Journal of Information Systems Education
Volume 4, Number 1

COMPUTER LITERACY FOR THE 1990'S

Helen W. Wolfe
Teikyo Post University
School of Business
800 Country Club Road
Waterbury, CT 06723-2540

ABSTRACT: With the increase of computer users many educators assert computer literacy has arrived and is no longer a bona fide subject to consider academically. This premise is denied demonstrating that there are misconceptions regarding the definition of computer literacy. Literacy implies more than an ability to turn on a machine that has been dedicated to an application or that automatically loads canned software selected and delivered by commercial vendors. Since computers have altered the way we solve problems, make decisions, manage institutions, and communicate, college graduates facing a global market economy must be prepared to comfortably utilize electronic technology innovatively, responsibly, effectively, and ethically. Providing this computer literacy is the interdisciplinary, academic challenge facing colleges in the nineteen-nineties.

KEYWORDS: Applications, Ethics, Global, Interdisciplinary, Integration, Multifaceted

INTRODUCTION

The infusion of computer technology has caused another concern to enter the arena of higher education, "Computer Literacy." Although there is significant discourse regarding the creation of computer literate graduates (8,25,21), integrating computers into the curriculum (16,25,4), and stressing ethical values for computer users and for society (11), no consensus exists regarding what is meant by computer literacy. If the subject matter for this literacy remains ambivalent, ambiguous, and shapeless, how can educators create this "computer literate" or, on the other hand, deny that teaching computer literacy is still an essential subject for undergraduates and/or graduate students? Rather than dispute the need for literacy, perhaps the problem lies in the degree to which past definitions for literacy accepted in the 1980's do not serve current literacy demands?

It is accepted that computer technology is widely available, useful, provides reliable information, and has become integrated into our culture. Computers no longer function as number processors but affect how we create, store, retrieve, and exchange textual information, build and process models, communicate, design and structure systems, test hypothesis, and finally make decisions. (13) Publishers and testing services have dictated the contents in this area by virtue of what is included in the major introductory texts and in standardized tests evaluating literacy. Chapters on computers in society, hardware, software, and careers have influenced the way we teach "Introduction to Computers." We must impart knowledge, awareness, and interaction (5), and foster expertise through application software leading to vocational skills. (13,18) In conjunction with this, computers must be viewed as interdisciplinary, a text-making tool, a research tool, a communication tool, (4) and as a "sixth skill/knowledge area." (15)

HAVE WE ATTAINED LITERACY?

If we are to shape our curriculums, we must come to a consensus regarding a definition of literacy. Should we assume students arrive as college freshman already computer literate? Have we permitted secondary school educators to define literacy for us? If so, why do so many of our freshman still suffer computer anxiety and think turning on the computer and playing a computer game constitutes literacy? (25,12) Why do educators at the graduate level ponder about making future teachers literate before they enter classrooms? (24,14,17) What about the ethical use of computers? Why have some of our more literate computer youngsters used their superior knowledge to violate

our systems? How have the use of telecommunication systems altered business communications - locally, nationally, globally?

Students arrive at American college campuses considerably more knowledgeable about computers (12) and professors have been forced into becoming literate (25), but nevertheless students are deficient in their ability to independently solve problems utilizing the software tools with which they profess to have become familiar. (16) Sixty percent of college freshman are deficient in their application and utilization of this literacy they should have acquired from their high school curriculums. (25) Computer literacy remains a factor in teacher training in order to deal with anxiety, provide essential experiences, develop programming skills, assist with problem solving, logical skills, and computer aided instruction. (27,9) Literacy for faculty, furthermore, persists as a personal professional development issue. (19) It appears that although our student and faculty supposedly have attained computer literacy, educators are not convinced that this ''literacy'' implies real expertise and college level computer literacy delivery systems continue to be discussed, tested, and implemented. How valid, then, are past computer literacy definitions? (26)

CAN WE ACCEPT THE DEFINITIONS OF STANDARDIZED TESTS?

The Standardized Test of Computer Literacy and Computer Anxiety Index (20) evaluated literacy on four levels: computer systems (functions, configurations, hardware, software, historical development, operations); computer applications (standard general production applications, information processing tasks, decision support applications, societal impact, educational applications, evaluation and selection); computer programming (problem solving strategies, algorithms/flowcharts, languages, simple programming logic); and attitudinal competencies (appropriate use as a fast and accurate problem solving tool, responsible use, acceptance of use, freedom from fear and intimidation). The Educational Testing Service's CLEP Examination on Information and Computer Applications (7) basically examines the same areas with the exception that anxiety is not measured.

These standardized measurements reflect a consensus of the multitude of literature generated regarding literacy, and some valid areas are highlighted for defining a more inclusive definition of computer literacy that must be incorporated by educators in order to insure that we impart the correct package of knowledge, skills, and abilities to our students. This definition for the 1990's must include general systems concepts, ability to use applications for production and decision support in the traditional modes as well as innovatively, the process of program development, and ethical responsibilities for applying computer technology in a humane society valuing personal privacy, security, and finally providing that which serves the common good in a democratic environment.

WHAT MUST THE COMPUTER LITERATE KNOW?

Those considered to be computer literate should demonstrate familiarity with system concepts such as: hardware/ software selection and implementation for small, medium and large configurations; telecommunications and networking; multi-user systems; storage and memory; batch and on-line processing; sequential, direct, and indexed sequential processing; and how operating systems serve and support users. Since information management systems, decision support systems, and expert systems software shells are available for implementation by innovative users, students must become familiar with the theoretical basis underlying these support systems. A summary of the basic concepts that should be addressed in a literacy course appears in Table 1.

It is important, additionally, for students to become comfortable with the basic applications of word processing, spreadsheets with statistical functions, database management, desktop publishing, and graphics so that familiarity with at least one package in each of these areas can be applied to specific problems across academic disciplines. If mastery is attained in a literacy course, these tools can be applied across disciplines in liberal arts, business, manufacturing, publishing, science or engineering.

TABLE 1: BASIC CONCEPTS FOR COMPUTER LITERACY

1. The personal and professional scope of computing today.
2. The structure of a computer system: hardware, software, memory (primary and secondary), data, information, personnel, documentation.
3. File structures for managing data: sequential, random, and indexed-sequential. How each is applied giving specific examples for when the structure meets the objectives of the task.
4. Processing systems: batch, on-line, single-user, multi-user.
5. The role of telecommunications and computer networks.
6. Issues in computer selection encompassing the different configurations available.
7. Applying and understanding the theoretical basis of Management Information Systems, Decision Systems, and Expert Systems.
8. The future of Artificial Intelligence.
9. Ethical application of computer systems in order to honor confidentiality and maintain security.
10. Software piracy, computer viruses, and other current issues.

In order to comprehend how computers process information, those considered computer literate should become familiar with how a program is designed, tested, and documented. Simple algorithms should be developed and studied for their logic. Students should follow the programming

process to solve at least one problem so that the tasks of systems analysts and programmers are appreciated and understood. Future users of computer technology most likely will encounter the necessity of customizing commercially available systems or contracting for new systems. What better way to appreciate the processes of designing, testing, debugging, monitoring, updating, and backup than by engaging in a simple systems engineering project utilizing computer assisted software tools, compilers or interpreters? This will result in user confidence, understanding hardware, appreciating the functions of operating systems and of programming procedures.

Furthermore, no computer user should remain unaware of the ethical and social responsibilities inherent in employing electronic technology enabling the collection, storage, access, and distribution of data collected for specific purposes such as data management, data processing, decision support or decision making and then used to violate personal privacy, national security, or property rights. Machine technology does influence the "ethical and moral fiber of our society." (11) Students must become sensitive to copyrights, software ownership, legal access to networks, and computer codes governing professional behavior that are currently in the process of being revised by professional organizations such as the Association of Computing Machinery and the Data Processing Management Association. Societal implications of computer monitoring and surveillance need attention from the ethical perspective, the democratic view, and the humanistic approach.

Finally, the use of specific software for computer assisted design, computer assisted engineering, and computer assisted manufacturing should be applied in specific courses preparing students for careers in these areas. To be computer literate implies a knowledge of how these applications assist in the workplace. Similarly accounting software should be introduced in accounting courses, specific statistical packages should be used in math classes, and simulations along with creating and testing models should be integrated into those disciplines where this technology naturally belongs - marketing or management for example. If students feel comfortable with the technology introduced in literacy courses, the integration into the remainder of their studies should flow naturally. This kind of literacy belies anxieties and makes a computer-based education both challenging and enjoyable while simultaneously creating an inherent awareness of professional preparation for careers.

Imparting literacy has become a multifaceted, interdisciplinary task that will require continuous redefinition as the technology changes and becomes even more pervasive.

Accomplishing all this in one college level course appears optimistic. Delivery systems to best fulfill the requirements of computer literacy is an area needing further study. Meanwhile several configurations are possible: select the most important topics for your student population, design courses for specific majors, or develop single credit modules in each major area of literacy so that students can select three or four as required by their disciplines. (3,1,2,8) Developmental topics for building a literacy foundation utilizing software are suggested in Table 2.

CONCLUSION

Computer issues provide challenges for educators. Imparting literacy has become a multifaceted, interdisciplinary task that will require continuous redefinition as the technology changes and becomes even more pervasive. Some traditional areas of systems and applications with their expanded implications for communications and production still need inclusion in literacy programs. Programming need only be introduced so that students may become familiar with developing algorithms and the processes of software engineering. Finally, no computer literacy course should omit references to the social responsibilities of ethical users.

Whatever the configuration, curriculum designers must have a valid concept of computer literacy before constructing a basic framework for a literacy course encompassing the specific topics outlined in Tables 1 and 2. Computer literacy will lead to application software productively utilized and system technology ethically implemented across disciplines preparing for the global marketplace of the 1990's. Educators in each decade need to revise literacy concepts to serve contemporary missions and current issues.

REFERENCES

1. Albro, Paul (1987). "Evolution of a Successful Faculty Computer Literacy Project." Cause/Effect, 10(2), 24-27.
2. Andrews, Wayne & Nourie, Alan (1988). "Enhancement of Computer Literacy Through a Library Computer Study Area." Library Software Review, 7(2), 108-115.
3. Baker, Ronald L. (1990). "A Comprehensive Integrated Computing Curriculum for End-Users." Education & Computing, 6(1-2), 47-53.
4. Barton, Ellen & Ray, Ruth (1989). "Developing Connections: Computers and Literacy." Computers and Composition, 6(3), 33-45.
5. Capron, H. L. (1990). Computers Tools for an Information Age. Menlo Park, CA: Benjamin/ Cummings.
6. Carlson, William L. (1988). "The Liberal Arts College in the Information Age: An Appropriate Response to Information Technology." Cause/Effect, II(4), 50-53.

TABLE 2: SOFTWARE LITERACY

Operating Systems

1. The role of operating systems.
2. Knowledge of commonly used internal and external (utilities) commands. (DIR, FORMAT)
3. Becoming familiar with the hard drive.
4. Creating and using subdirectories.
5. Transferring files between drives and subdirectories.
6. Examining the contents of files when in DOS using the TYPE or MORE commands.
7. Special support systems as Windows or Virus detectors.

Word Processing

1. Creating, formatting, editing,and printing a document.
2. Moving around the formatting menu structure to change the appearance of a document.
3. Using spell checkers, thesauruses, and grammar checkers to improve writing.
4. Exploring the desktop publishing features of the package.

Spreadsheets

1. Creating a spreadsheet using text labels, formulas, and selected functions.
2. Using the spreadsheet for what if analysis,goal seeking, and forecasting.
3. Graphing the spreadsheet exploring the options available in the package.

Database

1. Creating the structure for a database file and entering sample data.
2. Querying the file.
3. Modeling a report form and printing a report.
4. Modifying the report to meet a criteria.

Programming

1. Studying the structure (input, processing,output) of a simple program. (Suggest BASIC)
2. Viewing flowcharts of the basic controlstructure: sequence, selection, iteration.
3. Coding, testing, and debugging a simple program.
4. Revising the program to form a repetitive loop until a condition is met.

7. CLEP Subject Examination (1990). Information Systems and Computer Applications. Princeton, NJ: Educational Testing Service.
8. DeLoughry, Thomas J. (1989). "Professors Are Urged to Devise Strategies to Help Students Deal With 'Information Explosion' Spurred by Technology." Chronicle of Higher Education, 35(26), A13, 15.
9. Drew, David Eli (1989). "Why Don't All Professors Use Computers?" Academic Computing, 4(2), 12-14, 58-60.
10. Durndell, A., MacLeod, H., & Siann, G. (1986). "A Survey of Attitudes to, Knowledge about and Experience of Computers." Computers and Education, II(3), 167-175.
11. Gotterbarn, Donald (1991). "A 'Capstone' Course in Computer Ethics." The National Conference on Computing And Values, working paper subject to revision before publication in NCCV proceedings, August 12-16, 1991.
12. Harrington, Jan L. (1990). "Changes in the Computer Background in Incoming Freshman." Collegiate Microcomputer, VIII(2), 147-154.
13. Kerr, Stephen T. (1990). "The Soviet 'Conception of Informatization of Education' (An abridged translation of 'Kontseptsiia informatizatsii obrazovaniia'). Journal of Computer-Based Instruction, 17(1), 1-7.
14. Knierzinger, Anton (1989). "Teacher Training With and Without Hardware Constraints." Education & Computing, 4(3), 217-222.
15. Kraemer, Kenneth L. & Northrop, Alana (1989). "Curriculum Recommendation for Public Management Education in Computing: An Update." Public Administration Review, 49(5).
16. Lambrecht, Judith J. (1989). "Research Questions Related To Teaching Software." Business Education Forum, 43(5), 25-28.
17. Lorber, Michael A., Irving, Eugene R., & Klass, Patricia H. (1988). "Student Interviews Concerning Computer Literacy Reveal More than SPSSX!" Illinois School Research and Development, 24(2), 74-79.
18. Mahmood, Mo Adam & Medewitz, Jeanette N. (1989). "Assessing the Effect of Computer Literacy on Subjects' Attitudes, Values, and

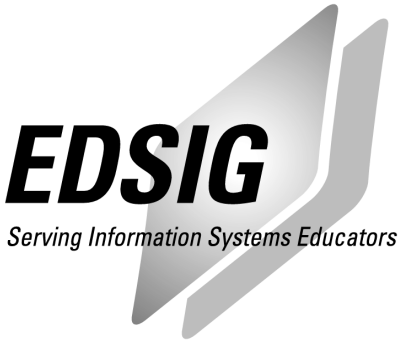
Opinions Toward Information Technology: An Exploratory Longitudinal Investigation Using The Linear Structural Relations (Lisrel) Model." Journal of Computer-Based Instruction, 16(1), 20-28.

19. McKay, Alan B., Speedie, Stuart S., & Kerr, Robert (1988). "Computer Literacy: A Strategy for Change." American Journal of Pharmaceutical Education, 52(1), 36-41.
20. Montag, Mary, Simonson, Michael R., & Maurer, Matthew M. Test Administrator's Manual for the Standardized Test of Computer Literacy and Computer Anxiety Index. Iowa State University Research Foundation, Inc. 1984.
21. National Commission on Excellence in Education (1983). A Nation At Risk: The Imperative for Educational Reform. U.S. Government Printing Office, Washington, D.C
22. O'Hair, Marilyn & Johnson, D. LaMont (1989). "Publishing Trends in Educational Computing." Computers In The Schools, 6(3-4), 1-10.
23. Summers, Mike (1990). "Starting Teacher Training - new PGCE Students and Computers." British Educational Research Journal, 16(1),79-87.
24. Thompson, Carla J., & Friske, Joyce S. (1988). "Programming: Impact on Computer Literacy training for Teachers." Journal of Research on Computing in Education, 20(4), 367-374.
25. Turner, Judith Axler (1987). "Familiarity with New Technology Breeds Changes in Computer-Literacy Courses." Chronicle of Higher Education, 33(45), 9, 12.
26. Watt, Daniel, H. (1982). "Education for Citizenship in a Computer-based Society." In R.J. Seidel, R.E. Anderson, B. Hunter (Eds.), Computer Literacy: Issues and Directions for 1985. New York: Academic Press, 53-68.
27. Winer, J. L., Strauss, M. J., Walling, D. D., Anderson, R. M., Ronshausen, N.L., & Lutzer, D. J. (1988). "Computer Science Literacy Training for Educators: A Case Study." Journal of Computers in Mathematics and Science Teaching, 7(3), 26-29.

AUTHOR'S BIOGRAPHY

Helen W. Wolfe holds B.A., M.A., and M.B.A. degrees respectively from Hunter College (CUNY), Southern Connecticut State University, and the University of New Haven. In addition she has earned a post M.B.A. Professional Certificate in Computer Information Systems from the University of New Haven. For the past twelve years she has directed the Management Information Systems curriculum, which she was instrumental in developing, at Post College - now Teikyo Post University. Currently she is an assistant professor in the School of Business Administration. In the past she has also served as an educational consultant for computer curriculums. She was involved in formulating a training program for women returning to work. Her current research interests focus on computer literacy and business ethics.

Information Systems & Computing
Academic Professionals



STATEMENT OF PEER REVIEW INTEGRITY

All papers published in the Journal of Information Systems Education have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

ISSN 1055-3096