ABSTRACT

With financial resources always at a premium in education, creating and equipping new facilities is often a lengthy and frustrating exercise in unpleasant compromise. This paper discusses the planning, construction, and application of a computerized classroom for specific use in Process Education and general use in a variety of collaborative learning environments.

Requirements for an effective Process Education facility are described and several computer generated diagrams show optimal classroom layouts and furniture design. This Purdue University Calumet case study describes the implementation of the design and provides assessment from the instructors and students who are using the laboratory.

With cooperation, commitment, and innovation, a resource was developed in a matter of weeks, with minimal cost, that will continue to provide an atmosphere of teamwork and discovery for students and faculty alike.

INTRODUCTION TO PROCESS EDUCATION

Process Education is defined as the philosophy that learning, thinking, problem solving, communicating, assessing, and teamwork are all processes and their continual improvement while constructing a knowledge base is the goal of education[1].

Process Education relies, in part, on the use of four person teams actively engaged in discovering knowledge from various resources and develops skills and an appreciation for lifelong learning. The following tools and techniques support Process Education: cooperative learning, discovery learning, technology, journal writing, and assessment [2].

To maximize the benefits of cooperative learning, each member of the team chooses a specific role. In all cases there is a team Captain, responsible for keeping the team focused on the assigned tasks. The Captain is also responsible for time management. Most of the tasks are timed to develop efficiency and to assist in learning to learn under pressure. After the group melds together and becomes a "team," the importance of having one person in charge, becomes acceptable to even the most autonomous learner. The roles, of course, are rotated after every few exercises so that everyone develops an understanding of the importance of each person’s part.

The Recorder keeps a log of role assignments, instructions, questions, answers, results, strategies, and discoveries and is responsible for producing any required written documents.

A Reflector is most concerned with how the team works as a team in accomplishing the task at hand. By using the standard measurement criteria, the reflector reports on the team’s strengths, areas for improvement, and insights about the learning process.

The fourth role is defined by the current assignment. Sometimes it is that of the Spokesperson who represents the viewpoints held by a majority of the team members and delivers oral reports about the activity. If required, this person may be a Technology Expert, or the one responsible for operating the computer if required by the task.

Regardless of the role, each person is still actively involved in the learning experience of the team, thus developing multi-tasking skills.

As activities are assigned to each team, the process for problem solving or discovery learning develops numerous other skills, including:

- communication - through conversation, restatement of the problem, articulation of concepts, and presentation of results.
- teamwork - including leadership, decision making, conflict resolution, and collaboration.
• assessment - either as the problem is being solved or when on the final results are articulated, requires the students to assess each other's team skills, thinking, and problem solving processes [2].

Exploring technological tools by the use of computers is essential throughout our society. Process Education is enhanced by using computers to focus group discussions, allow the testing of assumptions, visualize abstract concepts, record assessments, and support journal writing [3].

In Process Education, the instructor becomes a facilitator in the process rather than a lecturer. The typical, tiered computer lab with fixed working surfaces and computer layouts is not conducive to teamwork nor does it allow students using wheelchairs a great deal of flexibility. Embodying the essence of collaboration, a case study is described, wherein several academic departments, administrators, and students joined forces to create a laboratory using underutilized space and older computer equipment.

We are working to eliminate what one of our vice chancellors described as, "... the medieval paradigm ... of knowledge passing from the notes of the professor to the notes of the students, without passing through the brains of either."

An educational consultant, Pacific Crest Software, Inc., held several half-day seminars on campus during the spring semester of 1995. As a continuation of that work, they offer "Teachfog Institutes" at several other campuses during the summer. Our Vice Chancellor for Academic Affairs had funded attendance at one of these institutes held at DePauw University, Greencastle, Indiana, during the summer of 1995. The program was six days of intensive learning-by-doing experience where we realized how much the physical setup of the learning environment can facilitate the process of this kind of education.

On the return trip, four faculty members, representing three departments, discussed the possibility of creating such a lab on campus. The criteria for fashioning the operation would need to include:

- work areas for 4 person teams
- computers to assist in some of the technology skill building exercises and word processing for recording the group's progress and allowing real-time assessments.
- be in its own space, not shared with conventional computer lab classes
- eliminate the physical barriers associated with the old tiered computer labs that are not conducive to team learning.

PLANNING

Space - Upon return to campus, a review of the computerized floor plans of several buildings and examination of classroom size from enrollment data revealed that one of the manual drafting labs was being under-utilized. Envisioning some creative rearrangement and the use of surplus wall panels, negotiations began with the instructors who used the drafting lab.

The Chairs of three departments were contacted and agreed to reallocating space allowing the lab to be carved out. The only requirement was that the instructors review and approve the plans.

Computers - The University Division had a dozen 386 computers without hard drives, but Construction Technology had decommissioned 286s with the required drives. Both departments agreed to the combining of the hardware elements. The Mechanical Engineering Technology and Supervision Department also contributed 6 old dot matrix printers.

Furniture - During the planning phase, two of the participants traveled to Bellevue University in Omaha, Nebraska. There a Process Education laboratory had been created and funded through a grant from one of the telecommunications companies. Starting with a model of their desks, a design was created that allowed four team members to communicate effectively and make use of computer technology as needed.

A prototype was constructed from cardboard in the Construction Technology lab. Students were brought in to evaluate the design and make recommendations for improvements. Based on the student comments, the radius of the table was reduced to allow slightly more visual contact between team members. The greatest contribution was the suggestion that the CPUs be placed on the floor and the monitors be elevated on a shelf. This allowed the keyboards to be stored below or, when the
keyboards were being used, books and other reference materials could be within easy reach.

The Department of Construction Technology and the Mechanical Engineering Technology and Supervision Department had several laminated table tops and steel leg frames taking up space in storage and these were donated for the workstations. The author and the Construction Technology lab supervisor spent several days cutting the wood and trying various locations for the legs. The result is pictured in Figure 1.

![Figure 1. Purdue’s Process Education workstation.](image1)

Chairs - Because teams often become animated in their quest for knowledge, it was imperative that the chairs be easily and quietly moved. The University’s standard secretarial chair was not ideal for the purpose. With a donation from the Vice Chancellor for Academic Affairs the appropriate chairs could be purchased. Those selected had gas operated height adjustment and the fabric was chosen to complement the color of the table tops. The casters on the chairs allow effortless change from one classroom setup to another. In addition to meeting all the criteria, these chairs were one third the price of the standard.

Demising Walls - Several labs near the proposed one were defined with open office partition panels that are self-supporting and relatively movable. Some recent remodeling yielded a small surplus of panels and these were incorporated in the final floor plan. During the summer session, one student used the proposed plan to create a rendered computer animation of the completed lab as a term project allowing the planners to visualize the space from all angles and a “walk-through” of the space helped to communicate the concept.

Being still tethered, mentally, to the lecture format of classroom arrangement, the first iteration produced the plan shown in Figure 2. All workstations faced the same direction, to where the lecturer traditionally stands. Although enough space was allowed so that the instructor could move freely around the desks, there was still a regimentation that was not desirable. It would not be until after the lab had been in use for several weeks that a furniture rearrangement would provide the best solution.

While the plans for the physical construction were being finalized, the course content portions of the experiment were developing rapidly. A new text from Pacific Crest was in printing, and specific course material, including activity sheets, was being created. An essential part of discovery learning requires the teams to follow activity sheets that guide learning. Preparing these sheets for the first time can be rather arduous, but done well, they provide focus for the team effort.

Even though much had been accomplished in a short period of time, the beginning of the semester was coming nearer. Having consensus agreement on the floor plan, furnishings, and equipment it was time to begin construction.

![Figure 2. Initial lab floor plan.](image2)
IMPLEMENTATION

The preliminary floor plan was submitted to the heads of the affected departments. Approval was immediate and supportive, due in equal measure to the enthusiasm of the participants and the appropriateness of the idea. The Facilities Planning Department received the plan, made some minor revisions regarding fire safety, and then authorized the beginning of the work on the walls.

Workers from the Physical Facilities Department spent several days relocating existing partitions and installing surplus ones to enclose the space. Fortunately, one cad drafting lab was determined to have one too many doors and that was replaced with a panel and liberated for the cause of Process Education. Before all the partitions were in place, donations of file cabinets, an instructor's desk and side chair, bookcases and file cabinets were received from various other departments.

With apologies to the electrical inspector, relief for wire mold attached to the floor was begged on the experimental (equaling temporary) concept of the lab. The Dean of the School of Professional Studies generously donated required cabling, surge protectors, and miscellaneous items that were, at the last minute, discovered to not be in anyone's budget.

The completed workstation desks and reconditioned computers arrived and were put into place as shown in Figure 3.

Figure 3. Original lab layout.

REVISION

Shortly after the start of the fall semester, Daniel Apple and Karl Krumieg of Pacific Crest Software, Inc., paid a visit. They suggested that the lab would work better if the workstations faced the walls and the resulting center open area be used for a conference table. Making this change accomplished many things. First, the on-line work of each of the four person teams can be observed by the facilitator in one glance. Second, there is a greater feeling of privacy for the teams when working at the computers.

Once again, the author and the ever patient lab supervisor returned to the storage room to retrieve the remaining table tops and steel legs. With a minor amount of cutting and welding, four tables were built and now are located in the center of the room, as shown in Figure 4.

Figure 4. The revised plan.

The conference tables can be assembled in a variety of ways to allow discussions with all of the students or provide workspace for non-computer activities. The electrical inspector can now rest easy and the entire lab just has a better "feel." The movable blackboard is located at one end of the room if needed for instructions or summaries.

The present layout provides an open and refreshing change from what had become the de facto tiered design for computer instruction elsewhere on campus. The students focus away from the old central source of knowledge and in the Process, discover that for the rest of their lives, that source comes from within.
Continual, real-time assessment of the various activities, the students’ individual and group performance, and the instructor’s effectiveness is a key element of Process Education. This is done by requiring written statements regarding strengths, areas for improvement, and insights gained from the subject of the assessment.

By every measure the use of the Process Education lab has been a success. The lab is used on a daily basis for GNS 103, Introduction to Higher Education, with high assessments from the students. One instructor recently stated that her students “... just seem to be more friendly and more engaged in the learning process than ever before.” Several other classes have been introduced to examples of Process Education with similar positive results.

One senior level Construction Technology course, Construction Costs and Bidding will be using Process almost exclusively next semester. The class will be grouped in teams of four, identify themselves as competing companies, and learn new skills and software packages in a simulated construction bidding situation.

Using an environment that has been completely and exclusively designed for collaborative learning is very beneficial. The primary Process skills include communication skills, teamwork, and assessment. Having a lab that facilitates conversation and critical thinking has been positive for both the instructors and the students.

REFERENCES


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