DOCUMENT RESUME

ED 325 896 CS 507 337

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TITLE A Case Study for Evaluating the Diffusion of Computing Technology in Teaching Undergraduates by a Faculty in a Journalism and Mass Communication Program.
PUB DATE Aug 90
NOTE 23p.; Paper presented at the Annual Meeting of the Association for Education in Journalism and Mass Communication (73rd, Minneapolis, MN, August 1-4, 1990).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Case Studies; *College Faculty; Computer Literacy; *Computer Uses in Education; Faculty Development; Higher Education; *Mass Media; Models; *Teacher Attitudes; Technological Advancement; Word Processing
IDENTIFIERS Computer Users; Professional Concerns

ABSTRACT

A case study investigated how journalism and mass communication faculty members diffused and used computing technology in teaching. Subjects, 21 tenured and tenure-track faculty members in a mid-sized journalism and mass communication department, completed an indepth questionnaire designed to measure the general attitude of the faculty towards computing, the level of computer use, current and desired use of computing in teaching, and general demographics. From the data, four distinct user groups emerged with the following characteristics: (1) "programmers" are heavy computer users, personalize the computer system to meet individual needs, and use computing extensively in their teaching; (2) "processors" use the computer to process information, as a tool to replace a previous method, and as a tool in the classroom; (3) pre-processors see the value of computing and are motivated to learn more about it; and (4) "non-users" do not use the computer for teaching or other work. Results indicated that most faculty members use computer technology simply to replace past methods with a heavy use of word processing functions and little use of more sophisticated word processing, authoring programs and other available software. Results also indicated that for most faculty a primary source of computing information would be colleagues perceived as knowing about computing. (Two tables of data are included; 17 references are attached.)
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A Case Study for Evaluating the Diffusion of Computing Technology in Teaching Undergraduates by a Faculty in a Journalism and Mass Communication Program

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Presented to
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at the
Association for Education
in Journalism and Mass Communication 1990 Convention
Minneapolis, Minnesota

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Diffusion of Computing Technology in Teaching Undergraduates
by a Faculty in a Journalism and Mass Communication Program

ABSTRACT

There is little evidence on how journalism and mass communication faculties diffuse and use computing technology in their teaching function of journalism and mass communication faculty. This paper describes a case study conducted to establish a baseline of computer use in teaching by a faculty in a mid-sized journalism and mass communication program. This baseline study established three distinctive categories of users and a non-user group: programmers, processors, pre-processors. A dynamic model was developed to establish a foundation for further study of the diffusion of computing technology by this faculty.

A Case Study for Evaluating the
Diffusion of Computing Technology in Teaching Undergraduates by a
Faculty in a Journalism and Mass Communication Program

As technology permeates the mass media, it continues to redirect the professions of those communicating through the mass media industry, researching the field and preparing future professionals for the communication industries. Anthony Smith in Goodbye Gutenberg says, "Not since the invention of moveable type has there been an innovation with as great a potential to revolutionize communications as computerization." Reaching beyond typesetting and production, these new technologies have transformed the way mass communicators gather, process and disseminate information. This transformation has affected employment in communication industries and has dictated a need to change the way mass communicators are educated.

Like other educators, mass communication educators need to consider the profession's needs as they prepare young people to enter the field (Fleming 1987; Lockard, 1987). "Education is the means for enabling today's students and tomorrow's practitioners to take their places in the vanguard" (Fleming, 1987). It also means educating students in handling the merging of formerly distinct work places (such as the production worker, the manager, the writer, the editor, and the designer) which will become tightly integrated, with data flowing easily from one area to another (Savage, 1986). With the steady growth of technological innovations, it is no longer enough to prepare students for what careers exist at present, educational institutions have to prepare stu-

dents to adjust to changes generated by the technology. "In the next decade, technological change will have a substantial impact on the numbers and types of jobs available and on the nature of employment itself. To exercise control over these developments, we must be knowledgeable about the nature and potential societal impact of coming technological developments" (Savage, 1986). Students must be educated "to accept a working world where the only constant is change and be prepared to play an important role in it." (Crow, 1986 p.9) With technology taking a firm root in the profession, the educational system has a responsibility to produce citizens capable of successfully living and working in this new technological age. "The need for intelligent consumers of the computer cannot go unanswered" (Lockard,1987).

This educational need dictates the need for computer literate educators. Yet, in journalism and mass communication programs, many educators left their professions before the permeation of computing technology in the workplace. Some had moved to academia while most mass media print industries were still producing on linotype (Fleming, 1987). These same educators are encountering an entire generation of students growing up at ease with electronic mail, laser-scanned groceries, and video games — the artifacts of an electronic age (Crow, 1986 p. 105).

If journalism and mass communication faculty need to meet the mass communication industries' present and future needs, become computer-literate practitioners, conduct research on the use of technology and its effects on mass communication and teach computing technology applications, then the faculty need to be educated

in the use of technology and integrate it in their teaching, research and service functions. Yet, there is little evidence that journalism and mass communication faculty are using the technology, what their level of use is or how they are integrating the computing technology into their teaching function. "It's not to say educators are not meeting their obligations, only that there is a lack of information" (Fleming,1987).

In the past several decades the adoption/diffusion literature indicates that innovations are adopted by organizations, rather than individuals. This is important in the case of the new communication technologies, which frequently are adopted by organizations such as schools and business firms (Rogers,1986). There has been a recent move to look at how individuals in an organization diffuse the technology. Danziger and Kraemer's (1986) research recognizes that some of the most important and tractable questions address the effects of computing on individuals.

The organizational environment, how computing fits the department's organizational environment and how it answers the individual's question "Will this technology get the job done better?" (Drew, 1989) emerges as an important factor in faculty education and determining to what extent a faculty integrates computing. Theoretically, the context of a person's computing use might have a significant effect on the impacts of the technology, therefore, in an organizational structure, the environment can empower or block the diffusion. The literature suggests that to be successful in diffusing technology in an academic environment, faculty education would have to address the use of computing within

the existing environment and understanding how the technology would help them to do their job better. A study on public relations programs surmises that the obstacles in the adoption of computers were first costs and then faculty expertise (Fleming, 1987). This is also supported in a similar study on marketing education (Kurtz et.al., 1987). For the individual in an organization, the diffusion literature supports the recurring single variable influencing the diffusion of innovations as the personal interaction and influence of other computer users, enthusiasts, and experts. Usually these are informal relationships (Danziger and Kraemer, 1986; Drew, 1989; Dutton, 1987; Stolz, 1981; Kent,1988; Rogers, 1986). If local experts – faculty colleagues or staff members – can provide information and guidance, it is more likely that other faculty will use a computer (Drew, 1989).

The organizational structure, the organization's goals and the working environment may determine the diffusion of technology by individuals in an organization. In Drew's (1989) analysis of the existing literature, he draws from an early adoption and diffusion study of innovations by the Battelle Institute in 1973, to say that the most important of twenty-one organizational, social and technical factors important in innovation use decisions was the recognition of the need or the market demands. Danziger (1987) supports this in saying the working environment and goals will often determine computing utilization. Drew (1989) gives eight variables about how and when organizations incorporate new technologies: technical entrepreneurs, appropriateness for the task, willingness to break old habits, keeping technology in per-

spective, stimulating creative new applications, the professor's aptitude, and communication needs. Like Danziger and Kraemer (1987), Drew (1989) includes the environment as a variable, but defines it as university politics. This may suggest Danziger and Kraemer's (1986) organization of the context of computing in three general elements: (a) the organizational environment; (b)the computer package and (c)the characteristics of the users.

The university organizational structure presents some special problems in the diffusion of computing technology. Although members of an organization, faculty members are in a sense, independent consultants, who have the academic freedom to decide how to utilize the technology. The pressure to adopt and diffuse the technology may be recognized but not necessarily acted upon.

This study's purpose is two-fold: to establish a baseline that evaluates the existing computing knowledge and use of the computing technology in teaching by a faculty in a mid-sized journalism and mass communication program and to conduct a pilot study for conducting further study that can be expanded to include a representative sample of journalism and mass communication faculties. Although professors have many roles to play including research, teaching and service, this study focuses on computing use in undergraduate teaching and scholarly work because of the implicit value placed on these two functions. Computing technology has already been adopted, so the study focuses on Rogers (1986) second stage (implementation) and third step (redefining and/or restructuring) and looks at the levels of use and the obstacles hindering that use the diffusion process of computing technology

in organizations is usually considered successful if it leads to implementation (including institutionalization of the new idea) not just to the adoption decision. The study focuses on the individual since the individual plays an active, creative role in the diffusion process by matching the innovation with a perceived organizational problem and perhaps leads to redefining or restructuring the innovation. (Rogers, 1986)

Based on findings from the literature cited previously, the following two hypotheses were developed:

1) Most faculty members limit using computing technology to simply replacing past methods. Because of this tendency our findings would show heavy use of word processing functions but little use of authoring programs and other available software (spreadsheets, databases, electronic mail, presentation programs, graphics, text and graphics, etc.)
2) For most of the faculty, a primary source for computing information would be colleagues perceived as knowing about computing.

A FRAMEWORK TO ANALYZE FACTORS AFFECTING DIFFUSION

When studying diffusion of a new technology within an organization, it is important to take a systems approach that looks at many factors that may influence adoption decisions. The systems rationalism approach assumes that technology is managed for efficiency and satisfaction by individuals and organizations. Broad societal forces are seldom considered. Areas included in this approach may include a) technical rationalism with an emphasis on procedures, users, tasks and goals; b) structural analysis with an emphasis on organizations, information flow and structural units; and c) human relations with an emphasis on small groups, organizational resources, leadership and participation.

Taking this approach, four distinct categories were created

to study the factors that might have an impact on the adoption and diffusion of computer use in a journalism and mass communication program. Using these four categories provides a framework to help identify factors that may lead to adoption or hinder adoption of computers in teaching or research.

The first consideration is Physical Environment. This category looks at factors such as:

Administrative support through funding and equipment
Computer labs and adequate availability
Personal accessability to computers and equipment

The second category is Departmental Environment. This category will look at factors among colleagues such as:

Attitudes or moral support for computer use in the department
Current use among faculty members
Encouragement to use computing
Colleague training and information sharing.

The third category looks at the home environment.

The fourth category encompasses the professional environment outside the department (i.e. professional media, public relations firms, advertising agencies, etc).

Pressures or factors in each of these areas could be important to the adoption decision to use computing and the types of use.

METHODOLOGY

Rice (1984), in discussing research methods for exploring the new media, suggests that quantitative, variance research can seldom provide a very complete understanding of the over-time process nature of changing behavior due to new technologies. For more accurate understanding of the change process, case studies

and participant observation should be used. This allows the researcher to help identify unexpected variables and to study the wider context of the user system.

To accomplish these research objectives, a single journalism and mass communication faculty was selected for the case study. An in-depth questionnaire and observation was used to generate the case studies. The questionnaire provided an instrument to be used for follow-up research to conduct longitudinal studies of the same case.

The questionnaire was developed to assess current use of computers in a journalism and mass communication department with a focus on the use of computing in teaching. The authors wanted to measure the general attitudes of the faculty towards computing, the level of use, current and desired use of computing in teaching, and general demographics. The questionnaire was segmented into four divisions: attitudes, basic computing, use of computing in teaching, and demographics. The questions in the attitude section were written to measure anxiety towards computing, perceived benefits of computing, perceptions on computing support and interest in learning computing. Some of the attitude questions were modified from Bluhm (1988). The questions for the basic computing skills and teaching were adapted and expanded from a survey on faculty opinions and use (Yarbrough, 1988) and a farmers' information survey (Abbott, 1989).

The survey was pre-tested by seven adjunct professors and teaching assistants and clarifications were made before submission to the faculty.

All tenured and tenure-track faculty members were given a copy of the survey and asked to participate. The survey was administered at the beginning of February, 1990. Sixteen of 21 faculty members responded on the first request. After four weeks, a second copy of the survey and a second request was delivered to those who had not responded. Within two additional weeks, completed surveys had been received from all 21 faculty members.

RESULTS

Of the respondents, 71% were male, with 29% female. Twenty-nine percent are tenure-track, non-tenured and 71% tenured. The majority of the faculty are under 50 with 29% being 30-39, 33% in the 40-49 year range, 19% in the 50-59 year range and 19% over age 60.

The data was analyzed for patterns of computing use. The faculty demonstrated a level of high adoption of computers. Eighty-one percent of the faculty members in the department have a personal computer in their home and 81% have a computer in their office.

Respondents were classified on their ability to work with computers based on four levels of use:

a) Know many commercial applications, write my own programs, configure systems, troubleshoot and give advice to others
b) Know how to use one or more application proficiently
c) Just learning to use one or more applications but eager to use computers to perform my work.
d) Generally do not work with computers; either I am not aware of how they may help me perform my work or it is too much trouble for me to learn.

Of the 21 respondents, four were classified as heavy users, thirteen were in the moderate use category, two respondents were

in the third group, beginners, with the remaining two participants being classified as non-users. The two non-users did not complete the remainder of the survey consisting of how the computer is being used in teaching or future use.

PHYSICAL ENVIRONMENT

Two computer labs are available for faculty use in teaching. One lab consisting of 24 IBM compatible computers was put into operation in the Fall of 1988. Software in this lab is limited to word processing and it is primarily used for reporting classes. The second lab has 20 IBM compatible computer with word processing and a low end text and graphics package. It was completed in Spring of 1989 and is used primarily for advertising, editing and open labs.

In addition, a graphics lab consisting of 12 Macintosh computers will be installed by Summer of 1990. Until the actual lab is ready, faculty members have use of the computers in their offices, but once the lab is complete the computers will move to the lab.

Seventy six percent of all faculty members have a computer in their office and 90 percent use the computer in some aspect of their professional work. The two respondents who are not currently users, cite "not having taken the time to learn" as the primary reason.

Seventeen of the 19 computer users (90%) are using computers for teaching in some manner. Of the two not using the computer in teaching, one cited a lack of appropriate software and hardware; the other hadn't taken time to plan for and learn.

Thirteen (68%) faculty members currently are using the computer labs to teach. Eleven (58%) would use the labs more if more access was available.

Software availability is also a concern, primarily to the advanced user group. Three of the five advanced users claimed that they would use the computers for more advanced levels of teaching, but the software was not available within the department. In contrast, eleven out of the remaining 14 respondents cited a lack of knowledge about available software as the reason for not using it.

While the majority of faculty members are using computers and the labs, they don't perceive strong administrative support for computer equipment. Responding to a question of whether the university administrators have made it easy to get the computer resources needed 14 percent agreed, 29 percent neither agreed nor disagreed and the remaining 57 percent disagreed or disagreed strongly. Only 28 percent of the faculty members agreed that they were able to get most of the computer resources they needed.

DEPARTMENTAL ENVIRONMENT

Attitudes of colleagues are important to understand the environment within the department and to evaluate if diffusion is encouraged and supported or discouraged by other faculty members.

Sixty-two percent of the respondents agreed that colleagues encouraged them to use the computer, 19 percent neither agree or disagree and 18 percent disagreed or disagreed strongly.

At the time of the survey, no formal computer education program existed in the department for faculty members although there were a number of half day seminars available through the

university's computation center.

When asked where they would go for assistance with a problem in the use of a software program, two of the advanced users would use a manual as the primary source of information while one would use a professional computer expert and one would consult a knowledgeable colleague. For computer operation or hardware problems, two of the advanced users would consult a colleague and two would consult an outside professional. For learning a new program or computer system, all four would consult the manual.

The more significant finding is in the moderate and beginning group. Eight of the fourteen (57%) would consult a knowledgeable colleague as the primary source of information, with 5 consulting the manual and one would consult an outside expert.

For problems with computer operation or hardware problems a similar pattern exists. Eight of the fourteen (57%) would ask a colleague for assistance, with three going to the manual and three to an outside professional.

For learning a new program or computer system, eight would consult a colleague, five would consult the manuals and one would consult an outside professional.

This is supported by a response to a second question indicating that forty-eight percent felt that observing others has influenced their computer usage, with 19 percent neither agreeing or disagreeing and the remaining 33 percent disagreeing or disagreeing strongly.

Although many faculty members seek out colleagues in the department for more information and observe others in the depart-

ment, the extent of computer use in undergraduate teaching is primarily limited to word processing as the following charts show.

For the advanced users, 60 percent said they didn't use more applications in teaching due to lack of availability of software in the department. For the remaining 16 respondents, 11 (68%) said it was due to a lack of knowledge.

(Tables on software use on next page)

HOME ENVIRONMENT

Eighty one percent of the faculty members have a computer at home and of these 17 people, 15 are the primary users. Sixteen people use their home computer more than 50 percent of the time to complete their professional work.

SUMMARY AND CONCLUSION

After analyzing the computer usage patterns within the department for undergraduate teaching, four distinct user groups emerge.

PROGRAMMERS: Programmers are the heavy computer users that know many applications, programs or use authoring languages. They are able to personalize the computer system to meet individual needs and use the computer quite extensively in their teaching. Although a subject for further study, observation indicates that these users are less hardware or software specific and are not intimidated by a new computer environment or software program. In the classroom, they use the computer to introduce new teaching methods and techniques (i.e. using spreadsheets for "what if" analysis, hypermedia, computerized grammatical analysis).

PROCESSORS: Processors use one or more programs well. Processors generally are using the computer to process information and use the compute for a tool that is replacing a previous method (i.e. using word processor instead of a typewriter or a statistical package instead of hand calculation). They tend to take the same approach into the classroom, using the computer as a tool but not actually changing teaching methods or techniques. Processors tend to be more hardware

COMPUTER SOFTWARE	Currently Use In Teaching				Would Like To Use In Teaching			
	Programmer (4)	Processor (13)	Pre-processor (2)	Non-User (2)	Programmer (4)	Processor (13)	Pre-processor (2)	Non-User (2)
Word Processing	4	11	2	-	-	-	1	-
Spellcheck	4	7	2	-	-	-	-	-
Thesaurus	1	1	-	-	2	-	1	-
Outliner	1	1	-	-	2	1	1	-
Spreadsheet	2	2	-	-	1	2	1	-
Style Analysis	1	2	-	-	1	1	1	-
Database	-	1	-	-	2	2	-	-
Info. Database	2	2	-	-	2	3	-	-
Electronic Mail	1	-	-	-	2	3	1	-
Telecommunication	-	-	-	-	2	3	-	-
Graphics	1	1	-	-	2	3	1	-
Prompted Writing	-	-	-	-	2	3	-	-
Text And Graphics	2	1	-	-	1	4	2	-
Simulations	-	-	-	-	3	4	-	-
Programming	-	-	-	-	2	3	1	-
Presentation	-	-	-	-	3	2	-	-
Test Generator	1	1	-	-	1	2	2	-
Statistical Analysis	-	-	-	-	2	3	1	-
Hypercard	-	-	-	-	2	-	-	-
TOTAL	20	30	4	0	32	39	13	0
Mean Per User Group	5	2.3	2	0	8	3	6.5	0

Table 1

Table 1 compares current use and desired use of the computer in teaching among the three user groups. The highest user group, Programmers, is much higher in current use and have more applications that they would like to use in the future.

Extent Of Computer Use In Undergraduate Teaching	Extensively	Moderately	Limited	None
Use word processing to prepare outlines, exams, and assignments	18	1	-	-
Class management applications such as keeping grades	5	3	2	9
Prepare visual materials for presentation	6	4	6	3
In class demonstrations	-	2	3	4
Auto-tutorial/exercises	1	3	3	12
Require for students to complete assignments	10	2	1	6
Can use and teach MS-DOS commands	7	4	3	5
Word processing for pre-writing exercises	8	-	2	8
Use electronic databases to develop information files	1	1	2	15
Use established databases	2	4	2	9
Use text and graphic software packages	1	2	2	13
Use sophisticated word processing (styles, thesaurus, macro commands, etc)	1	1	3	12
Can create MS-DOS batch files	1	-	4	14
Create materials using authoring programs	2	1	-	16
Use Spreadsheets	-	1	1	15
Assist learning for colleagues	-	2	7	10

Table 2

Table 2 shows how the use of the computing technology is being used across the curriculum for undergraduate teaching.

and software specific, learning one computer system and specific software applications well and staying with it.

PRE-PROCESSORS: Pre-Processors are the people who see the value of computing and are motivated to learn more about computers. They may be just beginning to use computers or may be aware of how the computers may help them but just have not taken the time or have not had the opportunity to learn. Pre-Processors are not hardware or software specific as they are just learning to use the system. Applications and hardware decisions may be based on colleague and peer group usage as this study shows most faculty members are learning by colleague interaction.

NON-USERS: Non-users do not currently use the computer for teaching or other work. Either they do not see the computer as being applicable to their work or have not taken the time to learn.

This four-tiered model should be viewed as a continuum. People may move up through the stages rapidly or may stay in one stage for a long period of time. They may even move down in the model due to the rapid change in computer hardware and software. New technology developments may make obsolete a certain computer system or application. Many faculty members in this case study had purchased Osborne computers that are now obsolete. Some users transferred to other systems and maintained their use level, others did not.

Organizational changes may also affect these usage patterns. Software changes within labs or a decision to change the computer system from one brand to another may increase or decrease the level of use.

The results of this study indicate that each of the four levels of computer users has distinctive characteristics. The study did not find any significant demographic differences among the groups. Gender, education, and age appear not to be factors on the level of use.

Programmers recognize more uses of the computer and attempt to bring the technology to the classroom. That is supported by Table 1 (page 16), which shows the Programmer uses five or more software applications in the teaching function. Table 1 also shows that they recognize the potential of computing in teaching and would like to use many more applications. Programmers, in addition to the average of five (5) applications they currently use, have eight (8) more applications they would like to use as compared to Processors who use an average of two (2) applications now and would like to use an average of three (3) more. The reason Programmers give for not using these additional applications is that either the type of hardware or software needed is not available in the department or there is a lack of access to the labs. This is a problem that would need to be addressed by the department and university administration. Generally, if the Programmer encounters a problem with software or hardware, or wants to learn a new application, a computer expert outside the department will be sought out for advice or a manual will be consulted.

Some of the Processors identified in this study are at a high level of computer use and are moving into the programmer level. Nearly all Processors (11 of 13) use computers to some extent in teaching, but on a more limited basis than the Programmers. The heaviest use is word processing and spellcheckers. The faculty members in this group overwhelmingly cite lack of knowledge about other specific software applications for the reason they are not using them. This finding supports the finding of Fleming (1987) and Kurtz, et.al.(1987) that showed lack of faculty expertise hin-

ders diffusion. If a computing problem arises, the Processor will most likely seek help from a knowledgeable colleague. This may be another Processor if that person has a specific area of expertise such as statistical packages, but the data indicates that the Programmers fielded the most questions.

Pre-Processors are just learning to use the computer but may use the computer in teaching on a limited basis. At this level, they are using only word processing and spellchecks, but show a desire to learn more applications. They also cite lack of knowledge as the primarily reason they don't use the computer more. As their knowledge and confidence level increase, they will move into the Processor group.

No single characteristic could be identified for why the non-users are not using computing. Both responded simply that they had not taken the time to learn.

This study indicates that diffusion of computer use in this university department is closely tied to obtaining information. At the Processor level and below, the reason cited for not using the computer more was lack of information. Information about hardware problems, software problems or new software uses is generally sought out within the department. This indicates a need to develop a more formal education/training program within the department.

The results support the hypotheses that 1) most faculty members limit using computing technology to simply replace past methods with a heavy use of word processing functions and little use of more sophisticated word processing, authoring programs and

other available software (spreadsheets, databases, electronic mail, presentation programs, graphics, text and graphics, etc.), and that 2) for most faculty members, particularly for those identified as processors and pre-processors, a primary source for computing information would be colleagues perceived as knowing about computing.

Further research is needed to validate the model and to study the continued diffusion of computing technology in the teaching function of the faculty members.

Besides validating the model, further research may be called for in looking at and comparing the personalities of the Programmers, Processors, Pre-Processors and Non-Users, especially since the demographics were not a significant factor in determining their level of use. This case study also did not deal with how the mass media industries may be a factor in the adoption and diffusion of the computing technology in teaching. Future research would need to look at educational programs within and outside the department which may be a factor in diffusion.

[1]No generally accepted definition for "computer literacy" exists. There is some disagreement about what fundamental knowledge and understanding all members of a society would possess about computers to be "computer literate." For the purposes of this paper "computer literacy" is defined as being able to be an intelligent consumer of the computer with the skills and knowledge needed to survive and thrive in a society that is dependent on technology for handling information and solving complex problems, and is ability to manipulate or control computer technology. (Lockard and others, p. 319, 1987)

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