A Historical View of Education from the Perspective of Marshall McLuhan and Media Ecology

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The focus of our recent research has been on Marshall McLuhan as an educational theorist, which has been less than adequately covered by McLuhan scholars. Marshall McLuhan had a lot to say about education, in fact it was one of his principal concerns, but even after his passing, he still has much to teach us about contemporary education. We can learn about today's education in two ways from McLuhan. One is directly from his analysis of the educational system of his day, presented in lectures and writings from the 1950s until his death in 1980. Although some aspects of education have changed since then, particularly the arrival of digital technology, many of McLuhan's observations are as valid today as they were during his lifetime.

Another way we can learn from him is to apply his principals of media ecology, with their key idea that *"the medium is the message"* (McLuhan 1964, p. 7), to understand the impact of new technologies and new media on education. After all, a classroom is a communication medium, as are a chalkboard or whiteboard, a textbook, a lecture, or an online learning management system like Moodle. As McLuhan (1964) observed,

> *"A new medium is never an addition to an old one, nor does it leave the old one in peace. It never ceases to oppress the older media until it finds new shapes and positions for them…. Once a new technology comes into a social milieu it cannot cease to penetrate that milieu until every institution is saturated."* (p. 174).

This has been the promise of computers, the Internet and a whole host of other more recent digital media, which have the potential to transform education and the nature of schools, which are both a medium and an institution. However, such transformation at present is only partial at best and the full promise continues to be unfulfilled.

Each step in the evolution of communications systems and hence language affects the way a society sees the world, operates its economy and organizes its educational system. In this essay we look into the rear view mirror to consider the history of learning, education and schooling in relation to each of the major types of communication media that emerged in human history. McLuhan built on the ideas of Innis, dividing human history into three distinct periods, based on the modes of sensibility their dominant media made available to them: oral, writing/print, electric. We examine the impact of oral communication, written communication, separating the impact of scribal writing from the impact of the printing press. We then look at the impact on education and learning of electric mass media, including mainframe computers, and finally we begin to study the impact of personal computers, the Internet and other digital

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media. The purpose of this essay is to describe the ground on which education has developed over the millennia, because, as McLuhan often reminded us, one must consider a figure in relationship to the ground on which it operates. One cannot study the behaviour of fish without studying water, and by the same token, one cannot study education without studying communication.

The Educational Media of Language and Culture

We begin our history of learning and education with the two factors that distinguish humans from all other animals, namely their possession of language and culture. When we use the term culture, we are referring to the entire gamut of all the practices of a society, not just their forms of artistic expression. Culture includes social, political, religious and economic institutions, as well as practical activities such as the way people prepare food and drink, the way they dress and the types of dwellings they occupy. Language is both a tool and a medium for conceptualization, without which the only learning that is possible is percept-based learning of non-human animals. In *The Extended Mind* (Logan, 2007) it is argued that language arose in humans as a form of conceptualization that was required to deal with the complexity of hominid social organization, as our ancestors acquired the new skills of tool making, control of fire, group foraging, and coordinated hunting. The percept-based thinking of pre-lingual hominids could not deal with the complexity of more advanced hominid existence.

With the emergence of language, conceptualization became possible and the lessons learned from experience could be coded in language. Percepts no longer offered sufficient richness to represent and model the complexity of the hominid experience that arose with tool making, the control of fire and the complex social organization that was required to maintain the hearth and engage in large-scale coordinated hunting and gathering. Speech developed in this climate in which a transition or bifurcation from perceptual thinking to conceptual thinking occurred. The very first words of this spoken language became the very first concepts that made conceptualization possible, as well as a way to formulate lessons learned from experience. With language, lessons learned by individuals could be easily shared with other members of one's community, especially one's children, giving rise to the phenomenon of culture.

Each new word of this spoken language served as a metaphor and a strange attractor, uniting all of the pre-existing percepts associated with that word in terms of a concept represented by that single word. For example, all of one's experiences and perceptions of water, the water humans drink, bathe in, cook with, swim in, that falls as rain, that melts from snow, were all captured with the single word, water, which also represents the simple concept of water. With language, perceptual information could be converted into conceptual knowledge, lessons learned from nature and those lessons could be shared with others. It is with language that teaching or sharing knowledge was now enabled in a format

other than showing by example. In fact by combining showing by example, i.e. perceptual learning, with conceptual learning through vocalized instructions, humans acquired a knowledge acquisition and sharing tool that totally surpassed any other form of life on the planet.

Communication through spoken language allowed information and knowledge to be shared for survival purposes and to coordinate activities based on this knowledge. Education arose naturally, as a means whereby parents or elders shared with younger members of their community information and knowledge that would increase their well-being and their chances for survival. This form of education gave rise to distinct communities comprised of groups of individuals who were in day-to-day communication with each other and hence shared similar experiences, a common heritage and hence a common culture.

It is worth noting that language and conceptualization that bootstrapped into existence made a rudimentary form of science possible, in which perceptual observations and experiences could be formulated into structures that built upon each other. The acquisition of knowledge that gave rise to culture also created an often over-looked medium of instruction. In fact cultural learning is subliminal because it surrounds individuals, so that they are as unaware of it as fish are unaware of water and animals, including humans, are unaware of the air they breathe. We are only aware of air when we are deprived of it, just as we are only aware of our culture when we are thrown into a new culture markedly different from our own. Only travelers are aware of culture, not those who stay at home.

Language and culture are learning media that are intimately connected. Language is an explicit part of culture and it is also the medium for the transmission of culture. Culture, on the other hand, is the medium for the transmission of language. Before children ever reach a school, they learn the two most important lessons of their lives; they learn a spoken language and a culture without ever receiving any instruction (they might even learn more than one, in the case of children who grow up in bilingual environments).

> *Beyond fundamental skills of primate cognition… children's domain-specific knowledge and expertise depend almost totally on the accumulated knowledge of their cultures and its 'transmission' to them via linguistic and other symbols.... The amount of knowledge that any individual organism can gain by simply observing the world on its own is extremely limited* (Tomasello, 1999, p. 165).

Tomasello shows that language is essential for explicit knowledge and that it also provides a subliminal framework for organizing both the percepts of the observed world and the concepts of the inner mental world of the mind.

Oral Tradition Education

We have identified two subliminal modes of learning through language and culture, which have actually been characteristic of human learning ever since. The role of culture and language for learning has not changed, but the content of language and culture is constantly changing and evolving as new forms of technology, commerce, and social organization emerge. The explicit part of the education of the young in primary oral societies (Ong, 1982) took the form of vocational training and the other part focused on the tribal myths, legends and stories that were orally recited during communal rituals and family gatherings. Vocational training of youngsters was not formally organized, but took place through their participation in the work activities of their parents. It was through the story-telling that the values and wisdom of their culture were transmitted to them by the elders of their society. Both forms of education were mediated by the spoken word, either through oral instructions in the former case, or often recited legends and myths in the latter.

The basic form of preliterate education is mimesis or imitation, just as an infant learns to speak by imitating his or her parents. The oral instruction of vocational training was supplemented by demonstrations of how to do things correctly. The young people who were learning new vocational skills did so by imitating the work patterns of their elders, whom they served as assistants or apprentices. Secret societies or fraternities existed to ensure the perpetuation of vital skills, such as those of weavers, potters, toolmakers, warriors, hunters, fishermen, builders of shelters, and canoe makers. Imitation also played an important role in the education provided by storytellers and priests. The skills of their trade and the legends themselves were passed on through oral instruction and memorization.

The exact words of each story, down to the accents, were memorized and transmitted through the ages in much the same way that nursery rhymes are preserved to this day. This is why the tales were always in the form of poetry and never prose. The plot, rhyme, and meter of the tales were integral parts of the stories of the oral tradition; they served as mnemonic devices, aiding memorization. Non-poetic language or prose would have been much more difficult to recall and recite. The right-brain skills of pattern recognition and music were therefore an essential part of the education system and cultural development in oral societies.

In addition to the wisdom and cultural values the storytellers imparted, they also shared with their audiences important tidbits of practical information. Woven into the plots of his tales, the storyteller could explain how to hunt for prey, how to conduct oneself with elders, how to build a canoe, or the importance of being brave in battle. Eric Havelock describes the bard as *"at once a storyteller and also a tribal encyclopedia",* who taught his lessons through the narratives of his tales (Havelock, 1963).

Writing and the Emergence of Schools

The first symbols that evolved into writing were initially developed for the purpose of maintaining accounting records of trading transactions. The new medium of writing emerged in Sumer some 5000 years ago to deal with the information overload that record keepers encountered in recording the tributes of agricultural commodities, submitted by farmers to the priests for redistribution to irrigation workers (Logan, 2004). The first records were actually made with clay accounting tokens, which were initially stored in baskets and then in clay envelopes. At some point it occurred to one of the record keepers that if the tokens were pressed into the clay envelope just before it was sealed, they would not have to break open the envelope to see what tokens were inside.

Some 50 years later it occurred to another accountant that there was no need to put the token in the envelopes. Records could be made by simply pressing the clay tokens onto clay tablets. Thus the first rudimentary form of writing and numerical notation emerged simultaneously. It did not take long for the Sumerians to realize that by making marks on their clay tablets, they could record all kinds of information, not just records of tributes paid as taxes. Soon writing was adapted for communication and eventually the composition of poems, stories and essays. The writing systems and numerical notations that emerged allowed the amount and type of data being stored to expand enormously. The invention of writing and mathematical notation also had a tremendous impact on the informatics capacity of human language and thought. It also led to the creation of the first schools.

The institution of the school and formal education is such an intrinsic part of our culture that we take its existence for granted. We do not realize that schools, as opposed to education, are a relatively recent development. Schools were first organized only 5,000 years ago in Sumer, shortly after the invention of writing. The objective of these first schools was to train young people to become scribes. Education, as opposed to schooling, did not start with the advent of writing, but began at the very dawn of human history as we have already related.

Education and schooling are not the same, although their overlap during the industrial age was almost total. McLuhan (1966) argued that with the extensive use of electric media, education and schooling would separate and become distinct:

> In the future basic skills will no longer be taught in classrooms. They can be taught by gramophone records or by tape records or video tape playback machines. When video tape becomes available to the ordinary household as it will shortly, there will be a revolution in education … With the coming of the portable privately-owned printed book, the whole educational process took on a new character. This is going to happen with

video tape machines, because it means that anyone can have top-level surgeons, biologists, physicists, philosophers, poets – anything for his own private use on all subjects and at his own time, his own leisure and his open space. (p. 38)

It is now almost 50 years since he first made that prediction and we have seen the emergence of a whole new class of digital media in the meantime, but schools have not disappeared, despite the urging of Ivan Illich in *"Deschooling Society"* (1970), plus mounting criticism of the continuation of industrial era schooling practices in the Internet Age.

Our thesis is that schools still have a role to play in education and will continue to do so, but they are only part of learning in the information era. One of McLuhan's more sober predictions, namely that people would learn a living instead of earning a living, has certainly come to pass. The importance of workplace training has never been greater, along with the recognition that lifelong learning is essential for all skilled workers and professionals. The other idea that McLuhan developed is that the classroom as it was organized in his day would have to be reorganized to accommodate a new electronic communication reality. That has been happening for some time. But for now, we turn to considering the way in which the school and the classroom first came into being 5000 years ago in Sumer.

"The Sumerian school was the direct outgrowth of the invention and development of the cuneiform system of writing, Sumer's most significant contribution to civilization" (Kramer, 1959). Schools had to be organized to teach reading, writing, and arithmetic, because unlike the other previous skill sets, these three activities cannot be learned from observation and imitation. Speech is the only form of language, which is learned naturally by imitation. Formal instruction has to be organized for instruction in writing and mathematics. To the illiterate and innumerate, the secret codes of the letters and the numerals and their proper use have to be taught.

Judging from the exercise tablets prepared by students learning to write, along with descriptions of their training by their teachers found at the most ancient levels of archaeological sites in Sumer, it is evident that schools were organized almost immediately after the appearance of writing (Kramer, 1959). They were organized originally for vocational reasons, to train scribes for administrative duties. Reading and writing in education were at first used exclusively to teach the skills of reading and writing. As schools evolved, they were also used to teach other subjects as well. Despite the practical motivation for the founding of these scribal schools, which appeared in every major urban center of Mesopotamia, scientific, scholarly, and literary activities began to develop in these institutions. Lists of natural phenomena such as trees, insects, rivers, and minerals; lists of geopolitical features such as cities and rulers; mathematical tables, lexicons, dictionaries relating different languages,

theological tracts, and poetry were all created at these schools and used as teaching tools (Kramer, 1959). The "databases" inscribed on the clay tablets represented the first textbooks or software tools and were initially used to train students to learn the medium of writing; later, they became objects of study themselves.

The teachers in these scribal schools were:

"… keen observers of nature and the immediate world about them. The long lists of plants, animals, metals, and stones which the professors compiled for pedagogic purposes imply a careful study of at least the more obvious characteristics of natural substances and living organisms." (Kramer, 1959, p. 136).

The information on the tablets was then used to teach other topics, including mathematics, science, foreign languages, poetry, theology, accounting, and administration.

We know a great deal about the earliest school system of the Sumerians from archaeological finds made in Iraq. Actual classrooms were unearthed in which clay tablets used to teach the children were found. The mode of organization of Sumerian schools set the pattern for schools right down to the present day. The shape of the rooms, rectangular; their size, accommodating thirty to forty students; and their structure, with rows of benches facing the teacher, bear an uncanny resemblance to our modern classrooms, which fundamentally teach the same subjects as were taught in Mesopotamia. Mesopotamian schools, like those of today, were graded and hierarchical. There were primary schools in which basic literacy and numeracy skills were taught. There were also institutions of higher learning devoted to professional training. These institutes taught technical subjects such as astronomy, medicine, architecture, and engineering, or they specialized in the professions related to government service, including theology (or temple service), law, commerce, teaching, and military science.

All societies, which developed a formal education system, possessed a writing system and all literate societies had schools. The ancient Incas are a possible exception, because they had formal schools but did not have a true writing system. They did have a highly developed system of notation called quipus, which was a complex system of knotted colored strings that recorded both quantitative and qualitative information. The Babylonian, Egyptian, Hebrew, Vedic, Chinese, Mayan, and Aztec cultures are examples of the earliest cultures to have developed both a writing system and schools for training their young people.

The Egyptians were the second culture, after the Sumerians, to develop a writing system, and they were also the second culture to develop a formal school system. The Egyptians invented their writing system and organized formal

schools sometime in the third millennium BCE. *"The curriculum of elementary education was centere*d on writing" and writing was the "staple in all formal secondary education" (Power, 1970).

The Impact of the Phonetic Alphabet on Education

The next development in the evolution of communication to impact education was the invention of the phonetic alphabet by the occupants of the south Sinai, namely, the copper miners who traded with the Egyptians. Mentioned in the Bible as the Kennites, their leader was Jethro, the father-in-law of Moses (Logan, 2004). It is from the Kennites that the Hebrews, the "People of the Book", inherited the alphabet and developed a culture based on widespread literacy, because of the relative ease with which persons could learn to read using a phonetic alphabet. The Hebrews developed a system of formal education, based on their literacy, which combined both oral and written pedagogies. Notable is the fact that the schools in which the Torah and Talmud are taught are among the few, which have retained both the oral and written curriculum.

The ancient Greeks who inherited the alphabet from the Phoenicians improved on the Semitic alphabet by representing both the consonants and vowels. This made the learning of reading even easier, and hence, as with Israel, a large reading public developed in ancient Greece and the Hellenistic states that succeeded it. Whereas the Hebrews used their writing system mainly for sacred texts, the Greeks developed philosophy and science. They founded schools for learning the rudiments of reading, writing and arithmetic, as well as schools of higher education, such as Plato's Academy and Aristotle's Lyceum.

> *"Plato encouraged his students to use logic, science, and rationality to find fresh solutions to problems instead of relying on the traditional remedies of the past. Together with training in mathematics and logic, Plato encouraged his students to formulate the problems of human existence in scientific terms. The impact of the phonetic alphabet was to introduce both a new style of education and a new approach to problem solving."* (Logan, 2004, p. 128)

In India, the Buddhists developed the institution of the monastery, devoted to learning, which served as a model for monasteries in the Christian world, as well as for the Western university. In China, the education system served the government's need to train civil servants, who worked in the bureaucracy, the form of administration that is itself a by-product of writing. The examination system was a key element in Chinese education.

The Greek educational system was inherited by the Romans and thrived in Europe until the fall of the Roman Empire. The focus of Roman education was more on practical matters, such as civil administration, commerce, and law. When the Roman Empire collapsed, together with trade within Europe, so too did

the Roman administrative and legal infrastructure, along with the need for formal education, which fell into almost total decline, except for the activities of the Church and their monasteries.

It was not until the eleventh century that literacy entered the mainstream once again, due to the expansion of trade. Cathedral schools for the lay public began to be organized, along the principal trading routes. These schools evolved into the medieval universities some 300 years later. They provided training in the arts, theology, law, and medicine.

This was still the time before the invention of the printing press, so university instruction was organized around the need to create the texts that the students needed to study. Instruction consisted of lectures, repetitions, and disputations. The lecture, as the word *lēctūra* from Medieval Latin suggests, was nothing more than a *lector* dictating a book to the students, so that they would each possess their own copies to study from. During the repetition phase, the text was read aloud again, this time more rapidly, so that students could check their copied texts for inaccuracies. Finally, during the disputation phase, the ideas contained in the texts were actually discussed and debated. This oral transmission of written texts was the only practical way of creating textbooks that the students of the day could afford to own.

It is interesting to note that, despite the existence of the printing technologies today and affordable textbooks, today's universities more or less follow a similar procedure. Most university lectures are little more than a professor reciting some text that they have prepared before class. The repetitions phase has been dropped, but disputations have survived in terms of tutorials with the professor's teaching assistants.

Although the focus of study at medieval universities was on classical texts, a great deal of the learning occurred through oral discourse. The content of the education system involved written texts, but the learning medium was the spoken word. The actual curriculum of the medieval university consisted of the seven liberal arts grouped in the trivium of grammar (literature), rhetoric, and logic, and the quadrivium of arithmetic, geometry, astronomy, and music.

The Impact of the Printing Press on Education

Citing media scholars Ong, Logan, and Meyrowitz, Cassidy (2004) points out that our modern schools are themselves essentially products of print media and "typographic habits of mind" (p. 287). Levinson (1989) has called this traditional form of education "place-based book-paced", while Meyrowitz (1985) writes that graded schools are "closely related to the informational characteristics of print. Print allows for information segregation and gradation" (p. 254).

There was tremendous growth in the number and variety of schools with the advent of the printing press, because books were more plentiful and most importantly, more affordable. The availability of printing presses also encouraged

the production of books in the vernacular languages of Europe, eventually eliminating the barrier of having to learn Latin to become educated. There was a practical element to education, as well. The bourgeoisie considered education:

> *"… a means of fostering the moneymaking powers of their sons, for as bankers, traders, manufacturers, and landowners, they could readily see the practical value of education; consequently, children were hastily schooled in the rudiments of business and put directly to work at the occupations of their fathers."* (Palm, 1936, p. 38)

One of the consequences of the creation of a vernacular literature, made possible by the printing press, was the rise of nationalism. Nationalism, in turn, gave rise to the desire for national educational systems. The printing press made this goal a reality by allowing uniform national curricula, based on mass-produced textbooks to come into existence. *"Henry VIII could require all schools to use a single textbook in grammar and no other"* (Cole, 1950). The use of the same textbooks on a national basis also led to the standardization of national languages and the idea of "correct" grammatical usage of vernacular languages in both their written and spoken forms.

The availability of vernacular language books that were affordable also gave rise to self-taught persons, individuals who educated themselves by reading a great variety of books. Schools no longer had a monopoly on knowledge. A similar phenomenon is repeating itself with the availability of texts, pictures and videos via the Internet. Another impact of the printing press was that it helped fuel the Protestant Reformation that in turn encouraged lay people to read the Bible in their own vernacular languages, thereby encouraging them to become literate and undermining the authority of the Church. Thus literacy, the Reformation, nationalism, individualism and many other aspects of the modern world were by-products of Gutenberg's printing press.

> *"Gutenberg's invention made the soil from which sprang modern history, science, popular literature, the emergence of the nation-state, so much of everything by which we define modernity"*

The Impact of the Industrial Revolution on Education

The factory, a creation of the Industrial Revolution, produced wide-ranging social changes. One of these was the problem of what to do with the children whose parents went to work in the factories. At first children worked beside their parents in the factories. But, after child-labour laws were passed to prevent this practice, a system of universal education slowly emerged. The printing press, the forerunner of the Industrial Revolution, made universal education possible because of its ability to provide low cost schoolbooks.

Alvin Toffler (1980) has suggested that the curriculum of mass education evolved as it did, partly to train the children of the working class for factory work, which became its hidden or "covert curriculum". Toffler asserted that:

"Built on the factory model, mass education taught basic reading, writing, and arithmetic, a bit of history and other subjects. This was the overt curriculum. But beneath it lay an invisible or covert curriculum that was far more basic. It consisted - and still does in most industrial nations - of three courses; one in punctuality, one in obedience, and one in rote repetitive work" (p. 45).

Children were inculcated with the following lessons: show up to work on time, take orders from your bosses without questioning, and remain on the job, despite having to perform *"brutally repetitious operations"* all day long, as illustrated by Charlie Chaplin in his film, *Modern Times* (1936).

In the industrial age, work was no longer individualized, as it had been when production was based on craftsmanship. The educational system that developed during the Industrial Revolution reflected the mass-production assembly-line style of production. The factory served as a model for education, which was delivered to a mass audience in assembly-line fashion. This was not the case with universities and private schools, founded at an earlier time and attended by the privileged members of society, but it was certainly true for the public school system.

The modern industrial state assumed responsibility for education to ensure that its economy would benefit from a uniform, productive work force. The uniformity that the printing press and the industrial assembly line encouraged also influenced how children's education was planned and their performance evaluated. Unless a child was able to learn at the same rate as his or her peers and advance through the curriculum lockstep, he or she fell behind and was demoted, demoralized, or often both. Children unable to fit themselves into this inflexible system invariably dropped out.

The Impact of Electric Media on Education

We shall make a distinction between non-interactive electric media, which by and large are mass broadcast media such as TV, and interactive electronic media, such as computers, the Internet and digital or new media. McLuhan tended not to distinguish between these two classes of electric media. In his defense, we point out that the only computers he had a chance of personally observing were the large corporate, government and military mainframe computers, which are not as interactive as personal computers, nor available for ordinary users. Worth mentioning is that McLuhan's many predictions about electric media have held true, and in fact are more applicable to today's interactive digital media, than to the electric mass media which he commented on.

A further distinction must be made between the written and printed word and electric/electronic media. The former encourage patterns of information processing and organization, which are linear, sequential, analytic, specialized, and logical. Electric and electronic media, on the other hand, encourage information-processing patterns and organization which are holistic or global, integrated, synthetic, generalist, and metaphorical.

After World War I and during the 1920s and '30s, educational film in North America was linked to progressive education, both of the child-centered variety, following John Dewey and the "social efficiency" variety, following Frederick Taylor, appealing especially to the visual literacy movement (Cassidy, 2004). Dewey (1997) believed that "the image is the great instrument of instruction" (p. 21), which coincided with the child-centered progressive's beliefs that children learn best through visual exposure to images, rather than lectures.

Film in education also gained impetus from film's use for propaganda during World War II, when its power to instruct and influence was recognized. Furthermore, some of the educational research of the day seemed to suggest that the use of film and visual aids helped to speed up learning, especially for low-ability learners. That film did not gain a more prominent place in North American public education can be attributed to many factors, such as funding problems, technical and equipment difficulties, lack of fit with the curriculum, distribution and scheduling problems, the need for teacher training and support, teacher time constraints, fear that media might replace teachers, and a clash of cultures between educators and profit-motivated commercial media producers. There was also a backlash against child-centered progressivism, which was linked to communism during the McCarthy era and led to a purging of progressive elements from American public schools.

Radio met a similar fate for many of the same reasons (Cassidy, 2004). First used to deliver a physics lecture in Nebraska in 1921, teachers were excited by its ability to link the classroom to the outside world, to act as a democratizing medium, to equalize educational opportunities for students in remote schools, and to help children develop more sophisticated listening skills. However, early advocates exaggerated the educational potential of radio, receivers were expensive, lessons had to be fitted around program scheduling, often with no previews of program content, and teachers, conditioned by Depression-era cutbacks, became anxious about being replaced by the medium. Furthermore, there was a culture conflict between teachers and broadcasters, who criticized teachers for not being "radiogenic" and lacking showmanship, an NBC vice president defining the medium's bias simplistically: "Radio is a show business" (Cassidy, 2004, p. 137). Despite some successes, by the early 1950s educational radio had to contend with an even more promising new medium – television – against which it didn't stand a chance.

Greeted with great expectations in North America, *instructional* television (ITV) for classroom use, as distinct from *educational* television (ETV) for the

general learning public, was initially seen as a mass instruction remedy for deficient and overcrowded schools, plagued by teacher shortages (Cassidy, 2004). Blame was directed at America's public education system for Russia's apparent lead in science and technology that culminated in the launching of Sputnik in 1957. The resulting anxiety created renewed interest in new learning technologies as solutions for America's educational problems. The military took the early lead in ITV research, however while their findings were beneficial for military training, not much of it seemed applicable to K-12 classrooms.

ITV research in schools however, some of it funded by the Ford Foundation, was not without encouraging results; in certain cases, ITV appeared to improve student achievement on standardized tests. Other benefits included the improvement of educational opportunities for rural schools and cost savings resulting from fewer teachers having to be hired. While the latter endeared the medium to school administrators, teachers not surprisingly felt threatened. In the end, ITV did not succeed. Equipment and programming was expensive and some teachers were critical of a medium that in its popular form seemed to promote aggression, passivity, and illiteracy. Finally, teachers could not support ITV, as to them it appeared to be a top-down reform that eliminated teaching jobs, foisted upon them without their agreement.

Some of the promise of ETV has been realized. It is an excellent disseminator of information, giving the viewer a sense of "being there." It is both informative and entertaining, but its effectiveness as an educational medium has been limited. Sesame Street, for example, has helped correct some of the negative racial stereotypes, which abound in North American society, but it has not achieved all of its goals of improving inner city literacy and numeracy.

Despite some of its positive effects, ETV, has had an overall negative impact on education, as McLuhan believed. By providing information and entertainment in such an effortless manner, television discouraged children from reading more. Television occupies too much of the leisure time of children, robbing them of the opportunity to spend more time reading. It also undermines their desire to read, and destroys their attention span. Reading requires concentration and effort; with TV kids can get much more information and excitement than that they can get by reading with little effort. Television destroys children's attention span by providing them with carefully digested and packaged nuggets of information in extremely short time intervals of approximately 60 to 90 seconds. The painstaking process of learning the three Rs has been made to seem like a chore in comparison to the ease of watching TV.

McLuhan used to joke that the solution to the problem with TV was to pull the plug. Although a minority of families has done that, computers and the digital "new media" have diverted children's attention away from television by providing a more compelling interactive alternative.

If ITV seemed to be a logical solution for mass instruction, individualized automated instruction was provided for by teaching machines, programmed learning and computer-assisted instruction (CAI). The learning theories behind these initiatives derived from American military research and the behavioral psychology of Edward Thorndike and B.F. Skinner, who emphasized learner reinforcement through immediate feedback and the arrangement of learning content into small easy-to-digest units (Cassidy, 2004). Systems thinking, premised on the idea of user and machine as a discrete integrated system, also played a part, leading to the emergence of the field of instructional technology. Automated instruction was applied to education in the context of American national security Cold War fears that demanded better results from public education to support the technology race against the Soviet Union, as well as greater equality in learning opportunities.

However, because CAI was expensive, its application in American schools was primarily for research, since school children were needed to try out learning theories and technologies often derived from military research. However, a CAI school initiative that has had some staying power is the PLATO (Programmed Logic for Automatic Teaching Operation) system, the first generation of which was developed at the University of Illinois in 1959. Students worked individually on mainframe computer terminals, guided by printed course manuals and online instructions, and with recourse to an always-present lab instructor. The resulting learning was effective and entirely satisfactory for the kind of procedural learning required for computer and business applications. Cassidy (2004) writes that PLATO was used in 70 U.S. locations in 1974, mainly industrial, military, and collegiate sites. But PLATO Learning Inc. is still in existence (see Ubiquity, 2005) and some school districts still use their systems. Although CAI and automated instruction are clearly still in limited use, they never lived up to their proponent's hopes and do not represent the public education mainstream.

Interactivity, defined as *"reciprocity in actions and responses in an infinite variety of relationships"* (Simpson & Galbo, 1986), is what is "new" about "new media." Unlike the computers used for CAI, the computers at the center of new media are network-connected, the biggest and most important network of all being the Internet. And the Internet has given rise to an entirely new educational media ecology comprised of social media, blogging, syndication, podcasting, virtual worlds like Second Life, educational gaming, online synchronous as well as asynchronous courses using learning management systems (LMS), such as Blackboard, Desire2Learn (D2L) and the open source Moodle.

Teaching online courses requires different skills than teaching in a classroom, premised more on being a "guide on the side" - motivating, offering advice and direction, but not necessarily the solutions or answers - rather than a "sage on stage" who transmits content through lectures and directives. Palloff & Pratt (2001) offer the following description of the kind of skilled online teacher required to function effectively in an LMS-based online course environment: *"An*

instructor who is open to giving up control of the learning process, using collaborative learning techniques and ideas, allowing for personal interaction, and bringing in real-life experiences and examples, and who builds reflective practice into teaching…" (p. 22). Good online teaching requires active instructor engagement in online discussions, the antithesis of merely providing screen dumps of text.

Dr. Seymour Papert of MIT attracted major attention during the late 1970s and '80s with his work on children's use of computers as learning and creativity devices. His early work with Jean Piaget at the University of Geneva in the late '50s and early '60s led him to formulate his learning theory of constructionism, influenced by Piaget's epistemology of constructivism. While the latter holds that learners create mental models of the world around them, Piaget believed that learning was best achieved by learners making tangible objects in the real world (Papert, 1980; Papert & Harel, 1991). This led him to develop his LOGO computer programming language for young learners, the application of which he explained in his influential book, *Mindstorms: Children, computers, and powerful ideas* (1980). The book is premised on the idea that children can learn to use computers in powerful ways and that such learning can change the way they learn everything else.

The electric media era has been prolific in the introduction of new learning theories to help define optimal learning in both classroom and mediated learning environments. Besides constructivism and constructionism, mentioned above, some of the principal ones include situated learning (Lave), which holds that learning is unintentional and situated within authentic activities, contexts, and cultures; cognitive apprenticeship (Collins, Brown & Newman), which posits that people learn from each other through observation, imitation and modeling; discovery learning (Bruner) depends on inquiry-based instruction, by which learners are set to discover knowledge and relationships for themselves; problem-based learning focuses on the investigation and resolution of intractable, real-world problems, and; experiential learning (Kolb), a four stage view of learning through experience, perception, cognition and behavior (Driscoll, 1994; Learning Theories Knowledgebase, 2012).

Conclusion

Will networked computers and the Internet that have already revolutionized independent learning also revolutionize institutional education? That might happen, but the precedents are not encouraging and prospects not especially propitious. Electronic media have mainly been used to substitute for print media in conveying the same old content, without there being a wholesale educational system change. The educational system has been likened to an amoeba with "an uncanny ability to ingest a new idea … without changing [itself] very much" (Gardner & Barnett, 2003). Amoeba-like, it simply absorbs all media and reform initiatives, and flows remorselessly onward, remaining essentially unchanged.

As far as reform is concerned, with no historical perspective on the reasons behind earlier educational media failures, successive educational reformers have repeated the same mistakes with whatever new media they were espousing: devaluing and deskilling teachers by seeking to "teacher proof" classrooms through the use of electronic media, over-hyping the benefits to be derived from such media, failing to allay fears about perceived harmful effects of media on children, as well as educator suspicions of the motives of military, government and corporate sponsors of electronic media, as well as their own educational administrators. When this is coupled with funding problems, technical and equipment difficulties, lack of fit with the curriculum, distribution and scheduling problems, the need for teacher training and support, teacher time constraints, fear that media might replace teachers, and a clash of cultures between educators and profit-motivated commercial media producers, the reasons for the failure of educational media-driven reform become clear. Although there have been enthusiastic teacher advocates and exemplars using electronic media in education, they have been a minority of early adopters, with the efforts to introduce new media usually advanced by administrators, educational bureaucrats, government officials and business interests. Such top-down reform efforts have never yet succeeded. Whether networked computers and the Internet will finally achieve such reform and re-structuring of the educational system remains an open question. Numerous electronic media have attempted to supplant books in education, but none have yet succeeded, which is not to suggest that they eventually won't.

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