Editor's Note

by Byron F. Radebaugh

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The concept for this two-part issue of *Thresholds in Education* grew out of President Bill Clinton's Inaugural Address (*Chicago Tribune*, January 21, 1993, Sec. 1, p. 14). Among other things, he said:

> . . . To renew America we must revitalize our democracy. . . .
>
> . . . But our greatest strength is the power of our ideas, which are still new in many lands. . . .
>
> . . . My fellow Americans, you, too, must play your part in our renewal. . . .

It was with thoughts such as these in mind that a two-day conference on "Knowledge Production and Educational Change for Democratic Renewal," was held on the campus of Northern Illinois University on October 8-9, 1993.

This conference was co-sponsored by the Department of Leadership and Educational Policy Studies, NIU, and Thresholds in Education Foundation. Thirty-five presentations were made during this conference with educators, students, and the public attending.

The articles found in this two-part issue of *Thresholds* were selected from these presentations. Part I will focus on some of the theoretical and conceptual aspects of knowledge production and educational change for democratic renewal, while Part II will explore some of the practical implications that different views of knowledge production have for educational change and democratic renewal.

I think the ideas expressed in this issue will reveal a wide range of answers to the questions, "What is Knowledge?" "What is Knowing?" "What does it mean to know?" I also think you will find these ideas informative, insightful, and reflective. In any event, I hope the content of these articles will stimulate our readers to think anew, about "What knowledge is of most worth?" and use it to help bring about desirable educational change and democratic renewal.

The Degenderization of Knowledge Production: The Case of Sor Juana Inés de la Cruz

by Norma Salazar

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In the positivist traditions of mainstream research, knowledge is knowledge no matter how it is discovered or by whom. Historians of education, sharing the optimism of Voltaire and Kant, have depicted educational developments of the past four centuries as a march toward progress.

The life and career of Sister Juana Inés de la Cruz, a seventeenth century Mexican nun now widely recognized as a literary genius, calls this view into serious question. Her life illustrates that **WHO** discovers knowledge is as important or more important than **WHAT** knowledge is promulgated.

Who Was She?

Juana Ramirez was born 12 November 1648 in San Miguel de Nepantla, Mexico. Her father was a Spaniard. Her mother was a creole (a person of full Spanish ancestry born in the New World). The fact that her father was a Spaniard made him the social superior of her mother.

Spanish men could legally marry creole women, but rarely did so. Instead, they formed a kind of second class arrangement. This was the case with Juana's mother and father.

When Juana was two, her father abandoned the family. Juana, her two older sisters, and their mother went to live in her maternal grandfather's house in Amecameca, thirty miles southwest of Mexico City (Arroyo, 1971).

Juana had an intense desire to learn: "I had not yet reached the age of three when my mother sent my older sister to receive reading instruction in one of the places called Amigas," she recalled in an autobiographical account. "I was impelled by my love and mischief to follow her; and seeing that she (my sister) was given a lesson, I developed a burning desire to learn to read (Cruz, 1985)." She demanded a lesson from the teacher, saying that her mother had given orders. Although the teacher did not believe her, she gave the little girl instruction anyway. Seeing Juana's desire and ability to learn, the teacher kept up the lessons. By the time her mother discovered what was happening, Juana knew enough to continue learning on her own.

When Juana was eight, her grandfather died. Her mother, perhaps out of economic necessity, soon agreed to another second class "marriage." The birth of Don Diego, a baby half brother, followed in due course, and Juana's mother (who would have two more children by Don Diego Ruiz Lozano y Centeno) made arrangements for her youngest daughter to live with an aunt and uncle in Mexico City (Paz, 1983).

Juana's move to Mexico City, even if it may have been initially frightening, represented a childhood dream coming true. She had asked her mother earlier to allow her to dress as a male so she could attend the university in the capital. Her aunt Maria Ramirez and Uncle Juan de Mata provided a home for her. They also secured a tutor, Martin de Olivas, who introduced her to the study of Latin. It was customary for women to receive instruction from private tutors because they could not attend the university (Arroyo, 1971). Latin was the language of culture and, along with some Greek, was common among educated women in Old and New Spain. Therefore, Juana with her knowledge of Latin was able to achieve higher education without setting foot in the university (Muriel, Cultura, 1982).

Life in the Court

By age sixteen, Juana was becoming known all over Mexico City

as an attractive and intellectually accomplished young woman. She continued to write religious poetry. At about this time, her aunt and uncle were able to place her in the palace as a member of the viceroy's wife's (vicereine's) court (Calleja, in Muriel, 1982). In the palace, Juana established a lasting friendship with the viceroy and his wife, the Marquesa de Mancera, who became like family, providing her with warmth, friendship, and protection (Paz, 1983).

With the Marquesa's approval, Juana continued reading and expanding her knowledge. Many people in the capital had heard of her erudition. Her knowledge continued to expand by daily contact with the prominent people who visited the palace. They in turn were delighted with her poetry and her attention. Everyone seemed to approve her studies during this time. She was living in harmony with her immediate world (Muriel, Cultura, 1982).

Juana Joins the Convent

From sixteen to nineteen Juana seems to have enjoyed life in the court. It was a sparkling life, one that could not continue. A creole woman of nineteen had limited choices. She could marry a creole or follow Juana's mother's example and consummate an unofficial marriage with a Spaniard; or she could join a religious order. Some Sorjuanistas have concluded that an unhappy love affair led to a decision for convent life, but there is no evidence for their speculation (Salazar Davis, 1991). Juana herself—by written declaration and by her life—said that what she wanted most was the freedom to dedicate her life to study: "I became a nun because, although I knew that that way of life involved much that was repellant to my nature, . . . nevertheless, given my total disinclination to marriage, it was the least unreasonable and most becoming choice I could make to assure my ardently desired salvation," she said. She went on to explain that she wavered in trying to decide whether to take up the life of the cloister because of "its incidental, not its central aspects." She amplified this explanation, citing "my wish to live alone, to have no fixed occupation which might curtail my freedom to study, nor the noise of a community to interfere with the tranquil stillness of my books. This made me hesitate a little before making up my mind (Trueblood, 1988)." On 24 February 1669 she entered the convent of St. Jerome. She had a servant and eventually bought her own cell (apartment). She took the name of Sor (Sister) Juana Inés de la Cruz (Muriel, Cultura, 1982).

Sor Juana participated fully in the life of the convent. She served three terms as "bookkeeper," a position that gave her considerable responsibility for the house's extensive property and investments. This office required her to interact extensively with people outside the convent. She wrote plays, performed by some of the girls who were studying in the convent. She maintained a voluminous correspondence and entertained an extensive circle of friends and admirers, including the viceroy, vicereine, and other members of the court who called often.

Conflict With Her Confessor

Father Nunez became Sor Juana's confessor about the time she joined the convent of St. Jerome. For several years Juana Inez apparently followed her confessor's advice, seeking permission ("which I then held more necessary than that of his Excellency the Archbishop Viceroy, my Prelate") for anything she published. Father Nunez seems to have fully approved her activities for a time, proofing and correcting at least two carols before they were published (de la Cruz, in Paz, 1983). At some point Father Nunez began offering objections to Sor Juana's activities. She wrote love poetry in the baroque Renaissance style popular at the time.

In laying claim for women to all academic subjects pursued by men, Sor Juana took a long step toward full curricular equality for women.

It is not clear whether he objected prior to 1680, but tension between Nunez and de la Cruz reached a crisis in 1680. A viceregal inauguration was imminent. The ceremony was to be an occasion of extensive public celebration. The Cabildo (town council) commissioned Sor Juana and Carlos de Siguenza y Gongora (her intellectual friend) to take charge of the ceremony and write special poetic orations for the occasion. A writer could receive no more prestigious commission. It would provide Sor Juana the opportunity to demonstrate her writing abilities on a more public scale. It also helped her establish a friendship with the new viceroy and his wife, Maria Luisa Manrique Lara. (Maria Luisa had already become Sor Juana's friend and protector. She encouraged her writing. From 1689 to 1692 Maria Luisa would have two volumes of

Sor Juana's work published in Spain (Alatorre, 1987).

Sor Juana accepted the commission. She chose Neptune as her theme and composed an allegorical poem. Father Nunez de Miranda opposed *Neptuno Alegorico* (*Allegorical Neptune*), calling it mundane and inappropriate subject material for a nun. In his roles as confessor, self appointed mentor, and surrogate father, Nunez began urging the celebrated nun to read and write more around traditional religious themes and less about "worldly" matters. He accused Sor Juana of rebelling against the "masculine authority of her spiritual guide." He saw it as his duty to redirect Sor Juana's activities toward seclusion in the convent (Alatorre, 1987).

Sor Juana rejected Father Nunez's arguments. She proceeded with the triumphant celebration. This action obviously troubled Nunez so deeply that he began to publicly criticize the nun whom he had earlier encouraged to study. Finally, Sor Juana challenged her confessor in a private letter:

> Peace in Christ
>
> For some time now various persons have informed me that I am singled out for censure in the conversations of Y[our] R[everend], in which you denounce my actions with such bitter exaggeration as to suggest a *public scandal*, and other no less shocking epithets.

She then asks in her letter:

> Why do you find wicked in me what in other women was good? Am I the only one whose salvation would be impeded by books? . . . Why must it be wicked that the time I would otherwise pass in idle chatter . . . be spent in study?
>
> Y. R. wishes that I be coerced into salvation while ignorant, but, beloved Father, may I not be saved if I am learned? Ultimately that is for me the smoothest path. Why for one's salvation must one follow the path of ignorance if it is repugnant to one's nature?
>
> Is not God, who is supreme goodness, also supreme wisdom? Then why would He find ignorance more acceptable than knowledge? . . .

Sor Juana's allegory and arch were successful. She came to be great friends of the new viceroy and his wife, and the next several years were flourishing ones for her. But the skirmish with Nunez was not over. This Jesuit priest would wait for a more opportune moment to assert the Lord's will against a woman who refused to stay in her place.

Sor Juana Dismisses Her Confessor

Sor Juana wrote to Father Nunez de Miranda in 1681 to remind him that he did not own her life. "Vexing me is not a good way to assure my submission," she told him, "nor do I have so servile a nature that I do under threat what reason does not persuade me." Then she added, "innumerable times your words have been exceedingly repugnant to me; . . . yet I do not . . . condemn them, . . . but to Y.R. I cannot fail to say that by now my breast is overflowing with the complaints that over the course of the years I could have spoken, and that as I take up my pen to state them, rebutting one I venerate so highly, it is because I can stand no more." She told him she was "too sorely tried" to put up with more. "I am not as humbled as other daughters in whom your instruction would be better employed," she told him.

She concluded her letter by dismissing him:

> And . . . if you do not wish or find in your heart to favor me (for that is voluntary) . . . think of me no more. . . . God . . . will supply a remedy and order that my soul, awaiting his kindness, shall not be lost even though it lacked the direction of Y.R., for . . . in the world there are as many theologians, but were they lacking, salvation lies more in the desiring than in the knowing, and that will be more in me than in my confessor. . . .
>
> I reiterate that my intention is only to beg of Y.R. that if you do not wish to favor me, you not think of me, unless it be to commend me to God. . . .
>
> Your
>
> Juana Inés de la Cruz (in Paz, 1983).

It is not clear from available evidence whether Sor Juana's dismissing Father Nunez as her confessor ended her communications with him.

Sor Juana Begins Publishing

From 1680 to 1689, Sor Juana seems to have flourished. She acquired a library "that was admired by connoisseurs, and a collection of musical and scientific instruments, jewels, and rare objects (Schons, 1929, in Paz, 1983).

In 1689 Maria Luisa arranged for the publication of a volume of Sor Juana's writing and followed with a second, expanded, printing in 1690. This brought fame and

praise but also increased the jealousy and irritation felt by critics in Mexico City.

About this same time the bishop of Puebla, Manuel Fernandez de Santa Cruz, heard Sor Juana explicate a theological treatise. He asked her to write out what she had said and send it to him. She did and he published it under the title *Carta Atenagorica*, or *Letter Worthy of Minerva*. This was around November of 1690. (Fernandez de Santa Cruz wrote her on November 25, saying that he had her letter printed. Presumably he sent one or more copies along with his letter.) A second volume of Sor Juana's work appeared in April, 1692 in Seville, arranged by Maria Luisa. Octavio Paz says copies of this volume would have probably reached Mexico toward the end of 1692.

Seventeenth Century Mexican society was in dynamic tension. Conflicting interests and attitudes found expression in the court, university, and church and in their respective overlapping and interconnected bureaucracies.

Juana Inés was a participant—and after the publication in 1690 of her *Letter Worthy of Minerva*—a celebrated participant in the exciting controversies of the time. Much of the debate took place in sermons, a few of which ended up in print. This was the case with the subject of Sor Juana's 1690 letter. She was commenting on a sermon preached four decades earlier in Lisbon by a Portuguese Jesuit named Antonio de Vieyra, but apparently not available in Mexico City in Spanish until 1680's.

Reply to Sor Filotea

When Sor Juana received her copy of the pamphlet from Puebla containing her own and Sor Filotea's letters, she spent several months constructing an extensive reply. This is the source of much of our (auto)biographical information about Sor Juana and is now regarded as one of her most important works. It expanded upon many of the themes mentioned in her private 1681 letter to Father Nunez and stands as a forceful justification of her life and of the rightness and value of women's education. Along with a partly autobiographical poem entitled "First Dream," it stands as a ringing defense of intellectual equality between the sexes.

In her letter, Sor Juana explained the study of many secular subjects as a preliminary basis for studying theology—the queen of the sciences. This was patterned after Ignatius Loyola's hierchy of studies. She listed logic, rhetoric, physics, music, arithmetic, geometry, architecture, history, law, the church fathers, and astrology (astronomy) as subjects worthy of serious study.

In laying claim for women to all academic subjects pursued by men, Sor Juana took a long step toward full curricular equality for women. Not only would she not concede a separate sphere of studies for women and men, she playfully suggested that men could profit from women's traditional studies. "But, Madam, what is there for us women to know, if not bits of kitchen philosophy? As Lupercio Leonardo said: one can perfectly well philosophize while cooking supper. And I am also saying, when I observe these small details [of everyday life]: If Aristotle had been a cook, he would have written much more (Trueblood, 1988)."

Sor Juana knew the society in which she lived would not tolerate a suggestion that women study in the university along with men. She let this go but pressed at least for private and individual study. "Who has forbidden that to women?" she asked.

> Like men, do they not have a rational soul? Why then shall they not enjoy the privilege of the enlightenment of letters? Is a woman's soul not as receptive to God's grace and glory as a man's? Then why is she not as able to receive learning and knowledge, which are the lesser gifts? What divine revelation, what regulation of the Church, what rule of reason framed for us such a severe law?
>
> Are letters an obstacle or do they, rather, lead to salvation? Was not St. Augustine saved, St. Ambrose, and all the other Holy Doctors? And Y.R., with such learning, do you not plan to be saved?
>
> And if you reply to me that a different order obtains for men, I say: did not St. Catherine study, St. Gertrude, my [spiritual] Mother St. Paula, without harm to her exalted contemplation, and was her pious founding of convents impeded by her knowing even Greek? Or learning Hebrew (de la Cruz, in Paz, 1983)?

Sor Juana was herself a lifelong learner and, to use another current term, an "autodidact." She described herself as having no choice in either of these. The desire to learn was an unavoidable part of her nature. When she tried to suppress this propensity to study in her early convent days, "it exploded like gun powder (Trueblood, 1988)." As to her approach, she said: "My studies have . . . been so extremely private that I have not even enjoyed the direction of a teacher, but have learned only from myself and my work (de la Cruz, in Paz, 1983)." When not occupied by her convent obligations, her time was taken by "reading and more reading, study and more study, with no other teacher than books themselves.

Why Was Her *Reply to Sor Filotea* Not Published?

It seems that the friction between Santa Cruz, the bishop of Puebla and the Archbishop, Aguiar y Seijas intensified with Sor Juana's theological critique of Vieyra. Vieyra had dedicated earlier works to Aguiar and the Archbishop had ensured at least one earlier publication of Vieyra's as he moved from Michoacan to become archbishop of Mexico City. Aguiar and his supporters would have fully understood that the critique was an attack intended to embarrass him. Aguiar's abhorrence of women was widely known, so the masterful critique by one nun and its supposed publication by another would have been like a slap on the face for the Archbishop. Knowledgeable people would have instantly recognized that Bishop Fernandez de Santa Cruz was sponsoring the publication of the *Carta* by his use of the pseudonym of Sor Filotea de la Cruz, a nun and "student" of Sor Juana.

It is quite possible, even plausible, to view Santa Cruz's letter (from Sor Filotea) as a statement of praise and support. The expressions of encouragement to write more about religious matters follows praise for the appropriateness of the theological critique of Vieyra. Seen positively, it is support from a high church official to continue working in theology.

If this interpretation is correct, why did Santa Cruz not print the *Response* which his letter invited? A reasonable guess is that by the time it was ready Sor Juana had learned that Aguiar y Seijas would attack her by seizing assets of her convent. There was nothing the bishop of Puebla could do about this because the convent was not in his jurisdiction.

Holding Sor Juana's monastery hostage was en effective strategy so long as Aguiar could not be effectively challenged. We know that the archbishop demanded much of what Sor Juana personally owned and also confiscated assets belonging to her house. This would have produced strong pressure from her religious sisters to alleviate the stress Aguiar y Seijas was putting on all of them. The second printing of the first volume of Sor Juana's work would have arrived from Spain about this time to be shortly followed by the second volume containing seven theologians' approval. "The effect must have been just the opposite of what was desired," notes Paz. "The book was seen not as a refutation but as a challenge (Paz, 1983)." Under these circumstances publishing Sor Juana's eloquent response to Sor Filotea would have simply increased Aguiar's anger—and his negative actions against the convent of St. Jerome.

Her Death

By 1693, Sor Juana was apparently compelled to take Father Nunez back as her confessor. She gave up most (all?) of her books and scientific instruments for sale. In April 1695 many of Sor Juana's sisters in the convent fell ill because of a plague. Several of them died as a result , and after several days of intense involvement in helping the sick, Juana herself died from the illness. She was forty-six. She was buried in the convent.

Silenced or Defeated?

All societies have an official knowledge. And, when a set of people don't abide with **who** may produce knowledge, that will inevitably create conflict. Sor Juana by producing knowledge, confronted a dominant paradigm of her time. What she had to say was not really the issue. It was not that her knowledge was incorrect either. The real issue was whether or not a nun, a woman, should engage in producing knowledge and publishing it. If a man had written the same material that Sor Juana wrote, he would not have been charged with anything. Her efforts to include women as legitimate participants in knowledge production and dissemination has contributed to our own ability to bring about desirable educational change and democratic renewal for which we can all be thankful.

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A New Knowledge: Feminism From An Africentric Perspective

by Phyllis Ham Garth

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Introduction

What is invisibility? Does invisibility occur when something is not here, nonexistent? Or, does it occur when something exists, but is obscured by factors or social structures that render it shapeless, voiceless and thus, nonexistent?

The issue of invisibility is one that has historically characterized the debates around the relevance of white middle class feminism given its exclusion of Women of Color. Where, for example, are Afrikana women in mainstream feminist discourse? Where are their voices, their experiences, their realities? Indeed, they are invisible in that they have been rendered voiceless, their experiences shapeless in this discourse. Yet history is full of examples of the existence of Afrikana women in this country, one, according to La-Frances Rodgers-Rose (1980), that has been characterized by nearly four hundred years of struggle to exist, to be their own persons, not only for themselves but for their families. So where are they? Jean Yellin (1982) tells us that:

> Their presence is what is most important. If we are unaware of Black women in nineteenth-century America, it is not because they were not here; if we know nothing of their literature and culture, it is not because they left no records. It is because their lives and their work have been profoundly ignored. Both as the producers of culture and as the subjects of the cultural productions of others, however, their traces are everywhere (Yellin, in Hull, et al., 1982:221).

This statement by Yellin is most revealing. It calls our attention to the "invisibility" of Afrikana women in historical text. Yet, when we examine Afrikana women's experiences from their own voice, we find they have engaged in actions that historically were either/or both self-liberatory and liberating for Afrikan Americans as a group. Long before American women out of European cultural underpinnings became involved in organized activities later defined as feminism, women from Afrikan cultural underpinnings engaged in both formal and informal efforts to self-actualize; to define and secure their liberation.

Afrikan American women (aka Afrikana women) have been actively involved in the feminist movement from the onset of slavery. Their feminist struggle grew out of a history of oppression that shaped, created and recreated in them a sense of independence, knowledge and skill at warfare, and a deep commitment to their personal survival and that of their race. Sometimes in conjunction with Afrikana men and sometimes not, Afrikana women have consistently struggled against racist oppression in both formal and overt ways and informal, intangible covert ways. In this sense, Afrikana women were the forerunners of the Euroamerican middle class feminist movement. However, Euroamerican mainstream feminist theory and Women's Studies present a way of looking and seeing feminism that obscures the historical collective experiences of Afrikana women. Euroamerican feminists have the power to name that which goes by the name of "feminist." In this regard, they have produced and validated knowledge that ignores or at best marginalizes the knowledge, perspectives, and experiences of Afrikana women. They have been successful in centering their issues and experiences and decentering the issues and lived experiences of other women.

The purpose of this article is to begin to sort out and clarify various constructions of feminism paying particular attention to Afrikana women's self-definitions of feminism. This article is a "working paper" that is part of a larger more industrious project to develop and

explicate a new knowledge of feminism, in general, and Afrikana women's feminism, in particular. In this article, I will simply delineate and illuminate the various strands/theories of Afrikana women's feminism, identifying common themes as well as differences across conceptualizations of feminism.

The methodology utilized in this article consists of a critical analysis of literature identified by a search of feminist/womanist writings and discourse. Themes are identified in these writings and Afrikana women's feminism is classified and discussed within the following three categories: Black Feminism, Womanism, and Afrikana Womanism. The article concludes with a working definition and critique of mainstream Euroamerican feminism vis-a-vis the feminist theories of Afrikana women.

Black Feminism

Black feminism as a concept can be said to represent a point of view that emphasizes or is characterized by a focus on the historical realities of enslavement; the lived experiences of Afrikana women; the manifold and simultaneous oppression of race, class, and gender; and the life and death struggles for survival and liberation. This conceptualization of Afrikana women's feminism can be found in the works of Afrikana women scholars such as Patricia Hill-Collins (1989), bell hooks (1984), the Combahee River Collective (1980), and Michelle Wallace (1975).

According to Patricia Hill-Collins (1993), the origin of Black feminism is the lived experiences that enslaved Afrikan women brought with them to the United States in the eighteenth and early nineteenth centuries. Prior to their enslavement, Afrikan women were socialized to be independent, self-reliant, and resourceful. Despite the fact that this Afrikan feminism was modified by slavery, Afrikana women were determined to maintain these key elements of their Afrikan self-definitions as women.

Sometimes in conjunction with Afrikana men and sometimes not, Afrikana women have consistently struggled against racist oppression in both formal and overt ways and informal, intangible covert ways.

Contemporary conceptualizations of Black Feminism such as Collins', have their historical roots in the perspectives and activism of early nineteenth century Afrikana women, such as Sojourner Truth, Mary Ann Shadd Cary, Harriet Tubman, and Lucy C. Laney. However, although these Afrikana women laid the intellectual and political groundwork for a "Black Feminism," it was twentieth century Afrikana women that brought Black Feminism as a political movement and Black feminist thought as its intellectual voice and vision to full fruition (Collins, 1993).

Organizing around Afrikana women's struggles against racism, sexism and heterosexual oppression, the Combahee River Collective developed and articulated a statement on Black feminism and activism that firmly melds the two together. Afrikana feminist Barbara Smith describes the Combahee River Collective statement as "a concise articulation of Black feminist theory and practice. It exemplifies the way in which the richest analysis and ideology are integrally connected to organizing: that theory and practice are simply different spokes of the same wheel of making change" (Smith, 1986).

The Combahee River Collective basically defines Black Feminism as a logical political movement to combat the multiple and simultaneous oppression that all women of color experience. According to the Collective, the genesis of contemporary Black Feminism involves an affirmation of its origins in the historical reality of Afrikan American women's continuous life-and-death struggle for survival and liberation.

Picking up on this theme, Collins (1989) talks about Afrikana women's sustained resistance as the creation of a powerful foundation for a more visible Black feminist activist tradition.

This tradition is greatly influenced and shaped by the goals of Black feminist thought. Collins attributes the enduring and shared resistance among Afrikana women to their understanding of their oppression and their appropriate action to resist it. Afrikan American women have a self-defined position on their own oppression. They have a distinctive set of experiences due to their political and economic status. These experiences provide them with a different view of material reality than available to other groups. Afrikan American women experience a different world, a world that is unique only to them. In this sense, Afrikan American women have a distinctive Black feminist consciousness, one that has been structured by the intersection of race, class and gender. Thus, Black Feminism as a concept, concerns itself with the simultaneity of race, class and sexual oppression.

In addition, the concept of Black Feminism stresses the importance of solidarity with Black men. This is in

contradistinction from those Euroamerican and other feminists who advocate the separation of women and men. According to the Combahee River Collective, "our situation as Black people necessitates that we have solidarity around the fact of race, which white women of course do not need to have with white men, unless it is their negative solidarity as racial oppressors" (1986:12).

Womanism

Womanism is a concept utilized by some Afrikana women to characterize their commitment to the survival and wholeness of entire people, female and male alike.

The womanist philosophy represents a consciousness that incorporates racial, cultural, sexual, national, economic and political considerations of oppression. The concept of "Womanism" is borrowed from writer Alice Walker (1983) who coined the term following her review of Rebecca Jackson's autobiographical writings. Amid the editor's speculation that the relationship between Jackson and Rebecca Perot might have been construed in a modern context as lesbian, Walker attempted to clarify and distinguish Afrikana women's conceptualization and lived experiences of feminism. According to Walker, in the Black feminist cultural tradition, "womanism" includes women's love for other women but it is not separatist (Hine, 1993). Embracing and sometimes expanding Walker's concept of Womanism, a variety of Afrikana women have used this concept in their explications of Afrikana women's feminism. These women include: Elsa Barkley Brown (1989), Chikwenye Okonjo Ogunyemi (1985) in Donaldson, 1992, and Margaret A. Shaw (1992).

According to the Walker definition of womanism, a womanist can be described as a Black feminist or feminist of color. The concept was derived from the expression of mothers in the Afrikana community: "you are acting womanish." By this they simply meant that a not yet adult is acting like an adult, like a woman, wanting to know more than you should, wanting to be grown. Some Afrikana women who define their feminism in terms of the concept of womanism often relate to Barbara Smith's insightful discussion of the intersection of race, class, and gender. According to Barbara Smith (1983), everything in the world kicks our behinds—race, class, gender, and homophobia. She emphasizes that it is counterproductive to rank oppression. Sexism like all other isms is a part of our lives. Responding to Barbara Smith's comments, Ogunyemi contends that, "this description of 'womanism' affirms the interweaving of oppression and incorporates sexual, racial, cultural, national, and economic considerations into any politics of reading" (Ogunyemi, in Donaldson, 1992:21).

Afrikan American women experience a different world, a world that is unique only to them.

According to Brown (1989), many women have adopted the term "womanism" to avoid the limitations of other terminology. Walker and Ogunyemi define "womanism" as a type of consciousness that includes considerations of race, culture, sex, nationalism, economics, and politics. Brown quotes Ogunyemi as saying: "black womanism is a philosophy, that concerns itself both with sexual equality in the black community and 'with the world power structure that subjugates' both blacks and women" (Brown, 1989:613-14).

Margaret Shaw (1992), posits that Black women's concerns center on structural inequality, for example, race, class, rather than their place in the structure. She view's white feminists as being concerned with shifting the power from white middle-class males to themselves within the same oppressive racist system, whereas Black women of all socioeconomic status are concerned with changing the racist oppressive system (dominant power system) to effect equality for all people including Black men. Shaw provides a contrasting view of oppression. Male supremacy is regarded as the enemy by white feminists, but Black women view white supremacy as the enemy. White feminists are concerned with individuality (I and me), and Black women are concerned with uplifting the entire Black community. Shaw contends, "feminists tend to be middle-class and white and have as their major concern sexist economics versus the trilogy of Black feminist issues of race, class and economic oppression...we are all women but our experiences do not allow us to share common ground" (1992:21).

Afrikana Womanism

Afrikana womanism is a concept coined and defined by Clenora Hudson-Weems in 1987, and introduced at the National Council for Black Studies Conference in March, 1988. Hudson-Weems believes that it is crucial that women of the Afrikan Diaspora name and define their own unique movement. According to Hudson-Weems (1992), the term feminism, as defined and used by Euroamerican women, does not portray the reality of Afrikana women or their level of struggle. In many respects, it represents a type of inverted white patriarchy, with

Euroamerican feminists in charge and on top. Vivian Gordon eloquently articulates this perception. According to Gordon, "the movement fails to state clearly that the system is wrong, what it does not communicate is that white women want to be a part of the system. They seek power, not change" (Gordon, 1987:47).

Hudson-Weems argues that "Black Feminism" is a modified terminology that reflects some Black women's attempt to fit into an established Euroamerican feminist paradigm and thus should be reevaluated. Her position is that while it may deal with issues of sexism it does little or nothing to clarify the critical problems within the Afrikana community which are influenced by racism and classism. According to Hudson-Weems, historical realities greatly differ for mainstream feminists and womanists, subsequently a feminist ideology is not equally applicable to womanists. In support of this position, Hudson-Weems quotes Historian Bettina Aptheker who analyzes the problem accordingly:

> When we place women at the center of our thinking, we are going about the business of creating an historical and cultural matrix from which women may claim autonomy and independence over their own lives. For Women of Color, such an equality, such as empowerment, cannot take place unless the communities in which they live can successfully establish their own racial and cultural integrity (Aptheker, in Hudson-Weems, 1989:187).

Hudson-Weems finds "Afrikana Womanism" to be a more compatible and affirming concept. Using this concept, she develops a new terminology and paradigm for Afrikana women offering an alternative critical theory of feminism. Hudson-Weems sets out eighteen characteristics that distinguishes "Afrikana Womanism." These points can be summarized as follows: Afrikana women name and define themselves; are family centered; believe in sisterhood; encourage male presence and participation in their struggle; possess and demonstrate great strength; desire positive male companionship; have flexible roles as homemakers; demand respect and recognition in the search for wholeness and authenticity; are extremely spiritual; respect and appreciate elders and encourage their young to do the same; demand no separate space for nourishing their individual needs and goals; and are ambitious, but committed to mothering and nurturing their families, in particular and society in general.

According to Hudson-Weems (1992), the term feminism, as defined and used by Euroamerican women, does not portray the reality of Afrikana women or their level of struggle.

According to Hudson-Weems, "Afrikana Womanism" portrays the activism and the role of Afrikana women, and can be traced back to Sojourner Truth's speech which Hudson-Weems claims set the stage for Afrikana women's discourse that focused on their unique experiences, needs, and desires.

Conclusion

My analysis of Afrikana women's feminism highlights the problematic nature of Euroamerican feminism. It is clear from these conceptualizations that mainstream Euroamerican conceptualization of feminism is an inappropriate framework to address the concerns and issues of Afrikana womanism. What is mainstream Euroamerican feminism? Mainstream Euroamerican feminism is the dominant feminist paradigm in the United States. It comes from privileged Euroamerican women who have been and continue to be middle class, professional and/or academics.

As Afrikana feminists, such as bell hooks (1984) points out, this paradigm (1) negates the knowledge and lived experiences of Afrikana women; (2) ignores the complexity and diversity of Afrikana women's experiences; and (3) assumes that the reality of Euroamerican middle class women is the reality of all women. Thus, it reflects their class interests. In other words, they have been successful in making their interests the definitive statement of feminist theory.

Historically, Afrikana women have had respect for difference. Our lived experiences and the contemporary realities of racism, sexism, and classism have sensitized us to respect difference. Many Euroamerican feminists have failed to acknowledge our experiences, and the multiple and interlocking oppression which have shaped our lives. This may be partially attributed to the dominant feminist paradigm's co-optation of mainstream patriarchal values. It seems apparent that some Euroamerican feminists seek power within the very system that they view as oppressive. Why should Afrikana women wholeheartedly embrace a movement that is counterproductive and will not benefit them?

In addition, some Euroamerican feminists' demand for independence and freedom from family responsibility is problematic for Afrikana women. Afrikana women's opposition to the aforementioned has been historically demonstrated. hooks (1984) regards the feminist devaluation of family life analysis as a direct reflection of the class nature of the contemporary feminist movement. hooks states, "We wish to affirm the primacy of family life because we know that families are the only sustained support system for exploited and oppressed peoples. We wish to rid family life of the abusive dimensions created by sexist oppression without devastating it" (1984:37).

The uniqueness of Afrikana women's experiences cannot be overstated. We, unlike many others, were subjected to being dehumanized on a daily basis during slavery. Afrikana women have endured and continue to endure oppression that Euroamerican women neither experienced nor were subjected to. Afrikana women were ruthlessly exploited. We were enslaved, separated from our families, lynched, brutally raped and murdered. In her book, "Women, Race and Class," Angela Davis elaborates on this experience in her discussion of Afrikana women under slavery:

> Black women were equal to their men in the oppression they suffered; they were their men's social equals within the slave community; and they resisted slavery with a passion equal to their men's. This was one of the greatest ironies of the slave system, for in subjecting women to the most ruthless exploitation conceivable, exploitation which knew no sex distinctions, groundwork was created not only for Black women to assert their equality through their social relations, but also to express it through their acts of resistance...If Black women bore the terrible burden of equality in oppression, if they enjoyed equality with their men in their domestic environment, then they also asserted their equality aggressively in challenging the inhuman institution of slavery (Davis, 1983:19,23).

Davis also addresses the issue of expediency. She contends that when it was politically or economically expedient (profitable) to do so, the white slaveholder exploited Afrikana women as if they were men. That is, in effect they rendered Afrikana women genderless. On the other hand, when they could be exploited, punished and repressed in ways that only women could, then they were locked into their female roles.

Some Euroamerican feminists, like earlier slaveholders, utilize expediency to meet their agenda. Many of them do not differ very much from their male counterparts in their 'timely inclusion' of Afrikan American women. When it affords them credibility Afrikan American women are included in their discourse. However, issues germane to our lives and experiences are virtually nonexistent in the mainstream Euroamerican feminist movement.

According to Hudson-Weems:

> For many white women, Afrikana women exist for their purpose—a dramatization of oppression. White women define themselves as the definitive woman . . .there was no need to name their studies as 'White' Women's Studies. . . Gender-specific discrimination is the key issue for Women's Studies, it unfortunately narrows the goals of Afrikana liberation and devalues the quality of Afrikana life. Thus, it neither identifies nor defines the primary issue for Afrikana women or other Women of Color. Therefore, it is crucial that Afrikana women engage in self-naming and self-definition, lest they fall into the trap of refining a critical ideology at the risk of surrendering the critical self (1989:107).

Hudson-Weems goes on to say that the interpretation of the Afrikan experience is often imposed by Euroamerican feminists when it is convenient for them. They dramatize our oppression. A case in point can be found in their interpretation of Sojourner Truth's "And Ain't I A Woman" speech. It is ironic that Euroamerican feminists refer to this speech often to show that Afrikana women's concern, like theirs, was with sexist oppression. However, according to Hudson-Weems (1989), Sojourner was attacking not embracing a part of the Women's Rights Agenda that was excluding her.

The voices of women from the Afrikan Diaspora must be heard.

It is also both tragic and ironic that the contemporary feminist movement parallels the early women's movement in its sustaining racist practices. Diane Lewis (1988) posits that the current movement continues to deny the importance of our history and experience. According to Lewis, essentially Afrikana women occupy the same subordinate status within the current

Euroamerican women's movement as we do outside the movement.

The feminist movement has historically been framed to reflect Euroamerican feminist issues and experiences while peripheralizing and trivializing the issues of Afrikan American women, and others. Due to the unique oppression of Afrikana women, the importance of this article cannot be overstated. The voices of women from the Afrikan Diaspora must be heard. Throughout American history, the images of Afrikana women have been distorted and their contributions commandeered or dismissed.

The experiences/knowledge of Afrikana women must be considered and acknowledged within mainstream feminist/Women's Studies. Therefore, if the knowledge/experiences of women from the Afrikan Diaspora continue to be ignored or marginalized within feminist/Women's Studies, then feminism is a viable contributor to the enduring oppression of Afrikan American women. Thus, the contemporary feminist movement will perpetuate and exacerbate the same imperialist and oppressive forces that existed prior to its emergence.

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Double Functions of Knowledge Production in Education: Enlightenment and Emancipation or Dominance and Domestication

by Kyung Hi Kim

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The theory and practice of education, which, as a whole, represents learning, inquiry, understanding, and the knowing process, traditionally has been assumed to contribute toward the development of enlightenment and emancipation from ignorance. Indeed, the educational project of enlightenment and emancipation from ignorance provides the fundamental justification for the education of persons within society. The need for education is identical to both the personal and socio-cultural need to be enlightened and emancipated from ignorance. This educational need for enlightenment and emancipation originated in the contexts of human and social needs.

A fundamental question then arises: Why do persons and society need enlightenment and emancipation? Why not remain in ignorance? Does enlightenment necessarily lead to emancipation? The search for the answers to these questions can be related to the aspiration to construct and realize the democratic principles of human life and society. Furthermore, this search explores and explicates how knowledge leads to the construction of the democratic life and a democratic society.

In the effort to become enlightened, or simply to become less and less ignorant, the development, construction, and production of knowledge, which epitomize the opposite character of ignorance, constitute the primary educational endeavor. This means that the educational project of knowledge construction and production is assumed to be connected to the achievement of enlightenment and emancipation. But are they really connected in our most influential educational theories and practices? Unfortunately, a great number of critical educators claim that knowledge construction and production in education have been a crucial tool for domestication and dominance over people (Freire, 1992; Giroux, 1981; Shor, 1987). This view contradicts the prevailing views of the function of knowledge construction and production. At this time I want to attempt to clarify these apparently contradictory functions of knowledge production in education and to discuss some of the implications of their contradictory views of the functions of knowledge production in education.

I will lay out the contradictory functions of knowledge production by examining and analyzing the following concepts and relationships: a) the nature and character of knowledge; b) the nature of the subject and object relationship in knowledge production; c) the question of what determines and defines the divisions addressed in a) and b); d) the contradictory nature of these divisions; e) the problematic of prevalent knowledge production as a hegemonic and ideological tool for domestication and dominance; f) the necessity of knowledge in relation to enlightenment and emancipation.

. . . all persons are taking part in constructing a more self-determining, just, and democratic life and society.

I begin with the nature and character of knowledge. Traditionally, knowledge is distinguished from mere opinion and information. Then, what characterizes this distinction? What do we mean when

we say to others, "it's just my opinion." This statement simply offers "my" subjective opinion. And it presents no clear grounds to convince others. Nor is my subjective opinion meant to be an objective opinion which can be sharable and agreeable to everyone or anyone else. Therefore, one characteristic of mere opinion can be the lack of elaboration and grounding for arriving at shared understanding.

What characterizes information? As our modern and postmodern time is often epitomized as the "information age," we hear such phrases as "information agency," "information theory," and "information center." Moreover, we have even come to accept the view that schooling is "information centered," or that the school is an institution for the 'production and distribution of information' to meet the demands of our "information age." Therefore, we are quite accustomed to hearing comments from students such as, "I do not think I learned anything because I was not informed of anything new." Or, "this class was very informative."

What do these comments represent? Usually, they represent an input and output product oriented teaching and learning process. In other words, in the learning process, students are preoccupied with figuring out how many items of information there are and with making sure they get those items in time for their tests and in order to get a good grade. Moreover, students are interested in adding more items of information to their information storage. As evidenced from the above illustrations, and since information is perceived as isolated and fact-oriented items, things, or news, information tends to have a quantitatively cumulative character. However, those linearly structured, separated items of information do not foster critical thinking, reflection, and analysis of possibly related and interconnected phenomena. If one cannot identify, elaborate, and clarify the relationships between and among the factors and elements of phenomena, one cannot say that one has a clear and critical understanding of them. And if one has not a critical understanding, it will be harder for one to develop an insight into the subject or issue one is studying.

Unfortunately, a great number of critical educators claim that knowledge construction and production in education have been a crucial tool for domestication and dominance over people.

The nature and character of knowledge can be better understood through comparison with mere opinion and information. One will not say, "It is just my knowledge," if one does not have any intention or desire to share one's knowledge with others and making it agreeable to them through contributing to convincing and helping them reach understanding. Information by itself is not knowledge (Barnes, 1984; Gray, 1968; Maritain, 1940). Information is material for that understanding and insight which knowledge is. Information can become knowledge only when separated items of information are related to each other through one's critical reflection and analysis. And critical reflection and analysis of relevant information would lead one to develop critical understanding and insight into what one investigates in the process of attempting to construct and produce knowledge.

Who is capable of knowing? Who is capable of constructing and producing knowledge? Do we understand that these two questions are asking the same thing? Or do we understand them differently? In respect to the first question, most people would say that throughout our lives we are all involved in some way or other in the knowing process, therefore, we can say that we all are capable of knowing. As for the second question, most people would say that not all people are capable of constructing and producing knowledge and that only some specific and special people can do that job. Then, who are the people who are assumed to be in the position of, or in charge of, producing and distributing knowledge? Most people would answer that highly trained and educated experts, scholars, and academicians are the ones who are responsible for knowledge production and distribution.

Why do we believe that all of us are capable of knowing, but are not capable of producing knowledge? This division between being able to *know* and being able to *produce knowledge* is very closely related to the subject and object relationship in knowledge production in education. Teachers are the ones who are in the position of producing and distributing knowledge to students. And students are the ones who are in the position of receiving, being transmitted to, being imposed upon, and being indoctrinated into the knowledge. Therefore, it is clear that teachers are the subjects and students are the objects in terms of knowledge production and distribution in education.

What determines and defines this division and what legitimizes this division? What makes us beleive that teachers have the authority to produce and distribute

the knowledge to the learners even though we all, whether we are teachers or learners, take part in the knowing process and are all capable of knowing? One good symbol of legitimizing this division is considered to be the teachers' possession of degrees or certification. Possessing degrees and certification represent persons' fulfillment and completion of the objective standards and conditions sufficiently well for them to be able to construct, produce and distribute knowledge to other less educated or non-educated persons. Therefore, one generally accepted criterion for telling the difference between a person who is capable of knowing and a person who is capable of producing knowledge, in other words, between ordinary persons and elites, is the attainment of degrees and certificates which attests the completion of requirements and the possession of the necessary objective standards.

What characterizes the objective standards? Are these so-called objective standards necessarily the right standards for proving that one knows what knowledge is? Should we always consider that persons who have achieved these objective standards are the only ones or the best ones authorized to produce and distribute knowledge? Who constructs the objective standards? No one would doubt that one reason objective standards are framed by the academic elites is to produce other elites and to legitimize the knowledge industry for the elites. Given the problematic nature of knowledge production up to this point, we should further ask by whom, for whom, and for what is knowledge produced?

Depending on the different answers for these three questions, we can see that knowledge production can have double and contradictory functions. If the questions are answered with the claim that knowledge is produced only by the elites, for the elites to perpetuate and legitimize their privilege through claiming their authority, then knowledge production is functioning as a means for domesticating people into the masses and for dominating them. However, if the questions are answered with the claim that knowledge has been constructed and produced by all people who are living on this earth, for the ones who are struggling and searching for a better life, and for the construction of a more humanized life and society for all through overcoming ignorance, prejudice, injustice, and irrationality, then knowledge is produced by the attainment and advancement of enlightenment and emancipation from ignorance. This means that all persons are taking part in constructing a more self-determining, just, and democratic life and society.

I am arguing that the contradictory functions of knowledge production can be more fully overcome when education connects the capability of knowing with the capability of constructing knowledge.

If we agree that knowledge production in education is elite-specific, and is oriented and dominated by them, then knowledge production and distribution can perpetuate the legitimation of elite dominance over other people. Moreover, the dominance over other people by elites can be strengthened through domesticating them by promoting information- oriented, technocratically structured, and input and output product-centered educational processes, which do not foster critical thinking, reflection, and analysis in education. In other words, elite-centered knowledge production can be a powerful ideological and hegemonic tool for dominance and domestication. We cannot but ask again, Why we are involved in learning? To understand and make more sense about human life within human society? Or to purchase and sustain privilege and dominance?

If we go back to my previous discussion on the nature and character of knowledge, it is clear that the pursuit and attainment of knowledge require critical reflection, analysis, understanding, and a willingness or desire to share and to convince others through developing rational and reasonable arguments and justification. In this sense, the attainment of knowledge can lead one to become more enlightened and to become emancipated from ignorance, prejudice, and dogmatic irrationality. If this is so, why do we have contradictory functions of knowledge production in education? And how can we overcome this contradiction? I will say that the division between being able to know and being able to construct knowledge is the crucial cause for this contradiction. Therefore, I am arguing that the contradictory functions of knowledge production can be more fully overcome when education connects the capability of knowing with the capability of constructing knowledge.

In conclusion, I believe that the process of education can be better justified when educational projects promote enlightenment and emancipation-oriented knowledge construction and production. The reason for this is that enlightenment and emancipation are the necessary and crucial elements in our aspirations toward constructing, and par-

ticipating within, needed democratic renewal. Therefore, if we understand the contradictory function of knowledge-production in terms of its use as promoting domestication and dominance over people, I propose that desirable educational change must focus on overcoming the contradictory characters of knowledge production. Knowledge as a potential process of enlightenment and emancipation can be related to the realization of fundamental human and social needs. Moreover, human and social needs are very fundamentally related to the creation and continued recreation and renewal of democratic life and society.

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Future Issues

November, 1994 — **School-University Partnerships**

February, 1995 — **Creating Effective Workplace Literacy and Preparation**

May, 1995 — **Safe Schools Through a Comprehensive, Effective, and Positive Strategy: An International Perspective**

The Pedagogy of Information Technology: The Faster We Go the Behinder We Get

by Byron Anderson

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We've got a future and it's rushin' in.

Paul McCartney "We're Gonna' Get It Right"

My largest worry is that students will come to confuse information with education. To inform is not the same as to learn. (Suber, 1992)

The Information Age has been much touted, but when historians and others look back and reflect on the twentieth century, the move of society from an industrial base to an information base will likely be the most significant event of this century (American Library Association, 1989). Our society generates a prodigious amount of information. Approximately every fifteen years the amount of information in the world doubles. We generate over one billion pages of output each day in the United States alone. There are over 1.3 trillion documents stored in the country's business and government offices. (Frappaolo, 1993) Keeping track and making sense of available information is becoming increasingly difficult. What is being done to keep up with the information explosion? The answer lies in electronic information technology—online, CD-ROM, networks, discussion lists, ftp file transfer, e-mail, etc.

No technology has ever unfolded its potentialities as swiftly as computers and telecommunications are doing (Rosak, 1984). Ten years ago, personal computers were still relatively new, and the situation ten years from now is nearly impossible to predict. Already here and developing quickly are technologies such as virtual reality, interactive multimedia, and interactive cable. Today's communication companies, cable television providers, computer giants, and entertainment empires are realigning themselves to get a piece of this new pie. Technology has taken on a momentum of its own, so much so that its capacities have been stated with exaggerated claims. For example, I.G. Good and Christopher Evans in describing machine intelligence during the 1970s and early 1980s said, "The UIM (Ultra Intelligent Machine) will enable us to solve any practically solvable problem and we shall perhaps achieve world peace, the elixir of life, the piecemeal conversion of people into UIPs (Ultra Intelligent People), or the conversion of the world's population into a single UIP" (Rosak, 1984, quoting Good and Evans). Events since that time, while being technologically significant, would suggest that this type of thinking was exuberant and grossly exaggerated. Unfortunately, today's claims about technological capabilities continued to be overly optimistic.

A good way to think of information technology is to think of the personal computer, telephone, fax, modem, e-mail, ftp file transfer, networking, CD-ROM, interactive media, and multi-channel cable all in one.

Technology has become an all purpose weasel word meaning all things to all people; however, whether computers are God-like and capable of great things is not the point. For information technology the point is that it is here to stay, will continue to grow and take on new roles. We need to take this technology seriously and discover what it can do for us and to us. Immediately

recognizable are the rapid strides that technology has made in storing, organizing, retrieving, and networking of information, the four cornerstones of electronic information. Advances in fiber optics have created the potential to transmit the entire contents of the Library of Congress (60 terabytes of information or 60 billion sheets of paper) from Chicago to New York in only two hours. Over traditional copper wiring, this same transmission would take 2,000 years to complete (Frappaolo, 1993). In 1983, there were 310 million online database records; today there are more than five billion. The information explosion has become an information implosion, that is, access to an enormous amount of information through a single source—the personal computer. A good way to think of information technology is to think of the personal computer, telephone, fax, modem, e-mail, ftp file transfer, networking, CD-ROM, interactive media, and multi-channel cable all in one. There is little question that information technology has laid the foundation for a new world order.

It is interesting to note that before personal computers, we had little difficulty defining the term "information." Now we seem overwhelmed with the amount and types of information available and use adjectives such as inundate and overload to describe the current picture. Early in the picture of electronic information Naisbitt (1982) said, "We are drowning in information but starved for knowledge." New phrases have been coined such as "information literate" to define a level of intelligence citizens need in order to perform adequately in society. Its current meaning and use came in response to national education reform initiatives such as the Department of Education's A Nation at Risk which proposed a fourth "R" of computer literacy, and the proposed Goals 2000: Educate America Act. The American Library Association Presidential Committee on Information Literacy (1989) stated the need to "underscore the importance of access to and use of good information in an age characterized by rapid change, a global environment, and unprecedented access to information." The U.S. Department of Labor's SCANS Report for American 2000: What Work Requires of Schools, identified five competencies for workplace know-how: resources, interpersonal skills, information, systems, and technology. Three of the five involve components of information or technology.

A number of conceptual and organizational changes need to take place when introducing information technology into a curriculum.

Most of the literature on information technology discusses the hardware and software capability, but little of the training required for teachers and others to instruct students properly in understanding, accessing, evaluating, and using electronic information. There is even less research in how to educate an individual to become information literate, and we are just now coming to define information literacy. The American Library Association (1989) has issued a statement that defines an information literate person as one who is "able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information."

The remainder of this article will examine how technology changes the concept of information and what issues to consider when introducing the technology into a school's curricula. The pedagogy called for is not a new information access course, though this could be part of a larger picture, but rather a restructuring of the learning process. The restructuring is meant to incorporate information technology across the curriculum, and base the instruction on practical as well as the conceptual skills, that is, the evaluation and utilization of information retrieved.

Information technology, it would seem, should provide its own instruction for proper use. After all it's accessing a world of information. Yet, there is an estranged relationship between the users and the systems or products themselves. There are a number of reasons for this incompatibility. Barriers to access include among others a lack of standardization which causes wide variations in the way different systems work; sparse or excessive instructions that accompany a product; poor screen design; poorly worded instructions and help screens; and finally, a failure to provide a plan for formalized training of those who will be responsibile to teach others in the proper use of the systems and products.

In accessing online, CD-ROM or other electronic information, technology must not be the dominating factor. Users must be kept central to the activities of the technology. System boundaries must recognize the needs of the user, not just the systems designer (de la Pena McCook, 1993). Human/machine interfaces, the result of choices made by designers, appear to many users as things to which they must adapt. Systems analysts need to pay more attention to the ways in which people interact with computers and how information is used in real-life contexts. (Dunlop and King, 1991)

A well designed system will keep the user in charge, but more often than not the user will have to adapt to the silicon chip. Why is this socialization process tolerated? We have fallen victim to the seductive powers of computers, that is, we have a love affair with machines. We measure social progress in terms of technological progress, and resign ourselves to what computers offer regardless of consequences. Promotions capitalize on this love affair by incorporating anthropomorphic terms like "memory," "friendly" and "intelligence" into the sales pitches. While expressing easy access, the terms lack substance, are euphemestic, and have little meaning, other than making it a little more palatable (Barry, 1991). The delivery of information in microseconds is of negligible value if a poorly conceived presentation requires great effort by the individual to use the information (Ray, 1993).

We need a more realistic picture of what electronic information is and is not. In very basic terms, electronic information is no more than the digitizing of text, sound, graphics, pictures, and/or movement, into an electronic sequence of on/off codes called bits. Eight bits equal one byte, and bytes translate into characters, sounds, movements, or colors. The electronically coded information can then be relayed in on/off sequences over communications channels virtually anywhere in the world at very high speed. However, information, even when it moves at the speed of light, is no more than it has ever been—sometimes useful, sometimes trival, but never the substance of thought. Simply spreading a lot of information around through a lot of new technological devices doesn't mean anything (Billington, 1987). The mind thinks with ideas, not with information (Rosak, 1984).

The technology of electronic information has greatly outdistanced society's ability to assimilate it. Turning unlimited access to information into useful ends is the role of teachers, and the role of teachers is to impart knowledge. It is crucial that information technology be taught properly, including both the practical skills for access and critical thinking skills for evaluating and utilizing. Technology that simply delivers information is not education or educational. The technology is a tool, a means to an end, and not an end in itself. Technology, while a relevant player in the education process, isolates or ignores many of the conditions that make education relevant to the student: well-developed courses, engaged instructors, effective assignments, a good balance between structure and flexibility in a course, and uncongested facilities. Teachers bring sensual contact, intuition, inarticulated common sense judgements, and aesthetic taste—those things that are largely, if not wholly, left out of computer technology (Rosak, 1984).

Technology that simply delivers information is not education or educational.

Introducing Information Technology into the Curriculum

School systems are in a transitional period between traditional-based curriculums and technology-based curriculums. Using electronic information as a curriculum-based tool requires that administrators and teachers do the technology two-step, that is, dance as fast as they can in order to keep current with developments in the technology. The continual barrage of new software, hardware, systems, products and formats can make for a frazzled and resistant teaching staff.

A number of conceptual and organizational changes need to take place when introducing information technology into a curriculum. The organization and restructuring needed to accommodate information technology requires a plan. Students must learn both practical skills, (i.e., keyboarding, access procedures and commands, and system navigation), and conceptual skills, (i.e., understanding what information is being accessed, how to evaluate its reliability, and how to use the results toward problem solving). Below are areas that need to be considered by school systems, including administrators and teachers before implementing information technology as part of the curriculum.

Administrative Support

Before implementing information technology in the classroom, there must be agreement between administrators and teachers on the standard of content, methods to be used for instruction, and goals to be achieved. Too often, computer workstations are "dumped" on unprepared teachers with no provision for teacher training or curriculum direction. Once computers arrive, sometimes free, teachers have to scramble to improvise educationally defensible uses (Rosak, 1984). Society in general lacks a plan for computerization and information technology. We automate much for the sake of automation, and few question what should be available through a computer. Administrators and teachers will have to sift this out and determine what information technology is and how to best proceed within the curriculum.

What Machiavelli once said still holds true: "There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things."

Allowing staff adequate time and resources to learn new computer technology well must be part of the support provided by the administration. This is challenging because school budgets are rarely in a position to provide for increased funding or release time for staff training. Each new system or product generates its own quotient of additional staff time and expense. A two-hour training session, let alone a two-day session, is rarely adequate. Built into an information technology plan should be resources that allow teachers and others to learn a system well and try out new directions and applications on a continuing basis.

A personal computer that is five years old or more, while perhaps still usable, is obsolete in terms of running current programs and applications.

Since information technology is evolving so quickly, goals and plans must be kept flexible and visited periodically for review. To put the development of computer technology into perspective, all one needs to do is realize that personal computers were introduced to our society in 1980, CD-ROMs in 1985, and the High Performance Computing Act, the basis for networking worldwide in the United States, in 1991. A personal computer that is five years old or more, while perhaps still usable, is obsolete in terms of running current programs and applications. For example, software applications for the Apple IIE or DOS 286 machines are no longer being produced. Today's DOS computers are sold with 486 chips and research is proceeding on not only the 586 chip but also the next generation of microchips. What does all this mean? It means that there is a continuing pattern of change based on more power, speed, and applications, all which need to be continually monitored.

Conceptual Teaching Skills

Critical thinking skills need to be part of the instruction. While it is generally true that younger generations are assimilating computer technology more readily than older generations, today's youth are, in fact, becoming more AND less sophisticated in the use of computers. They learn how to access information long before they are able to evaluate its reliability. In learning information technology, students tend to grasp the "how" but not the "why" (Collins, 1993). The "how" of information technology instruction teaches how to navigate a system for information. Education must not be limited to instruction that simply fills the student's head with information. The pedagogy of information technology must include the "why" which involves a much larger arena. In this, a student learns to 1) identify a need for information; 2) locate sources to turn to for answers; 3) know alternate strategies to try; 4) evaluate the information retrieved; and 5) use the information to address a problem or issue. Students need to be aware that electronic information may not have all the answers or solve all the problems, and that there is a wealth of information in other sources and formats.

Students assume too hastily that access to electronic information is the passport to objectivity. (Suber, 1992) Students must learn that because information is retrieved from a computer does not guarantee that it will be accurate or comprehensive. Toffler (1970) suggested educational goals necessary for the shift to an information society: ability to analyze and judge, assimilate and evaluate, and differentiate and anticipate. He goes on to propose that students learn to manipulate data rather than accumulate it; to communicate through skills of argument and persuation; and to overcome the problem of overchoice through re-evaluation of premises.

Practical Teaching Skills

Teachers need to demystify the aura surrounding information technology. The first step is to tackle the worst problem—the entry vocabulary. While it's understandable that a new technology will evolve new words and phrases needed to express those things associated with the technology, in today's world jargon runs rampant. The gulf of communication is widening between the language of the layperson and the technology designers and analysts. The best way to break down jargon is to understand the technology well enough to verbalize difficult electronic information concepts in a layperson's language. Concepts concerning scope and structure of a database, record organization, movement within a database, design of a search strategy, and options for display and printing are difficult to express and will often resort to jargon for explanation. For students new to a system or product, terms such as online, database, modem, password, CD-ROM, search strategy, records and fields,

download, connect time, output, and many others associated with the technology should be introduced like a foreign language.

Teachers will need to prepare for students who will likely be overwhelmed with their first experience in accessing electronic information, and go from being excited and expectant to lost and frustrated (Carroll, 1990). In addition, teachers must not only be prepared to present information concepts at the student's level of learning, but also be prepared to present these concepts in different ways to meet different learning styles. Training should be provided in a no-fault training atmosphere, a technostress-free environment, where students can learn from their mistakes.

Instruction should accommodate student's impatience with computers. Teachers would do well to recognize that most people are impatient when interacting with computers and want an immediate response. It seems in conflict with other research and information gathering processes which requires time for thought, seeking alternative avenues, evaluation, judgement, and reflectiveness. Be that as it may, the impatience when interacting with computers can be accommodated with a minimalist approach to instruction that is designed as follows: 1) allow students to start immediately on meaningful realistic tasks; 2) reduce the amount of reading and other passive activity in training; 3) help make errors and error recovery less traumatic; 4) exploit prior knowledge; and 5) support the student's sense-making efforts (Carroll, 1990).

Measuring Results

School systems need to find a way to measure the results of using information technology. Does an increase flow of information translate into more knowledge? The technology will likely work well in certain applications, but will be unnecessary in others. This determination may prove difficult. Few measurement tools are in place, and further research is needed in how to evaluate results of electronic information. Related to this is student feedback. Students will know when their needs are not being met, and their input may prove valuable. Teachers can provide for feedback and revise instruction as needed.

Egalitarian Access

Information technology must be viewed as universal and not something limited to the gifted or talented (Voices From the Field, 1993). While instruction is generally moving in this direction, education must help everyone from K to 99 learn how to navigate and evaluate the maze of information that emanates from electronic technology.

Conclusion

Why concern ourselves with information technology to the extent suggested in this article? First, whether one feels that technology is an imposition or an opportunity is beside the fact. The fact is that the technology is here, is not going away, and is taking on new roles. Second, given its impact, dominance, and continual growth, the technology needs to be taught properly. Conceptual misunderstandings of the technology confuses information with education, produces uncritical consumers, and threatens democracy. We seem enamored with what the technology can do and unconcerned or unaware with what it can undo (Postman, 1992). Technology does not invite a close examination of its own consequences, and ethical considerations seem to get lost. For example, we are doing little about the movement toward a world of information haves and have nots and the creation of an information elite. We must take information technology seriously. The immediate future of the technology will unleash an information revolution that will change forever the way people live, work, and interact with each other. Howard Resnikoff (1991) put it squarely when he said, "Whether our society is sufficiently elastic to accommodate the current hectic pace of social change induced by continually self-renewing information technology is one of the profoundly important questions of our time." This mandates a proper pedagogy, complete with practical and conceptual skills, and this responsibility falls mainly on teachers and school systems.

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"If You Know What's Good for You . . .": Prevention, Coercion, and Democracy

by John Lawson

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This article identifies barriers that keep education from contributing to people's quality of life as effectively as it could. I focus here on educational interventions that are community-based, but I suspect that many of my criticisms also apply to classroom-based interventions. I will begin with brief descriptions of three educational initiatives typical of those I will criticize.

What is wrong with the following pictures?

1. Alarmed by rising rates of adolescent alcohol and drug use, a federal agency follows its legislative mandate to act. It offers grants to support local agencies in building community coalitions to provide prevention education and incentive programs to adolescents. Not all such coalition-building movements succeed, but many do in fact reduce rates of adolescent drug abuse (U.S. Office for Substance Abuse Prevention 1990; National Institute on Drug Abuse, 1988).

2. A group of state agencies offers seed funding to local nonprofit organizations to build school-focused community coalitions that will find ways to ensure that children enter school ready to learn. The coalitions include parents, representatives of local agencies, and other key community members. Communities are required to develop action plans to improve child and family well-being by providing access to such services as preventive health care, nutrition, and substance abuse prevention. Local coalitions are encouraged to find local resources to accomplish these goals and to continue their own work after the seed funding runs out, both by raising funds, and by improving resource sharing and collaboration among state and local agencies (Illinois State Board of Education 1993).

3. A prestigious east coast university surveys a nearby African-American community to determine which chronic diseases most seriously affect that community, and what lifestyle choices people are making that contribute to those diseases. The university team develops a set of health status goals for the community, and the behavioral objectives that will be necessary to achieve those goals. It then surveys the community again, interviewing leaders and residents, conducting focus groups and other forms of ethnographic research, to discover the most effective ways of intervening to prevent these chronic diseases over the long term. Then, working closely with churches in the community, the team implements a plan to motivate and support behavior change (Levine, et al., 1992).

All three of these examples are real initiatives that I have encountered during my work as a health promotion planner, and they are typical. It may seem perverse to suggest that there is *anything* wrong with these efforts: they, and a myriad of other community-based health education projects like them, are obviously well-intentioned, addressed to real problems, and often effective in reducing preventable mortality and morbidity (see, e.g., Carlaw, et al., 1984; Elder, et al., 1896; McAlister, et al., 1982). They are in fact practicing state-of-the-art public health science, under the rubrics of "community empowerment" and "community ownership." These catch-phrases suggest that what is going on here is not only consistent with democratic principles, but that it is actually devolving power over people's lives back to the people themselves—in neighborhoods, at schools, at worksites. I want to suggest that, instead, closer examination reveals that this utopian reading is illusory, and that educational interventions of the kinds I have just described may actually diminish community empowerment.

Consider, in the first place, what it would be like if six, ten, or twenty of these initiatives somehow came to roost in one community. What you might well end up with is six, ten, or twenty separate community coalitions working on their separate emphases—school preparedness here, alcohol abuse there, skin cancer somewhere else—depending entirely on what diseases or conditions the project funders were interested in focusing on, and what ap-

proaches to coalition-building they preferred. The efforts and energies of community members would be frittered away in many competing directions—and, despite the rhetoric of empowerment, they would in fact be empowered only to find ways to help "the experts" achieve their predetermined goals.

Or consider the opposite condition, which is in fact more common: a smattering of such efforts are scattered across the country, depending on how much the funding institutions can afford in these impecunious times, as well as on other factors (for example, the fact that there is a finite number of "experts" to go around). A community coalition is recruited, and focuses its efforts, at the behest of the funders, on malady x, y, or z; it either achieves or fails to achieve its goals. In one case, victory is declared, triumphant papers are published, and everybody goes home; in the other case, various approaches are tried until everyone gets tired of it, including the experts. In either case, the funding eventually disappears, and community participants melt back into their daily routines, feeling bitter, confused, resigned, numb, or victorious, depending on their own experience and the outcomes of the project—but knowing in any event that they have done their bit for the community, and that next time it will be somebody else's turn.

The analogy here might be a cloud that passes over a piece of parched ground, and scatters a few solitary drops of rain that instantly evaporate. Perhaps there is some immediate relief and refreshment—it may even be that the particular problem addressed by the project has gone away. If the project lasts long enough, perhaps a whole set of habits and behaviors detrimental to health are erased, though this level of perfection is seldom realized. But even under such optimal circumstances, the community is not empowered; local capacity is not enhanced. No cadre of community members is built that can diagnose the community's problems from its own perspective; no process is put in place to keep the conversation going. The community's fundamental position here is one of passivity, of accepting someone else's definition of their problems, of the priorities they should adopt, and often of the ways they should deal with those problems. Even if this sort of top-down, bureaucratic initiative is maximally successful, it only succeeds in addicting the community to a high-priced commodity called expertise.

. . . resource people go too far when they determine the health education and promotion agenda for a community.

Worse, it has merely manipulated local resources, tying them to broader, overarching social purposes that may not be, that probably are not, optimal goals in each local context. Initiatives of the kind I have described may evoke a spirit of community activism for a while, but sooner or later these piecemeal, narrowly-focused efforts fade away, and no synergistic or lasting energy is generated to identify and deal with other problems. And there are always other problems. As one quality of life deficit fades away, another becomes more important—relatively, if not in absolute terms (Green and Kreuter, 1991).

Public education projects of this kind didn't start with the Year 2000 initiatives, but unfortunately it appears to be associated with them, since they encourage these top-down approaches to quality of life deficits, approaches based on a technocratic rhetoric of expertise: "We have the statistics; we know what the most significant preventable problems are, and what solution is best for you." This technocratic rhetoric can be very persuasive—the Year 2000 goals are based on a tremendous amount of research, and appear to constitute a plausible portrait of the country's health and educational needs, overall.

But these overall goals do not necessarily translate directly to the local level. Each community has its own traditions, its own culture of health- and education-related behaviors and expectations; and many of these local habits and traditions have nothing whatsoever to do with health or education, as far as local people are concerned. What, after all, is the intuitive connection between the fact that everybody in your community eats a lot of eggs or bratwurst and the fact that a couple of people down the block died of heart attacks? Or between the facts that Mr. Smith gets drunk sometimes and his daughter seems like a dumbbell in school? These dots can be connected, but many people haven't connected them, and local traditions—not to mention individual habits based on those traditions—often keep people from recognizing, or acting on, their own best interests. "Everybody eats brats. Everybody gets drunk once in a while. It's only natural."

The community-based health education and promotion efforts I've described are designed to deal with these cultural barriers, of course; but instead of really engaging those traditions, they simply manipulate them to achieve their own apriori goals, apparently assuming that what the community members themselves want is irrelevant, unless it contributes to what the experts know they really need.

What alternative is there to this pattern, this piecemeal smattering

of raindrops? Can the community play a part, not only in achieving the goals, but also in defining them? Can these scattered efforts turn into an ongoing process carried out by and truly owned by an empowered community, or does local culture simply have to stick in the craw of education? And if empowerment is possible, what is the appropriate relationship between the metaphorical "top"—the experts and funding institutions—and the local folks at the metaphorical "bottom?"

Chances are that, under prevailing conditions, few communities will be able to step back and assess their own health traditions without a catalyst to do so. So there is a role for outside experts, for funders, educators, community organizers—people who can constructively confront communities with epidemiologically-based perspectives. But these resource people go too far when they determine the health education and promotion agenda for a community. Their appropriate role is to build ongoing community processes that will engage all constituencies in the community—by ethnicity, social class, location, and so on—engaging them in a communitywide dialog to diagnose the community's key quality of life issues.

This vision is difficult to attain under present circumstances, because so many resources are targeted to specific problems—cancer, heart disease, AIDS, child abuse—that little consideration is given to creating ongoing processes. It's the old Vietnam mentality: clear the enemy out of one hamlet, then march on to another. And it is bearing the same fruit: no sooner do the occupation forces move away than new enemies spring up in the supposedly pacified territory. Enemies like heart disease don't stay dead—and they'll come back, unless you give the local people the weapons to keep them at bay. In this case, those weapons are primarily skills, the ability to run an ongoing conversation within the community.

But that conversation can't be limited to heart disease, or to smoking, or any other single category. No matter what the mandates of our funding agencies and support services may be, whether they are government, voluntary, or university-based, the overwhelming quality of life requirement at this point is really to empower communities. And that can only be done by establishing stable, representative self-diagnostic processes that communities can use to define their own problems and priorities.

What we do have the power to accomplish is the preparation of a citizenry capable of taking part in community processes, and of thinking in quality of life terms.

Any reputable program designer is likely to dismiss that kind of proposal out of hand, of course. What becomes of accountability in a situation like that? What becomes of our Cartesian certitude, our scientifically induced principles of program design? How do we justify our actions? What becomes of Ralph Tyler's four foci for educational planning, for God's sake? Do we just let these yokels run off, wildly pursuing whatever hallucination they get out of a whiskey bottle or the latest issue of *Mademoiselle*, scattering taxpayer money over the landscape with no basis for evaluating processes, impacts, or outcomes?

Well, no. In the first place, that kind of stereotype is endemic to our "expert" academic or bureaucratic perspective, because it justifies our place in the hierarchy of social power. We who are higher on the food chain—who have a shot, at least, of more direct access to funding—have to explain why it is we can help people further down the line, why they can't help themselves and cut out the middleman—i.e., us. But even after we acknowledge that our perception of the public as ignorant yokels (relative to ourselves, anyway) is a thoroughly subjective, and hardly disinterested, judgement, our vision of an improved, participative process of public health education still has a number of roles reserved for "outside experts."

We should no longer unilaterally set the goals, whatever our precious statistics say. But we are still here, and we have our statistics, and they should go into the mix when it comes time to decide what local goals should be. We have our perspective, and we should not confuse that perspective with objective truth; it is a perspective among perspectives, and local people will have a variety of perspectives, too, which deserve to be considered just as seriously as our own. I say that, not because I feel morally obligated as a citizen of a supposedly democratic state, but out of pure pragmatism: the fact is, their opinions ultimately count as much as, more than, ours do, because they are the ones who ultimately decide what lifestyle choices they will make. So the success or failure of any educational initiative is ultimately in their hands. (I will add, parenthetically, that I'm happy, as a member of a democratic society, that people have that final choice in their own hands. But that choice is in many ways a merely resistive, passive one; my democratic moral compulsions *and* my pragmatic impulses as an educator both tell me that people must

have a more active role in developing policy.)

In order to exercise meaningful choice, people need to have the whole smorgasbord set before them. The ultimate priorities have to be theirs, but educators and experts have a role in making sure they consider a significant range of problems, and the resources available to address those problems. To ensure that, experts also have a role in expediting the process, in helping to establish forums in which all constituencies within the community are effectively represented, where the full range of perceived barriers to quality of life can be freely confronted, and where a genuine consensus on priorities and strategies to address them can be shaped.

In addition to this concern with constitutional and processual issues, experts and institutions can use their resources substantively, as well, not to prejudice local decisions about what problems to tackle, but to make sure that a full range of potentially significant problems are considered at the local level. They can provide training and technical assistance to ensure that communities become aware of these problems' impact on local quality of life. And they can help communities identify resources to address the problems. These are the two ingredients communities need to determine their priorities, after all: they have to know the extent of the problem, and they have to know what resources are available to redress it. No matter how bad a particular problem may be, if nothing can be done about it, it automatically becomes a low priority. Experts and institutions will often be able to provide resources to supplement those that are locally available (see, e.g., the Centers for Disease Control and Prevention's PATCH program, and the National Association of County Health Officials' APEXPH program). Even if they can't provide such resources themselves, they may be able to put communities in touch with other sources. In addition, they may be able to train communities to recognize local resources that they had never thought of before.

Finally, a word about what this problem implies for educators' classroom practice. Much of what I have said so far concerns institutional funding patterns and approaches that are not within our direct control as academics. We can effect those institutional patterns in a variety of forums, of course. We can help to change those patterns by beginning to argue, within our professional circles, in favor of ongoing, genuinely empowering community-based research, instead of the prescriptive, top-down, hit-and-run research model now in vogue. Those of us who advise institutions can begin to modulate that advice along the lines I have indicated. To students planning careers in education, we can point out the ways the prevailing top-down paradigm interferes with itself, in hopes that they will be able to change things when a new generation accedes to institutional power. And, perhaps most difficult, we can start submitting grant proposals that include strong arguments to the same effect. That is a risky recommendation, of course, until the educating professions understand the problem. But change has got to start somewhere.

What we do have the power to accomplish is the preparation of a citizenry capable of taking part in community processes, and of thinking in quality of life terms. Every subject matter, from bowling to freshman composition to bioengineering, has implications for quality of life, and students should be encouraged to see the connections between these narrowly-focused specialties and the wellbeing of self, family, and community. In addition, we can begin preparing students for active, involved, and critical citizenship by allowing them as great a role as possible in structuring their own learning experience, within the parameters of each class's basic purpose. Empowered students, students who are encouraged to apply course content to the problems they presently face, or that they realistically anticipate, will become the empowered citizens of tomorrow. And if we enable them to see their own problems in a community context, not as individual failures, but as interconnected with broader conditions that effect large numbers of people, we will be laying the groundwork for the new, grassroots, democratic community institutions of tomorrow.

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Do Thermostats Have Beliefs? Adult Education and Technicist Thinking: A Call for an Adult Epistemology

by Bruce Woll

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Computers have played a key role in bringing about a new global economy in which "information" and "knowledge" are the critical economic resource (Carnoy, 1993). What position should adult education take regarding computer technology? Is this a serious question? Can anyone doubt that adult education should adopt computer technology on all fronts? Wendell Berry did just that in an article that appeared in *Harper's* in 1987 entitled "Why I am Not Going to Buy a Computer" (Berry, 1990). One reason for Berry's decision is his resistance to becoming hooked to the computer manufacturers in the same way that we are all "hooked to the energy corporations." A second reason is substantive: "I do not see that computers are bringing us one step nearer to anything that does matter to me: peace, economic justice, ecological health, political honesty, family and community stability, good work."

It would be difficult, I suspect, to find too many voices speaking out in support of Berry. It is far more common to read that computer literacy is the key to the future and that adult education is behind and needs to catch up, as, for example, in the January/February issue of *Adult Learning* (McCullough, 1993, p. 5).

How we think about knowledge (epistemology) matters because knowledge and power are inextricably linked.

I do not agree with Berry. I have bought computers. I use a computer. I depend on computers for a living. Nevertheless, I take him seriously. I think computers, like other technologies, are being used to do harm as well as good, in ways that directly affect adult education. For example, computers are central to the "profoundly anti-democratic" metaphors of production, distribution, and consumption of knowledge being relentlessly forced upon us by dominant corporate interests (Stanage, 1993, p. 5). I think adult education policy regarding computer technology cannot afford to be blindly enthusiastic, cannot afford to simply adopt a policy of "catch up."

Computer policy, I suggest, is inextricably tied to issues of knowledge, what is happening to knowledge in the "information age," what impact computers are having on knowledge, and how we should be thinking about knowledge and knowing (See Note 1). In short, I have become convinced that computer policy and epistemology, that is, how we think about knowledge and knowing, are inextricably linked.

Before elaborating on this argument, I want to comment on the word "epistemology," which does not appear often in adult education literature (See Note 2). This is not to deny that significant attention is being paid by some adult educators to different ways of thinking about knowledge, especially by those who view adult education broadly in terms of its social, economic, and political contexts.

The word "epistemology" is a kind of non-word because it is too often associated with empty, irrelevant abstractions; nevertheless, I want to suggest that it is a powerful, even potentially dangerous "tool for thought" that needs to be brought to the forefront of our thinking as educators if we are to respond critically to an age and a culture stamped by the concepts of knowledge and information. We cannot afford to let it stay buried deep in the basement of academia where its critical and constructive potential remains neutralized. In part this article is an effort to reconstruct how we use this word.

How we think about knowledge (epistemology) matters because knowledge and power are inextricably linked. How a society defines knowledge determines *whose* knowledge is visible *as* knowledge, and whose knowledge is invisible, whose knowledge is acknowledged, recognized, listened to and whose knowledge is silenced. Societies, cultures, polities, and states have dominant ways of knowing, dominant epistemologies which render some ways of knowing invisible or marginal or discredited.

The Impact of Computers on The Way We Think About Knowledge

What impact are computers having on the way we think about knowledge, on our epistemology? Are computers being used to contribute to richer ways of knowing or re-enforcing narrow paradigms, enlarging public space or constricting it, recontextualizing knowledge or re-enforcing abstract, individualistic, scientistic, monistic models. Are computers expanding our vision of reality or contracting it, enlarging our capacity to understand others, or re-enforcing our prejudices?

In the first place, computers have demonstrated in startling, dramatic ways the power of what computer scientists call "algorithmic" thinking. Computer science today is defined as "the systematic study of algorithms and data structures" (Gibbs, 1986, p. 204). An algorithm is a procedure or "recipe" for doing a job. Computers are a product of belief in the power of algorithmic thinking, which we can also describe as a computational, or rules-based, or procedural way of knowing. The computer is testimony to the power of this kind of intelligence. One could argue, in fact, that the computer is an exemplar, or paradigm of algorithmic knowing, using the word "paradigm" in Kuhn's narrow sense (Kuhn, 1977).

. . . adult education policy regarding computer technology cannot afford to be blindly enthusiastic, cannot afford to simply adopt a policy of "catch up."

The goal of "algorithmic" thinking is control. Rules-based intelligence was, in part, a product of "cybernetics," the systematic study of control and communication methods and mechanisms (Wiener, 1964, p. vii). In the first stages of computer history, dominated by mainframe systems, one finds expressions of an exaggerated belief in the power of computational knowledge to extend cybernetics to the total organization. Writing in 1960, for example, Herbert Simon made the prediction that "[w]ithin the very near future - much less than twenty-five years - we shall have the technical capability of substituting machines for any and all human functions in organizations" (Simon, 1970). In the same essay he refers explicitly to physicians, corporate vice presidents, college teachers as positions which will be capable of being automated completely (Simon, 1970, p. 417).

This sort of claim I would describe as "technicist" thinking, defined as an inappropriate or exaggerated belief in the power of technical knowledge. Technical thought is powerful. But like all ways of knowing, scientific, technological, artistic, like all paradigms, it is limited. When its limits are not acknowledged it becomes self-blinding (See Note 4). Technicist thinking is belief in the myth of technological progress (See Note 5). Wendell Berry, in replying to critics of the essay cited above, refers to "technological fundamentalism that, like other fundamentalisms, wishes to monopolize a whole society and, therefore, cannot tolerate the smallest difference of opinion" (Berry, 1990, p. 175). Mechthild Hart talks about "encircled thinking" to refer to a way of thinking that "sees the solution to the problems caused by the introduction of new technology within the very same technology" (Hart, 1992, p. 134).

The Limits of Technicist Epistemology

The blindness of technicist thinking can be demonstrated by looking at computer history itself. Technicist thinking **cannot do justice to the history of computer technology itself.**

One cannot account for the impact of the computer by viewing it purely in terms of the triumph of

algorithmic thinking. For one thing, the impact is not one-way. Individuals, groups, cultures, classes, societies, institutions bring something *to* the computer. This includes not only computational epistemologies, but feelings, the individual and organizational hopes, fears, ambitions, greed, in short, the subjective attitudes, emotions, and assumptions of individuals, the taken-for-granted premises and ways of seeing that define cultures, and the premises, purposes, and goals of corporations, and other institutions (Turkle, 1984).

Computers are playing a key role in the "informatization" of the global economy and of societies and politics (Carnoy, 1993). The current computer scene is marked by the increasing integration of computer networks into high-speed telephone and other communication networks on a global scale, creating a new international economic infrastructure. One consequence of these developments is that the **economic** construction of knowledge is becoming more and more dominant and all-encompassing. In other words, computers are contributing to what Cohen and Arato have described as the totalitarian march of capitalism, which is "engulfing all spheres of social activity under the single dimension of economic activity" (Cohen, 1992, p. 37).

The impact of the computer on knowledge is being determined to an enormous extent by the assumptions and beliefs about knowledge **that are being brought to the computer** by those who have the most control over the corporate resources in society, beliefs in the supremacy of the market to determine matters of social equity, for example. The assumptions that are being brought to the computer by the corporations who dominate the control of computer technology are beliefs about knowledge as an economic resource, knowledge as a resource to be turned into profits, knowledge as a resource for accumulating economic and political power.

What's wrong with "technicist" thinking? It blinds and constricts. In a provocative article on "information as an organizational problem," Aaron Wildavsky suggests that "looked at in the large, organizations exist to suppress data" and that by inundating an organization with undigested information computer departments subvert the organization's need to focus (Wildavsky, 1983). The computer brings us the information age. It brings us the data superhighway. It brings us salvation by data. But data without meaning is blinding. It becomes the blinding sun. The sun gives light but if you stare at the sun you go blind.

. . . data without meaning is blinding.

Specifically, technicist thinking can blind to the nature of knowledge itself. It can blind to the unavoidably **contextual** nature of knowledge and knowing. It re-enforces the belief in neutral knowledge, which blinds to the connections between knowledge and power. To say that knowledge is power is a meaningless generalization without further elaboration. However, certain kinds of knowledge in the hands of certain individuals or groups in certain situations is indeed power. Scientific and technical knowledge has become a major example of this phenomenon.

Not only is knowledge power, but power defines knowledge. Power can be and is used to determine what knowledge will be recognized as knowledge and what will be silenced or rendered invisible. Technicist thinking is characterized by a "ritual power blindness" to such relationships between knowledge and power (See Note 6). Computers re-enforce the constricted, narrow epistemology of technicist thinking. Computers derive from a way of thinking that is committed to stripping knowledge from context, to a belief that contextless, universals are a higher form of knowledge, that only universal truths are real truths. Contextlessness is an ideal of algorithmic, procedural, rules - based thinking (Winograd, 1986, p. 28).

Second, computers re-enforce the blindness of technicist thinking to subjectivity, to the connections between knowledge and knower, between knowing and the full being of the knower, emotional, spiritual, moral, as well as rational. The question posed in the title of this essay, for example, Do thermostats have beliefs? is answered in the affirmative by John McCarthy, the inventor of the term "artificial intelligence." When asked what beliefs a thermostat has, he replied, "My thermostat has three beliefs - it's too hot in here, it's too cold in here, and it's just right in here" (Postman, 1992, p. 111). Belief has been stripped here of all reference to human experience, personhood, interiority, all reference to the spirit.

Let me repeat my argument. What's wrong with "technicist" thinking? It blinds and constricts. As such it is contrary to the goals of adult education, contrary to the commitment of adult education to the enlargement of vision. Technicist epistemology is immature. Its view of the universe is limited to what can be controlled, what I can "play" with. It is characterized by an obsession with games that carries the metaphor of "games" beyond being a source of pleasure or a heuristic tool to the level of a total way of seeing the world.

The Implications for Adult Education

What are the implications of these observations for adult education practice, policy, and theory relative to computer technology?

In the first place adult education cannot uncritically adopt a "catch up" policy of appropriating computer technology. Such a policy will inevitably re-enforce the "cybernetic" function of adult education, that is, its control function, maintaining the status quo, despite the rhetoric of change (Westwood, 1991, p. 111). As I have tried to suggest, the study of the computer both demonstrates the power of rules-based, computational, instrumental thinking and brings to light its limitations and weaknesses and in this paradoxical way provides support for those who are warning adult education against placing all its eggs in the technological basket.

A "catch up" policy will mean the perpetuation of a narrowly "technicist" epistemology which is already rampant within adult education. According to Michael Collins, for example, adult education is in crisis because of the extent to which it has come under the sway of "technocracy" which he defines as a "tendency to make more and more areas of human endeavor . . . amenable to measurement and techno-bureaucratic control according to what is invoked as a scientific approach" (Collins, 1991, p. 9). Technocracy is further defined by Collins as an "ideology," a "paradigm," and "ethos," a form of rationality, a cult of efficiency. Adult education's preoccupation with professionalization, its "technicist" understanding of self-directed learning, its addiction to competency-based learning models are examples of "technocratic" thinking.

This leads to a second point. If adult education computer policy cannot be blindly technicist, then adult education must develop an alternative epistemology which will provide the basis for a mature, critical use of that technology for purposes of adult learning and education. If technicist thinking cannot even provide an adequate account of the rise and development of computer technology itself, this constitutes a central contradiction at the heart of the social construction of the computer which needs to be exploited by educators looking for ways to resist the institutional and subjective blindness of technicist thinking and for ways to exploit the computer as a tool in working for greater justice and equality.

If adult education is to appropriate the computer responsibly it cannot overlook the ways in which the computer as myth and as tool is being used to re-enforce privilege and growing inequalities.

Adult education must bring to the computer what I would describe as an "adult," grounded epistemology. In reflecting on the resources for developing such an alternative epistemology, it is important to note that what Michael Collins describes under the label of "technicist," or "technocratic," or instrumental models of adult education represents one expression of mainstream adult education, especially within the United States. Other characteristics include its individualistic, psychological, positivist, functionalist orientations.

In one form or another, each of these defining characteristics is under attack from a variety of sources, especially by those adult educators who are in touch with international adult education discourse and practice and who see the goal of adult education to be social change rather than control. Therefore, in developing an adequate approach to computers and computer technology that is grounded in a critical view of knowledge and knowing, adult education needs to look to these voices (See Note 7).

Thus, for example, computer policy must interpret computers within their historical, social, economic, political, and cultural contexts. They cannot be viewed as merely neutral tools. They come to us saturated with assumptions and tangled in associations with the state, military, and corporate institutions which produced them and retain dominant control of them (Molina 1989). Those adult educators who have moved away from an individualistic to a sociological understanding of adult education will be more likely to provide a basis for a critical appropriation of the computer that may be able to "decouple" computer technology from their accompanying cultural and political "entailments" (Marglin, 1990).

In drawing on these alternative voices for developing an adult education policy regarding computers, however, I suggest that there must be much more explicit attention to the epistemology of adult education. The importance of ways of thinking about knowledge is clearly recognized. For example, in the survey of international adult education cited earlier, Phyllis Cunningham begins by citing the seminal importance of Berger and Luckmann's sociology of knowledge, which "challenged the prevailing hegemony of a single objective social reality that

had become a fixed concept in the consciousness of most North American adult education theorists and practitioners" (Cunningham, 1991, p. 347, referring to Berger, 1966). Nevertheless, I believe that the challenge of the computer and of the information age which it has helped to bring about demands that adult education explicitly thematize epistemology as a critical conceptual tool and begin constructing an "adult" epistemology. If adult education is to appropriate the computer responsibly it cannot overlook the ways in which the computer as myth and as tool is being used to re-enforce privilege and growing inequalities (See Note 8). It must bring to the computer a truly "adult" understanding of the place of education in society, committed to goals of social justice and equity, an understanding which sees the making of "adults" in the sense spelled out by Frantz Fanon (1963), as the point of it all (See Note 9). An "adult" education demands an "adult" or grounded epistemology.

I define a grounded view of knowledge as one which reconnects knowledge with knowing, knowledge with knower, knowledge with context and therefore an epistemology which discloses the connections between knowledge and power. An "adult" epistemology is characterized by what Lorraine Code calls "epistemic responsibility" (Code, 1987). It asks about ends, purposes, consequences, goals, not just means, technique, skills, tools. Adult education must bring to the computer the "courage to know" (Hart, 1992 p. 203), that is, the courage to step outside the taken for granted assumptions of technological progress and prosperity and see through the eyes of those who are on the other side of the growing gap between rich and poor.

Adult education must bring to the computer what I would describe as an "adult," grounded epistemology.

An adult epistemology is not a system to be "finished" but an ongoing social process (Resnick, 1987, p. 2). It is a process that must include those outside the spell of technology-dominated epistemologies, as well as those who are critical from within. Many in positions of privilege speak contemptuously of the fallacy of reverse privilege, that is, privileging the knowledge and virtue of the poor and oppressed. In doing so, they continue to ignore the powerful, vital, refreshing, creative vision, intelligence, and critical thought of those who are in a position to see the world through other eyes and from other experience. Epistemology matters. And it is precisely those on the outside, those at the bottom who are insisting that epistemology is **not** an academic matter but an essential concern in the political struggle for justice, equity, and survival (Mbilinyi, 1992, for example).

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Notes

1. See, for example, Mechthild Hart's critical analysis of "knowledge work" in Hart, 1992, ch. 8.

2. Mechthild Hart is an important exception to this generalization. In Hart, 1992, she critiques the epistemology embodied in computer-mediated work which expresses the rationality of capitalist production for profit and argues for "subsistence knowing," grounded in the epistemology of mothering (p. 183) as an alternative basis for approaching education and learning and knowing. Another female adult educator, writing from an African context, likewise focuses explicit attention on epistemology as a key issue in the political economy of adult education (See Mbilinyi, 1992).

3. See, for instance, the fundamental importance ascribed to sociologist of knowledge, Peter Berger, in Phyllis Cunningham's treatment of international adult education (Cunningham, 1991, p. 347). Neo-Marxist theory about knowledge production and the manufacturing of consent is also a key influence in Cunningham's approach to adult education. See, for example, her use of Gramsci (Cunningham, 1988, p. 137).

4. Kuhn's comparison of paradigm shifts to gestalt shifts is the clearest indication of the way in which paradigms both illumine and "blind" simultaneously. When I see one gestalt image I *cannot* at the same time see the other one. See Kuhn, 1970, p. 85.

5. See Ferkiss, 1969. One of the best summaries of the various functions of myth is in Peter Novick's introduction to his history of 'objectivity' in the American historical profession where he uses the term myth to describe the functions of objec-

tivity within that profession. (Novick, 1988, pp. 3-5). I am referring to technology as myth in the way Novick uses it.

6. This expression is quoted in Staniland (1985, p. 22) who cites Albert (1971, p. 28).

7. Phyllis Cunningham is one of the major figures in the United States challenging mainstream paradigms. See, for example, the opening pages of her discussion of international adult education cited earlier (Cunningham, 1991). Students of Cunningham, such as Sean Courtney, have taken up the challenge (Courtney, 1992).

8. See, for example, Reich(1992) on the growing gap between rich and poor and the role of computers and the "symbol analysts" using them in contributing to this gap.

9. Fanon, 1963, p. 181, speaks of making adults as the true goal of political education. I believe that his passionate conceptualization of "adulthood" articulates a vision of what adult education's mission should be.

The Applications of Neurobiological Research in Special Education Instruction

by Clyde A. Winters

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Introduction

In this article the important role that the neurobiological knowledge base can play in improving the delivery of special education services to the learning disabled is discussed. The author illustrates how combining task analysis and what is known about neurobiologic learning, the learning disabled child can become a more efficient learner while his/her learning problems are remediated.

Today we know more about the brain than any time in the history of the world. This knowledge, hidden away in scientific journals, can revolutionize what we know about learning and teaching. In this article we will discuss the implications of the neurobiologic learning knowledge base and how it can be used to make special education professionals more effective in the instruction of the learning disabled.

This article will discuss what Dr. Angel Diaz, of Chicago State University calls neurobiologic instruction. Neurobiologic instruction can be defined as the use of the neuropsychological knowledge we have of learning disabilities to make our instruction centered toward stimulation of those parts of the brain that moderate behavior/learning. In this way the teacher can make his/her instruction more focused toward the specific centers of the brain that can lead to the remediation of the academic deficits exceptional children bring with them to the classroom. Dr. Diaz (1992, p. 31) has observed that:

> Knowledge of the arrangement of the neural networks and the way the individual neuronal processes are connected, how they grow and develop, how their functioning is altered when they do not develop, how they tend to restructure themselves after they have been lesioned or damaged, and how their operation can be modified by dietetic and psychopharmaceutical intake provides a wealth of information from which educators can derive teaching and/ or learning principles. The information can also provide educators with a more appropriate rationale for improving a child's learning efficiency and with improved techniques to identify and remediate learning problems.

Definition of Learning Disability

Learning Disabled (LD) is the second largest category of special education (Ysseldyke, Algozzine & Thurlow, 1992). In Illinois, 5.19 percent of the special education students are LD (Ysseldyke, Algozzine & Thurlow 1992, p. 182). Nationally LD students account for 43.6 percent of the special education categories served in the United States (Ysseldyke, Algozzine & Thurlow 1992, p. 76).

The U. S. Office of Education defines a specific learning disability as:

> a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, read, write, spell, or do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.

> The result of visual, hearing, or motor handicaps, mental retardation, or emotional disturbance, or of environmental, cultural, or economic disadvantage. (U.S. Office of Education, 1977, p. 65083)

In school, the teacher seeks to make learning more purposeful. Here the student has to learn information based on the school curriculum. This form of learning is called intentional learning. Intentional learning can be defined as learning with instruction. The fact that intentional learning is the norm in our educational system, requires that students possess a number of prerequisites for intentional learning and success in school.

Academic success makes it necessary for children to possess at least four skills or prerequisites for learning. The skills necessary for a person to progress academically include:

1) Good discrimination of auditory and perceptual/visual stimuli;
2) Good attention, i.e., the student must be able to pay attention to the material s/he is to learn;
3) Good short term and long term memory; and
4) Good fine and gross motor movements.

A person may have trouble in school because s/he fails to possess one or more of the skills outlined above.

Before a student can be classified as learning disabled and placed in appropriate special services s/he must meet one of the five criteria or ideas associated with learning disabilities.

The five criteria (Learner, 1988, p. 8) associated with the learning disability definition and may result in Special Education placement are:

1) there must be an intrinsic neurological problem, i.e., faulty processing of information in the brain;
2) intraindividual differences must be present in the child, i.e., s/he must illustrate problems in learning that are unique for that child only;
3) there must be a discrepancy between the child's potential (as illustrated by testing) and his academic achievement;
4) the child must not show any exclusionary factors, e.g., the learning problem must not be the result of mental retardation, sensory problems, limited English, cultural differences, and emotional illness; and
5) the person must show developmental and/or academic problems.

A person cannot be labeled learning disabled unless he has trouble in school due to a deficit in one or more of the five processing areas outlined above relating to underlying academic and/or psychological processing problems. Therefore, if a child's learning difficulty can be explained by other factors not attributable to a developmental or academic problem, that child does not meet the criteria for special education due to learning disabilities.

To be learning disabled a person must have an above or average IQ, and show a discrepancy between his academic performance and his achievement. The learning disabled person has a learning disability because of a neurological dysfunction resulting from a lack of development or damage.

A learning disability is not slow learning. True learning disabilities are not transient, they are not grown out of and can not always be remediated.

Public Law 94-142

In the United States, handicapped children have a right to an education. This constitutional right to an education is given handicapped children through the statute of P.L. 94-142, which was enacted in 1975.

Public Law 94-142 insures that all American children up to the age of 21 will be provided a free and appropriate education. This law calls on school districts to conduct a systematic "child fine," to search for handicapped children to receive special education.

The "child find," is a concerted effort by school districts to find handicapped children who can benefit from special education services. Children will be identified as handicapped through screening procedures conducted by qualified professionals who will determine the child's eligibility for special services. Children identified as possible candidates for special services will participate in a case study evaluation. Special education personnel will then write the child's individual education plan (IEP).

Children who may require special services will be screened to determine if they should receive a case study. The professionals conducting this evaluation at a multidisciplinary conference will decide which students show a pattern of need for special services and make recommendations for each qualified student's individual education plan. In general, this law requires the school to address the child's problems, not the parent.

The learning disabled student usually only experiences difficulty performing certain academic and developmental tasks and will often experience few problems outside the school environment. In school, the learning disabled student can experience considerable pain and social stigma. At school the learning disabled student is often harassed

and made to feel insignificant in comparison to his peers that are not learning disabled. This negative environment can encourage many LD youth to "skip school." It may also explain why most LD students fail in school because of low attendance (Cawley, Kahn & Tedesco 1989, p. 634).

Learning disabled students experience very little success in and out of the regular classroom unless the teacher helps the LD child/adult develop a good self-concept. Self-concept is dependent on comparison with others. Positive perceptions of one's ability leads to good self-concept, negative perception leads to poor self-concept.

The student with learning disabilities due to his lack of success in school, unless his problems are remediated, is characterized as:

1) frustration prone,
2) manifests a failure set, and
3) has a poor self-concept/ self-devaluation.

In the regular classroom the learning disabled person, due to his basic academic limitations is often put into a position in which he will become frustrated. This can lead the learning disabled student to expect failure in the classroom, due to previous unsuccessful efforts to learn. As a result of being frustration prone and the manifestation of a failure set due to the lack of academic achievement, the learning disabled person is prone to develop a lack of self-esteem or poor self-concept.

Neuropsychological

Most of the principles in teaching the learning disabled person is found in the neuropsychological approach of Helmer Myklebust. Myklebust (1964b, 1968) developed a comprehensive theory of learning disabilities. Myklebust theorized that the brain was made up of semi-independent systems that either function in an independent or interdependent manner.

The neuropsychological teaching approach encourages 1) testing, 2) assessment and 3) diagnosis. **Testing**—the exposure of a child to any given (testing) instrument to obtain quantitative characterization of one or more traits **under standardarized conditions**. **Assessment**—includes a quantitative and qualitative evaluation of the total child in the social situation. **Diagnosis**—is the determination of strengths and weaknesses in order to provide a better educational program. Basically, a diagnosis is made which leads to the treatment of the child's learning problem through a learning prescription.

Myklebust's idea of interrelated systems modulating brain operations led him to develop his concept of interneurosensory learning, which can be defined as learning that "utilizes all these systems to functioning simultaneously" (Johnson & Myklebust, 1967, p. 26).

Myklebust encouraged the use of psychological testing as a diagnostic tool to discover student weaknesses for remediation. This remediation was to be accomplished by using the student's positive modalities. In general, the Myklebust and Johnson (1967) teaching approach encouraged multisensory stimulation for the learner and addresses the student's weaknesses while teaching through the student's strengths.

Some researchers have questioned the frequency of integrative learning (Myers & Hammill, 1991, p. 133). Today, due to dynamic neurological research, we know that integrative learning is the primary model for learning (see Note 1).

According to Myklebust (Johnson and Myklebust, 1969) there are several types of learning disabilities:

1) Auditory disabilities,
2) Reading disabilities,
3) Written language disabilities,
4) Arithmetic disabilities, and
5) Non-verbal learning disabilities.

These disabilities result from the lack of three integrities. According to Myklebust (1964b) the integrities necessary for learning are

1) **Peripheral**—you must be able to see and hear correctly;
2) **Central Nervous System**—must have good function;
3) **Psychodynamic**—is the psychological dimension of man (this is based on the psychological experiences each person experiences.

Myklebust (1968; Johnson and Myklebust, 1967) from this analysis of the learning styles of disabled children developed the idea that children should be process analyzed. Students have to be analyzed, i.e., the psychological testing of LD students to determine how they process information. It is necessary to process the child so the instructor can understand the total child, and his acquisition of skills to determine the child's disability or lack of development.

Neuropsychology is the integration of the physiological maturational forces of the brain and psychological development. This has made the **task analytic approach** important in the diagnosis of neuropsychological processing problems. Processing is defined as the way a person understands and retains holistic information.

There are three types of task analysis: **skill analysis, product analysis**, and **process analysis.** The instructor makes a task analysis when the content and sequence of what a student is learning is analyzed. Process analysis occurs when one looks at the channels necessary for learning to take place. Product analysis occurs when one analyzes

the child's work product to determine his level.

This process analysis is supposed to lead to clinical teaching. This type of diagnostic prescriptive teaching is teaching based on neuropsychological testing to determine the child's **specific** learning problem and then developing a teaching plan to remedy the child's deficits.

As a result of this theory professionals working with LD children believe that common learning disabilities are the result of intrinsic neurological dispairment. The presence of an LD may not be due to cell damage. But the brain is dysfunctional as a result of the lack of development or damage.

The neurological dysfunction results in problems in academic and developmental processes. These problems are usually "corrected" by professionals seeking out a child's specific skill deficit for remediation.

Neurobiology of Learning

The psychoneurological basis of learning disabilities makes it necessary to review the literature on neurobiological learning and apply it to teaching the learning disabled. We argue that because LD has a neuropsychological foundation, application of recent findings regarding the neurobiological basis of learning will help remediate many LD problems efficiently. This results from the fact that one must exercise all parts of the brain to keep it viable.

We know that specific neuroanatomical changes occur that can help in the remediation of academic deficits and nonverbal problems associated with learning disabilities Bigler, 1990, p. 321.

> However, as knowledge increased about brain behavioral relationships, it became evident that the concomitant expression of learning disabilities and problems in social-emotional development shared similar neurologic substrates. This relationship between learning and emotion is a very complex, interactive process. . . . In some cases, a learning disability is a manifestation of a developmental lag in brain maturation which also impedes and slows emotional maturity.

The learning disabled adolescent exhibits marked difficulty in reading, writing and\or using numerical concepts in contrast with average to superior academic ability in other areas. Often the adolescent learner may have a higher reading score than math score. The LD student, on the other hand, may have a math score higher than his reading score but, he still has problems in math in addition to a reading problem.

The presence of a learning disability implies a problem in processing. This means that special attention must be given to teaching students metacognition and self-monitoring skills (Rourke, 1985; Strange & Rourke, 1985).

Knowledge of the brain's anatomy helps us develop remediation strategies that can make learning easy for many adolescents. First we will review the normal anatomy of the brain (Rothstein & Crosby, 1989).

Everyday we are learning more and more about the brains anatomy and learning (Rothstein & Crosby, 1989; Grady, 1984). This knowledge of brain behavior correlates can help us to better understand the role neurobiological knowledge can play in the remediation of many learning problems.

Learning is the accumulation of experiences. It takes place through an integrated process of physiological and behavioral activities. These activities are controlled by neurons.

The brain is composed of four layers, the spinal cord, cerebral cortex, the hippocampus and thalamus. The cerebral cortex is the outer or wrinkled layer of gray matter neurons or cells making up the brain (see Figure 1).

The cortex is divided into two hemispheres. Each hemisphere has four lobes: the frontal, parietal, occipital and temporal.

The occipital lobe processes visual information. The **primary visual cortex** interprets the raw information. The **secondary visual cortex** recognizes (remembers) that something has a particular purpose or meaning. The occipital lobe processes the visual information and sends it out to other parts of the brain for interpretation.

The temporal lobe processes auditory information. The **primary auditory cortex** interprets the raw auditory information.

The **secondary auditory cortex**, recognizes (remembers) that something has a particular purpose or meaning. In general the temporal lobe discriminates between general experiences.

The Parietal lobe processes tactile-kinesthetic information.

The right **parietal cortex** plays an important role in self-awareness and visual-spatial processing. The parietal lobe and the occipital lobes are mainly used to process information.

The frontal cortex is a very important part of the brain; it houses memory and language centers. In the prefrontal cortex decisions are made about what to do or planning things. Problems in this area would affect a student's ability to pay attention.

The hippocampus is situated on both sides of the brain in the temporal lobe, it is shaped like a finger. A ball shaped object called the thalamus is located in the middle of the head.

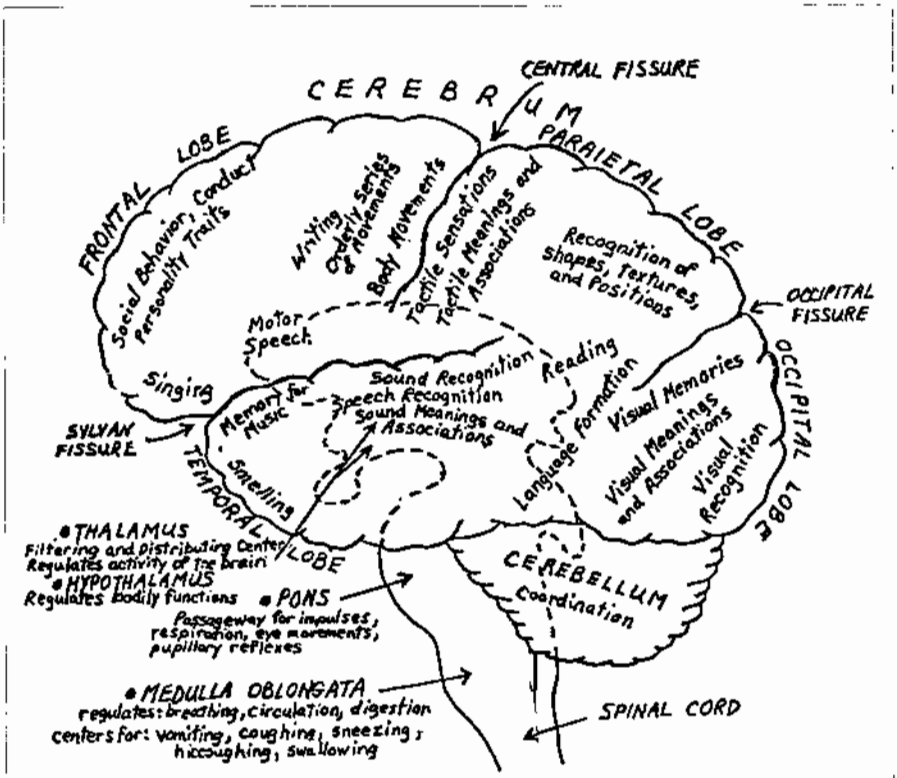

Figure 1. Functions of the Brain

Learning is the accumulation of experiences. It takes place through an integrated process of physiological and behavioral activities. These activities are controlled by neurons.

The neurons have four parts: dendrites (the branches of the neuron), soma (the cell body),axon (the structure that goes to the terminal buds) and terminal buds (that part of the neuron which touches new dendrites). The space between the terminal buds and the dendrite is called the synapse. The number of neurons do not grow it is the connections that grow through stimulation.

The initial response of the central nervous system to learning are neuroanatomical changes at the synaptic regions in the brain (Shashoua, 1982). These neuroanatomical changes at the synaptic regions of the brain and receptor sites after a learning experience probably represents short-term memory (STM). This leads one to speculate that extracellular neurochemicals: proteins and peptides play an important role in the process of long term memory (LTM) or long-term potentiation (LTP) formation, and encoding of the LTM onto the memory trace (MT). As a result, learning requires certain modulating factors that strengthen the MT.

This means that learning is a series of memories. A memory occurs when an electrical signal carried by the axon causes a change in the spine. This chemical change encourages postsynaptic LTP that lasts for months. The LTP is strengthened by repetition and can last indefinitely.

Memory is stored in the circuits between the cortex and the hippocampus. Memories are believed to have been made when (an electrical charge) chemical messenger cells, called neurotransmitters, cross from the **axon** through the terminal bud to the **spine**. This calcium which is excited by the electrical charge carried by the axon enters the **dendrite** which forms the spine. Here it invigorates **calpain**. The activated calpain causes a physical change in the spine, which researchers have hypothesized "contributes to memory function."

The electrical charge changes the nerve circuits, this change is hypothesized as evidence of an MT. The calcium is then eliminated from the spine (too much calcium can cause damage) while the structural and receptor changes remain constant. The growth of the spine indicates that learning has taken place.

The new LTP, remains in the hippocampus as an MT for some time until it is sent on to "relevant" centers of the brain for long term storage. The LTPs are strengthened through repetition.

There are two memory storage systems identified as the habit system and the cognitive system. The habit system is a group of behaviors that exist as a result of "habit." The cognitive or declarative/ explicit system is made up of "stored representations of stimuli that are retrieved."

These memories from the various sites in the cortex are then coordinated when ever necessary by the prefrontal cortex. The prefrontal cortex decides and guides how plans will be carried out. It is also in the prefrontal cortex that attention is controlled.

Skills Necessary for Learning

Bigler (1990) has demonstrated the positive application of neurobiological learning theory to the remediation of many non-verbal learning disabilities. Bigler (1990) hypothesizes that LD problems are probably the result of a failure of the brain to mature properly. This developmental lag is manifested in emotional maladjustment.

The brain also plays an important role in remediating the academic deficits of children with learning disabilities. This results because learning appears to depend on two reasoning processes: attention and discrimination. You must pay attention to learn.

Attention is divided into three types: focusing attention, maintaining attention, and shifting attention. These three types of attention must be intact for learning to take place.

There are two types of learning: incidental and intentional learning. Incidental learning can be defined as learning **without** instruction. In school we seek from our students intentional learning, which can be defined as learning **with** instruction. This form of learning requires explicit memories that are located in the temporal lobe.

To help LD students learn we must take control of the reticular formation which is stimulated by visual and auditory stimulation. The reticular formation is a cluster of neurons in the brain stem. The reticular formation makes you aware of your environment. This is where you obtain your level of awareness.

Children learn because they are able to pay attention, be aware. You must get the student's awareness before s/he can learn. Awareness makes the student ready to learn. It is the reticular formation that sends the electrical impulses throughout the body and prepares one for learning.

The best way to "alert" the student is through motor activity which is the result of a physiological response. This makes writing an important aspect of learning.

In learning, the student must use both associative and working memory. Patricia S. Goldman-Rakic (1992) noted that "A simple activity involving working memory is the carry-over operation in mental arithmetic, which requires temporarily storing a string of numbers and holding the sum of one addition in mind while calculating the next move." A more complex example, is performing multiplication. In multiplication the student not only has to hold the multiplicand and the multiplier in the working memory, she/he also has to go into the long term memory to retrieve the product. This math knowledge is probably stored in the prefrontal cortex.

In using neurobiological learning the cognitive and direct teaching methods are both applicable. The cognitive approach emphasizes the individual as an active learner in control of his learning situation, with the teacher inculcating in the student planning self-evaluation and self-monitoring skills. This method is usually incorporated in learning strategies approaches that are basically psychoneurological.

The direct teaching method emphasizes the active effort of the teacher to structure the student's environment. The direct teaching method includes (1) grouping immediate instructional needs; (2) sequencing academic skills to be remediated; (3) modeling successful academic practice; and (4) pacing academic skills that encourage many response opportunities.

In summary, learning involves the development of LTPs through repetitive strengthening of memories which constitute learned behaviors. This learning occurs when a student has the major prerequisites of learning-good discrimination and memory skills.

As a result, learning is the development of neuronal connections. For neuronal connections to grow, there must be stimulation to make new connections.

Clearly, the case has been made by the neurobiological origin of learning that one must exercise all parts of the brain to keep it viable. This viability can come through the use of learning strategy teaching approaches to increase the number of neuron connections at centers of the brain that account for a child's neuropsychological problem.

This article has explained that an understanding of the role specific centers of the brain play in learning will help special education instructors develop an appropriate individualized instructional program for the learning disabled. The neurobiology of learning also makes it imperative that we apply our knowledge of neuroanatomy and learning to teaching the learning disabled. Neurobiological learning makes it clear that the teaching of the learning disabled should be based upon the principles of learning strategies instruction, neuropsychological testing and task analysis.

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Notes

1. The teaching methods of Myklebust and Johnson do have several deficits. These deficits include the fact that the tests are given in an individualized setting and teaching is also individualized. This is a good approach but in most classrooms even with the assistance of an aid, it is very difficult to spend considerable amounts of teaching time with one child. The second deficit in the Myklebust and Johnson theory is that Myklebust makes the assumption that brain damage is evidenced in children who are psychologically tested and present LD problems. This view often is invalid; an LD problem may not be evidence of neurological damage within children that have an LD problem, even though these children may have centers in the brain that are not being used or lack maturation. This lack of maturation or lack of use may encourage the presence of a learning problem in some children, not neurological damage.