Using Laptops in the Biology Classroom and Laboratory

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ABSTRACT: Incorporating computers into classroom and laboratory instruction is becoming increasingly common. Unfortunately, in many cases the use of desktop computers limits the ability to integrate computers into the classroom experience. In this paper, we describe the advantages and disadvantages of using laptop computers rather than desktop computers. In general, laptops provide flexibility that desktops do not, but greater expense. We also provide a list of uses of laptops in our department’s curriculum.

KEYWORDS: computers; desktops; laboratory; laptops; lecture; technology

The introduction of technology, such as computers, into science courses is a worthwhile goal and a common reform in college and university curricula. However, it often seems that the technology is added on to a course, rather than integrated into a course. In some ways this is a function of the common practice at many colleges and universities of setting up special computer rooms or labs, thus dissociating the technology from the typical class. In other words, it becomes “special.” If students in the sciences are to see computers as tools rather than as pedagogical gadgets more must be done to weave the use of computers and technology into the fabric of the course. One way to do this is to use laptop computers rather than desktop computers.

As part of an NSF-ILI grant designed to enhance and extend the hands-on experience of a classroom, lab, or field project by using laptop computers, our department was able to purchase 24 Macintosh PowerBook laptop computers for use in classes and laboratories. These Powerbooks supplemented desktop computing resources in the department and on campus. The Powerbooks were chosen to facilitate the use of computers and technology in our curriculum, including general education courses the department teaches.

We use the laptops in many ways and in a variety of courses for majors and non-majors (see Table 1). The greatest use has been in labs, but our use of laptops in lecture settings and for student presentations has increased as we continue to modify our courses to allow greater levels of active learning by our students and as we and our students present the results of our research at regional and national meetings. In addition, we allow our senior thesis research students to check out the laptops to use in their research projects both on and off campus.

Laptops have several advantages as well as disadvantages relative to desktop computers. The biggest advantage of laptops is the flexibility they provide. We can easily move up to 24 computers into a lab or classroom in a very short amount of time, something that could never be done with desktops (even if we had the room). For example, by bringing laptops into lecture, we are able to have students immediately apply concepts they have just learned (e.g., running ANOVAs or linear regressions), thus allowing the lecturer to assess, facilitate, and reinforce student comprehension of the material on a one-on-one basis. The size of laptops allows them to be used on lab benches, on individual desks in classrooms, or even taken off campus for presentations. Because we can move the computers from room to room and thus put some in one room and some in another, we can use them in more than one class simultaneously. If we were restricted to using a common computer lab, we would be unable to use computers in more than one lecture or lab at a time. In other words, we are able to take the computers to where the action is, not the other way around. For example, because we are able to use laptops, we can bring them into the physiology labs where students can hook them up to MacLab equipment right in the laboratory, which would not be
possible if we were restricted to the use of desktops in a common computer lab.

The biggest disadvantage of laptops is that they are relatively more expensive than desktops. In most cases a laptop with the same technical specifications (e.g., RAM, hard drive space, etc.) will be more expensive than a similar desktop (e.g., some basic models differ by at least $300-400). One pays for the convenience. Another disadvantage of laptops relative to desktops in the greater risk of damage, loss, or theft that their portability brings with it. We have taken steps to reduce such risks by keeping our laptops in locked cabinets when they are not in use, and restricting unsupervised use to senior research students (who must personally check them out and can only use them in the science building). We also purchased and used carrying cases for all of the laptops to provide easier and safer transport. Other disadvantages of laptops, such as screen size and color, are quickly becoming less important as the quality of laptops, particularly their screens, improves. Problems such as screen quality can be overcome by using supplemental color monitors, which is what we do when a program such as EcoBeaker or a BioQUEST module requires color monitors.

In conclusion, we recommend that as departments assess their computer needs they consider allocating some of their resources to laptops, allowing greater integration of computers into courses. Our experiences so far have been positive, and our students and curriculum have benefited from our decision to use laptops.

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<tr>
<th>Activity or Use</th>
<th>Course(s)</th>
<th>Setting</th>
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| 1) Simulations (e.g., EcoBeaker, BioQuest modules) | BIO133 Evolution and Ecology (1st year; majors)  
BIO453 Ecology (jr./sr.; majors)  
GEN250 EarthBeat (soph.; non-majors) | Lab              |
| 2) Statistical Analysis               | BIO133 Evolution and Ecology (1st year; majors)  
BIO134 Biological Diversity and Design (1st year; majors & non-majors)  
BIO308 Vertebrate Ecology (jr./sr.; majors)  
BIO312 Invertebrate Zoology (jr./sr.; majors)  
BIO453 Ecology (jr./sr.; majors)  
BIO361, 460, 461 Senior Thesis Research (jr./sr.; majors) | Lecture and Lab   |
| 3) MacLab                            | BIO250 Physiology (soph.; majors & non-majors)                  | Lab              |
| 4) Spreadsheet (e.g., manipulate life tables) | BIO133 Evolution and Ecology (1st year; majors) | Lab              |
| 5) A.D.A.M.                          | BIO243 Human Anatomy (soph.; nursing majors)                    | Lab              |
| 6) Web-based material (e.g., video, images) | BIO312 Invertebrate Zoology (jr./sr.; majors) | Lab or Lecture   |
| 7) Presentations                     | BIO461 Senior Thesis Research                                   | Regional and National Conferences |

**Table 1.-- Uses of laptop computers in the curriculum of the biology department at William Jewell College.**

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