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Beyond The Introductory Information Systems Course: A Mini-Course Series For Business Students

ABSTRACT: In order to be competitive in this increasingly complex world of information technology, business and industry, government, and entrepreneurs must be aware of the proper application of technology and must manage it effectively. Undergraduate students need more than an introductory survey course; they need in-depth application of technology to real problems. This mini-course approach is designed to motivate students with hands-on software applications and systems design concepts. The minicourse series is comprised of one-credit modules, is project-oriented, and is scheduled to accommodate general business and liberal arts students in preparation for their application of information technology in the workplace.

Robert DeMichiell
Department of Information Systems
School of Business
Fairfield University
Fairfield, Connecticut 06430

Seth Lewis
President
Personal Computer Support, Inc.
Lecturer, Fairfield University
Fairfield, Connecticut 06430

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INTRODUCTION

Today, computer literacy is not enough. Tomorrow, computer fluency may not be enough. Students need more than a single, introductory information systems course in order to prepare for both immediate job entry and for future executive careers. They must be aware of the implications of computer technology and must be educated and trained continuously throughout their career. Their capabilities to think creatively and constructively must be exercised so that they can adapt to the changing global environment and be receptive to the marketplace.

Effective use of information technology will continue to be more important as the new century approaches. In more flattened organizational structures, which move corporate accountability closer to operating managers, the factors of timeliness, completeness, and information sharing become even more important. Corporations are making hard demands for soft skills (human communication, synthesis as well as analytical thinking, strategic and visionary approaches, and team participation) in addition to diffused technological competence [1]. Managers at all levels in the organization must be trained to use effectively this diffusion of technology. According to a report by the American Society for Training and Development, 75% of the currently employed will need training by the next century [2]. Although programming training for end users has been available, most solutions either fall short of expectations or exceed the capability of the typical user [3].

Some corporations continue to rely on higher education to provide such training. There exists a need for colleges and universities to provide students enrolled in all academic programs the opportunity to enhance technological competence in preparation for careers in the next century [4,5]. However, such computer literacy programs should remain focused on educational goals and objectives and not be driven by the technology itself [6]. Students need short, intensive, easily-scheduled information systems courses to make them more effective users.

Many educators agree that more computing is good; few can agree on the topics and the method of inclusion. How much knowledge of the application of computer technology should a general business student possess in order to be effective upon graduation? The literature has been organized by Juneau [3] into five categories of literacy definitions: a) specific, b) global, c) planned, d) evolutionary, and e) individual. The problem with this computer literacy classification system is that the technology has progressed so fast that a clear definition never emerged.

For the information systems major, professional organizations such as DPMA and ACM have published curricular guidelines which are function-based, objectives-driven, and increase in depth until a satisfactory level is achieved [7,8,9]. Although these guidelines indicate service to the non-IS professional as well, general business or liberal arts students would have to take several courses beyond the introductory IS course in order to acquire information system components from the "knowledge clusters" upon which the curricula are based. Since these programs are suggestions only, some smaller institutions have developed variations providing for a less centralized IS structure [3], for operating under resource limitations [10], or for meeting AACSB requirements [4]. Jackson's research [10] indicates the need for academic programs to address two types of professionals, the end-user guru (application of technology to business functions) and the technical guru (design and development of complex technology for business). His variation to the DPMA guidelines includes these two separate options within the IS major program.

As the emphasis in business continues to

move away from the IS professional through distributed systems, networks, and end-user applications development toward general practitioners, perhaps fewer IS majors will result. Such a situation will produce more pressure to expose the general student population to information systems concepts. In addition, typical IS curricula cover a wide range of management and technology issues, some of which may be more relevant to certain business functions or academic disciplines. The treatment may very well be too much in-depth for students interested in general business practice and the application of appropriate information technology to help them handle information processing effectively.

At this time, general business students and liberal arts majors select IS courses from a menu designed for dedicated information systems majors. The dilemma between teaching software specificity (spreadsheet command syntax) and generality (spreadsheet design to support decision-making) will continue to plague educators [2]. Courses designed for the non-IS major focus on both syntax and design concepts and are packaged for ease of integration into the student's schedule. What is needed is a different menu of courses for the non-IS major where selected components are extracted from the in-depth IS courses and are compressed into smaller modules.

GENERAL CONCEPTS AND IMPLEMENTATION

A series of 1-credit mini-courses is suggested which requires business students take the traditional introductory information systems course as a pre-requisite. Any one or more of these 1-credit mini-courses could supplement the normal five course student load without undue burden. Normally, a mini-course is derived from the content of a full 3-credit IS course and in those cases, IS majors would be restricted from enrollment. Other mini-courses experiment with emerging technologies which are then incorporated into the full 3-credit IS courses.

Students like the idea of complementing their academic program with 1-credit courses. In the past five years, it has become increasingly evident that students recognize the importance of information technology not only to the decision-making process of organizations, but also to their personal performance. Most corporations no longer ask about computer feasibility, but rather ask how it will return its investment in information technology. In order not to complicate the process of registration, a 3-credit time code (e.g. Mon, Tue, Wed meetings of 1 hour each session) is selected; however, the instructor meets with the class for one-third of the time (Monday only). The time period spans the entire semester (all Mondays) or covers some segment of the semester (all days for first third of semester). The same time code is used for offering more than one 1-credit course during a semester. Three 1-credit courses could be taught in one semester with each course sequenced for one-third of the time code. In this way, students, faculty, and rooms are arranged through the regular registration process.

Figure 1. CLASSIFICATION OF MINI-COURSES

	Current Technology Focus	Emerging Technology Focus
Software and/or Systems Cornucopia Approach	Fourth Gen. Languages Business Graphics	Multi-media and Hyper-media Expert Systems
Hybrid Approach	Comparative Operating Systems (PCs and Workgroup Macs) Prototyping	Network Software Computing
Software Immersion Approach	Spreadsheets Data Managers Project Mgmt.	DOS, Windows and OS/2

Although technology is the medium, the message is the proper application of technology to real business problems. Design and implementation considerations complement the "hands-on" program to ensure that both technology and management of technology are treated equally. Computer-fluent managers are like architects, set designers, and other scientists who create scaled-down models to build realities [12]. Sinetar's art form of "positive structuring" has application to the required skill sets of information technology. Students need these skills with software to become creatively active in seeking new opportunities for its use. Students are overly anxious to use the software; our experience shows that some restraint must be exercised so that "design" concepts are stressed at the outset.

In order to address all of these design issues, the mini-course program was created according to the software technology used by organizations. Some courses are designed to introduce students to technology currently in use. As the marketplace changes, these mini-courses will change, drop, or be replaced. In this way, the course and its complementary laboratory segment will be aligned continuously to the marketplace. For example, the course in spreadsheets may have been once centered around Personal Software's VISICALC but now features Lotus Development Corporation's 1-2-3 and Microsoft's EXCEL.

Other courses of the program focus on emerging technology and expose students to technology entering the marketplace. An emerging technology course in the early 1970s might have been a timesharing-based, financial modeling language. By the middle of that decade, these languages would be characterized as having current technology focus. Today, they are spreadsheets. In addition to the timing of technological advances, design of the minicourse program considers the types of software employed in presenting the program:

a. Software and/or Systems Cornucopia Approach—When there are many products in a market without a dominate leader, or when the market is being defined with different functional approaches, the lab is used to survey the different products and approaches and require students to match technology choices to client needs;
b. Hybrid Approach—Where the market is

Figure 2. TEACHING METHODOLOGY

A problem-resolution approach is used which includes not only the exercise of software tools, but also creative problem uncovering by the student. The student is forced to find a problem, issue, or topic and investigate it thoroughly for assumptions, constraints, and feasible solutions. The approach emphasizes:

- Problem-centered orientation
- Student-centered investigations
- Student project teams and team-building
- Software selection for various applications
- Generic solutions to specific problems
- Independent and team problem-solving
- Creative and critical thinking in solutions
- Facilitated discussion on business projects
- Interdisciplinary concepts in design
- Organizational impact of applications
- Thorough systems analysis and design
- Heavy individual attention outside of class
- Evaluation of skills and application of concepts
- Formal written and oral presentations

Figure 3. EXAMPLE OF SOFTWARE AND/OR SYSTEMS CORNUCOPIA APPROACH:

Emerging Technology Focus

Multi-media and Hyper-media Mini-course

Topics

Hardware, Software, Imaging, Scanning, Formatting
Picture-based Data Base and VISUAL BASIC CD-ROM,
Frame Grabbers, Audio Digitizers
Video Output, Multi-media Literature
Full Motion Graphics and Sound Digitization
Multi-media Management (Macintosh and PC)

Procedure

Video presentation with several production shortfalls is created by the instructor on a microcomputer and is recorded on video tape. The class "walks through" this project to produce a better solution applying the theory covered in lectures. A debriefing session reinforces lessons learned and application to another problem. One-half of course is content-predetermined; the rest is developed as technologies emerge during the semester.

Problem to Resolve: Illustrative Example

A customer wants to develop a data base of real properties with pictures of houses in the data base. Conduct an investigation of real estate requirements (perhaps from local realtors) and design and produce a working prototype.

Instructor Comments

Current developments in the marketplace effect drastically the course syllabus. The course must be recreated each offering on a just-in-time basis. News articles and demonstration software are brought to class within two weeks of publicity and/or vendor marketing efforts. New technology is brought to class using:

Company demonstrations (actual reduced software version)
Videotape demonstration of software
Sales literature on software product and videotapes
Press reports in trade journals

in transition, a hybrid of immersion and cornucopia approaches is used; and,

c. Software Immersion Approach—When one or two clear market leaders dominate a software area and the products have similar functionality, the lab will generally immerse the students into these software products and require application to business problems.

TEACHING METHODS

In order to provide a challenging academic experience, the minicourses use a problem resolution approach. This method provides a much broader focus than the step-by-step agenda typically used in commercial seminars and typical hands-on skill courses. This approach has the added advantage of preparing the student for independent investigation and fosters critical thinking abilities. It is not good enough for students to demonstrate software proficiency to assigned academic problems. They must examine new applications for effective use of the software, including selecting the most appropriate package for student-defined business requirements. The students are required to investigate the symptoms, to uncover the real business problem, and to define the scope, limitations, and assumptions for problem solution. Because many businesses are reorganizing with cross functional teams [13], a mini-course on workgroup computing is included (hybrid approach, see Figure 1).

The mini-course focuses on a problem and then provides instruction on how to use software components toward resolution of the problem. Generic problems from the authors' case study research and outside consulting experience form the scenario for problem investigation. In addition, student experiences present another context for learning by an approach suggested by Christensen which allows students to take some responsibility for the direction of the discussion [14]. The assigned problems require students to look beyond the process of how to use the technology by examining broader business and systems design issues. They become active participants in the process (Figure 2).

One aspect of the laboratory sessions is to force students to think about when and when not to apply computer technology to business applications. In addition, future managers should be made aware that too much time can be spent learning and applying every software product on the market to some aspect of their assigned tasks. A proper balance between the effective use of technology for business purposes and over indulgence in computing knowledge for personal interest is maintained. Students have the same problem when they focus on too much proficiency in products that rapidly become obsolete. The mini-course series highlights this danger and makes students aware of business feasibility issues for short and long-range planning.

Three illustrative examples of the mini-course series are shown in Figures 3, 4, and 5. A brief description of each course is included with some comments on the major

considerations for implementation.

Clearly, the focus of this program is on microcomputing. The examples demonstrate that skills and applications are microcomputer-based. However, in some cases, mainframe computing concepts are introduced as appropriate. The existence of LANs connected to the host computer provides an added dimension and is utilized whenever the contrast is beneficial to the learning experience. Often, the microcomputing scene is easiest for students (future managers) to use and they may overlook the need for communicating with university-wide (corporate) systems. This issue is addressed in each mini-course.

FACILITIES

The long-range planning process for computer laboratory facilities varies among colleges and universities. Laboratories and their continuous upgrading are necessary for success of any information systems program and of this mini-series concept based on changing emerging technologies and a larger student audience. A very brief description of the status of computing at our university provides the setting for implementation of our program.

In addition to a Digital Equipment Corporation computing facility, our university has several standalone and networked Mac and PC labs. The LANs are connected by optical fiber to the host computer system for university-wide capabilities. The computing center oversees all computing resources through a facilities manager contracted to support all administrative and instructional systems design, acquisition, and allocation of computer resources. Several advisory user groups of faculty, students, and staff contribute to all aspects of the process.

Some classrooms have projection equipment for computer-driven demonstrations. These facilities allow the instructor to discuss problems interactively while the students watch, comment, and work concurrently. Specific areas of the computer screen projected on a white board can be highlighted by writing on the board using different color markers. Individual students can approach the instructor station to expand on the problem and its solution. At some point in the general discussion of the problem to be resolved, all work is sent to the file server and retrieved by students at their own workstations. While students continue to explore solutions at their own pace, the instructor can circulate among the students and help them with unique problems. When unique problems present a more universal learning opportunity, student work is transferred to the instructor for computer projection and review. These capabilities allow the instructor to work with large numbers of students and provide individual assistance with appropriate use of the technology.

Figure 4. EXAMPLE OF HYBRID APPROACH:

Current Technology Focus

Comparative Operating Systems Mini-course

Topics

DOS and Other Operating Systems
Specifications, Paths, Help, BAT Menus
Configuration Systems, Memory Management
Windows, Macs and System7
OS/2 and Presentation Manager

Procedure

First half of course on DOS
- Hands-on exercises in PC Lab
- Skills-based evaluation

Second half of course with lectures and demonstration
- Video and/or computer projector review of material
- Macintosh applications

Problem to Resolve: Illustrative Example

Loss of file: how to find it using PC (DOS, OS/2, Windows), Mac (System 6 or 7): Launching applications from network main menu and commands (with and without mouse) on PCs and Macs.

Instructor Comments

The skill set is easy to teach and easy for students to become proficient. The second half of the course forces students to apply the concepts in a variety of scenarios. The focus shifts from skills to higher order thinking and application. Students are required to think critically about the application (feasibility) and to synthesize academically-sound, practical, and operational solutions to real business problems.

Figure 5. SOFTWARE IMMERSION APPROACH:

Current Technology Focus

Spreadsheet Mini-course

Topics

Spreadsheet Software
Immersion into LOTUS and EXCEL
Labels, Numbers, Formulas
Menus, Layout, Design Considerations
Commands

Procedure

Navigating the spreadsheet
Diagnostic techniques during design of layout
Business applications
Evaluation: On-line examination of new application (design and preparation of spreadsheet)

Problem to Resolve: Illustrative Example

How do you avoid the trap of adding or deleting a row or column to a data area without impacting the area of the speardsheet set up for formal printed presentation? How do you design an interactive checkbook stub balance record-keeping system?

Instructor Comments

This course has a more standard presentation format and supplements one of the many application notebooks available. Emphasis is on efficient (best use of software skills) and effective (right software and skills applied to the right type of problems). Heavy focus on proper design considerations. As course proceeds, students from different disciplines work at different paces and you may have to divide the projects into teams (novices vs. power users).

MATERIALS: SOFTWARE AND TEXTS

University and/or the information systems department budgets for and provides software for course offerings focused on current technology. For emerging technologies, the instructor relies on demonstrations and working models provided by vendors; student editions of software are required for purchase at the book store. Usually, this approach works and up-to-date software is acquired at minimal cost to the institution and student.

The instructor using evaluation software provided by various vendors often will connect his or her own computer to the projector, or perhaps provide video tape sessions of the software [15]. At our university, the media support department is very helpful in this process. In addition to having computer based laboratories of their own, media staff have the expertise to assist directly in the implementation of this mini-course series. Some software publishers offer demonstration videotapes to sell their products. These tapes can be obtained, reviewed, and shown; if purchased, they can be placed in the library or computer laboratory reserve shelf for convenient student access. The planning, design, and execution of this mini-course series places a heavy burden on the instructor. Much time is needed to solicit and obtain demonstration software, sometimes at the last minute. Additional time is needed to evaluate working copies and use them appropriately in the learning environment. Videotaped sessions of multimedia computing and other software which is not available in the labs can be used in lecture/demonstration format to replace some of the hands-on features.

The task of selecting texts for the mini-course series is more challenging than for standard body of knowledge courses. For example, the rate of change of technology is very fast requiring text changes each time the course is taught; the text chosen is either too software-specific on a given topic or it is too general to be of practical use. For software cornucopia courses, there very well may be no text available. Magazine articles are timely but require hands-on validation. Do the products really deliver what was advertised?

A combination of modular workbook texts [16] together with magazine reviews of software are the best solution for the text selection problem In this way, lectures and up-to-date reviews complement the hands-on laboratory sessions. The laboratory program portion requires some instructor development of customized materials to integrate workbooks with available facilities.

SUMMARY AND CONCLUSIONS

Most mini-course offerings have been in the current technology area (fourth generation languages, business graphics, comparative operating systems, spreadsheets, and data managers). These courses use software immediately available to students through standalone and networked laboratories and do not require excessive preparation by the instructor. Recently, more focus has been given to emerging technologies where software is not available and instructors need more time to prepare and deliver the courses.

At the present time these courses are elective. Enrollments have been fairly steady and students from all university programs provide a heterogeneous audience. Although their academic backgrounds vary, student teams on business projects show diversity in approach and concern for organizational impact. Of the twelve minicourses, six courses (business graphics, hypertext and multimedia, comparative operating systems, spreadsheets, data managers, and DOS) have been taught on a regular basis over the past six years. Fourth generation languages, expert systems, and prototyping topics have been taught only as full 3-credit courses and are under development for minicourse offerings. Network software, prototyping, and project management topics are covered under the umbrella of other courses and will be extracted and compressed into the mini-course series during the next year.

Designing mini-courses is difficult. Since the experience is primarily hands-on with laboratory sessions requiring much student time spent on projects, the tendency is to include too much material. Educational objectives drive the process and include the more conceptual aspects of technology application in addition to skill development. Students react more favorably to fewer more complex topics.

Mini-courses are popular. Not one course has been canceled due to low enrollment (typically, one section has 20 students). The courses are focused and students know that these skills are needed immediately upon graduation in order to compete in the workplace. The program attracts students from across the university. Such popularity causes problems in implementation. Instructor workloads increase significantly (three one-credit courses require much more work than one three-credit course) and demand on computer laboratories is noticed.

Our experience in teaching this program suggests the following additional conclusions:

a. The university must provide the resources needed to implement the program in a timely fashion;
b. There must be coordination of the mini-courses with other programs to eliminate content duplication;
c. An updated software listing should be maintained;
d. Use of PCs, Macs, and mainframes complicate the teaching approach; however, the advantages of using all systems far outweigh the disadvantage of providing instruction on one or two platforms.
e. Instructor preparation is heavy, especially for emerging technology courses; the program requires constant supervision, including outside-of-class assistance with the software;
f. For outside-of-class assistance, the instructor should have the computer hardware and software (if feasible) available in the office for direct help to individual students or student teams;
g. Instructors must be able to use facilitation techniques, business-driven problems, and student-centered problem-solving in order to lead hands-on exercises and student project teams;
h. If more than one instructor teaches the program, the general concept of the approach must be maintained;
i. If adjunct lecturers are employed, the extra preparation time should be considered in compensation;
j. Student interest is high due to the practical nature of the program; classes must be limited to the number of computer stations available in the laboratory so that individual attention can be provided;
k. Student-purchased versions of software should be encouraged if the costs are reasonable;
l. Students must be ready not only to learn specific software skills, but also to apply them to business; and,
mStudents need extensive monitoring and prodding to produce creative solutions and to think critically.

As the computing marketplace expands, computing specialization emerges. End-users are becoming spreadsheet

experts, graphics designers, database builders, and data communicators. It is becoming more clear that students other than information systems majors will comprise most of the enrollment in the minicourse series so that they can acquire the information technology skills needed for organizational and personal productivity in the next century.

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Authors' Biographies

Dr. DeMichiell is Area Coordinator and Professor of Information Systems, School of Business, Fairfield University, Fairfield, Connecticut. He is active in professional presentations and publication for national and international programs. His consulting experience in education, government, and business complements teaching computer science and information systems programs during the past three decades.

Seth Lewis is President, Personal Computer Support, Inc. and is Lecturer, Fairfield University. His company is active in the design and installation of microcomputer stations and networks for business environments. At Fairfield University, he has assisted in moving the minicourse concept from a few random course offerings to a significant academic program for non-IS majors.

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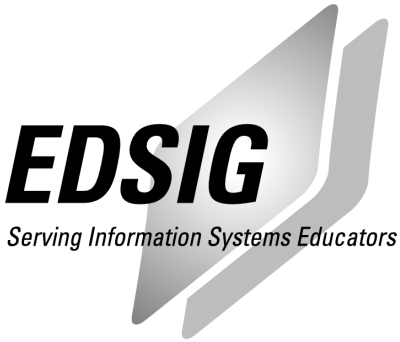

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