

Teaching Methods in Honors Biology

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In Honors Biology the school year is divided up into 2-3 week units (we operate on a block schedule where each class meets every other day for 92 minutes). A student's grade in a unit is based upon accumulated points rather than percentages. At the beginning of each unit, the students are given a "menu" of all the learning activities on the "buffet" for the unit. The students have the opportunity to choose which activities they want to do to earn their accumulated points towards a grade of D, C, B, or A for the unit. I have written the activities so that no matter what combination of activities a student chooses to do (or in what order), he/she will be able to master the required objectives for the unit. The students also know that there are more activities available on the "buffet" than an A student would ever have time to do. This student choice takes into consideration differences in learning styles and increases student motivation (the kids love having the choices!) For each unit the students know how many points each activity is worth and how many days in class we will devote to the unit. It's exciting for me to see these freshmen learn to take charge of their own learning, set goals, assign themselves homework, and take an active role in monitoring their own progress. In each unit there are normally a couple of activities that are not optional but required. These are the computer tutorial and the test at the end of the unit. The computer tutorials have been a hit with the students. I have ten Apple computers spaced around the perimeter of the classroom/lab. Each computer has two sets of headphones allowing students to work through the computer tutorials in pairs. Since the 1990s I have spent some summers using a powerful authoring program called Macromedia Director (now called Adobe Director) to develop computer tutorials for each of the units. These self-paced programs contain text, audio, graphics, animations, video clips, interdisciplinary real world relevancy, and humor. I've written the tutorials so that they contain a high level of interactivity, as students are frequently required to respond to understanding checks during the lessons. If the student inputs an incorrect response, then he/she is rerouted to a short remedial lesson in the program and must then respond correctly to the question before being allowed to move on. The highest level of interactivity involves virtual labs on the computer where students can click and drag objects around on the screen, performing simulations of labs that are not impractical in a high school setting (for example, in the genetics unit the students are able to do an amniocentesis procedure on screen, culture the fetal cells in the medical lab, and perform a karyotype analysis to check the fetal chromosomes for abnormalities). As the students work through the computer tutorials they fill out a study guide to record their notes. Students take a much more active role in their learning in this way, as opposed to sitting through a traditional whole class lecture. A visitor to my class on a typical day would likely find some students on the computers working through the tutorial or working on a website activity. Some students might be seen with headphones in a corner of the room, watching a short video related to the unit while writing out answers to questions that accompany the video. Some students would be seen carrying out laboratory investigations. Some might be seen around an educational game board. A few students would likely be seen at the light stand, aquariums, or incubator tending to their ongoing science fair projects (the

students are required to design and carry out a science fair experiment throughout the school year, which they then present at the regional science and engineering fair in the spring). A few students might be seen organizing their course binders or thinking and writing reflection sheets designed for them to reflect on their learning, and self-evaluate their efforts. Many of the activities in each unit can be done in small, self-selected groups of 2 to 5 students. My advocacy of small group work is based in part on the research of William Glasser, which suggests that students learn 10% of what they READ, 20% of what they HEAR, 30% of what they SEE, 50% of what they SEE AND HEAR, 70% of what they DISCUSS WITH OTHERS, 80% of what they EXPERIENCE PERSONALLY, and 95% of what they TEACH TO OTHERS. As I move about the classroom it's exciting for me to hear students in their groups working without direct instruction from me, observing, exploring, testing hypotheses, puzzling through problems, applying or extending concepts and skills in new situations, analyzing data, and teaching one another. In short, these activities provide opportunities for students to probe the upper levels of Bloom's taxonomy as they engage in higher-level thinking. Last spring some teachers who visited and observed were amazed that "100% of the kids were on task 100% of the time in three consecutive 92 minute periods." For me, teaching this way is not only effective but it's fun. It allows me opportunities to informally sit down with a small group of students and respond to questions that they initiate. Students hand in the learning activities as they complete them and I grade them all before the next class meeting. Occasionally, on any given day, I find it necessary to pull the whole class together for the first 15 or 20 minutes to explain a concept that a significant number of students appear to be having trouble with (based upon the results of the previous night's grading). To a visitor the classroom may appear difficult to manage and juggle all of the activities, but it's a system that has evolved through years of experience, plus the fact that I have written most of the activities (during those summer months) helps me to keep things straight in my mind! Besides, the students love the approach. It helps them to see that science is relevant, has real world application, allows them opportunities to meet their social needs because of the group work, and is fun because of the hands-on, active nature of the learning experiences. Not long ago I smiled when I overheard a student in the hallway tell another student, "I love biology because we get to do stuff in there!"