

Title: Using Computers in Native American Classrooms: Trojan Horse or Cultural
Affirming Technology?

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In the special issue on Technology and Native Culture (Wicazo sa Review, 1988), Craig Howe concludes his discussion of the Western cultural patterns reinforced through computer mediated thought and communication with the following observation:

“The Internet is an exceedingly deceptive technology whose power is immensely attractive to American Indians. But until its universalistic and individualistic foundation is restructured to incorporate spatial, social, spiritual, and experiential dimensions that particularize its application, cyberspace is no place for tribalism” (p. 27). This warning, however, goes unheeded by educators, linguists, and some tribal leaders who see in the computer a means of regenerating within youth the language and traditional knowledge essential to tribal identity. As elders pass on, the tribal knowledge encoded in a CD-ROM appears safe from going extinct. The Tewa Language Project CD-ROM, the classroom use of computers adapted to the characteristics of the Hawaiian language, and the use of computers in Native classrooms for purposes of exchanging ideas within the "global village" represent just a few of the efforts that ignore Howe's warning about the Janus nature of computers.

While Howe observes that computers are the latest "foreign good" that encode the Western ideal of individualism (p. 26) and a rootless form of existence, most educators continue to justify the use of computers in Native classrooms on grounds that echo the arguments being used in the dominant culture. David Lewis, for example, explains the educational gains for the Naskapi students (who live 1000 miles north of Quebec City) in the following way:

The rationale for using technology involving traditions and culture, and therefore the community, is to interest and motivate the students, bring the school and community closer together, create needed resources for the community, and enhance understanding between students, staff, and other people in the community. p. 31

He concludes a brief discussion of how some members of the community view modern technology as undermining traditional ways with the statement that "it all depends on how the technology is used." In other words, the technology, including computers, are culturally neutral.

Similarly, in writing about how the networked classroom helps Hawaiian students learn their native language and other cultural traditions, Constance Hale made the claim that computers represent "a medium perhaps better suited to an oral tradition than the book ever was"

(1995, p. 4). And in a conversation one of the authors of this paper had with two university graduates who were working with the village elders in the Sierra de Juarez mountains of Oaxaca in helping the youth learn to solve current problems on the basis of ancestral knowledge, he was told that the computer is a cultural neutral technology. As one of the graduate students put it, "the purpose of the user determines whether it is a constructive or destructive force."

As the above statements suggest, the advocates of using computers in Native classrooms need to reflect more deeply on the cultural transforming effects of this technology and, in the process, engage the fundamental issues that Howe raises –issues that need to be framed in terms of cultural forms of knowledge and community that have a smaller ecological footprint than that of the technologically dependent dominant culture. In order to facilitate this deeper level of reflection and discussion among educators, as well as within the councils of elders, and among members of the community, the issues raised in a scholarly body of literature (Ihde, 1979; Winograd and Flores, 1986; Roszak, 1994; Bowers, 1988, 1993, 1995, 1997, 2000), will become foci for these discussions.. It is also hoped that the analysis of these issues will bring into question the wisdom of training teachers in the various applications of computers but not in helping them understand how computers contribute to undermining the cultural diversity that represents the alternative to a global consumer and technologically dependent monoculture. Lastly, as this analysis should be viewed as clarifying relationships and issues that have not been part of the literature on educational computing, it is hoped that others will extend those parts of the analysis that have only been briefly touched upon, and extend the analysis in directions that have been overlooked.

In order to avoid being prejudged as anti-computer, it must be acknowledge at the outset the many ways computers have been highly useful in maintaining the networks of communication among indigenous groups, and thus helping to increase their effectiveness in the political arena. The ability of the indigenous people of Chiapas to focus worldwide attention on their political demands, as well as on the efforts of the Mexican government to suppress them, is perhaps one of the more prominent examples of the political effectiveness of computers. Computers are being used to recover indigenous languages that are in danger of disappearing. Members of many tribes, as well as officials within the United States Bureau of Indian Affairs, view computers as the essential linkage in the educational process that will open doors more widely to employment in the mainstream economy. If everything goes according to plan, all 185 schools financed by the bureau will be wired for Internet access by the end of 1999. Similar efforts are being made in First Nation schools across Canada to make computers an integral part of the curriculum. For example, the new high school on the Eskasoni Reserve on Cape Breton Island integrates

technology so completely into the curriculum that students will be able to graduate with Microsoft or multimedia certification.

As computers become integrated into more aspects of economic life, competency in their use does indeed become essential to finding employment. The claim that computers will help Native students learn about their cultural traditions is, as suggested earlier, more questionable. While the computer industry has multi billion dollar reasons for maintaining the myth that computers are a culturally neutral technology, educators, politicians, and large segments of the general public not only continue to perpetuate this misconception but fail to recognize that the myth that represents technology as a culturally neutral tool, which encompasses all forms of technology, was important to hiding the forms of cultural transformation required for the spread of the Industrial Revolution. It is this linkage that needs to be examined here. It is also important to clarify how the integration of computer mediated learning with the changing needs of the workplace also leads to the loss of important forms of knowledge and communal relationships that are one of Howe's central concerns.

As one of the main arguments here is that computer mediated learning reinforces the same cultural transforming patterns that were essential to the Industrial Revolution, it is necessary to digress momentarily from the main line of discussion in order to highlight one of the most fundamental cultural changes necessary for the creation of a consumer, individually-centered form of culture. In Rebels Against the Future: The Luddites and Their War Against the Industrial Revolution (1995), Kirkpatrick Sale notes that

all that 'community' implies -- self-sufficiency, mutual aid, morality in the marketplace, stubborn tradition, regulation by custom, organic knowledge instead of mechanistic science -- had to be steadily and systematically disrupted and displaced. All of the practices that kept the individual from being a consumer had to be done away with so that the cogs and wheels of an unfettered machine called 'the economy' could operate without interference, influenced merely by invisible hands and inevitable balances.... p. 38.

(italics added)

In short, the industrial model required not only the elimination of the traditional market that was generally limited to a specific day of the week and to being held in a particular locality within the community, it also required an autonomous individual who, in lacking personal skills and interdependent relationships within the community, would be dependent upon manufactured goods and expert services. This transformation continues to be encoded in the modern way of equating greater individual autonomy, consumerism, and technological development with progress. It is also expressed in such recent technological developments as e-commerce which

connects the manufacturer directly to the consumer by excluding the need for small community centered enterprises--not to mention personal skills learned in mentoring and other intergenerational relationships that are at the core of traditional communities.

Today, the myth of technology as a culturally neutral tool hides the fact that we are entering the digital phase of the Industrial Revolution which is speeding up the process of globalizing consumerism and the increasing dependency on technology. Both of these trends undermine local knowledge. This connection between computers and the Industrial Revolution creates a special challenge for cultures attempting to maintain their traditions of community and spiritual connectedness. As pointed out earlier, computers contribute to economic and political gains, but at the same time they are a cultural transforming technology. What they reinforce is the modern, Western pattern of individually-centered relations and form of consciousness that Sale described as essential to the earlier phase of the Industrial Revolution.

The increasing dependency upon computers in nearly every aspect of daily life, from communication, transportation, to health care, makes it difficult to argue that students should be isolated from a knowledge of how to use computers. But this growing dependency, along with the regeneration of the awareness among indigenous cultures of the importance of traditional knowledge of communal relationships, makes it all the more essential to understand the culturally transforming nature of computers. This understanding, in turn, makes it possible to recognize more clearly the appropriate and inappropriate uses of computers, as well as how computers enable certain groups to gain power and economic advantage over others.

Just as the printed word has a long history of being represented as a culturally neutral technology, while also being an expression of progress beyond reliance on the spoken word, computers are also being represented as possessing these dual qualities. A careful examination of the forms of personal experience and cultural patterns they reinforce reveals something entirely different. Expanding upon Martin Heidegger's (1977) observations about the mediating characteristics of technology, Don Ihde notes that humans have three fundamental ways of experiencing technology: as background in a field of relationships (technologies that control temperature, sounds, light in a room, etc.), as interacting with a technology (switches, gear levers, key boards, etc.), and as a mediated experience where the nature of the technology amplifies certain aspects of individual/cultural experience while reducing or eliminating others (1979, pp. 53-65). For example, the way in which the characteristics of a technology select certain aspects of experience for amplification and reduction can be seen in how the nature of the stick amplifies a person's ability to reach into the higher branches while marginalizing the other aspects of embodied experience--smell, taste, sound, and so forth. A second example can be seen in how

the nature of the telephone projects voice over vast distances while eliminating the visual aspects of interpersonal communication. Similarly, it is the nature of the computer that determines the patterns of thinking, communicating, and experiencing that will be reinforced as well as the patterns that will be marginalized or represented as non-existent.

One of the characteristics of the computer that contributes to its existential/cultural amplification characteristics is that it carries forward the cultural patterns associated with print--which many scholars have associated with a modern form of consciousness (Goody, 1977; Ong, 1977, 1982; Havelock, 1986; Tannen, 1986). As these scholars have observed, given certain cultural variables, print posits a reality that is separate from the reader, and thus reinforces the form of consciousness associated with the autonomous form of individualism where personal perspective, analysis, and decisions are considered the most valid sources of knowledge. The spoken word cannot be recovered with the same accuracy as the printed word, and thus does not lend itself to critical analysis which, along with the act of reading, is an individualized activity. In effect, the printed word (which is always separated from context) has been represented by Western thinkers as a more accurate representation of reality than the spoken word --which is dependent upon context and interpersonal accountability (Goody, 1977). Indeed, the privileging of print over the living reality of the spoken word has been an important source of past oppression in Native and Euro-American relationships. Computer mediated thinking and communication further exaggerates the cultural patterns inherent in print technology. It does this partly by the way in which advocates of computers treat oral and print-based communication as identical, and by their emphasis on identifying computer mediated communication and thought with participating in global networks--as though the participants share an identical cultural epistemology.

The argument being presented here that computers reinforce the rootless form of individualism described by Sale needs further clarification as some readers may interpret it in a way that is not meant here. That is, it is not being claimed here that the form of individualism reinforced by computers prevents people from connecting with others in electronic communities. Indeed, this occurs--and computer mediated communication may even enable some individuals to share personal concerns with others in the electronic community that they cannot share on a personal, face-to-face basis. The more important point about how computers reinforce a modern form of individualism is stated in the most effective way by leading advocates of computers. Sherry Turkle, the author of The Second Self: Computers and the Human Spirit (1987), and more recently, Life on the Screen: Identify in the Age of the Internet (1995), explains the connection between computers and individualism in the following way:

I have argued that Internet experiences help us to develop models of psychological well-being that are in a meaningful sense postmodern: They admit of multiplicity and flexibility. They acknowledge the constructed nature of reality, self, and other. The Internet is not alone in encouraging such models. There are many places within our culture that do so. What they have in common is that they all suggest the value of approaching one's story in several ways and with fluid access to one's different aspects. We are encouraged to think of ourselves as fluid, emergent, decentralized, multiplicitous, flexible, and ever in process. pp. 263-264 (italics added)

While the computer allows people to share thoughts, information, and engage in problem solving with others, the form of individual subjectivity that it amplifies is profoundly different from the forms of moral reciprocity found in face-to-face, and intergenerationally centered communities. Harold Rheingold, one of the original members of the electronic community in the San Francisco area called the WELL, gives an account of his own personal experience that highlights this difference:

On top of the technology-imposed constraints, we who populate cyberspace deliberately experiment with fracturing traditional notions of identity by living in multiple simultaneous personae in different virtual neighborhoods. We reduce and encode our identities in words on a screen, decode and unpack the identities of others. The way we use these words, in stories (true and false) we tell about ourselves (or about the identities we want people to believe us to be) is what determines our identities in cyberspace. 1993, p. 61

The supposedly autonomous and experimental nature of individualism fostered by print based communication, which is facilitated by the amplification characteristics of computers (including the speed of interaction that simulates only the time element in the interactive nature of face-to-face communication) is profoundly different from the forms of individualism found in indigenous cultures. An example of this difference is brought out in Keith Basso's description of the form of subjectivity that accepts the guidance of ancestors, and the moral lessons encoded in place names. In Wisdom Sits in Places: Language and Landscape Among the Western Apaches (1996), Basso notes that for the Apaches from Cibecue

the past lies embedded in the features of the earth--in canyons and lakes, mountains and arroyos, rocks and vacant fields--which together endow their lands with multiple forms of significance that reach into their lives and shape the way they think. Knowledge of places is therefore closely linked to knowledge of self, to grasping one's position in the

larger scheme of things, including one's own community, and to securing a confident sense of who one is as a person. p. 34

The stories connected with place names, and which morally connect the present generation with the experiences (the 'path' or 'trail') of the ancestors, are part of an oral rather than a print tradition of communication. The form of individualism celebrated by Turkle and Rhiengold cannot experience these ancestral reference points in cyberspace. Again, the argument here is that the cultural transforming nature of computers has to do with the forms of intergenerational communication and embodied experiences that computers cannot reproduce--except in a de-contextualized way that fundamentally changes a form of community participation and renewal into reading a text as an objective and detached individual.

One of the double binds associated with how computers continue the tradition of representing print as a more progressive form of cultural storage than the oral tradition is that the rapid rate of technological innovation has diverted most people from asking about the forms of knowledge and communal relationships that are being undermined by this technology. The ecological significance of this double bind becomes even clearer when the ecological foot print of the autonomous and thus consumer dependent individual is compared with the ecological foot print of the individual who participates in the non-consumer oriented, intergenerational activities of a community that possesses the characteristics that Sale viewed as being undermined by the Industrial Revolution.

In spite of the many beneficial uses of computers, the questions that must be asked by groups struggling to preserve communal traditions in the face of the relentless pressure to become a modern society of consumer-oriented individuals should include the following: What cultural patterns are being reinforced when, for instance, Choctaw students attending Red Water School in Carthage, Mississippi participate in on-line conversations with Navajo students attending Cottonwood Day School, and with students attending other reservation schools across North America? What changes in cultural ways of thinking, values, and interaction are reinforced when they engage in computer-based learning? Does this form of communication weaken the patterns that contribute to networks of mutual support so essential to communities that have not been totally turned into niche markets by corporations?

When students use the computer, their pattern of thinking must adapt to the requirements of the machine, and to the thought patterns of the people who write the software. A critical relationship overlooked by those who view computers as a neutral technology was made explicit by Theodore Roszak when he wrote in The Cult of Information (1994 edition) that the basic relationship between the student and the computer screen is "mind meeting mind." He goes on to

point out that the "subliminal lesson that is being taught whenever the computer is used (unless a careful effort is made to offset that effect) is the data processing model of the mind" p. 241). This model of thinking, which is now being further reinforced by the learning theorists who argue that students construct their own understanding of relationships, corresponds to the conceptual patterns taken-for-granted in the dominant culture. Furthermore, this model of thinking tends not to be recognized as specific to a particular cultural group. Thus, the shaping influence of computers goes largely unnoticed, particularly when the user assumes that the computer is a culturally neutral technology. In connecting this discussion more directly to the use of computers in reservation classrooms it is important to recognize that when students attending Red River School use a computer, regardless of whether it's a chat room situation, a simulated decision-making program such as SimCity, or the retrieving of information from a data base, they will experience themselves and the surrounding world in the following ways—which are dictated by the cultural mediating characteristics of the computer.

(1) Decisions about which aspects of cyberspace they will become involved with will be experienced as an autonomous choice. That is, the computer involves an isolated experience of interacting with abstractions (words, pictures, graphs, etc.) that appear on the screen. Unlike face-to-face communication, the student is alone with her/his thoughts, expectations, and immediate choices.

The sense of being an autonomous individual is further strengthened by how computers reinforce the experience of communication as a process of sending and receiving information. That is, the computer reinforces the conduit view of language (Reddy, 1979) that has played an essential role in maintaining the Western view of the individual as the source of rational thought, and the equally powerful and problematic idea that there is such a thing as objective knowledge--that is, knowledge that does not encode the deep and taken-for-granted assumptions of a cultural group (Bowers, 1995). The sender/receiver (or conduit) model of communication experienced by the student hides a profoundly important though generally ignored characteristic of the language that appears on the screen. While the words and grammatical constructions appear to communicate objective information and data about the real world, these basic building blocks of thought and communication actually encode the metaphorical thought processes of a specific cultural group (Lakoff, 1987; Johnson, 1987; Bowers, 1995, 1997) . In short, words such as "tradition," "wilderness," "progress," "individualism," "data," and so forth encode and carry forward the earlier metaphorical constructions that underlie modern consciousness. To put it another way, as students adopt the schema of understanding carried forward by these words (such as equating

change with a linear form of progress, data as objective, and tradition as impeding modern progress), as well as by other words and images, their thought process is being shaped in a culturally specific way. In short, the computer mediates the use of language in ways that hide its cultural origins--which is, in the case of computers, that of the dominant, high-status culture of the West.

The experience of self as an autonomous decision maker is further reinforced by the way in which the computer frames how the flow of time is experienced. Unlike many cultures that recognize and value traditions as an integral aspect of the present, and even as having authority that guides present thought and behavior, computers reinforce the modern view of tradition--which places authority in the judgment of the student for deciding whether traditions have any relevance to immediate experience. The subjective, immediate experience of the student sitting in front of the computer becomes the ultimate source of authority. The unit of time is the immediate problem solving situation, or choice of what is interesting and entertaining. It is a way of experiencing time that makes the relevance of elder knowledge a matter of subjective judgment of the autonomous individual. In effect, the past and future are judged from the perspective of the individual's immediate interest and experience.

(2) The ability of computers to enable students from different tribal groups to communicate with each other may, in some instances, represent a positive educational experience. But this gain also involves the reinforcement of a different set of cultural expectations. In addition to substituting communication that is abstract and reductionist for the contextualized face-to-face and intergenerational learning essential to the life of Native American communities, the computer also reinforces a cultural pattern that has become grossly exaggerated by the Industrial Revolution.

All cultures have engaged in the exchange of goods, knowledge, and skills. The means of exchange was largely a barter system, and (in many instances) the weekly market day. The Industrial Revolution, with its need to continually find new markets for the steady stream of technological innovations, has distorted this traditional balance between market and non-market oriented activities that characterized the rhythms of community life (Berthoud, 1992, p. 75). This drive to turn every aspect of human relationships, knowledge, skill, entertainment, and even the biological basis of life itself into a commodity that can be mass produced and sold (now on a global scale) is now furthered by computers. Unlike the face-to-face aspects of community life, computers involve commodifying the most basic aspect of community--the ability to communicate and to learn from others (Bowers, 2000). The commodification of thought and

communication begins with the purchase of a computer, Internet services, and the continual upgrades required by the latest innovations of the computer

industry. The commodification process is carried even further by the ability of computers to monitor human activity, which yields data that can be sold to corporations whose goal is to identify potential consumers.

The use of computers in reservation schools may challenge students and sustain their interest in ways that the often lifeless content of textbooks could not. But in becoming dependent upon computers as a means of communication, entertainment, and problem solving, students are drawn into a complex set of cultural patterns and values governed by the forces of the market place. And like the earlier history of the Industrial Revolution, the expansion of markets requires the creation of the autonomous individual who, in lacking personal skills and the ability to meet basic psychological needs through the non-commodified traditions of the community, is dependent upon the commodities produced by outside experts. In effect, as students communicate on-line, access information for their reports, and learn the mechanical functions that will enable them to perform in a computer-dependent workplace, they are also being initiated into the seductive consumer lifestyle of continual technological innovation required by the digital phase of the Industrial Revolution. This fact is clearly understood by computer manufacturers such as Apple and IBM. Corporate strategists know that there is a connection between the type of computer students first learn to use and future product loyalty--which is one of the primary reasons they donate computers to schools.

(3) The classroom use of computers also reinforces a key aspect of the scientific mode of thinking--that is, the objective nature of knowledge. From the students' perspective, the data, information, images, and graphs appear on the computer screen as objective and accurate representations of some aspect of the real world. Educators currently (and mistakenly) view this capacity of the computer as providing students with the means of constructing their own way of understanding. This capacity to construct one's own knowledge, in turn, is seen as the source of new ideas that will lead to even more technological progress. There is also another process of cultural reinforcement that accompanies learning to view relationships and attributes as objectively real.

Unlike the knowledge of nature passed on from generation to generation through mentoring and stories that foreground the Native American's sense of moral reciprocity and interdependence, the scientific way of understanding represents the individual as an objective

observer in a world where moral values are seen as the expression of pre-scientific ways of understanding. That is, science is supposedly free of cultural bias, including being free of any cultural group's moral tradition of understanding human/nature relationships. While the dominant tradition in science (including computer science) represents the individual as a cultural-free objective observer, the findings of several branches of science are being used to construct a powerful narrative of the creation and evolution of life on this planet. This story of evolution, which increasingly locates the life forming and renewing process in how genes reproduce themselves, is displacing traditional stories of creation that serve as the basis of moral values with an approach that is secular, competitive, and dependent upon the judgment of scientific experts. According to E. O. Wilson, the basic unit in the process of evolution (which operates in an environment of chance and necessity) is the gene. The gene's sole purpose is to replicate itself in future generations, while the environment selects the fittest genes--that is, the better adapted. In Consilience: The Unity of Knowledge (1998), Wilson describes the gene in the following way:

They feel nothing, care for nothing, intend nothing. Their role is simply to trigger the sequence of chemical reactions within the highly structured fertilized cell that orchestrate epigenesis. Their writ extends to the levels of molecule, cell, and organ. This early state of epigenesis, consisting of a series of sequential physicochemical reactions, culminates in the self-assembly of the sensory system and brain....Across evolutionary time, the aggregate choices of many brains determines the Darwinian fate of everything human--the genes, the epigenetic rules, the communicating minds, and the culture. (p. 165)

This story of evolution, in locating moral values in the drive of the "selfish gene" to continually replicate itself in future generations, revives the "survival of the fittest" arguments that were influential among Western thinkers in the late nineteenth century. Today, a number of scientists are attempting to explain how computers represent the latest stage in this evolutionary process--which they view as part of Nature's process of evolving a global form of super intelligence. Hans Moravec has even argued that computers represent the emergence of the "post biological" phase of the evolutionary process (1988, p. 5).

In effect, the form of cultural experience reinforced when students use a computer (the sense of autonomy, view of language as a conduit, de-contextualized information, subjective judgment about whether the distant past and future are relevant, commodification of thought and communication, secular-human centered view of nature, and so forth) are being viewed by computer advocates as evidence that computers are helping humans evolve to this next stage of super intelligence. Kevin Kelly, the former editor of Wired, concludes his book, Out of Control:

The Rise of Neo-Biological Civilization (1994) with the statement that the evolutionary process governing the development of computers is "out of our control." That is, the evolutionary process, where only the fittest form of cultural intelligence not only survives but displaces on a global scale other forms of cultural intelligence, is not something that can be resisted. The title of Gregory Stock's book, Metaman: The Merging of Humans and Machines into a Global Superorganism (1993) sums up where we are heading, with a professor of developmental biology who teaches at one of the country's premier universities claiming that Stock's "book created in me an optimism, almost a longing for the future."

Unfortunately, the explanations of how computers are essential to educating students for citizenship and employment in the emerging Information Age ignore that just as the diversity of species is vital to a healthy ecosystem, the maintenance of cultural diversity is equally important. Nor do they take account of the fact that the dominant Western pattern of thinking reinforced by computers, while seen by scientists such as E. O. Wilson as more evolutionary advanced, has an ecological footprint that is undermining the viability of the Earth's ecosystems. That many traditional cultures have taken different pathways of development, and demonstrated the capacity to live in a long-term sustainable relationship with the environment, should be viewed as "better adapted" in an evolutionary sense is also being ignored. When educators claim that the most important question facing reservation schools is how to obtain funds to acquire more computers, and to maintain and constantly upgrade them, they are ignoring the deeper questions associated with the cultural transforming characteristics of computers. They are also ignoring how science is being used as the basis of a new ideology that justifies the "extinction" of cultures that do not "adapt" to the expanding network of computer mediated intelligence required by the global economy.

As computers become more integrated into business, government, and the service sectors of the dominant society, the question should not become "How do we shield students from computers?" Rather, it should become "How can we educate students to understand the appropriate and inappropriate uses of this technology?" This question recognizes that there are always trade-offs, even in what appears to be a constructive use. The latter question is especially important to cultural groups that want to maintain as many of their cultural traditions as possible in the face of modern pressures. As compromises with the dominant culture are required by any form of participation in the business/technology and political/legal sectors of the dominant culture, there are special advantages for Indian students to learn how to use computers. Whether these economic gains exceed the loss of cultural traditions is an open question. What is being suggested here is that, over the long-term, the loss of local knowledge and patterns of moral

reciprocity essential to traditional communities will be more significant to the world's ecological well-being.

The fundamental differences between the form of culture reinforced by computers and the wide range of cultural ways of knowing that characterize indigenous cultures should be taken into account when considering the special challenges and opportunities that computers pose for teachers. Learning how to use the Internet and other practical applications of computers seems now as essential as learning the English alphabet. But there is much more that can be learned from computers if the teacher understands that computers are a cultural mediating technology; that is, if teachers understand how computers amplify certain cultural ways of knowing and reduce or eliminate others. A strong case can be made that the use of a computer in a reservation classroom provides an opportunity to examine the differences between the dominant culture's way of knowing and value system and that of the students' own cultural traditions. Especially important is the ability of the teacher to frame the discussion of cultural differences in terms of the benefits of mutual support networks within a community, as well as in terms of the impact on the viability of natural systems.

The contrast between the modern mind set reinforced by computers and the complex languaging processes involved in the Native intergenerational experience of community is quite remarkable. How many teachers, for example, engage students in exploring these differences? How many teachers help students understand how the local, richly contextualized rituals, dances, stories, and traditional productive economic activities become distorted and lose their character/identity forming qualities when represented on a computer screen. The passing on of intergenerational knowledge comprises holistic lessons from one generation to the next, incorporating localized environmental knowledge, social skills, and spiritual values--all of which constitutes a major strength of many Native cultures. The lessons engendered in these communal, spiritual, social, and economic activities are not the sort found in schools, computers, or modern lifestyles. They have been the basis of sustainable community and family life, which is often one of the few resources Native peoples have left. When these are taken away, as anthropologists have documented everywhere, humanity is the lessor for it.

Hopi *katsina* dances represent an even better example of what cannot be experienced through a computer. The dances, and the extensive communal preparations for them, provide multi-layered opportunities for a village to come together in a ritual drama, calling on the spirits of the land to bring rain and other blessings. The dances join together young and old men in the *kivas* and women in the *piki* houses--with all coming together in the plaza in ways that pass on the moral and spiritual teachings along with the opportunity to visit and exchange gifts. The

opportunity of these reciprocal activities for centering sometimes wavering young people is often lost on outside observer who do not or cannot appreciate the ecologically and culturally-based frameworks of collective sharing of knowledge and the underlying values they represent.

Instead of turning the computer over to students with vague guidelines for a writing assignment or some other educational task, the teacher needs to be especially aware that the content of educational software provides important opportunities for discussing the cultural non-neutrality of computers. It is an educational opportunity that far exceeds what students will learn from interacting on their own with the thought process encoded in a simulation program. For example, what cultural assumptions are embedded in such popular educational software as The Oregon Trail, SimLife, SimCity, and Storybook Weaver? Will students recognize on their own that the assumptions played out in The Oregon Trail are the same assumptions that underlie current effort to globalize a consumer dependent lifestyle that is rapidly overwhelming the life sustaining capacity of the Earth's ecosystems? How does SimCity influence students to think about community? That is, what are represented as the characteristics of a successful and growing community? What are students learning from Storybook Weaver? This is a simulation program that encourages students to write their own stories (rather than listening to the stories told within their communities), and to populate the environment in which their stories are situated with plants and animals that fit their sense of imagination? What are the teacher's responsibilities when the mind of the student (which reflects the patterns of thinking of her/his language community--as well as patterns assimilated from the dominant culture) is meeting the mind of the people who designed the machine and wrote the software? The critical point in this relationship that should be recognized is that these different minds may carry forward different forms of cultural intelligence--and that these differences have important consequences that are not immediately (if every) understood.

The different educational uses of computers, from participating in electronic communities to learning various forms of decision making and model building, should be seen by teachers as opportunities to help students understand the forms of knowledge and relationships that cannot be communicated through a computer. It would be important to teach why computers cannot communicate the forms of local knowledge passed on through face-to-face relationships. Students should also be encouraged to recognize that computers cannot be used to communicate the following as a living experience: elder knowledge, participation in ceremonies, family relationships and interdependencies, mentoring in clan knowledge and skills, and the stories and practices that carry forward an awareness of how the spirit world requires different expressions of moral reciprocity. In short, the teacher should be able to use the computer as a reference point for

clarifying how important aspects of community are transformed or lost when using the computer as the basis of thought, communication, and problem solving.

The teacher should also foster discussions around a different set of questions. It was suggested earlier that computers represent the digital phase of the Industrial Revolution, which continues to have as its primary goal the transformation of more aspects of daily life into commodities that can be mass produced and sold. Teachers should be able to help students understand the different ways in which computers help to bring more aspects of individual, community, and nature itself into the market economy that is undermining traditional forms of communal self-sufficiency. This would also involve examining the different ways in which computers are essential to the process of globalization--a process that has especially important implications for the world's indigenous cultures.

Understanding how computers contribute to turning knowledge, relationships, and even the genetic basis of nature itself into commodities should lead to an examination of the many non-commodified aspects of community life. What are the activities and relationships that are a source of meaning, self-identity, entertainment, mutual support that are not dependent upon some form of consumerism? What are the qualitative differences between having to purchase what meets a need, and possessing the personal skill or engaging in a reciprocal relationship with other members of the community? Another aspect of the spread of a market oriented culture that needs to be understood is its impact on natural systems. This is perhaps the most critically important relationship, particularly as it relates to the viability of communities and natural systems. This relationship can be explained in terms of the following circular process: The more people are dependent upon meeting various needs through consumerism, the more they will have to work--which may mean that both parents must work outside the home. The more parents work, the less parenting is done--which too often leads to the parenting being taken over by television and the computer. This, in turn, leads to more exposure to the shaping influence of the advertising industry--which leads to pressure within the family to buy the latest consumer fad. The more needs are met through consumerism the less time and energy there is to meet needs in self-sufficient ways, and thus the more of nature that is turned into a resource for the manufacturing process that is eventually cycled back as toxic waste. This part of the cycle, in turn, further undermines the health of natural systems. Increasingly, computers must be seen as an integral part of this destructive cycle of media controlled communication, consumerism, and identity formation.

Whether the use of computers in reservation schools simply subverts Native cultures, or are used in ways based on the recognition of the cultural gains and losses, depends to a large

extent on the teacher's understanding of the cultural transforming characteristics of computers. Again there is a cycle that few experts mention when they urge that computers are the answer to the problems facing reservation schools. Teacher education programs reinforce the idea that computers are a culturally neutral technology ushering us into the Information Age. Courses in other departments of the university communicate the same message. Like so many past relationships between indigenous cultures and the Euro-American culture, the ability of indigenous communities to distinguish between the necessary uses of computers and the uses that are destructive of community traditions is being undermined by educational institutions that exert an increasingly powerful influence on the next generation--though the technology that university educated people create and through teachers who too often do not understand the ecologically problematic nature of the modern values and way of thinking they pass on through the use of computers.

This subversion occurs through the technology and through teachers who, too often, do not understand the ecologically problematic nature of the modern pattern of thinking and values amplified by computers--even as we use them to solve problems and to access abstract forms of knowledge that may serve useful purposes. Computer mediated learning not only accelerates the process of alienation from the natural world, it is moving us into a whole new media paradigm--but one that retains the fundamental separations inherent in a Cartesian way of thinking. The danger in this new paradigm, which is based on the most fundamental anti-tradition traditions of modern thinking, is the relegating of diverse ways of knowing to the junk heap of a past that is no longer seen as economically useful. In acculturating Native students to this new paradigm of commodified knowledge and relationships, which is often hidden under the guise of entertainment, we must ask ourselves if we are, in fact, precluding once and for all their enculturation into the rich environmental knowledge of their own traditions. The educational use of computers, like the Trojan horse that allowed the Greeks to gain access to Troy, needs to be given more careful scrutiny. The losses in the form of assimilation to the environmentally destructive patterns of the Euro-American culture may be far more important than the short-term economic gains and personal conveniences.

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