Supplementary Essay

An Archival Retread in Electronic Records: Acquiring Computer Literacy

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Abstract: Archivists may find acquiring computer literacy the most difficult aspect of becoming an electronic records archivist. To reassure archivists and urge them to become involved with the new media, the author explores five aspects related to learning about computers—gender, age, computer anxiety, ways of thinking, and extrinsic knowledge.

About the author: *Linda J. Henry began work in the Center for Electronic Records of the National Archives and Records Administration in June 1991, after seventeen years of archival experience in several repositories, including work with manuscripts and public and private records and in archival education and public programs. Her only knowledge of computers, however, consisted of using one word processing system.* *She presented a version of this article at the fifty-sixth annual meeting of the Society of American Archivists in Montreal in September 1992. She thanks Lisa B. Weber and Susan E. Davis for many helpful comments and Thomas E. Brown for his support.*

I WOULD LIKE TO BEGIN by talking about a HASH-coded output file from a BASIS version 2.0 database management system running on a DEC system. If you understand that, this article is not for you. But this article may be useful if you think a platform is something a candidate runs on and that a server is someone who waits on you—or if, when you hear "sequel," you don't know it's SQL (structured query language) but think it refers to the successor to *Gone With the Wind.*

The reader I am addressing has substantial archival experience, is at mid-career point, is probably middle-aged, and knows little or nothing about computers. If you fit that category, you probably feel—as I did—that you *ought* to know about electronic records, that you really *should* learn, but that it seems like dieting or exercising. Hey, the topic really is not that bad; in fact, you may find it stimulating and rewarding.

I see three parts to becoming an electronic records archivist. Number one is being a good archivist in the first place, as recommended by the Curriculum Project of Society of American Archivists (SAA) Committee on Automated Records and Techniques, or CART.[1] In other words, "practice literacy," or mastery of substantive content, comes before "computer literacy," the introduction of the technology of the practice.[2] Appraisal offers an example. Beginning archivists want to save everything, and only substantial experience in rejecting records—"just say no"—sharpens appraisal skills. As another example, an archivist starting an electronic records program needs interpersonal, organizational and problem-solving skills, which archival experience heightens. The archival profession resembles the 140 other occupations in one survey that found computer skills formed only a small part of the skill content of the job.[3]

That small part, however, is the reason for critical step number two: acquiring computer literacy. I believe the reluctance to become computer literate is the largest obstacle in the path to becoming an electronic records archivist. We tend to want to avoid step two and go directly to step number three, dealing with the archival issues related to electronic records. But this article focuses on step number two, the issues related to learning about computers, and not on step number three, the issues related to electronic records. So even though I work on a thirty-seven-person staff devoted to electronic records, and you may be solely responsible for such records, we easily may share the same problems in acquiring computer literacy.

My ignorance about computers was vast when I joined the staff of the National Archives Center for Electronic Records in 1991. My bosses may not have fully realized that they had hired a "nincompute."[4] I lacked an important part of what CART's Curriculum Project calls the Foundation Cluster of learning objectives. That part, Basic Concepts in Automation, includes knowledge of system components, such as hardware and software; of storage media and methods; of data structures, such as spreadsheets, databases, text files, and bit-mapped images; and of several other topics.[5]

I define computer literacy for archivists

[1]Victoria Irons Walch, "CART Curriculum Project Final Report," (Report prepared for the SAA Committee on Automated Records and Techniques, First Draft, August 1992): 9, 23.

[2]John P. Flynn, "Issues in the Introduction of Computer and Information Technology in Human Services," *Computers in Human Services* 6 (1990): 24–26.

[3]Harold Goldstein and Bryna Shore Fraser, *Training for Work in the Computer Age: How Workers Who Use Computers Get Their Training* (Washington, D.C.: National Commission for Employment Policy, 1985), 2–3, 37.

[4]H. Stanley Jones, "Advice for the Nincompute," *Association Management* 37 (March 1985): 113.

[5]Walch, "CART Curriculum Final Report," first draft, 26–28.

as "the skill to use computers, the knowledge of computer functions, applications, capabilities and limitations, and the understanding needed to communicate effectively with electronic data processing personnel and others about electronic records."[6] Archivists disagree about how much we need to know about computers, although I find those who claim we do not need to know a lot are the ones who know the most. As I remarked to one colleague, "You can't remember when you didn't know." (Frankly, I look forward to being in that position someday.) Archivists can agree, however, that we all need to know how to communicate effectively about electronic records, particularly with the creators or maintainers of those records. And to engage in that communication, we have to know something about computers—the more we know, the more comfortable we are.

I will discuss five factors related to learning about computers: gender, age, computer anxiety, ways of thinking, and extrinsic knowledge. Most of these, but particularly the first three, apply to anyone, in any professional group, who has trouble learning about computers. So this article is not just about the National Archives, and it is not just about archivists. My main purpose in discussing these issues is to offer possible explanations about why we may find the second step in becoming an electronic records archivist—learning about computers—difficult.

Gender

Gender can be a factor in learning about computers because of the underrepresentation of women in the computer science profession. Both adults and children "stereotype . . . computer science as more appropriate for males than for females. . . . Boys dominate computers at home, in videogame arcades and at school."[7] The "computer jock" subculture in high school deters girls from joining, and the "hackers" and "wizards" in college computer labs may show off rather than explain and teach. The "mathematics filter"—the prerequisites for many computer courses—still exists to the detriment of women.[8] This is discouraging; I would like to believe things are getting better for the young. No wonder, then, that women seem to have less knowledge and interest in computers and may have more computer anxiety. Nevertheless, women have equal problem-solving skills and aptitudes for learning about computers, and the studies do not "indicate a superiority of one sex over another in the ability to use computers."[9] Okay, sisters, we have no excuses.

Age

Like gender, age might at first appear to be a problem in learning about computers. Electronic technology is dominated by the young. The mid-career, middle-aged archivist I am addressing is probably accustomed to feeling competent and confident.

[6]*Computer Literacy: Definition and Survey Items for Assessment in Schools* (Washington, D.C.: National Center for Education Statistics, 1984), 8–9, has several definitions from which I borrowed phrases.

[7]Naomi McCormick and John McCormick, "Not for Men Only: Why So Few Women Major in Computer Science," *College Student Journal* 25 (September 1991): 345.

[8]Jane Reisman, "Gender Inequality in Computing," *Computers in Human Services* 7 (1990): 54–57; McCormick and McCormick, "Not for Men Only," 348. A more thorough discussion of the mathematics filter can be found in Pamela E. Kramer and Sheila Lehman, "Mismeasuring Women: A Critique of Research on Computer Ability and Avoidance," *Signs: Journal of Women in Culture and Society* 16 (Autumn 1990): 158–73.

[9]Lori J. Nelson, Gina M. Wiese, and Joel Cooper, "Getting Started with Computers: Experience, Anxiety, and Relational Style," *Computers in Human Behavior* 7 (1991): 186; Reisman, "Gender Inequality in Computing," 47.

To learn something completely new puts us at risk of feeling ignorant and stupid, so avoidance is understandable. The skimpy literature on adults learning about computers makes generalizations difficult, but older adults do appear to need more time and assistance than young adults. One study found that better performance was associated with "greater frustration tolerance," and it recommended that training include a clear explanation of hardware and software.[10] (Indeed, one wonders what these study subjects had to endure.) Other studies, however, found a lack of negative attitudes in older adults, who "can master new and emerging technologies."[11]

We can also infer other positive aspects about adult learning from studies of the field of learning in general. First of all, age and the ability to learn do not correlate negatively. There are differences between young and adult learners. For example, the former may learn faster, but adults possess accumulated knowledge and life experiences, which may enable them to learn more in other ways. Regarding the "old dog learning new tricks adage," perhaps the old dog is not convinced that the new tricks are better than the ones that served so well in the past. The best evidence about age and intelligence is that if the old dog "starts out as a clever young pup, he is very likely to end up as a wise old hound."[12] Furthermore, "people who are open to change, active, and who continue to 'learn' either formally or informally tend to age more slowly."[13] Learning may be a basic human need—like food, shelter, and love—which we require all our lives.[14] So if we learn new things like electronic records in middle age, we build good habits to help us as old archivists. I rather like the image of one of us speaking at an SAA meeting twenty years from now about the latest in archival records technology.

Computer Anxiety

If gender and age are not real problems, perhaps we suffer from factor number three, computer anxiety, or the mild to severe discomfort with computer technology that 10 to 40 percent of the population experiences.[15] And why not, given the popular image of the computer? The media bombard us with images of computers that are either out of control or controlling us. The 1992 Public Broadcasting Service series, "The Machine That Changed the World," showed excerpts from movies in the 1950s and 1960s with punch cards flying everywhere or the computer threatening to blow up or take people's jobs. More recently, we have worried about computers invading our privacy.

Computer anxiety can also stem from the intimidating computer jargon. This specialized vocabularly is often not only unnecessary but also filled with words kidnapped from the general vocabulary and

[10]Elaine Zandri and Neil Charness, "Training Older and Younger Adults to Use Software," *Educational Gerontology* 15 (1989): 627–29; Marilyn Gist, Benson Rosen, and Catherine Schwoerer, "The Influence of Training Method and Trainee Age on the Acquisition of Computer Skills," *Personnel Psychology* 41 (Summer 1988): 263–64; Penelope Kelly Elias, Merrill F. Elias, Michael A. Robbins, and Pauline Gage, "Acquisition of Word-Processing Skills by Younger, Middle-Age, and Older Adults," *Psychology and Aging* 2 (1987): 344–47.

[11]Jane Ansley and Joan T. Erber, "Computer Interaction: Effect on Attitudes and Performance in Older Adults," *Educational Gerontology* 14 (1988): 118; Adam J. Garfein, K. Warner Schaie, and Sherry L. Willis, "Microcomputer Proficiency in Later-Middle-Aged and Older Adults: Teaching Old Dogs New Tricks," *Social Behavior* 3 (June 1988): 146.

[12]Sharan B. Merriam and Rosemary S. Caffarella, *Learning in Adulthood: A Comprehensive Guide* (San Francisco: Jossey-Bass, 1991), 200, 309–11, 158.

[13]K. Warner Schaie, quoted in Kay L. Carter, "Lifelong Learning: Fact or Fantasy?" *Adult Learning* 2 (February 1990): 31.

[14]Carter, "Lifelong Learning," 31.

[15]Michelle M. Weill, Larry D. Rosen, and Stuart E. Wugalter, "The Etiology of Computerphobia," *Computers in Human Behavior* 6 (1990): 361.

assigned a restricted meaning. Its tone is accusatory and loaded with the language of death and war, as John Shore, author of *The Sachertorte Algorithm,* puts it. "After a hesitant keystroke, a message like ILLEGAL INPUT . . . FATAL ERROR . . . JOB KILLED can easily be fatal to [the novice user's] interest as well."[16]

The most perceptive study of computer anxiety makes a distinction between computerphobes and uncomfortable users. Computerphobes will go to great lengths to avoid computer interaction, are severely distressed and intimidated when they must use a computer, and feel awkward, nervous and dumb. Computer experience does not allay their fears; rather it increases anxiety. In contrast, an uncomfortable user may have slight anxiety, will not avoid technology as forcefully, and experiences some discomfort. This user has both positive and negative feelings about computer experiences, is to some degree hesitant about continued computer interaction, but approaches the task with a positive attitude. Computerphobes are too scared or frustrated to ask for help, whereas an uncomfortable user will ask many questions.[17] Archivists may be uncomfortable rather than phobic.

Ways of Thinking

Gender, age, and computer anxiety might apply to anyone, but factor four, ways of thinking, takes us closer to archivists. Sherry Turkle and Seymour Papert of the Massachusetts Institute of Technology (MIT) argue that computer culture keeps people out by ways of thinking that make people reluctant to join in. Although the authors were studying programmers, their research on ways of thinking can be helpful to us. The dominant computer culture style is formal and logical thinking, and it emphasizes control through structure and planning. It is rule-driven, hierarchical, and abstract. Computer science is taught with this thinking style in mind,[18] and I would argue that it filters down to all the rest of us as well—in the manuals we read, the courses we take, or the explanations we hear. Computer culture does not favor those with concrete thinking, who like to learn through movement, intuition, and visual impression, and who see things in terms of relationships. For example, one such thinker prefers to build large programs by first writing "her own, small, building block procedures even though she could use prepackaged procedures." Another, a musician, prefers to "master her music by perfecting the smallest 'bits and pieces' and then building up. She cannot progress until she understands the details of each part." Turkle and Papert find that concrete thinking is valid and powerful even within the computer culture, traditionally assumed to demand abstract thinking, and they note that newer trends in the computer industry, such as icons and the mouse, make it easier for concrete learners. The authors argue persuasively for "an acceptance of the validity of multiple ways of knowing and

[16]John Shore, *The Sachertorte Algorithm and Other Antidotes to Computer Anxiety* (New York: Viking, 1985), 41–43. See also Deborah L. Brecher, *The Women's Computer Literacy Handbook* (New York: New American Library, 1985), 7–9, and chapter 1 for how jargon can be comprehended.

[17]Weill, Rosen, and Wugalter, "Etiology of Computerphobia," 362–63, 374–75.

[18]Sherry Turkle and Seymour Papert, "Epistemological Pluralism: Styles and Voices Within the Computer Culture," *Signs: Journal of Women in Culture and Society* 16 (Autumn 1990): 128, 132–35, 141–47. For interactive styles of computer users, see also Joan Hall and Joel Cooper, "Gender Experience and Attributions to the Computer," *Journal of Educational Computing Research* 7 (1991): 51–60; and Gayle V. Davidson, Wilhelmina C. Savenye, and Kay B. Orr, "How Do Learning Styles Relate to Performance in a Computer Applications Course?" *Journal of Research on Computing in Education* 24 (Spring 1992): 348–58.

thinking" in the computer culture and, by implication, outside of it.[19]

The findings from the MIT study may apply directly to archivists. Most archivists do not come from abstract disciplines like math, science, and engineering; most of us are from the humanities and social sciences, which are concrete disciplines.[20] When the PBS series explained the earliest computers by showing light bulbs going on and off, even though modern computers do not use light bulbs, this made more sense to me in thinking about how computers work than anything I had read. Likewise, I found particularly illuminating an explanation of early programming which took a simple equation, like 2 x 7 x 8, and showed how many one and zero combinations a programmer had to write to get the computer to read it. Part of the problem archivists face may be that they are concrete learners whose ways of thinking and knowing do not jibe with the way computer science is typically explained.

Extrinsic Knowledge

The fifth factor, *extrinsic knowledge,* applies even more directly to archivists. This is my term, and it is not as precise as I would like, so let me explain. Although we want to deal with electronic records, we must first learn about computers. Knowledge about computers is so unrelated to what we already know, so extrinsic to our traditional domain, that we cannot "hang" the new knowledge on previous knowledge. It is analogous to our having to learn Greek in order to appraise records, and meanwhile having to communicate with the records creator in Greek. We have to step outside all we know, acquire extrinsic knowledge, then step back in and use the new knowledge. Quite often I have not understood some computer term or concept but have gone on to something else anyway. At such times I felt as though I was getting puzzle pieces that I could not match with pieces I already had.

The closest I could come to this problem in the adult learning literature was a discussion of learning as an accretion (which archivists ought to understand)—that is, adding new information to the base of one's knowledge. Learning can also involve "restructuring," when new information does not fit the knowledge base. This requires reorganizing both prior knowledge and the processes of assimilating new information.[21] The type and degree of new knowledge required for computer literacy is the major difference between learning about electronic records and learning about automated archival techniques.[22] For example, the distance between the USMARC AMC format and archival description is not as great as the distance between software problems and appraisal of electronic records.

Conclusions

My discussion of these five aspects of learning about computers raises an obvious question: What should we do so that archivists can acquire the basic computer literacy they need? Although I can offer some

[19]Turkle and Papert, "Epistemological Pluralism," 129–44, 133–34, 154–56.

[20]David A. Kolb, "Learning Styles and Disciplinary Differences," in *The Modern American College* (San Francisco: Jossey-Bass, 1981), 237–43.

[21]Merriam and Caffarella, *Learning in Adulthood,* 169–72. I have greatly simplified their explanation of scheme theory, and their discussion does not address specifically my argument about extrinsic learning.

[22]Contrast, for example, Lisa B. Weber and Richard M. Kesner, *Automating the Archives* (Chicago: Society of American Archivists, 1991), 1–8, with anything you have read on electronic records.

suggestions, the best way to do this is unclear to me.

We have come to expect that we can find archival training workshops, particularly from SAA, to fill our educational needs. The positive aspect of a workshop on computer literacy is that we probably do learn more effectively from and with individuals who are part of our subculture.[23] The problem I see is the amount of information to be learned, and the fact that it is unfamiliar, or extrinsic, as I discussed earlier. The CART Curriculum Project's Basic Concepts in Automation covers a great deal about computer concepts and terms. Such new information is hard to absorb quickly, and hands-on practice seems necessary. So I am uncertain that an SAA workshop can fill our need. If SAA does offer a workshop lasting, for example, two days, we should try to base it on models that we might copy and adapt.

The CART Curriculum Project also suggests exploring other "delivery systems" besides workshops, such as forms of self-directed study an individual could use at home or at his or her work site. Written materials, videotapes, or even computer-aided instruction would be included. *Distance learning* is the new term for this improved successor to correspondence course work. Many universities now offer telecourses, as they are called, which link teachers and students in scattered locations; these courses commonly use technology such as television, videotapes, and computers. The time, place, and pace of education is much more flexible.[24] Furthermore, use of technology provides other benefits. It is a medium of imagery and, as such, it offers a superb learning and teaching mechanism because it helps us remember.[25] The PBS series mentioned earlier offers an example of learning by imagery. Concrete learners find imagery important. Using the computer to teach about computers seems wonderfully fitting to me. Again, we might explore whether others have developed distance learning for computer literacy, and whether we could use or adapt these models.

However, I do not think archivists should wait for SAA to provide the ideal training for computer literacy. That is just an excuse for us to put off learning about computers. As an individual archivist, you can read books and take courses and ask lots of questions. Through your workplace, you can also seek help from others, for example, from librarians who have computer experience and from people at a computer center on campus or a state agency computer center. Find *someone* to learn from. As Sue Gavrel suggests, "Take a programmer to lunch."[26] Still another suggestion is to use a computer to do something you enjoy—play games, draw, create a cookbook, or whatever—to acquire positive experience.[27] However we obtain the knowledge, the more we know, the more comfortable we are.

My main purpose in writing this article has been to offer some points to consider to those who feel unsettled or uncomfortable in learning about computers. If you

[23]Walch, "CART Curriculum Project Final Project Report," first draft, 49. Her discussion is in the context of "innovation-diffusion." I do not think that acquiring computer literacy is in this category, although dealing with electronic records is.

[24]Victoria Irons Walch, "Remarks Prepared for Mike Miller, CART Chair, Re: The Cart Curriculum Project," (Paper presented at the SAA Annual Meeting, 28 September 1991), 5. Avra Michelson and Jeff Rothenberg, "Scholarly Communication and Information Technology: Exploring the Impact of Changes in the Research Process on Archives," *American Archivist* 55 (Spring 1992): 278–81; Mary Jordan, "More Adults Are Hooking Up to Higher Education," *Washington Post,* 14 August 1992, pp. 1, 17.

[25]Mary Alice White, "Imagery in Multimedia," *Multimedia Review* (Fall 1990): 7.

[26]Katharine (Sue) Gavrel, "Educational Program for Machine-Readable Records" (Paper presented at a preconference workshop, SAA Annual Meeting, 2–4 October, 1983).

[27]Mark Conrad and David Bearman emphasized this point to me.

are having trouble, it is not because of your gender (if you are a woman) and it is not because of your age (if you are middle-aged). You probably are not really terrified of technology. Chances are you are an uncomfortable user who approaches things positively. It is most likely that you think and know in a different way and you are trying to acquire extrinsic knowledge.

Returning to my definition of computer literacy, we have to learn to communicate effectively. One of my conversations with an electronic data processing (EDP) person seemed confusing, and he returned my call saying, "Oh, you want data." (I cannot imagine what else he thought I wanted—tapes without data?) The miscommunication was not his problem. It is up to me to learn to talk to him, even if I find that difficult, which it sometimes is. I heard a story about an archivist who was talking to an EDP person about creating a database of artists. She gave as an example a fourteenth-century Italian painter who was known by different names, and she wanted all the names linked in the database. The EDP person, after thinking about it for a bit, said, "Oh, that'll be easy, we'll just link the names by social security number."

When I first saw the term *nincompute,* it seemed perfect to use in an article title. But I have changed my mind. The term denotes a negative image, an inherent lack of competence, which does not apply to our field. So I want to replace it with more positive images. Sherry Turkle asks, "If the computer is a tool . . . is it more like a hammer or more like a harpsichord?"[28] The latter is appealing. I do not think this way about computers yet, but maybe I will someday. Another positive image of the computer is the title of published conference proceedings from a meeting of the Association of Computing Machinery. Although I did not understand one article in this book, I loved the title: "Wings for the Mind."[29] A positive vision of the machine that changed the world is the first step toward holding positive views of ourselves while we learn about computers—on our way to dealing with electronic records.

[28]Turkle and Papert, "Epistemological Pluralism," 152. I use this quotation simply to suggest a pleasurable image of the computer. The authors, however, use it in a more complex discussion of establishing a relationship with the computer.

[29]Ken Bice and Clayton Lewis, eds., *CHI '89: "Wings for the Mind,"* Special Issue of the SIGCHI Bulletin. (Reading, Mass.: ACM Press and Addison Wesley, 1989). Conference proceedings, sponsored by the Association for Computing Machinery's Special Interest Group on Computer Human Interaction (ACM SIGHI) in cooperation with ACM SIGCAPH, ACM SIGGRAPH, ACM SIGOIS, Human Factors Society, Computer Society of the IEEE, Cognitive Science Society, Division 21 of the American Psychological Association, Human-Computer Interaction Specialists Group of the British Computer Society, European Association of Cognitive Ergonomics, Software Psychology Society, and The University of Texas.