly, since I lack the background of teaching science by the Integrative Method and with no education in the field of teaching, I basically learned the art of teaching, with the students who I taught.
- My teaching is eclectic, based upon what I found would work with teens over my 40+ years in the classroom as a teacher of Research (my first passion) and secondly mainly Biological courses.
- I was a pure science major with a BS in Zoology, an MS in Rehabilitation Counseling and a PhD in Psychoneuro-gastroenterology, still conducting my own research today.
- The above quote from the first Americans is my reminder of how collaborative learning occurs in our small world.
What is Critical Thinking (CT)?

- "Powerful indeed is the empire of habit."  
  Publicus Syrus, 42 BC

The habit of being a lifelong learner from birth is a powerful tool for the student & adult of today.

- In AP Biology, weekly outside subject requirements, are student written abstracts of weekly scientific readings, looking for updated (current) scientific knowledge to be discussed by student and class.

- As soon as the teacher can not answer a question, students volunteer to ‘google’ to find answer.
A Possible definition of CT

- Experts include as being at the very core of critical thinking: interpretation, analysis, evaluation, inference, explanation, and self-regulation (Arthur Costa)

- If limited to one definition provided to date, I would select Richard W. Paul (2000), “Critical Thinking is that mode of thinking about any subject, content, or problem in which the thinker improves the quality of his/her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them”.

- Since critical thinking is essential to learning well, then we need to incorporate critical thinking into our courses, so as to move from the “parrot stage of short term memorization to pass a test” (Glass) which provides no real long term learning for the world in which we live.

- Within my first year of teaching, I realized that teaching science or life skills was the same as teaching the “scientific method”, which once learned, can apply to all aspects of one’s life from social and personal to professional and ethical decisions.

- I found a strong connection between a structured CT educational environment linking passions for learning with habits of the mind.
"The empires of the future are the empires of the mind."
-Winston Churchill

The 5 Passions of Effective Teaching
(Costa & Garmston, 1994)

1. Passion for Efficacy: as self-empowerment
2. Passion for Flexibility: as adapting and expanding responses
3. Passion for Craftsmanship: as becoming more precise, congruent and integrated
4. Passion for Consciousness: as monitoring and reflecting oneself
5. Passion for Interdependence: as need for reciprocity & becoming one with community

Above Passions are Generators of Effective Thought and Action

• “There is a dimension of the universe unavailable to the senses”
-Joseph Campbell
The 16 Habits of Mind identified by Costa and Kallick include:

- Persisting
- Thinking and communicating with clarity and precision
- Managing impulsivity
- Gathering data through all senses
- Listening with understanding and empathy
- Creating, imagining, innovating
- Thinking flexibly
- Responding with wonderment and awe
- Thinking about thinking (metacognition)
- Taking responsible risks
- Striving for accuracy
- Finding humor
- Questioning and posing problems
- Thinking interdependently
- Applying past knowledge to new situations
- Remaining open to continuous learning
"Habit is a cable; we weave a thread of it each day, and at last we cannot break it."

Horace Mann

- Students in the class are now “Pavlov-like conditioned” to immediately ‘google’ for answers not known by teacher or classmates; this is now a learning habit
- Students in class now automatically sit up straight, when one within eyesight does so
- Students in class now say in unison answers to questions
“You’re OK, I’m OK”, and we are both highly intelligent: the 7 Intelligences by Dr. Howard Gardner

Teachers need to be aware of the different intelligences
The Seven Types of Intelligence

Psychologist Howard Gardner identified the following distinct types of intelligence. They are listed here with respect to gifted / talented children.

1. **Linguistic**
Children with this kind of intelligence enjoy writing, reading, telling stories or doing crossword puzzles.

2. **Logical-Mathematical**
Children with lots of logical intelligence are interested in patterns, categories and relationships. They are drawn to arithmetic problems, strategy games and experiments.

3. **Bodily-Kinesthetic**
These kids process knowledge through bodily sensations. They are often athletic, dancers or good at crafts such as sewing or woodworking.

4. **Spatial**
These children think in images and pictures. They may be fascinated with mazes or jigsaw puzzles, or spend free time drawing, building with Leggos or daydreaming.

5. **Musical**
Musical children are always singing or drumming to themselves. They are usually quite aware of sounds others may miss. These kids are often discriminating listeners.

6. **Interpersonal**
Children who are leaders among their peers, who are good at communicating and who seem to understand others' feelings and motives possess interpersonal intelligence.

7. **Intrapersonal**
These children may be shy. They are very aware of their own feelings and are self-motivated.

(text from Bill Allen, photo from http://www.ed.psu.edu)
"The sum of one's intelligence is the sum of one's habits of mind."
Lauren Resnick

I found Damian Baynes statement to be the most reflective of my current classroom, quote.

- There are also many other aspects of the classroom work and culture that are less obvious for the development of such habits of mind as Finding Humor, Gathering Data through all of the Senses, and Responding with Wonderment and Awe, having a strong and respected student voice, using a shared decision making process, respect for each other and for ourselves, an emotionally safe environment conducive to risk taking, lots of group work, lots and lots of dialogue, authentic and constructive feedback, being aware of the stories we tell in the classroom as these stories become our reality, and being passionate about what we are doing. For passion is contagious and those around us will be more inclined to enter into an educational journey of Learning Continuously with us if they see that we truly believe in that which we are doing.

- "We ourselves have to first become that which we want others to become."—Pace Marshal, 2003

- (Habits of Mind and a Journey into Student-Initiated Learning by Damian Baynes)
"It is not enough to have a good mind. The main thing is to use it well."

-René Descartes

*S.U.C.C.E.S.S. of Habits of Mind*, simplified by Henry Toi of Nurture Craft Pte. Ltd in Singapore
"Nothing can stop the man with the right mental attitude from achieving his goal; nothing on earth can help the man with the wrong mental attitude" - Thomas Jefferson
“Very few really seek knowledge in this world. Mortal or immortal, few really ask. On the contrary, they try to wring from the unknown the answers they have already shaped in their own minds – justification, explanations, forms of consolation without which they can’t go on. To really ask is to open the door to the whirlwind. The answer may annihilate the question and the questioner.”

Spoken by the Vampire Marius in