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Incorporating Problem Solving Within End User Computing Courses

Gwynne Larsen, PhD and Kathryn Marold, PhD
Department of Computer Information Systems, Metropolitan State College of Denver, Colorado
Tel: (303) 556-2932, Fax: (303) 556-8044, larseng@mscd.edu

ABSTRACT

The authors trace the process of revising and updating a long existing Micro-based Software class at the undergraduate level at Metropolitan State College of Denver. The course was designed to allow students to become proficient at end user computing at the operational business level. The revisions were prompted by the increasing sophistication of horizontal microcomputer application programs, the increase in level of computer literacy among undergraduate School of Business students, and the student need for experience in problem solving and application of the theory learned with the Office 2000 software suite. A pilot class followed the revised curriculum in the Fall of 2001. The revised curriculum involved much Web-based material and frequent presentation sessions for solutions to assigned problems. An efficacy survey was administered at the end of the class, to determine student satisfaction with the revised curriculum. The success of the pilot class has resulted in implementing the revised content in all sections of the Micro-based Software class as of spring semester, 2002.

INTRODUCTION

In today's business environment, most of the commonly occurring daily business problems are solved at the desktop computer, using existing horizontal software applications. The majority of the operational level problems are solved using the most popular horizontal application suite, *Office* 2000 or *Office* XP. It is installed on almost all business computers and it is used almost universally throughout the organizational environment. The value of end user computing proficiency is more important than ever. The central typing pool and the EDP (electronic data processing) or end user support services for problems requiring a short turnaround are almost nonexistent anymore. Office staff and lower level managers solve daily problems on their own, using the horizontal microcomputer application program with which they are familiar. With current GUI software programs and enhanced Help facilities, including well-designed Search facilities, cascading Windows where Help steps remain on the screen, and social interfaces like the Microsoft *Office Assistant*, the software skills to perform a task is no longer the hurdle: the problem-solving process is.

Rationale for Revising Existing Class

The authors revised the existing CIS Micro-based Software class to reflect the changes in computing in the last decade and the pressing need for business students to solve problem by applying the theories learned in this end user computing class. We revised the existing CIS 3270 Micro-based Software class so that it taught School of Business students to become software solutions architects to handle the numerous business problems that occur daily at the operational level in all arenas. In the past decade the level of computer literacy for entry-level School of Business students taking the CIS required beginning information systems class has increased 10% (Marold and Fustos, 2001). We concluded that the need for teaching skills of a particular program—in this case *Office*— was not as pressing as it was when the course was first designed by Dr. Larsen. It is common for business workers at all levels, including those in top management positions, to use computers and software as tools to solve their daily problems: those programs are easier to use than they have ever been, and students are often comfortable with the program interface already. The newly-graduated employee is now much more computer literate and much better prepared to use popular software productivity packages. In most business positions employees are expected to know how to use microcomputers.

Standardizing of End user programs

End user computing has matured and become much more standardized in the past decade. Horizontal application software programs are now used in place of the narrower specialized vertical applications of the past. One of the most used among these is the Microsoft *Office* suite of applications. The tool itself, consisting of *Word, Excel, Access, PowerPoint*, and *Outlook,* is easier to master. However, developing solutions for problems occurring in daily business situations is still no easier than before, and we noticed a deficiency in student ability to apply theory, despite problem-solving courses in other areas of their undergraduate curriculum. Our premise was that after taking our revised CIS 3270 course, students would be better equipped to solve business problems using the *Office* tools.

The Course within a Program

The Micro-based Software course is the cornerstone course for students minoring in CIS and a major component in our End User Support certificate, popular with students who may already have an older or non-technology degree and who want to update their skills. Also, other CIS courses such as Micro User Operating Systems, Analysis of Hardware and Software, and various Internet courses revolve around material taught in this class. Frequently, students from outside the Business School at Metro—those in the School of Professional Studies and Language Arts and Sciences—take the course to enhance their personal computing skills and increase their employment opportunities. The course curriculum had not been revised except for software programs used since it was officially adopted. It was time to update the course curriculum to better reflect current student needs.

LITERATURE REVIEW

Much has been written on end user computing since microcomputers became the *modus operandi* of the business world. More than one journal is devoted entirely to end user computing, such as *The Journal of End User Computing* sponsored by IRMA and published by Idea Publishing. The microcomputer has added a new dimension to end user-support by increasing the range of computer information systems and increasing the computer literacy of the end user (Lundgren, 1998.)

When hands-on laboratory sessions were introduced into end user computing courses in the 1990s, students were given the opportunity to "learn by doing." The computer provided the vehicle for the learning, whereas students actually learned with the software program. It became obvious that learning programs should be designed to allow the flexibility that resource-based, self-paced learning can provide (Stoney, 1999.) When the hardware could support it, self-paced, resource-based instruction, such as multimedia, promoted the links between conceptual and experiential learning. (Stoney, 1999.) Increasingly, as the program interfaces became totally graphical many concepts and ideas could not be taught without the aid of technology to represent

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and manipulate them. Molnar noted that computers have revolutionized the representation and manipulation of information. (Molnar, 1997.)

Web delivered courses spawned a new surge in research on micro-based courses. A study was recently done comparing 94 students in a traditional classroom with 37 students taking the same course online. It was found that the perception of the online students was that they learned as much and had the same quality of instruction as the students in the classroom (Cooper, 2000.) End user computing courses could be successfully offered online.

Incorporating problem solving into end user computing courses was a natural progress. At the undergraduate level, the faculty wants to educate future CIS professionals so they will have both the business acumen and the technical skills to solve organizational management problems and provide technical solutions (Rodriguez, 2000.) It has been found that basic skills are not learned in isolation, but in the process of completing real world tasks that integrate numerous skills (Stoney, 1999.) Problem solving could give students practice at application of theory learned, and practice with the skills obtained by learning specific application programs.

In the 1960s Marshall McLuhan noted that we were witnessing a revolution that was totally new and changing the very nature of human perception and experience. The electronic environment put us are in the world of pattern recognition and out of the world of mere data collection. Now competitiveness depended not only on the discovery of new innovations. The speed at which that knowledge was transmitted through our educational systems created highly skilled workers who could apply their knowledge (Molnar, 1997.) Powerful technologies are now available to significantly augment the skills that are necessary to convert data into information and transform information into knowledge. (Molnar, 1997.)

End user computing courses were studied and researched throughout the 90s. Experts agreed that an educator must be more than just a "talking book". One way to accomplish this was to use multimedia tools in the classroom, which freed the instructor to enlighten the student's mind." (Luna and McKenzie, 1997) Withrow noted:

> The 21st century will go down as the age of the mind, the brain and telecommunications. Those who have the skills and knowledge to navigate cyberspace will participate fully in the global village of the future. (Withrow, 1997.)

End user computing skills became more important than ever. Courses to teach application programs could even be converted to computer delivered courses. CBTs (computer based training) and WBTs (Web based training) could free the instructor if they were designed correctly. Payson noted "It is pedagogically important in computer mediated instruction to have effective educational programming that can take advantage of new technologies" (Payson, 1998.) End user computing was alive and well—just taking on new forms. One distinguishing feature of a CBT is that it is self-sufficient. The student needs little or no outside help beyond the tutorial. The contents of the program and other training management methods motivate the students (Ganger, 1990.) Online reference guides are a form of user help on a computer system that reduces the need for formal training (Ganger, 1990.)

Whether the course environment was a new "smart classroom" or the Web, end user computing courses survived. Payson noted that the integrated use of several technologies allowed for both synchronous and asynchronous instruction in the most academically sound and cost effective combination for a particular course or program (Payson, 1998.) When combined with problem solving elements, the end user computing courses could be even stronger. The state of technology today allows for demonstration of active problem solving by instructors and actual interactive problem solving by students during class (Niederman and Webster, 1998.) After all, the goal of end-user training is to produce a motivated user who has the basic skills needed to apply what has been learned and then to continue to learn on the job (Niederman and Webster, 1998.)

In addition, technology use encourages teacher-as-facilitator approaches. McGrath noted that with technological tools, students show more persistence in solving problems. Technology makes classroom activities feel more real-world and relevant, so that students take them more seriously (McGrath, 1998.) Thus, incorporating problem solving into the end user computing courses was supported by earlier research.

HISTORY OF COURSE

The CIS department began teaching end user skills with the availability of the first microcomputers in about 1984. In Micro-Based Software we used the "stand-alone" packages *of dBASE, Word Perfect, and Framework*. A single integrated package that was powerful enough to include a relational database application was unheard of in the mid eighties. The smaller integrated programs such as *Works* and *FirstChoice* were used in the Introduction to Computers course, but they were not robust enough for serious business applications and the 3000 level of the course. The next progression was to *dBASEII, Word Perfect* and *Lotus*. In about 1984 a software package called *Smart* actually combined a data base, word processing and a spreadsheet, although the integration was primitive.

A local industry survey (Mawhinney C. H., *et. al., 1999)* confirmed our opinion that knowledge of software such as word processing, spreadsheets and database was very important in hiring criteria. During the '90s we moved from Microsoft's *Office 95*, to *Office 98,* to *Office 2000*, and now are looking forward to *XP*. Some of our colleagues think it is no longer necessary to teach end user computing in our department, that students are computer literate at an advanced level already, and programs are intuitive, anyway. We think there is a need for a type of self-paced instruction that students can tailor to their needs and learn the required skills in an anytime, anyplace setting. (Marold, et al, 1999) We believe it is more necessary than ever before, but that it needs to be taught in a way that enhances their problem solving and presentation skills, as opposed to just learning keystrokes.

GOALS AND OBJECTIVES OF THE REVISED COURSE

Before beginning the course revision plans and implementing the pilot course in the Fall '01 semester, we solidified some general goals and some measurable objectives. Our main goal was to produce "software solution architects" who could take a problem at the operational business level, design an organized solution process, solve the problem, and implement it within a short turnaround time. The tool—*Office 2000*— used for problem solution was the same tool that ninety per cent of the business world uses today

Course Objectives

Following are the objectives of the CIS 3270 course known as Micro-based Software:

- To provide our Computer Information systems (CIS) majors and minors and those students obtaining a specialized CIS Certificate with business problem solving skills using Microsoft *Office* software.
- To give our students the opportunity to use word processing, spreadsheet, database and presentation graphics programs at an advanced level.
- To assure the level of learning in accordance to Blooms' taxonomy (Bloom, 1956) reflected the content of a 3000 level IS course—specifically to apply theory in a problem-solving situation.
- To emphasize theory and provide for testing concepts gained as a result of skill mastery in current office software applications at the operational level, namely Microsoft *Office 2000* (will be *Office XP* in 2002.)

Course Revision Specifications

Because this course is also taught online as a Web-delivered course, all of the revisions would have to be configured to work in an online

environment. Material previously printed, such as Class Notes, would have to be transformed into Web pages that could be loaded on the Class Website. Problem solving exercises would be modularized to be delivered at specific intervals on a Forum or Bulletin Board. Solutions to the problems would have to be in a form that could be uploaded to a public viewing area, such as a Workspace or Forum, for all class members to see. Oral presentations at specific class meetings would work fine for traditional classroom sections, but not online. Preparing solutions using the *PowerPoint* application would allow converting to HTML and subsequent uploading to a public viewing area for all class members to review.

To meet the above objectives, we constructed a series of general business problems at an operational level that could be solved within a short turn-around cycle either individually or within dyads. This would emulate the operational business environment of most organizations.

[Note: Sample problem-solving scenarios used in the pilot delivery of this course will be given to attendants of the conference presentation.]

METHODOLOGY

Not only have software applications programs changed in the last decade, so have teaching methods. The "chalk 'n talk" lecture sessions and lab demos have given way to smart classrooms and more interactive classes. Sections of almost our entire CIS core curriculum are offered as online Web-delivered courses. The methodology for delivering the CIS 3270 course had to change, too. The traditional classroom sections of the course will be delivered in smart, or what we have termed "semi-smart" classrooms, where the high-end presentation equipment with instructor laptop, intranet connection, sound system, and overhead projector is available; however, each student does not have to have his/her own computer.

Physical Delivery

The pilot class was a classroom setting in one of these latter classrooms, with one session a week in a campus lab, where all students had computers with *Office 2000*, the Web, and all campus servers. All lecture, theory discussion, and software demonstrations were delivered in this classroom. The class syllabus was loaded on the Web for all students to access in addition to printed copies distributed the first week of class. Hyperlinked within the syllabus page were pertinent materials for the class. So in what Mawhinney and Morrell (1999) termed a WAD—Web augmented delivery—the traditional class became a variety of what sometimes is mistakenly labeled "hybrid." (Technically, hybrid classes meet some of the time on the Web, which was not the case here. All class meetings were physical, in a classroom three times a week.) Instead of overhead transparencies and other more traditional aids, most lecture material was prepared as Web pages, using *DreamWeaver 4.0*. The Web was accessed from within the smart classroom and the material was projected for students as Web pages. Those same Web pages could be used for review by students because they were hyperlinked from their syllabus page. Not only did this allow a high-end multimedia presentation of class material and student access ATAP, it also would facilitate porting the class material to the Web-delivered section once the pilot class was successful.

Problem Solving Component

For the course revision the students worked in a team environment to solve a series of office-type problems using the *Office* software applications as tools. The students were required to study the problem, determine alternative solutions, decide on a solution, and use presentation software to present that solution to the rest of the class and the instructor. The class as a group would then come to a consensus as to the most effective and efficient solution.

For the pilot classroom section, the current assigned problem was loaded on a campus intranet server for students to view, print, or download. The problems were assigned in two or three-week intervals and students were allowed, and encouraged, to ally with a classmate to solve the problem and present the solution in a team environment. They were given the option to solve each problem solo as well, but after the first three problems, almost everyone decided to team up; the barriers to working together were far outdistanced by the benefits of collaborative effort and sharing the workload.

Assessment

Students were evaluated by several means, testing both their skills at end user computing, and their analytical ability. The following methods were used

- Problem solving grades for solutions (50%)
- Quizzes and tutorial submission for skills in the *Office* (15%)
- *MOUS* type certification test for final exam (23%)
- Independent papers: non-*Office* software reports (5%)
- Final integrated report (7%)

Performance and final grades in the pilot class did not differ significantly from the final grades in the non-pilot section of CMS 3270, although the assessment was quite different.

EVALUATION OF THE COURSE REVISION

In order to evaluate student efficacy of the revised pilot section of CMS 3270 Micro-based Software, we developed and administered a Student Satisfaction Survey. We personally were satisfied with our revision plans, but what did the students think of the class? Micro-based Software had always been a popular elective, and we wanted it to remain so. The ten students in the pilot class had not experienced the previous curriculum, but they did know that they were signing up for a pilot class that was a significant revision of what they might have heard 3270 was all about. The section was added and scheduled at a time after the initial offering of the classroom section. Half the students in the section were from the School of Professional Studies. They were Aviation Management majors. The other five were CIS majors from the School of Business, taking an elective course. All were juniors or seniors at Metro. The instrument, which is appended below in Figure 1.0, was designed to measure the degree to which a student agreed with our main objectives, not as a comparison between the two curricula.

Table 1: User satisfaction survey (n=8)

Question	(Disagree) Scale (Agree)					
	0	**1**	**2**	**3**	**4**	**5**
Confident of ability to solve problems				2	5	1
Proficient in advanced WP skills					7	1
Proficient in advanced SS skills				3	5	0
Proficient in introductory DB skills				3	3	2
Proficient in *Office 2000*					5	3
Improved analytical reasoning ability					5	3
Class syllabus and class notes were helpful		1	0	2	4	1
Ability to self-learn new applications				2	2	4
Learned from classmates				5	3	0
Course content too much work	1	1	1	4	0	1
Course content too little work	1	1	3	3	0	0
Expected grade in course (A=5)				2	3	3

Note: Two students from the original 10 dropped out after September 11.

CONCLUSION

We believe that by incorporating problem solving into the existing Micro-based Software class, it becomes a stronger end user computing course. The area in which students always need more experience—applying the theory they have learned—is added to the curriculum, making the highly practical course even more practical. Tutorials provide instruction in skills and keystroke mastery; solving problems puts those skills to the test. Students enjoy the challenge of solving an operational problem similar to what they would experience on the job, without the pressure of losing a job if the solution should be wrong.

The protection of the academic environment gives students the freedom to "test their wings" with operational level business problems within a semester long course. The instructors, the members of the CIS curriculum committee, and the students who took the course were satisfied with the results of the pilot course. We caution that implementing the changes in all future sections of the micro-based software course may not meet with the same success. The planned changes put an added burden on the instructors and require them to be technically savvy with new classroom equipment and proficient with the Web. In addition, students have to work harder than before when there was no test of their ability to apply skills and solve problems in this course. The student satisfaction in the pilot class may not be at the same level in future classes. Perhaps the excitement of a pilot class appealed to those innovator students who enjoy *any* change from the routine class. Future classes will not always have that population. All of these items dictate more study and cautious optimism toward incorporating problem solving within end user computing courses.

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