Strategies for Teaching Computer-aided Design in Landscape Horticulture

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Strategies for teaching computer-aided design should be based on developing assignments that can appeal to a variety of students. Some students can and want to learn faster than others. To create an environment that can satisfy both types of students, two teaching methods were developed that work well: 1) Concepts are integrated into a building block approach that allows students to begin with blocks of simple information, adding more blocks as they reach a more complicated level of understanding; and 2) Assignments are organized within a flexible structure, so that students can co-create assignments that reflect their own interests and skill-levels.

Introduction

The use of computers for word processing, statistical analysis and computer aided design (CAD) has exploded in the past few years. Increasingly, students are coming to higher education with a stronger background in computer technology, and they are expecting to find state of the art computer labs and software in their curriculum. The alumni from Colorado State's Department of Horticulture have also stated in a 1988 survey that computer education was one of the areas most important to the success of future graduates. The Department of Horticulture, responding to the changing teaching needs, provided computers and software for the Landscape Horticulture students, concentrating in Landscape Design and Construction. The instructor faced the task of preparing to teach a course that lacked a strong tradition in teaching techniques and methodology. Based on several years of teaching experience, the instructor identified certain goals and techniques which would be useful for teachers preparing to teach such a computer course or, more specifically, a CAD course.

The first goal is to teach CAD to Landscape Horticulture students. To support this goal, LandCADD (CADD: computer aided design and drafting) was selected. LandCADD is a third-party program that is specifically designed to work in conjunction with AutoCAD on an MS-DOS platform. Landscape architects, designers and civil engineers are the professional groups that predominantly work with LandCADD in the field. Entering students have already had a semester of AutoCAD training as a prerequisite. Approximately a third of the class have enough knowledge to work independently of a structured class. A self-paced course on the computer itself could adequately support these students learning at their own pace. They like computers and find them intriguing and exciting. Since these students can find their way around a computer program with minimal direction, it's an adventure to them.

Two-thirds of students, however, need guidance and focus. Students who might be afraid of computers or feel as if they can't remember anything from the prerequisite AutoCAD class need guidance. They sometimes simply get frustrated with computers. And students who need focus simply don't do well in a self-paced environment, because they miss the structure of a traditional classroom setting. They need to know what is expected of them, when assignments are due, and that they can easily access the teacher. A course designed with assignments specifically intended to create a "flexible structure," and thus adaptable for those who need a stated criteria as well as for those who want to do more complex work was implemented.

The second goal for the class instruction is to prepare students to solve problems and to find their way through a computer program. If a prospective employer has another software program besides LandCADD, the graduates must feel confident that with time they can figure out another program. To fulfill this goal information is presented during lectures as a series of building blocks, beginning with very simple information to build confidence and then providing more complicated information that can be integrate to create higher levels of understanding. These building blocks of information are presented as straightforwardly as possible. However, many students rearrange the blocks, turning them upside down and moving them around to suit their own specific ways of learning. Again, this reflects the goal of creating a flexible structure in the classroom which works so well in teaching with computers.

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Methodologies and Techniques

Classroom organization is an essential ingredient in creating a successful learning environment for students. Learning to operate a computer with confidence requires hands-on interaction with the computer. Students physically need to go through the command sequences, be successful and make mistakes, and try again, over and over if necessary. The instructor uses the computer lab as "the classroom" and considers it an excellent learning environment. The instructor can be in the lab while students work on assignments and give them immediate feedback. For lectures a computer activates a Liquid Crystal Display (LCD) panel on an overhead projector which displays the computer monitor's image on a large classroom screen so the students can see. As possible, each student can work at her/his own computer work station during the lecture. If the class does not allow this students share computers during class time. It is important that students are not allowed to sit with the same person the entire semester. It is too easy for students to get dependent on one another, and those students who "like" and work effectively on computers tend to dominate the in-class work time. In such an environment the less confident student watch the faster student do the assignment in class, plan to return after class during open lab time, only to become more frustrated trying to do without any support that which looked so easy to do in class.

Sample drawings from the manuals are a lifesaver for any first-year teacher. However, they can actually provide too much information and are too easy. Typically, they spell out each command and the appropriate responses for each desired function. For the student who wants to go further faster they are confusing and frustrating. These students find themselves becoming mired down in too much detail. Other students who methodically follow all the commands face an even greater problem. They never become comfortable making mistakes or learning how to navigate through a problem. These students then have a tendency to stop or give up too easily when they encounter a problem.

A typical class session begins with simple follow-along exercises, which are intended to teach the concepts and provide a model for how to work through the assignment. After this "lecture" period, students work on the assignment during the lab period. During this time the instructor can help them individually, or if several students are having the same problem, the class as a whole can address the issue so the total class benefits.

The semester begins with easy yet powerful assignments. In the LandCADD program this means working with the symbol file. With very little training a student can begin to access tree, shrub, or vehicle symbol files and start creating a drawing. In this way students can experience immediate results, have fun, and begin to feel confident. The assignments ask students to explain and document different ways to access symbols rather than to create drawings that look like pre-established examples. LandCADD presents a variety of ways to do any one function, including tablet, screen and pull-down menus as well as keyboard commands. This requires a student to experiment on the computer and document the series of commands that worked. Instructors can also learn many short-cut command sequences from their students.

A similar learning format is used during the review of the AutoCAD program. Instead of giving the students a "how to" list of functions that would fulfill a specific AutoCAD command, they receive several AutoCAD commands, such as TRIM. The students must create a figure that needs to be trimmed, copy it, then TRIM one of the copies. In this way a student can be as creative (or noncreative) as they like.

Since this course is for Landscape Design and Construction majors, assignments deal with situations they may encounter on the job. For example, in the review of the DOS commands, such as MAKE DIRECTORY (MD) or CHANGE DIRECTORY (CD), students create a filing system for an imaginary company. In this assignment the students must think about the types of drawings a company might use--such as grading plans, planting plans or irrigation plans--and about how they would best be organized.

As the semester progresses, the assignments continue to go deeper into the LandCADD program adding more commands and modules. In the final assignment students create an original project specifically designed to help them find a job. The project usually consists of either a drawing that goes into the student's portfolio or a project that investigates some aspect of LandCADD (or AutoCAD). The student begins by writing a proposal that is discussed individually with the instructor. It contains their goals of the project. A major project requirement is a journal of the time spent on the project and a description of each success and failure they encounter as they conduct their investigation. The journal gives students their own reference document. It also gives students who hit a stumbling block the opportunity to let the instructor know that they did spend time on the project. It is crucial to integrate writing into assignments.

Conclusion

The strategies outlined earlier are intended to benefit faculty teaching any computer course and more specifically those teaching computer-aided design to Landscape Horticulture students. Ideas worth integrating into existing courses include: 1. Moving class instruction into the computer lab, 2. Organizing course work in a comprehensive fashion beginning with very basic exciting information that is used repetitively and leads to more complex assignments, and 3. Allowing students to define aspects of the assignments within a given structure.

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