CREATIVITY IN THE SCIENCE CLASS: A discussion of teaching creatively in order to engage and enhance learning in science students  
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★ABSTRACT★  
Natural science students are often relegated to a simple, passive "lecture & textbook" course design in which they are expected to memorize and potentially synthesize the material, but are not typically rewarded for creativity or application/integration of the material. We designed an upper level biology course, entitled "Neuroscience & the Environment," in which we sought to encourage student creative synthesis and critical analysis. In order to facilitate thinking and discussion, we utilized a multimedia-based interactive lecture/discussion course design, making use of various data formats including video & radio clips, case studies, games, and popular science articles. We worked to increase and encourage active student participation, by requiring students to engage in active question and answer interactions during lecture, shared-responsibility group work, and in-class presentations/discussion of complex biological concepts. We framed the course to allow for a variety of student learning styles, to integrate a wide range of material, and to foster both time and classroom management skills, as well as to reward creativity and active participation.

Through personal observations, student feedback, and weekly Catalyst postings we witnessed a quantitative increase in student participation, corresponded to a spectacular retention in student attendance. Based on test responses and scores, we also witnessed increases in student integration of the material, and a qualitative increase in student creativity and conceptualization.

★MULTIMEDIA/INTERACTIVE EXAMPLES★

The Tools:

- Neuroscience "Jeopardy" to review concepts and encourage synthesis of material.
- "Coke versus Pepsi?" NPR segment on "Neuromarketing" in class taste test to exhibit changes in perception based on the environment.
- Design your own "Organism" exercise to encourage application and integration of the neuroscience subunits.
- Clips of penguin behavior, shark attacks, bird mating displays, other kinship displays via YouTube, BBC "Planet Earth," and Google Video to demonstrate and visualize the interaction of behavior and the environment.

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Student Response:

- "I liked the examples and explanations used by the instructors, and I liked the variety of learning styles used in this class!"

★STUDENT PERFORMANCE★

Student Creativity:

We were required to design and lead an entire discussion period as a portion of their group project assignment. Students were encouraged to use multimedia examples to lead a discussion on one of the units of the course combining both a popular press article and two primary literature articles about an assigned topic. Their presentation was expected to facilitate discussion.

They were graded on the following criteria:

- Organization of material (5%)  
  - Professionalism (polish)
  - Content accuracy & comprehensiveness
  - Article appropriateness
  - Critical analysis
  - Relevance
  - Creativity
  - Engagement

Student Response:

- "I felt the papers we read and the activities in our section that the teachers and students led. I would say the group project stretched my thinking the most because / had to be creative."

Student Participation & Attendance:

We retained over a 90% attendance rate throughout the quarter. Many studies have shown that student attendance correlates positively with student performance. Attendance has also been shown to be influenced by "quality of teaching" and "nature of class lectures." (see "recommended reading" for references).

Student Response:

- "This was a very interesting class. I attended every lecture and rarely do that for a class."

Test Scores:

Throughout the quarter, we witnessed a qualitative improvement in students’ test answers. The majority of students failed the initial assessment given the first day of class, but quality of test performance improved substantially for the majority of students over the course of the quarter. Test questions were specifically designed to assess both knowledge and the integrativeness/synthesis of concepts covered in class. Test questions required students to answer how ecological pressures influence the evolution/development of detailed physiological mechanisms and vice-versa. Questions were designed to discourage regurgitation of information, rather requiring analysis and creative problem solving. Thus concepts of physiology, ethology, ecology & evolution were integrated, applied and synthesized. While students were at first uncomfortable with this test format and described it as being "too broad" or requiring too much "knowledge outside of this class", over the quarter they learned to rely on knowledge they gained from their prerequisites and their own analytical abilities, as well as course-specific concepts. Average end-of-quarter GPA=3.3.

Student Response:

- "The way I learned to think and learn helped me and will help me in all my future classes."

★DISCUSSION/CONCLUSIONS★

Course design included the following characteristics: a point breakdown that accounted for various learning styles, an interactive lecture style, peer teaching, rewards for creativity, a focus on critical thinking, and a heavy use of multimedia tools. The course resulted in steady student attendance, excellent student feedback, and a qualitative increase in students ability to integrate, apply and synthesize material from a variety of science subsets. This demonstrates that interactive, multimedia courses can both increase student engagement and facilitate student learning and thinking skills.

Student Response:

- "This class was what I expected college courses to be like, except it’s the only one I’ve had."

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