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HOW COMPUTERS IN THE CLASSROOM CAN AFFECT TEACHERS'
PROFESSIONAL AUTONOMY THROUGH THE REDEFINITION OF TECHNICAL
AND WORTHWHILE KNOWLEDGE

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ABSTRACT

HOW COMPUTERS IN THE CLASSROOM CAN AFFECT TEACHERS' PROFESSIONAL AUTONOMY THROUGH THE REDEFINITION OF TECHNICAL AND WORTHWHILE KNOWLEDGE

Margaret Simpson

While educational theorists are postulating a technical revolution through the introduction of computers into the school system, little investigation has been done into the attitudes and behaviors of teachers as the significant instigators of this new educational technology. This thesis takes the view that it is the teachers, through the responsible practice of their autonomy, which depends on the understanding of their own technical knowledge base and their identification of worthwhile knowledge, who will define the new technical reality within schools.

This is a small scale study and contains the standard restrictions of such studies. It is a study of 29 teachers of a combined elementary and secondary school in Montreal. The effect on professional autonomy of the introduction of the micro computer in the school system is examined using four dimensions of teaching established by Macklin (1981). These are: a) basic concepts, assumptions, and beliefs employed in teaching, b) the designation of worthwhile knowledge, c) the technical knowledge base, d) the

management of the technical base in the classroom. The findings revealed that teachers, far from sharing the enthusiastic acceptance of administrators and theoreticians, are exercising professional autonomy in their critical evaluation of the new technical curricula, which they see as underdimensioned and of limited value.

ACKNOWLEDGEMENTS

DEDICATION

To Lillian and Patrick Bucher in gratitude for my
first education; to Michael Hogben in gratitude
for my second; and to Keith Hogben and Mark Hogben
for the faith and encouragement that made this
work possible.

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CHAPTER I

INTRODUCTION

This study proposes to examine the cultural and philosophical roots in the formation of teachers' attitudes towards professional autonomy as represented in Macklin's four dimensions. The specific intent is to identify the factors that determine teachers' attitudes towards the introduction of computers into the curriculum. Thus we must address the various dimensions of the "sciencing" of the curriculum through the introduction of computers in the classroom, and to examine the effect of the introduction of computers on the technical knowledge base, and the management of the technical base in the classroom. In this way we can analyze the effects of computer aided instruction on the autonomous dimension of professionalism attitude, where teachers' critical judgement is the basis for curriculum implementation and usage. Basic questions which are posed and analyzed are as follows: What constitutes autonomy for the school teacher and how is it achieved? What do teachers consider to be the specialized/technical knowledge base in the classroom, and what is the effect of the introduction of computers on this technical knowledge base? What do teachers consider to be 'worthwhile' knowledge and how has the introduction of a computer curriculum affected their views? Do teachers designate as 'worthwhile' that knowledge which is synonymous with higher

order technology?

Not only is it necessary to explore the ideological base for the teacher's perspectives of curriculum and pedagogy, but also to examine the social infrastructure within which these changes are proposed. Only through a consideration of both the sociology of knowledge and the sociology of professionalization can the parameters of the realities of computers in the classrooms be defined. The occupational perspective of teachers derives cognitive support from the institutionalized views of society together with the practices of membership in their profession and acceptance of its orthodoxy. Consideration must be given to these areas within teaching institutions. It is here in these institutions that teachers perform their jobs, and it is within the practice of their jobs that teachers articulate, negotiate and legitimate ideologies.

I. Teachers: Autonomy, Technical/Specialized Knowledge*, and Worthwhile Knowledge*

While controversy over the definition and/or recognition of teaching professionalism has continued for many decades, the formal framework within which the teaching profession can be examined is divided into two dimensions;

*For the purpose of this study, the terms specialized knowledge and technical knowledge are interchangeable and refer to the expertise developed by teachers from their 'on the job' experience. Worthwhile knowledge refers to those aspects of the curriculum deemed important by teachers based on personal and societal values and conveyed implicitly or explicitly to students.

structural and attitudinal (Macklin, 1981). Richard Hall in his classic work on the measurement of attitudinal components of professionalism outlined five aspects for assessing teacher professionalism: use of professional organization as a major referent, belief in public service, belief in self regulation, sense of calling to the field, and a feeling of autonomy (Snizek, 1972). Further research on the attitudinal dimension of professionalism concludes that

"the most single important factor affecting teachers' mentality still resided in their immediate working environment as peer relationship measured by group characteristics in school, affected profoundly from four out of five dimensions of professional attitude" (Lam, 1979, p. 168)

Macklin focuses on the last of Hall's categories; autonomy. He states, "If this autonomy is to be used responsibly, then teachers must be capable of operating in a complex and constantly changing social interactive situation where rule following is inadequate" (Macklin, 1981, p. 29). He proposes four dimensions of teaching in order to specify its professional elements: 1. basic concepts, assumptions, and beliefs employed in teaching; 2. the designation of worthwhile knowledge; 3. the technical knowledge base; and 4. the management of the technical base in the classroom. He observed, quoting Brown (1968),

"Intelligent evaluation and clarification of the vast jungle of teaching practices is possible only if the concealed cultural and philosophical roots of the competing interests in the controversy are raised to

the level of consciousness and are opened for public inspection. This requires teachers to make a serious effort to identify the values they use as guiding principles in making judgements about teaching practice" (Macklin, 1981, p. 30).

Teaching practice and technical knowledge base have assumed new significance as a result of the "technological revolution" our schools are now undergoing. There are over 350,000 computers in place in U.S. schools (Bradley, 1984), and predictions indicate that every student will have his own computer by 1990 (Papert, 1980). Educators are not unanimous in this acceptance of computer universality. Some observe that "it is a passion not likely to be sustained by a sizeable part of the population, out of school or in." (Bradley, 1984, p.21). Others, more numerous, would agree with John Leyin that "a rejection of this technology, or at least a rejection of what can be learned from it, will limit the social relevance of Canadian institutions of higher learning" (Leyin, 1984, p. 84)

If we are to understand the implications of this new curriculum for both teachers and students, we must begin to examine the ways in which computer knowledge is becoming institutionalized and designated worthwhile.

II. Teachers: Knowledge and Professionalism

Educational processes, teaching, learning and the organization of knowledge have usually been studied in sociology as separate phenomena. Because of this, the

basis for the intentions, cognitions, and the knowledge
they are founded upon, have been either ignored or accepted
unexamined (Esland, 1971). The situation has been
exacerbated by the conceptual separation of curriculum
research from the study of teaching. Research is necessary
in order to understand the framework by which knowledge, as
it is arranged in the curriculum, is related to the ways in
which teachers organize that knowledge and the ways in
which this knowledge is identified by the pupils. Of
particular importance is the understanding of the
pedagogical principles which form the basis for the
implementation of innovative curricula, and the ways in
which this new knowledge effects and transforms the
subjective reality of both teachers and students.

Only through this kind of analysis can the assumptions
and definitions of worthwhileness, validity and social
order be bracketed in terms of their social-structural and
socio-psychological realizations" (Esland, 1971, p:73). By
examining the sociology of both knowledge and
professionalization we can begin to discover the parameters
defining reality within the schools.

Through the consideration of the institutionalization
of the views found outside in the dominant society,
reinforced by the members of the school society, and the
strategies by which these views are maintained, the
cognitive base of those views will be revealed. To

discover this occupational perspective requires
consideration of the locales where teachers do their work
and where ideologies are articulated, negotiated and
legitimated (Esland, 1971).

Changes in curriculum to introduce computer learning
are not the result solely of the decisions of the school.
Rather this change is related to the major society which
produces it, and to social change in general. For
curriculum change to occur, there must be changes in the
universally held beliefs of the social structure and
general acceptance of these changes. Curriculum change in
fact reflects a changing power relationship within the
cognitive communities. The task for the researcher in
examining the 'computerizing' or 'sciencing' of the
curriculum must be to attempt to understand the emerging
educational processes as they explicitly and implicitly
change the perceptions and explanations of the world for
both teacher and student and what the implications of this
new reality are for teaching as a profession.

In determining the worthwhileness of knowledge,
questions of truth and validity themselves become
problematic. The new philosophy of science has redefined
our understanding of objectivity and scientific. Where
once problems were thought to reside in an outside body of
knowledge, we now realize that the definition of problem,
the rules for its effective solution, and its verification

are themselves socially constructed. From this it is obvious that "The rules of the game change with a shift in interest" (Mills, 1959, p. 77). The cognitive tradition which forms the foundation of the school system can exist only through a supporting community of people. The production and survival of reality depends upon its plausibility to that community. It is teachers and students, through their common action, who will determine the 'reality' of the computers being introduced into the schools. The truth and validity of computers in the classroom will be derived from the relevancies and legitimacies conferred by those who must use them.

But as noted by Esland, "Surprisingly little is known about the constitutive processes of teaching and learning" (Esland, 1971, p:72). Yet it is this reality-building and world-building formulation by teachers and students that is central to acceptance and success of a new curriculum. These participants in the classroom act in intersubjective*

*Intersubjectivity: A category which, in general, refers to what is (especially cognitively) common to various individuals. In daily life, a person takes the existence of others for granted. He reasons and acts on the self-understood assumption that these others are basically persons like himself, endowed with consciousness and will, desires and emotions. The bulk of one's ongoing life experiences confirms and reinforces the conviction that, in principle and under "normal" circumstances, persons in contact with one another "understand" each other at least to the degree to which they are able to deal successfully with one another (Schutz, 1970, p. 319).

ways to typify and interpret actions. They do this through
vocabularies and behaviors that they accept as plausible.
Much of the knowledge that forms the base of these
transactions is implicit and unless we begin to examine
these taken-for-granted parameters, we will
not be able to understand what is happening in our schools
with the proliferation of computers.

This thesis, using Macklin's focus on responsible use
of professional autonomy will examine the pertinent factors
relating to this proliferation of computers into schools.
Chapter II will review what constitutes autonomy for
teachers and will describe the specialized/technical
knowledge base upon which this autonomy depends. Through
the examination of the role of computers in this
specialized/technical knowledge the new accommodation
experienced by teachers and the effect on teachers'
perceptions of worthwhile knowledge are explored. Chapter
III will concentrate on the way in which the introduction of
computers into the classroom is determining the current
specialized/technical knowledge base and thereby
professional autonomy for teachers. The significance for
the teaching profession in meeting these changes
responsibly; in adaptation to the sciencing of the
curriculum; and in the implication for designating
worthwhile knowledge, will be investigated. Chapter IV
presents a case study which reflects the main concepts

presented in this investigation. Chapter V examines general conclusions and areas for further study.

CHAPTER II

THE EFFECTS OF THE INTRODUCTION OF MICRO COMPUTERS IN THE
CLASSROOM: PROFESSIONAL AUTONOMY AND TECHNICAL KNOWLEDGE

I. Teachers: Professional Autonomy

In an exemplar context the characteristics essential for a
valid profession, the specialized knowledge required to
practise, control of entry to the profession, formulation of
ethical code, and the freedom to practice without lay
interference, would occur in balanced unison (Musgrove,
1965). Prestige and autonomy would "flow naturally from the
cognitive and normative bases of professional work" (Larsen,
1981, p. xi). Variations of these characteristics are
numerous, especially between the traditional professions
such as medicine and the 'para' professions such as
teaching; but some element of them remains common to both
(Esland and Salaman, 1980). Autonomy, the right of a group
to control its own work, has been proposed as the basis for
the distinction of a profession from other occupations
(Freidson, 1970).

The element of autonomy varies not only from profession
to profession, but in reference to teaching, within the
profession itself. While the profession of teaching demands
of its practitioners both high ethical standards and exact
qualifications, teachers do not enjoy the corresponding
freedom to practice as their own members dictate. Very few,
if any, professional teachers in the Quebec school system

are independently employed. When an entire profession is employed by the state, the profession begins to resemble a body of experts, employed by a patron (Musgrove, 1965). It has been argued that when teachers are placed in the position of simply selling their labour, proletarianization is the result and the profession as such no longer exists (Oppenheimer, 1980).

This dependence upon the state has resulted in the erosion of traditional control and in the use of advisors who are laymen to the teaching profession to proscribe the conditions of service. While both medicine and teaching in the province of Quebec are government controlled, direct interference is far more pervasive in education. Teachers have virtually no autonomy over curricula. The Department of Education sets curricula and dictates their implementation. However, teachers do enjoy wide freedom for individual practice within the contemporary norms relating to curricula and pedagogy.

While theoretically all teachers are equal, and therefore enjoy equal autonomy, in actual practice a hierarchy among teachers already exists before they ever enter the classroom. From the time they are engaged to fill a position, their prestige is established. The higher the grade level; the more status. Even though the professional requirements for teaching in the province of Quebec are standard and universal for all grade levels, this bias is

obvious and pervasive.

Once in the classroom as practitioners, teachers establish a hierarchy within the school. Friedson (1970) has noted that within professions, a fairly clear awareness exists of differentiation between the levels of achievement and competence of different practitioners. Teachers quickly assess each other on many factors; from education level to classroom discipline, and categorize each other. Since the cognitive functions of hierarchy are intimately connected with the way we solve problems, and the school is an organization structured precisely for solving problems, it is not surprising that hierarchical structuring penetrates it so deeply (Burns, Karlson & Veljki, 1979).

Research has indicated that the more esoteric the knowledge required, the more the worker must learn, and the more likely it is that the importance of the working knowledge will be recognized both by the workers themselves and by others (Kusterer, 1978). The special academic knowledge of the teacher is what establishes one's entry into the hierarchy but it is the technical knowledge base, i.e. the strategies used by teachers in the classroom, and their management that is recognized by fellow workers and predicts their internal status.

Working knowledge is an adaptation to the workplace or environment and is the essence of 'on the job' learning. This increases the worker's effectiveness to manipulate

and even transform the environment and the basis for power.
Teachers develop this ability both for survival and
satisfaction (Lortie, 1975). A worker, professional or
otherwise, must be able to get along with fellow workers, to
perform up to the expectations of colleagues and thereby
secure help and cooperation when needed. Everyone should
know enough about the social environment to enable
prediction of occurrences, and preparation for, and perhaps
prevention of crises. The person who achieves this
competence is the one who is perceived as 'the best'
(Kusterer, 1978), i.e. teachers who can get both fellow
teachers and students to obey their will.

Development of this type of expertise demands high
personal standards. The person must wish to work to the
best of his/her ability; and develop extra knowledge -
beyond entry level expertise. This ability is rewarded by
the respect of colleagues and control over the work
situation. Working knowledge does, in fact, provide,
teachers with a technically informed perspective of their
work environment. The teacher who hones this skill is more
equal than others and is so recognized by fellow teachers
(Lortie, 1975).

Within the complex social system of the classroom, with
its constantly changing relationships and activities, the
teacher may practise almost total autonomy over certain
areas. While the legitimacy for this autonomy and for the

teacher's presence in the classroom is rooted in the specialized knowledge of the teacher, the achieving of this autonomy in practical terms depends upon technical /specialized knowledge.

The most obvious manifestation of the teacher's authority is the myriad administrative decisions governing everything from the physical properties of the classroom to student/student, student/teacher interaction and deportment in the classroom. Teachers are free to establish their own personal conditions of work, albeit within the normative curricula framework. It is the teacher's judgement which decides who is a gifted student and who is a slow learner; who will get more teacher time and who less. The state of social control within the classroom is in the hands of the teacher (Musgrove, 1965).

Students learn to accept the teachers' right to dominate the classroom verbally. Studies have demonstrated that two thirds of all time in classrooms is spent talking and two thirds of that time is spent in teacher talk (Delamont, 1976). In the methods and applications of learning the teacher is almost totally free. While it is true that as some children grow older, they will be better able to negotiate with the teacher on classroom management, teachers will continue to emphasise their own ideology to develop in the student the attitude that most nearly matches their own. The teacher's role in developing the child's

perspective on school cannot be overestimated. Studies show that by secondary school, students have "very largely accepted the map and _methods_ of learning offered by their teachers" (Musgrove, 1965, p. 250, emphasis added).

When a reflective choice is to be made in a new or problematic situation, teachers base their solutions on their present teaching viewpoint and overall philosophy. But many of these day-to-day decisions concern not substantive content but the management connected with it. Boydell (1974) demonstrated in an analysis of 'teacher talk' in the classroom, only one quarter of the conversation addressed content. The other three quarters of teacher conversation was about the children's _activities._

Teachers attempt to orchestrate a learning situation by enforcing within the classroom their own outlook, values and perspectives. Generally this is done by dictating a series of particular standards pertaining to the use of space, time and resources. Teachers define which interactions are acceptable between students, and between students and teacher, and decide not what the content will be, but certainly the way in which it is taught. Success is measured by whether or not students are conforming to the blueprint for the classroom behavior. "Inevitably the reputation of any teacher, particularly among his peers, is very dependent upon the success that he achieves in controlling his own classes" (Musgrove, 1965, p. 254).

Inasmuch as the individual is successful, that teacher will be left alone to enjoy classroom autonomy. Otherwise the interference and dictates of superiors will be imposed. The ability to cope successfully with the constantly changing permutations of classroom interaction is the way in which autonomy is achieved.

II.   Teachers: Professional Qualifications and Technical Knowledge

Fundamental to the definition of profession is the body of specialized knowledge upon which it is based. The ignorance of the consumer is inherent in his consultation of a professional. The members of any profession must develop certain knowledge, skills, and techniques unique from any other occupational group. While there are many commonalities of knowledge, the individuality of application is peculiar to the specific profession. In all professions the current practice is to demand a formal, scholarly program of preparation to ensure the competency of those entering the profession.

In the province of Quebec, teachers at the elementary and secondary levels are required to have a minimum of a bachelor's degree and government certification in order to teach. While the state as the main employer is involved in specifying certain standards of knowledge and skill, teaching preparation remains vested in university programs.

However, teachers or their representatives are not themselves responsible for control of entry since the system is operated by the Department of Education through administrative regulations.

The teaching profession also differs from the traditional professions because of the difference in the clientele served by teaching. Teachers have a captive clientele which has little effect on the development of the service offered to it. "Very rarely does the consumer, whether he is defined directly as the pupil or indirectly as his future employer or his parent, have much influence" (Musgrove, 1965 p. 170).

For autonomy to exist, every teacher must function in a dual role: as a practitioner, but also as a responsible member of his profession (Sennet and Huggett, 1963). Every profession, and teaching is no exception, must be constantly concerned with the quality of university programmes that prepare its members, if reasonable standards are to be maintained. This professional knowledge base must be protected and maintained or the profession forfeits its reason for existence.

Evaluation of their preparation programmes by teachers indicates that as a group they believe mastery of subject matter is important (Lortie, 1975). However, it must be emphasised that teachers believe that their work is complicated and difficult and that it requires more than

subject matter. In a national study conducted by the National Education Association in the United States (National Educational Association, 1967), a large majority of teachers expressed satisfaction in the amount of time spent on substantive study, both in general work and their area of specialization. They were considerably more critical of the practical instruction they received.

As noted previously, intelligence, training, and the mastering of a body of relevant knowledge are required to become a professional. While recent modern developments (mass media, advertising, etc.) have shown that they can sometimes teach some things better than many teachers, "it is still true that to practice as a teacher assumes a core of specialized knowledge and skills, and that a relatively high level of intelligence is needed to be a teacher." (Musgrove, 1965, p. 170).

Teachers currently share neither a powerful technical culture, nor collegiality; teachers are characterized by social individualism. However, studies do reveal significant peer relationship effect (Lortie, 1976). The relationships among teachers are complex, ranging from views of fellow teachers as sources of help to sources of annoyance for neglecting to share unpleasant tasks.

There is much variation in the norms among teachers on collegial relationships. While there is some degree of self-isolation on the part of teachers, there is also

recognition of the 'good colleague'. A good colleague is friendly, sociable, and open. S/he does not manifest snobbery or arrogance. But more to the point for this study, teachers laid particular emphasis on the _technical_ performance of peers (Lortie, 1975, emphasis added).

Studies showing the advantageous relationship of working knowledge and peer relationships are well demonstrated (Kusterer, 1978). The workers who become expert reap the benefit of peer respect, gain social and environmental control, and set their own goals.

If the present division of teachers (computer literate vs. illiterate) continues, with the above advantages accruing to the teacher with expertise in computer aided instruction, we are, in fact, creating a hierarchy of teachers; and by implication of knowledge.

III. Teachers: the Role of the Computer in Technical Knowledge

Change is inescapable in education. At the present time the technological revolution has culminated in an administrative stampede to provide our students with computers. Teachers of necessity, and in some cases for survival, must begin to examine the parameters of this action to understand what is changing and in which direction change is occurring.

Recent literature suggests that computers will feature prominently in education, allowing children to learn to think in new computer-like ways (Winin, 1984). Demands for training of teachers in computer literacy are legion (Bruce, 1984; Colin, 1984;) and vary from the complex to the simple and vague expedient of ensuring all teachers can use the computers. It is difficult to argue against the fact that certain kinds of individualized learning will soon be far easier to implement, "with the computer acting as either an educational instructor or manager, or just providing assistance" (Welford, 1984, p. 49). But it is equally difficult to deny the observation that to date, computers are used to further entrench learning objectives and that they are adaptations that serve curricula that are product oriented and divided into discrete units for efficiency (Leyin, 1984).

Constant discussion of change has methodological implications: it can create the impression that fundamental alterations have already taken place. But has there been, in fact, a cultural change, an alteration in thought about practice? Some writers (Landry, 1984) argue that this seemingly unquestioning acceptance of the importance of computers in teaching is the result of confusing the best interests of students and education with short-term economic and political advantage on the part of the proponents. Computer technology should be used to relieve teachers of

routine, time consuming tasks to enable them to concentrate
on more innovative work. Drill, which is a necessary but
tedious part of the learning process, would be handled by
the computer; but work involving abstract concepts would be
handled by the teacher. Perhaps more disturbing is the
observation that control of the curriculum and deskilling of
the work of the teacher are exemplified in the wide use of
systems of pre-packaged sets of curriculum materials (Apple,
1984). Advocacy of such prepackaging is increasing with the
proliferation of computer systems. Certainly if reliance on
this type of material increases, the relevance of the
academic specialized knowledge of the teacher will diminish
not withstanding the observation that,

> "We must remember that, while we may train students in
> the use of tools, we teach human beings. The former
> task is explicit and highly deductive; the latter, a
> multifaceted human interaction of greater and more
> important complexity." (Landry, 1984, p. 121).

Teachers see themselves as problem solvers. The
ability to suggest and to try to find the best course of
action depends on teachers' knowledge, experience,
creativity, and freedom to make decisions in light of the
values held by themselves and the community. If our society
still believes that one of the indices of professional
people is ability to use their education and experience to
make critical judgements or choices regarding problem
situations that arise, we must examine more carefully the
use of school computers.

IV. Teachers: The Technical Knowledge Base

Schools are allocating large budget resources to buying computers.   Technology is forcing new accommodations with values and causing beliefs to evolve by the creation of new attitudes (Bereano, 1976).   While the definitions of technology are various and multilevelled, a commonality of factors does emerge.   One dictionary defines it as "the totality of means employed by a people to provide itself with the objects of material culture" (Webster, 1966).   The inherent manipulative power of technology has not gone unnoticed.   In his work "Technology: The Opiate of the Intellectuals", John McDermott refers to technology as "Systems of rationalized control over large groups of men, events, and machines by small groups of technically skilled men operating through organizational hierarchy" (McDermott, 1969, p. 29).   Technology rests in application; technology is for use (Wald, 1969).   When we examine technology, and by extrapolation, technicians, we examine "tools, machinery, and applied knowledge and the social/political context within which they are employed" (Bereano, 1976, p. 7).

Pedagogy is defined in the simplest form as the science or art or teaching (Schribner-Bantam Dictionary, 1977, p. 666).   A teacher is one who is adept at the practice of the science or art of teaching.   Few people would define schooling as purely intellectual in intent - the general

tendency is to include a variety of socialized goals. This breadth of purpose means that teaching is seen to be, and is judged in terms of, moral, aesthetic, and scientific values all at once (Lortie, 1975). The work processes in teaching, and the products sought by teachers are difficult to measure by several assessment criteria at the same time. We refer to teaching goals as intangible and thus underline their insubstantial qualities. Teaching acts are normally assessed in terms of multiple criteria applied simultaneously. The appropriate time to assess teaching outcomes is ambiguous; it varies from one goal to the next. Teachers work with inherently changeful materials; the objects of their efforts, maturing children, are supposed to keep changing after they have been taught. The teacher's art or science, then

> "is marked by the absence of concrete models for emulation, unclear lines of influence, multiple and controversial criteria, ambiguity about assessment, timing and instability of product" (Lortie, 1975, p. 136).

It is the teacher's skill in manipulating these inter-relationships and the teacher's insights into them that can be construed as the creative art or science of pedagogy. An apt distinction between the creativity of science and technology has been made by Polanyi who described the difference between the two. While originality is appreciated in both, in science

> "originality lies in the power of seeing more deeply than others into the nature of things, while in

technology it consists in the ingenuity of the
artificer in turning known facts to a surprising
advantage" (Polanyi, 1958, p. 178).

New technology does create new opportunities for
society but it also generates new problems. Whatever the
motivation, realization of the opportunities inherent in the
new technology will demand changes in social organization -
i.e. the ways in which people and institutions are organized,
to accomplish their purpose (Mesthene, 1976). In
considering the implementation of this new technology in the
schools we should reconsider the fact that the goals of
education have not changed; have not been redefined by its
advent. What is, in fact, being redefined is the teaching
profession.

'One of the ways of defining a post-industrial society
is through the change in occupational distribution - not
only where people work, but the kind of work they do (Bell,
1976). Unless teachers and the education profession in
general begin to examine the implication of computerization,
the move towards a more technical orientation with its
emphasis on quantitative knowledge will continue, and less
teaching autonomy will result.

While, as has already been discussed, teachers do not
enjoy autonomy in choosing the curriculum, autonomy is
almost absolute in the curriculum-planning activities of the
classroom. Within the teaching-learning situations teachers
are constantly forced to make critical judgements and

choices. Five frames of reference can be delineated as the basis for teacher decisions: 1. definition of specific instructional objectives, 2. choice of and organization of subject matter items, or centers of interest, 3. the choice of classroom activities or techniques, 4. choice of instructional materials, and 5. the determination of student progress in direct relation to the statement of instructional objectives (Harnack, 1968).

Recognition of these responsibilities is fundamental to professional teaching. The specific instructional objectives must be defined by the teacher. Failure to do so results in random wandering through a labyrinth of educational experiences. The accidental/incidental learning that would result would be totally unacceptable to any professional. It is precisely because the teachers believe they have an expertise and therefore know what to teach and what judgements to make, that a sense of autonomy exists. Given that the profession accepts that basic goals of the education system are defined by the community represented by the government, the teacher proceeds to exercise professional freedom in specific teaching-learning situations. While laymen may determine the over-all function of the school, teachers define the specific instructional objectives which will, in time, accomplish the overall objectives defined by the community. This definition of subject matter, instructional material and

instructional activity is the technical skill basic to teaching.

The choice of subject matter or other centers of interest demands the expert ability which qualifies the teacher as a professional. The teacher alone defines and organizes the subject matter content in order to fulfill the objectives. Whatever approach is decided upon, talking, reading, writing, etc., the activity must be directed towards something - that something and the way it is approached is the subject matter - and is solely the province of the teacher. This choice is not incidental or accidental but results from careful and informed thinking about the best approach to the teaching-learning situation. Such thinking revolves around many criteria which vary from the relevance of sequencing to the characteristics of the learner. It is the mastering of these criteria that constitutes the second technical base for effective teaching.

Daily decisions about teaching methods are fundamental for the teacher. Since classroom methodology is vital to the development of teaching/learning situations, teachers must be expert. The choice of technique is abundant. The choice among these methods is based on the knowledge and experience of the teacher together with the ability to consider specific purposes, pupils' characteristics, subject matter, and the availability of instructional material.

Inseparable from the methodology decisions are those made regarding classroom instructional materials. The teacher must choose from an already wide and ever-increasing availability of instructional materials. While the material must be related to subject matter, the teacher must also consider its relationship to the students themselves and the classroom techniques to be employed. An awareness of the advantages and limitations of all the permutations and an understanding of the latest developments in the field must be maintained.

Determining student progress is a somewhat subjective undertaking and while greater emphasis is being placed on "scientific" results - i.e. what is measurable, it must be noted that what the student has learned and how he/she progresses is not always quantifiable. The assessment of this non-quantifiable aspect of student development lies within the province of the teacher. It is the teachers' expertise and experience that underlies judgement and decision-making. The controversy over the classification of teaching as a science or as an art has been debated for many years. But regardless of one's professed interpretation, either 'scientific' or 'intuitive', the teachers must master the techniques outlined above, then they must learn to manage them successfully.

In the study conducted by NEA (1967) teachers in large numbers expressed dissatisfaction at the practical

instruction they received. More than half said they had too little preparation in classroom management, routines and discipline. Similarly a high percentage deplored the dearth of sufficient instruction in teaching methods (Harnack, 1968). While respondents criticized their practical courses because they were lacking in content and usefulness, they were more approving of practice-teaching experience. Further studies on teacher training indicate that while education professors set high and difficult goals for their students they do not provide the means to achieve them (Lortie, 1975).

Teachers in the classroom must find ways of effectively managing the technical knowledge base in that classroom. Yet one of the ways education seems to progress is through ideological change. The introduction of the computer is an example of an ideological shift, reflecting the new emphasis society places on reductionist, convergent, linear thinking which is expressed in bimodal logic and quantitative knowledge. The teacher is constantly confronted with 'new theories' which are normally advanced by discrediting former practices and outlooks. This repetitive discrediting of the past results in the lack of systematic codification of practical experience. A practice-oriented inquiry into problems and alternatives in the classroom has not been undertaken. The recording of cases together with the commentaries and critiques of highly trained professors

allows new generations to profit from the experience of the old. The denial of this training to teachers results in a situation where the beginning teacher starts afresh, largely uninformed about prior solutions and alternative approaches to recurring practical problems. Their professional training has not linked recurrent dilemmas to available knowledge or to consideration of reality (e.g. cases, simulations).

This repudiation of past experience produces curricula which demand excellence but fail to cope with routine tactical and strategic problems. In the absence of this type of instruction teachers are forced to rely on individual reactions and interpretations and the small expertise they have developed during practice teaching.

Yet as we have already noted the ability to control the class and the successful achievement of students is the criteria by which teachers' reputations are made or broken. Such practice tends to produce teaching that is individual rather than collegial simply because there is no shared technique. The new teacher learns by trial and error, and must learn quickly in order to survive. While the attrition rate of teachers is high (Lortie, 1975), the number of teachers who successfully develop effective management of the technical base in the classroom is impressive. But the isolation in which such knowledge is achieved and the incredible variety of the resulting techniques mitigates

against the construction of a common occupational subculture. Nevertheless, it is upon this type of specialized knowledge that teaching autonomy is based.

Teachers enjoy a very individual professional autonomy. For teachers, professional autonomy is based not only on academic qualification but on grade level taught, peer assessment, and management of the technical knowledge base within the classroom. This technical knowledge itself is affected to some degree by teacher training but generally is acquired only through practical experience; and it is within the management of this technical knowledge base in the classroom that the teachers' views on worthwhile knowledge are revealed. The current academic climate suggests that education is in the midst of a technical revolution and demands computer literate teachers. But before any sensible changes can be recommended, teachers must analyze what in fact their technical knowledge consists of; and how the introduction of the computer affects this knowledge and therefore, professional autonomy.

CHAPTER III

THE IMPLICATIONS OF THE INTRODUCTION OF THE MICROCOMPUTER IN THE CLASSROOM

I. **Teachers: Management of the Technical Knowledge Base**

The effect of the introduction of computers on the technical knowledge base of teachers (and by extrapolation on autonomy) could be profound and cataclysmic if their introduction is not carefully examined. If computerized learning is to be implemented in ways currently being advocated in the literature (Papert, 1980), we are working towards the development of computer-like thinking in our students. That objective is clearly proposed. Teachers will no longer be called upon to define specific instructional objectives except in the limited area of choice of software.

The choice of subject-matter or areas of interest will be determined, not by the multiplicity of vehicles for learning-teaching situations; talking, reading, making, etc., and may become secondary to computing wherever possible. Some researchers suggest that many classrooms do not serve as a social, interactive, communicative setting, and propose that microcomputers may be used to create the classroom's communicative context (Liebling, 1984). Indeed, the teacher will be relieved of making daily choices about

methodology technique. The methodology is built into the computer. The decisions on whether to have group discussion, or to read aloud, or to have committee activities, etc., will no longer be necessary. All that will remain for the teacher to do is to maintain an understanding of the latest developments in software. For some proponents in the field, this approach is still inadequate because it means that our schools are primarily using "concepts and skills from the last decade, in a time when we must prepare students for employment in the next decade" (Fischer, 1984, p. 22). The software, and by extrapolation the technical knowledge base, will be designed by someone other than the teacher.

Lastly and perhaps not unexpectedly, computer programs can be very exact in measuring student progress (albeit a limited interpretation of progress). The computer in itself is never in error, never biased, never judgmental; but it takes on the bias of the computer programmer. The computer is "scientific" in its assessment, ignoring the most important component; the human user.

Thus, in fact, if the universal implementation of computers becomes absolute and curricula are built to depend upon them, the technical knowledge base of the professional teacher will change fundamentally from strategies and techniques designed to develop abstract concepts to those designed to develop instrumental reasoning. The teacher will

no longer need to master successful management of the

various techniques. If, as has been recently advocated, all

schools have the same type of computer, and if they

implement the standardization of software available because

"every microcomputer should recognize the same school

environment. And really that environment is not

intrinsically different from that of the electronic office

or the video arcade" (MUSE, Vol. 7, No. 1, 1984, p. 2), all

prospective teachers will need to master is how to plug in

the machine and what software to use. Intuitive judgement

and experience will be redundant. Teachers will only need

to become computer enthusiasts who

> "like lovers contemplating the beloved - students and
> teachers alike - (will) spend endless hours gazing into
> the eye of the machine, enthralled with the subtleties
> of data processing, the nuances of programming
> languages" (Bradley, 1984, p. 21).

Although it must be noted that teachers are not as

receptive to innovation as this quotation would lead us to

believe (Stern and Keisler, 1977).

In analyzing the effect of computer based learning one

cannot help but question why there is such enthusiasm for an

approach to the learning/teaching experience that strikes

so forcibly at the basis of teachers' autonomy. While there

are many and various elements at work that are extrinsic to

teaching, it is the attitude of the profession itself that

concerns us here and it is in the consideration of the

management of the technical base that the value to teachers

of computer based learning becomes apparent. Any teacher
new or experienced has access not only to the same technical
base but to the same management of that base. It is no
longer necessary to develop a skillful pedagogy for the
classroom. Once the student sits down at the computer, the
steps of learning are programmed; that is, both the subject
matter and method are prescribed. An individual works at a
determined level; the computer prescribes the next level.
The computer provides instant feedback on progress. Indeed
the computer's analysis of work is instantaneous and seems
to be inexorably correct.

While this precludes the teaching of abstract concepts
which cannot at this time be programmed, and if class
management and control are the criteria upon which a
teacher's reputation is based, then the computer is surely
the philosopher's stone for teachers.

II. Teachers: Mechanization and Worthwhile Knowledge

There are always delays in adjusting to a new
technology. To deny the incredible extension of the
capabilites of mankind through technology in general, and
computers in particular, would be fruitless and dishonest.
We now have mechanical slaves to do our bidding; to work
miracles unheard of by the ancients (Ogburn, 1976). But we
must also be aware that this technology itself, far from
being neutral, reflects the values within the social context

of its proponents; and furthermore, that the changes it
causes are either for better or worse, and demand a
corresponding reevaluation and redefinition of worthwhile.
knowledge. Changes may offer prospects for new
opportunities to make the world a better place or they may
bring threats that we feel we should oppose.

The technological society in which we live makes
special demands on education. Our school curricula have
changed from exclusively humanistic to predominantly
scientific (Rusk,1978). Skills are replaced by technology
and people by machines. The knowledge that is worthwhile
becomes identified with the higher order technology.
Technology has brought about an increased emphasis on
material things and a corresponding neglect of values
(Mumford, 1976). Modern life without the technological
conveniences and comforts is now almost unimaginable to
western society; our schedules revolve around them; they
are, in many cases, dictators controlling our lives (Ogburn,
1976). While few teachers would suggest a Luddite
rebellion, those concerned with education must examine
critically the implications of the automation of
instruction.

If the results of the mechanization of industry are
relevant to the classroom, the first obvious casualty of
computerization will be the students. In the workplace as

the machine age replaced handicrafts, the individual worker created only a part of the product. From the classic studies of the scientific management movement initiated by Frederick Winslow Taylor in the mechanization of the moving of pig iron for the Bethlehem Steel Company, to the establishment of the Ford Assembly line, this type of 'technological advance' has produced a natural revulsion on the part of the worker (Braverman, 1974). The skill and joy that went with work were destroyed, replaced by routine, monotony, and toil (Ogburn, 1976). New and better tools brought material advantages, but they did little or nothing to help the human being to find meaning, joy, or values. Currently in our schools, we have a system that is value-laden and that attempts to incorporate the teaching of abstract principles which are identified as worthwhile knowledge. An education that emphasizes the technological at the expense of the humanistic in a world replete with self-destructive technology, and particularly poor in human harmony, is short sighted at best. A curriculum whose increasing dependence is on socially-isolated and product-divorced activity is positively destructive.

For teachers, the situation is just as grave. A technological society is not one that merely uses sophisticated technology, "it is one in which human reason is used almost exclusively to the service of instrumental rationalism" (Stanley, 1976, p. 20). We have already seen

that the teaching profession is a singularly
non-quantifiable enterprise. History, value, purpose, are
fundamentals in the transmissions currently involved in
education. The teacher's task is to consider the student as
the 'whole' person, with a wide span of capabilities and
potentialities. Mechanized production is depersonalized
production in education no less than in other fields.
The final achievement of automated knowledge is automatic
man. While many seem to see automation as the climactic
fruition of human culture, we are, in fact, adapting
ourselves to the limitations of the machines. Education
must strive to foster the seasoned values of collective
history and individual human experience to discourage
society from overvaluing the contemporary, the dynamic, and
the novel. The task of the teacher is to work "to make the
genuine good derived from the automation of knowledge
subservient to the superior, history-laden functions and
purposes of human culture." (Mumford, 1976, p. 29). One of
the ways of doing this is to preserve the human autonomy
that teachers already possess and to regard with informed
skepticism the new elite practitioners of the
underdimensioned system of the school computer.

Ideological changes within curriculum are complex, and
are related to the changes in the social infrastructure
where they originate. They are indicative of wider social
change than that exemplified within the school system.

Because they indicate shifts in commonly held principles of social order or emphasis, they are, in fact, reflections of the changing power relationships of the cognitive community. The emergence of a 'computer curriculum' indicates that the valuing of computers has become ideologized, based on the pedagogical belief that computer knowledge is worthwhile knowledge, and the assumed need for technocratic citizens. Teachers are being committed to computer use, often without knowing why and with little awareness of the problems of management and institutionalization of that knowledge. The justifications for innovative curricula are varied and can be both pragmatic and philosophical. However, for whatever reason they are introduced, the simple fact of their objective reality transforms the original intentionality and creates totally new subject and pedagogical ideologies. For this reason examining what is actually happening to teachers, students and knowledge within schools where computers have been implemented, remains the only way to uncover the new reality that has been thus created and to discover the possibility of a shift in the definition of worthwhile knowledge.

If we can conclude that teaching and learning formulate the intersubjective construction of reality, the necessity of examining what is actually happening in our schools becomes even more obvious.

> "When a teacher (or pupil) participates in new
> curriculum projects, the relationship between the
> different perspectives with their intentionalities and
> rationales, will have a crucial effect on the
> operation and outcome of the project" (Esland, 1971,
> p:78).

By drawing on Esland's observations using the sociology of
knowledge, the origins, interactions, and transformations
within the interactions between teachers and those with
whom they must deal – i.e. their public - students, fellow
teachers and administration, can be used to suggest
important outcomes for both teachers and students.

The Perceived locations of legitimation and cognitive
support, the levels of subject and pedagogical perspective,
and the negotiation between teachers and superiors, define
reality. Curriculum and pedagogy should be regarded as
professional knowledge, subject to the constraints within
professional organization and negotiation, and
accountability. It is through teachers, through the
professional paradigms, the loyalty structures within the
profession, the way in which competing interests and
alliances are legitimized, and the redefinition of
worthwhile knowledge, that curriculum change occurs. By
implication then, curriculum change has consequences for
both pupil and teacher identity.

Esland supports the notion that man's consciousness
arises out of his social being. We must now begin to
explore 'how' ideation which arises in social activity is
formulated and accepted by the self. Schutz (1967) suggests

that one's stock of knowledge is the result of a continuous process of accommodation, not formulated in isolation, but as a social product of interaction with other individuals. Thus to begin to understand is to begin to question 'the theoretical relevance system'. This consists of four dimensions: the accepted base from which investigation begins, the knowledge which must be socially approved, which ways are deemed feasible for dealing with the problem, and the conditions under which a problem can be solved. These form the framework whereby the content of new curriculum can be analyzed and recognized as a coherent entity.

In the analysis of teaching and learning as the organization of knowledge, we must consider the assumption that the teacher's stock of knowledge arises through the interplay of subject and pedagogical knowledge. The problems of change and resistance to change are closely related to the social distribution of knowledge and the social distribution of expertness and its control through the professional mandate. Therefore, the question of power as control over legitimacy, exclusion/inclusion, transmission and administration of any new curriculum, is critical. These theoretical insights suggest ways to examine the professional identities of teachers in relation to their subject and pedagogical perspectives as a result of the introduction of computers into our schools

and how 'worthwhile' computer knowledge is and will be.

Once the basis of teachers' technical knowledge becomes apparent, the widespread implementation of computerized education by its very nature demands change in that technical knowledge. Teachers must recognize that they are making profound choices about their professional expertise. The technical knowledge base which is now the foundation of professional autonomy will be drastically changed by the emphasis on computer aided instruction. This, in turn, leads to more fundamental accommodation that is being demanded of the teaching profession. This new mechanization of the curriculum has social implications beyond the historical sciencing of the curriculum that has already taken place. If the mechanization of other occupations can be used as a model, we must conclude that the schools as a reflection of society's emphasis on the worth of scientific knowledge (i.e. that which is quantifiable) are becoming primary proponents of computerized knowledge as worthwhile knowledge. Only by investigating teachers' attitudes and behavior towards this innovative curriculum can the current organization of knowledge be exposed.

The following chapter presents an exploratory case study examining the incorporation of computers into one school. This study attempts through an emically phrased description of the structure and function of the behaviors of the members of this small group to identify the emerging

patterns which may be related to the more heterogeneous
cultural setting.

CHAPTER IV

A CASE STUDY

The apparent neglect of attention to the 'actual' behavior (Wolcott, 1974) in schools, is obvious in an area where studies on actual attitudes and behavior are characterized by paucity and vagueness. This study is an attempt to investigate the introduction of computers into one small private school, to examine the attitudes of teachers toward the new technology and its effect on their profession, to explore actual implementation of the new technology, and to investigate the effect on what teachers designate worthwhile knowledge.

I. Problem Statement

This study examines three dimensions of the introduction of computers into the curriculum. It attempts to illustrate how computers are being used in schools; which teachers do or do not use them; and the relationship (if any) to the autonomous dimension of professionalism of teachers, the technical knowledge base of teachers' 'on the job' expertise; the knowledge that teachers consider important - worthwhile knowledge; and possible reasons for these decisions.

A. Administration of the Questionnaire

The questionnaire used (See Appendix A, p. 86) was one developed for the investigation of attitudes of teachers and the interaction among curriculum planners, school administrators, and teachers in the introduction of the new technology of instructional television into the school (Jengo, 1973). The questions were adapted and revised by substituting the word(s) computer(s), computerized learning, and computer aided instruction for instructional television; and by the addition of three questions to provide information on the subjects rated important by teachers.

The questionnaire consisted of 21 items. Questions were a mixture of both closed and open ended. In the analysis the use of computers in the classroom together with the relationship of that use to the accessibility of computers, use of other media, teaching experience, relevance of computer programs, and teachers' perceived computer effects on normal teacher-student relationship created by face to face instruction, are examined.

The school was chosen because the investigator had taught there for five years and therefore had easy access; the principal had expressed interest in the project from the inception of the thesis work and had offered considerable encouragement. When the questionnaires were revised, the vice-principal was contacted. He confirmed the date for the administration of the questionnaire, choosing to have it

administered at the next general staff meeting for all
teachers. Because of the interest of the principal and vice
principal, the investigator was asked to address the group,
outline for them the problem being researched, and the
nature and method of the study. This talk lasted about ten
minutes then the questionnaires were given out. In her
introduction of the investigator, the principal expressed
approval of the program and requested the teachers to
cooperate. The questionnaire was scheduled as the last item
on the agenda for the meeting and teachers were allowed as
much time as necessary to fill them out, after which
everyone met in the staff room for a staff social. The
shortest time taken to complete the questionnaire was
fifteen minutes, the longest was thirty-five. As they
finished filling out the questions, the teachers placed them
on a desk and left the room. The questionnaire was
administered on September 23, 1988; 29 out of 30
questionnaires were returned.

B. Sample

The population was made up of elementary and high
school teachers in a small private school in west central
Montreal. Unlike the majority of schools in this area, this
school is basically English speaking, having added an, as
yet, small French section in 1985. While the main emphasis
of the school is to serve children who are learning

disabled; those whose parents wish them to benefit from the
small classes and individualized attention are also
accepted. The age spread is from seven to nineteen. The
school program ranges from grade one to grade eleven, and
follows the Department of Education curriculum with special
emphasis on individually designed programs to meet the
specific needs of each student.

The school population has increased every year, and in
the nine years since its inception the school student
population has risen from 10 to 210; and the teaching
population from to 30 full time staff members.
Teacher/pupil ratio is kept as small as possible and classes
of four students are not unusual.

The school is housed in a conventional school building
attached to a synagogue even though the school itself has no
religious affiliation. The school administration rents the
space which was formerly used as the synagogue's own school.
The classrooms are small and conventionally equipped.
Because of the steady expansion of the student body, space
is always at a premium. There is no cafeteria, classrooms
are used as lunchrooms. There is no gym and all physical
education classes are held at a nearby Federal Armed Forces
facility. There is an auditorium which may be used by
permission of the administration of the synagogue and it is
used for all large scale events; concerts, skipathons, art
exhibits, etc. There is no school yard although there is a

public park across the street where the students can play in warm weather and skate in the winter. Recess, however, is spent indoors in the classrooms. The school administration has been seeking a larger building for three years.

Because of the emphasis on individualized programmes and the constant demand for teaching aids to help the learning disabled, computers were introduced with much enthusiasm by the Principal of the school in September, 1984. Five Apple or Apple Compatible computers were available to all teachers on demand. Corresponding to the change in the school population and because of the emphasis of the Principal, the school now has 18 mostly IBM compatible computers available.

Because of the small size of the teacher/student ratio, teachers in this school must teach a combination of subjects. Neither the Director (and founder) of the school nor the Vice-principal does any teaching, their duties being totally administrative and disciplinary.

C. Characteristics of the Sample

The study is a case study of the population of teachers in a private school teaching both elementary and high school students. Of a total of 30 teachers, 29 returned questionnaires; 95% of the total teacher population. Seventeen are female, twelve are male. The age groups are: 20-29 years - 11 teachers, 30-39 years - 12

teachers, and 40-49 years - 6 teachers. Thirteen teachers
have less than five years teaching experience, six teachers
have from six to ten years teaching experience and ten have
more than ten years experience. All twenty-nine respondents
hold Diplomas in Education, fourteen teachers have degrees
at the Bachelor level, nine have graduate work beyond the
Bachelor level, four have Masters' degrees, and one has
graduate work beyond Master's degree. Eighteen teachers
indicated specialization in the field of Education, ten
teachers indicated a discipline other than Education, and
one teacher did not answer this question. In areas of
specialization ten teachers listed one area, eight listed
two areas, seven listed three areas, and four listed four or
more areas of concentration; one teacher did not answer this
question. The number of grade levels taught by teachers
ranged from 1 to 11 with the median being four grade levels;
the number of subjects a teacher taught varied from 1 to 8
with the median again being four, with one teacher not
answering this question.

II. Significance of the Study

As has already been observed, one of the dimensions of
teachers' autonomy is reflected by their freedom to
establish their own conditions of work within the normative
curricula framework. Curricular innovation is dependent on
teachers' attitude and behavior. Studies on the introduction

of new educational technologies demonstrate the effects of availability and accessibility on teachers' attitudes towards using new technologies (Bessent, Waitland and Harris, 1968; Aquino, 1970).

Teachers' perceived value of the use of computers in the classroom should reflect society's emphasis on scientific knowledge with the corresponding lessening of the importance of the humanities which deal with non-scientific aspects of life (Wilson, 1967; Entwistle, 1977). Their attitudes and choices of 'worthwhile' knowledge should give some insight into "why and how scientific and technical knowledge comes to acquire its enormous societal relevance and force." (Bohme and Stehr, 1986), and into how this curriculum shift is being incorporated into their professional technical knowledge and reflected in their choice of worthwhile knowledge.

The significance of official policy as a determinant in the implementation of new technologies cannot be ignored, as a direct relationship between official policy and pressure and teacher usage has been established (Bessent, Waitland, and Harris, 1968).

Considering that "Science and technology are going to penetrate and change the realm of `...education" (Bohme and Stehr, 1986, p.125) it becomes necessary to consider the "extension of the responsibilities of scientific-technically trained staffs" (Bohme and Stehr, 1986, p. 125). For this

reason this study has included teachers' college level specialization to determine whether attitudes to computers in the classroom were related to academic specialization.

For the purpose of this study, availability is defined as the actual computers physically in the school, accessibility refers to the ease with which teachers can use those computers. Age of the teacher corresponds to chronological age, official policy refers to administrative organizational procedures governing teaching, teaching experience corresponds to the number of years a teacher has spent classroom teaching. Personality and teaching methods of the studio teacher refers to the ability of the computer specialist in the school to be of use to his/her colleagues, his/her availability, and his/her ability to involve other teachers.

The question of what the school curriculum should emphasize remains one of the most persistent, complex and controversial educational issues. While the school system is too often expected "to correct many of the ills of our society - from poor driving to racial prejudice" (Chandler, 1983), often the curriculum field is characterized by an uncritical acceptance of current theory or the proclaiming of minor modifications of early proposals as major breakthrough. Such a simplistic approach is ahistorical and reductionist (Glatthorn, 1984) and is to some extent responsible for the current situation in curriculum

planning.

One of the ongoing problems in curricular thought and practice addressed by Dewey (1934) is that of the relative neglect of one of the commonplaces of curriculum; teacher, student, subject matter, community. He showed that both the comparative disregard of one of these factors and awarding of greatly unequal weight in educational import was the result of considering them as separate and distinct entities (Knitter, 1984).

What a child learns in school is not limited to that which schools intend to teach - the array of options from which the student selects courses within his area of interest. Much work has been done which demonstrates that this explicit curricula has a reciprocal implicit curricula (Dreebren, 1968; Jackson, 1968, and others). Studies have already shown that teachers' attitudes to the implementation of educational technology are important because of the teacher's influence on pupils' learning from the new media and the fact that "whatever equipment is made available to the school, the teacher controls the extent of its use in the classroom" (Teather, 1972).

Schwab in his series of landmark papers (1969, 1970, 1973), argued that the curriculum field would make little progress unless it diverted its energies from theoretical pursuits aimed at knowledge generation, and focused attention instead on practical disciplines which emphasize

choice and action. Since Schwab's conceptions of the

practical

> "suggest that the practical problems of school
> administrators, curriculum specialists, and most
> importantly classroom teachers must be the central
> focus of inquiry concerning curriculum improvement"
> (Harris, 1984),

it is the aim of this study to address one of the aspects of

teaching faced by the classroom teacher today, i.e. the

implementation of computer technology into the classroom, by

examining the interaction between teachers, school

administrators, and computer specialists.

The power of modern technology as reflected in the

introduction of the computer into the school system has

acquired a certain acceptance of its inevitability

(Tollefson, 1980). For some new philosophers of science the

power of modern technology is accepted as being seen as a

sacred phenomena (Ellul, 1975). This technical concern

which today dominates all other factors results in the

replacement of human spontaneity and passion by objective

calculation as the origin of conduct. When the development

of technique expands as an extension of authority

(corresponding to administrators in the schools), the result

is a creation of two classes: a schism between a mass of

workers who accomplish specialized, particular tasks, and a

technical elite who exercise a "technical monopoly" in

decision-making through their monopoly of technical

knowledge. Thought and action are separated through the

growth of technical power and this in turn leads to the
disappearance of autonomous decision-making power
(Tollefson, 1980). This study is an investigation into the
ways in which the introduction of this technical mechanism,
the computer, has affected the motivational impulses
regarding control over knowledge, conduct, decisions, and
choices, made by teachers, i.e. the autonomous dimension of
their professionalism.

The study also explores which knowledge is considered by
teachers to be most important and which knowledge is
designated 'worthwhile' in the light of the emphasis on
computers in the school system.

Lastly, the relevance of the study must lie in the fact
that only through investigations in the field can meaningful
decisions be made by those who are required to implement the
new technology and those who prescribe it.

III. Results

According to some researchers, the past two decades
have witnessed several technological revolutions, and yet
their promise in educational fields has not been fulfilled
(Weizenbaum, 1979). Most of the idealistic predictions of
the impact of computers are similar in varying degrees to
those claimed at other times for other technological
resources (Dertouzos, and Moses, 1983). In the prior
technologies, for example, television was expected to

transform education. This, however, has not been the case. The present study attempts, by using a questionnaire investigating teacher attitudes in the implementation of television in classrooms revised to reflect the new computer technology, to identify the actuality of computer use in the schools. While this study cannot establish statistical significance, it is hoped that some insights into the 'real' school world rather than the 'ideal' can be gained.

Since prior studies indicated that accessibility of the new technology would determine use (Bessent, Waitland and Harris, 1968), the expectation was that teachers who had easy access to computers would use computer assisted learning more often than those who had difficulty procuring a machine. Computer users are defined as those teachers who used computers one or more times a week.

The immediately obvious finding in the figures generated by the questionnaire is that in this school where the introduction of computers has been enthusiastically initiated and supported by the principal, only 20% of the teachers use computers at all. There is some indication, however, that this use is related to access of computers and supports earlier studies in the introduction of new technologies (Bessent, Waitland and Harris, 1968; Aquino, 1970). Those who used computers were unanimous in claiming that they had ready access to computers; those who did not use computers were unanimous in their claim that they did

not have ready access.

What is perhaps more significant is revealed by a further piece of information. Each teacher in the school, with the exception of the computer specialist, has the same access to computers. The procedure for reserving computer(s) is to make arrangements with the computer specialist or to reserve any of the five extra computers available for teacher use. Each teacher must follow this procedure and yet five teachers accept this as easily accessible and twenty-four do not. This indicates that perhaps what needs to be investigated is what teachers see as accessible and why. Of the 29 teachers responding, 24 said they did not have easy access to computers. Of these 24, however, 15 indicated that they did not want greater access to computers, some going so far as to add notations to this question such as, "I don't use computers, ever!" and "No, no, no and no!" While not perhaps conclusive, these comments do indicate that more than availability is a factor here.

Since general attitudes seem to indicate that computer aided instruction is superior to other forms of instructional methods, it is logical to suppose that teachers who made use of computer assisted learning would be less likely than other teachers to use different instructional materials. However, on the four media examined, the computer users ranked higher in their use of

the materials offered than did non-users. The use of the computer users of other media was 85%; of non-users, 60%, which suggests that the computer user is more versatile than indicated or that the educational material for computer use is inadequate.

Only four of the media were examined for tabulation, chosen because they were the instructional material commonly selected by the two groups. Just as interesting as frequency of use are the choices where the two groups did not overlap. For users of computers, the media that had the highest incidence of positive non-use were the opaque projector and 16 mm film. These are both technologies which have been superceded by more modern techniques. With the non-users of computers the highest incidence of positive non-use were the computer and flannel boards, reflecting two extremes of the media spectrum, since the flannel boards were one of the oldest instructional materials and computers, the newest. This is perhaps an indication that non-users of computers tend to use that with which they are already familiar.

Taking into consideration the two different approaches to the computer, the relationship between what is taught and by whom becomes significant. In new technologies the pertinent subject is no longer whether a teacher uses computer aided instruction but rather how, when, and for what subjects (Schramm, 1962). The use of computer assisted

learning could be influenced more by the type of subject(s) taught by the teacher than by the teacher's subject specialization. While it is true that because of the variety of subjects taught by the teachers in this school, and the lack of relationship to teachers' area of specialization no conclusion could be drawn in this study, the characteristics of the sample should be noted. Of the staff 25 had areas of concentration in the arts/humanities and only 5 in science. Although these are not the same 5 who are identified as computer users, one cannot help but question if reversed areas of concentration would have produced similar results. The datum, while inconclusive, is similar to that found in earlier studies (Jengo, 1973).

Keeping in mind the modern training of teachers and the new emphasis on computer assisted learning, teachers with less than 5 years teaching experience should be more likely to use computers in their teaching than those with less than 5 years. However, the results as indicated in Tables 6 Appendix B, p. 94) and 7 (Appendix B, p. 95) did not indicate any trends in this matter and teachers in the younger age bracket used computers no differently from those in a higher age bracket.

It could be expected that teachers with a background in Educational Technology would use computers more than those without such a background, and questions pertaining to this were included in the questionnaire. Since only one teacher

recorded such a background, little information could be gleaned. Nevertheless, it is interesting to note that this teacher ranked among the non-users of computers but did state that he would prefer greater access to computers by having one available in his classroom. This, in turn, indicates that more investigation is necessary on the interpretation by teachers of accessibility.

In the introduction of new technologies into the curriculum studies show that innovations work best when teachers have access to a resource person who can give assistance with technical aspects of programming or software availability and usefulness (Austin and Lutterodt, 1982). One of the best ways of obtaining information about programs is free communication with other teachers who are using them (Titus, 1985). An examination of teachers' opinions on the effectiveness of the computer resource person and the appropriateness of the computer material available show what is, in this particular school, the relationship between the technical advisor and teachers; and the effect this together with the relevance of computer material available has on the incidence of computer use.

This was the section of the questionnaire that teachers demonstrated the most reluctance to answer. When asked to rate the personality of the computer specialist 13 refused to answer this question. Several wrote across the questions this sort of question was irrelevant or non-applicable.

These refusals, however, were all given by non-users of computers and while they could indicate a lack of knowledge on the part of the answering teacher, the choice of neutral for this section was included in the questionnaire and ignored by them. This together with the teachers' written-in responses would suggest that teachers are reluctant to rate another teacher on this kind of scale. Of the 11 non-users who answered 2 rated the teacher favorably, 9 as neutral. The teachers who do use computers all answered this question: 3 neutral, 1 unfavorable, and 1 highly unfavorable. Similar results were obtained when the teachers were asked to rate the programs available. Of the 29 teachers answering only 6 expressed favorable ratings for the material available. In this section, also, many teachers wrote in that they were not aware of what was available in their subject area.

"Since it has been estimated that it takes a qualified person about forty hours to review an instructional program" (Austin and Lutterodt, 1982), the need for an informed, available resource person becomes apparent. While the data in Table 9 (Appendix B, p. 96) indicate that the majority of teachers feel that personality and teaching methods have no effect on their use of computers, the fact that in a population of 29 only 5 use computers cannot be ignored. It would be difficult to disagree with the already established view,

> "For computer aided instruction to be successful,
> teachers need to be willing to evaluate critically its
> effectiveness, and yet teachers need more information,
> knowledge and enthusiasm for computer aided instruction
> and computers than they currently have" (Kolich, 1984,
> p.429).

One of the greatest problems in fostering computer use is

the difficulty of providing appropriate software. However,

since most teachers will not become computer experts, they

need access to that expertise: access to a resource person

who is knowledgeable and accessible (Austin and Lutterodt,

1982; Kolich, 1985).

As studies on the introduction of new technologies

indicate (Bessent, Waitland and Harris, 1968) a large number

of teachers are influenced by official policy. Use of the

new technology reflects pressure from superiors. For this

reason the teacher's decision to use computers should be a

function of official policy. With few exceptions the

decisions to implement computers and determine their use is

the result of official policy rather than teacher requests

(Pop. Computing, Oct., 1984). In the school studied the

Principal has expressed support and enthusiasm for computer

aided instruction. Official school policy is that as many

teachers as possible should use computers as often as

possible. This attitude is reflected in the number of

computers in the school and the proportion of the school

budget assigned to computer learning. The computer to

student ratio is 1:10 compared with the Montreal Catholic

School Commission where the ratio is 1:35 (Ministere de

l'Education, 1988).

Nine teachers did not answer the question concerning official policy but in Table 10 (Appendix B, p. 96) showing the data for this question, it can be noted that the answer was unanimous for the remaining sample. While the 5 computer users all agreed they were influenced by official policy, it is difficult to interpret the data from the 15 non-users. If they are indeed influenced by official policy, why are they non-users? Perhaps the answer lies in the fact of the ambivalence of the traditional teacher to the implementation of new technologies (Papert, 1980), and the relationship of the way in which teachers view their autonomy in the classroom.

It has already been established that teachers determine how resources, both new and old are used in the classroom (Stern and Keislar, 1977). Several studies (Beauchamp, 1974; Langenback, 1972; and Mahan & Gill, 1972) have shown that teachers are more favorably disposed towards curriculum innovation when they have been a part of the decision-making about the implementation. One of the main obstacles to curriculum change is the negative attitude of teachers. While teachers have very little control over the options presented to them, they can, in fact, control what goes on in their own classrooms (Stern and Keislar, 1977). The data in this study indicate that teachers are doing just that, and in this particular school that does not include the

universal implementation of the computer regardless of official policy.

The importance of the human element in education is no longer ignored. It has already been established that teacher enthusiasm and personal relationships in the classroom are of more importance than knowledge of subject matter (Bybee, 1972; Shrigley, 1974) and that teachers do not respond to workshops designed to change their attitudes (Stern and Keislar, 1977). Workshops are ineffective in changing attitudes because the teachers are not simply expressing caprice or laziness in their reluctance to accept the new technology. According to some studies (McCauley, 1972) teacher attitude towards teaching must totally reverse itself in the acceptance of a new curriculum. To effect such change in ideology and behavior is no small undertaking. To insist that a program be implemented by someone who is basically antagonistic towards it is neither wise nor productive, but to neglect to examine the basis of this antagonism is to ignore the root of the problem.

Would teachers use computer aided instruction if they had computer programs relevant to classroom teaching programs? Only 4 teachers out of the 29 thought that the available computer programs were relevant. This supports the idea that one of the main current problems in teacher computer use is computer potential vs. limited software (Kolich, 1985). Studies have already shown that the

integration of computer technology into the schools can be impeded by an insufficient supply of quality course ware (Forman, 1983). It would seem logical to conclude that this is the simple answer to lack of computer use. However on the questionnaire many teachers wrote in comments such as, "I am not familiar with any programs for my areas of teaching.", "Computers have not been made yet for my program.", "I have never seen any programs for use in the teaching of Chemistry, Biology or science programs.", and "I am not aware of any programs in my teaching area," was written in several times. This again reflects the need for a well-informed and informing resource person if this budget-giant resource is to be used effectively.

In a school where the number of non-users was so high one would expect that there would be some indication that these teachers judged computer aided instruction to be detrimental to student-teacher relationship. Teachers who feel that computers destroy the normal teacher-pupil relationship created by face-to-face teaching would tend to use computers less than those who did not. Yet the response was almost unanimous agreement that this is not so. Twenty-eight out of twenty-nine teachers stated no effect, and no evidence suggesting a relationship between computer use and attitude to face-to-face relationship was established. In fact this was one of the questions where teachers responded with many comments. These ranged from the very positive,

"If used properly, the computer expands the teacher/student relationship," to the emotional, "No!! Do paper and pencil tasks impair normal relationships?", to the individual, "Non, l'enseignant devient plutot un guide, une personne-resource pour les etudiants.", to the perhaps more guarded, "Theoretically, it shouldn't." Whatever else is keeping these teachers from computer aided instruction, it is not because they think it interferes with their personal effectiveness.

A small number of teachers indicated that they find computers useful for class preparation. In response to the question, "What contributions do school computers make in your lesson planning?", seven teachers indicated that they did use word processing, especially for examination preparation. Twenty-two teachers stated that they make no use of computers in their lesson planning. Their responses ranged from the simple "None", in fifteen cases; to the very definite "I have not considered using a computer program as a teaching aid in class"; to the more thoughtful "Computers bypass many of the problems that must be considered". These results together with those reflecting the paucity of computer use in the classroom indicate that teachers are rejecting the value assigned by society to computer aided instruction.

During the last century the stress placed on science and technology has been well documented (Bohme, 1986).

Current theory now suggests that the progressive transformation of society resulting from this emphasis will affect not only the role and social status of those using this knowledge but the definition of the knowledge itself (Ericson, 1986; Wallen, 1986). When scientific knowledge is treated as the agent of social change, it is characterized by an acceptance of the inevitability of both this knowledge and its value (Shelsky, 1986).

The introduction of the computer into the school system is one reflection of the acceptance of the importance of objectified knowledge. No other educational tool has evinced such an emotional response. "Yet the same powers of the computer which generate hostility in some men evoke hope in others" (Traviss, 1970, p.4). But one need not accept unquestioning that our schools as represented by teachers are in fact unanimously supportive of this 'sciencing' of the curriculum. Geoffrey Esland (1971) has noted that while sociologists have begun to make a theoretical contribution to our understanding of the organization and transmission of knowledge, there has been little insight into the arrangement of this knowledge in the curriculum in the subjective organization of teachers. He feels that it is only by studying the ways in which teachers "handle the selection and transmission of knowledge during the introduction of new curricula" (Esland, 1971, p. 72) that we can understand the constitutive processes involved.

Considering the 'sciencing' of the curriculum that has already occurred and is still taking place, the knowledge considered most important by teachers should be the subject(s) belonging to the science part of the curriculum. Of the 29 teachers, 26 chose training in language arts to be the most important area for students. What the teachers' answers did reflect was a concern for the development of a holistic approach to education. They did not minimize the need for science as is shown by Table 12b (Appendix B, p. 97). But they did indicate in their comments that unless a student had an acceptable level of competence in language, all other subjects were at risk. "Learning to read and write is the basis of all learning regardless of subject area." Another stated, "In order to succeed one must be able to read and write accurately and at a reasonable rate." A final comment reflected the importance of the task, "I feel that the most difficult thing for a child to learn how to do well is to communicate effectively and to read. Everything depends on this."

One of the major difficulties facing analysts of educator's attitudes is that there are major philosophical differences among them as to the nature of what teaching and learning are and should be. This study refutes the view that the knowledge designated worthwhile by teachers is related to those subject areas where computer programs are most developed. While many of the teachers in this study

did not know what software was available to them, those who
did know accepted computer aided instruction but only on a
limited basis. This reinforces the argument that, for
teachers, computers are of limited value and use in the
development of their technical knowledge base and do not, in
fact, engender that knowledge which teachers consider
worthwhile. They were aware of the drill-practice systems,
tutorial systems, and the dialogue systems, and used those
programs with their classes. They rejected, however, the
need for 'technocratic students' for a technocratic
workforce. In this they are supported by the literature
which claims that less than 10% of the new work force will
involve high-tech positions (Noble, 1984). Their main
objection, however, was to the restricting of 'knowledge' to
that which can be computerized. While these teachers see
themselves as preparing students to function in society,
they feel that this can only be done by teachers who develop
values in the student rather than by imparting computerized
skills.

CHAPTER V

GENERAL CONCLUSIONS AND SUGGESTIONS FOR FURTHER STUDY

I. General Conclusions

This study was implemented to investigate the effect of the introduction of the microcomputer in the school system on the relationship between professional autonomy, technical knowledge, and worthwhile knowledge. By examining how professional autonomy is achieved through the technical knowledge upon which it is based, and the resultant redefinition of worthwhile knowledge, the influence of society's demand for more scientific change within the school system as exemplified by the introduction of computers is considered.

The computer, and its introduction into the school system has become synonymous with a good/evil dichotomy. While some educators have suggested that the computer "will go a long way towards solving our basic problems in education"/(Taviss, 1970, p.5), others choose to view it with hostility as a dehumanizing agent (Weizenbaum, 1979). But rather than become entrenched in a simplistic, unfruitful, and one-sided crusade, educators must begin to reject the "unexamined conviction, more felt than understood" (Noble, 1984, p.602), which has been responsible for the universal educational rush towards uncritical

endorsement of this new technology.

Some researchers attribute this lack of concerted critical perspective on computers to the acceptance of the Ellulian inevitability of the computer revolution; that computers, like other technologies before them are inevitable; and that no one knows the long-term result (Teachers College Record, Summer, 1984). Others (Oettinger, 1967) observe that if educational technology is to have meaningful progress, and is to be integrated into schools, we must begin to examine what is actually happening within the schools themselves.

This investigation began as a case study of the introduction of computers into the school system in the expectation of providing some insight into those unexamined convictions, "which have somehow triggered a mass educational campaign whose urgent, uncritical, endorsement is without precedent in the history of technological education" (Noble, 1984, p. 602). While the computer has excited the imagination of educators and administrators, little is known about the attitudes and behavior of teachers. The argument presented here is that by drawing on concepts presented by some sociologists in the area of knowledge and professionalization we can begin to attempt to understand the institutional locale where teachers work. and where their ideologies are articulated, negotiated and legitimated (Esland, 1971).

These innovative curricula proposals present challenges to teachers at both particular and general levels. Fundamental to the existence of a profession is the autonomy which it enjoys. For teachers, this autonomy is based on four dimensions (Macklin, 1981). These are: the basic assumptions, concepts, and beliefs of teachers; the designation of worthwhile knowledge; the technical knowledge base; and the management of that base in the classroom.

The demand for increased technology is a reflection of current public attitude. This is demonstrated in everything from the Department of Education's demands for more computers in schools to television commercials using computer analysis to sell everything from car-brakes to hairstyles. From our experience within the school studied we can conclude that teachers do not support this uncritical acceptance of computer analysis with its corollary implication that quantitative knowledge is superior worthwhile knowledge. In consequence they do not share with equal enthusiasm the administrative proliferation of computers in their classrooms.

Esland suggests that case studies are the first obvious step to uncovering the reality of the classroom. The methodology employed in this case study was based on the assumption that teachers' attitudes in the form of written verbal responses to largely open-ended questions would elicit reasons not only for incidence of computer aided

instruction in the classroom, but also for the underlying
philosophy of knowledge determining these decisions. By
examining the demographic data, and the teachers' responses
to the relevance of computer aided instruction programs, the
usefulness of the computer resource person, official school
policy, perceived effects of computer aided instruction on
the normal teacher-pupil relationship, perceived
'worthwhile' knowledge, to name only a few, important
relationships and influences were revealed.

The speed and nature of particular social changes are
determined not by technology but by the society within which
policies are set and resources are allocated (Taviss, 1970).
Curriculum change has consequences for both teacher and
student. This study examined teachers' behavior which
contains tacit and explicit inferential structures through
which the teachers' 'natural world' is intersubjectively
constructed (Esland, 1971). While many studies (Papert, et
al) extol the virtue of computers and expect that within a
short time each student will be equipped with one, this
study indicated that even if this were the case, teachers
would not necessarily endorse computer aided instruction.
In fact 75% of the teachers who stated that they did not
have easy access to computers also stated that they did not
want more access to computers.

At first glance this may seem to be an example of the
'computerphobia" identified by some researchers (D. Noble,

1984). But further investigation reveals that these same teachers do not express concern over the idea of computer aided instruction per se. Their objections are based on what they define as 'worthwhile' knowledge. It has long been established that the role of education in our society is concerned with the transmission of culture which includes the entire range of individual, political, and social values, not simply the transmission of knowledge (Suppes, 1968). Certainly the teachers in this study do not regard themselves solely as channels for that knowledge which can be computerized. If, as Kuhn (1970) has projected, professionalized knowledge is perpetuated through textbooks and teaching programs these teachers are exercising their professional autonomy effectively.

Many teachers expressed concern that the emphasis on computer aided instruction was in fact a fundamental change in the basic parameters of their pedagogy. The main objection expressed about computer aided instruction was not that it in any way interfered with teaching, but simply that it is a tool, and an inadequate one upon which to predicate the entire learning experience. For these teachers the knowledge that was 'worthwhile' was that which would enable their students to become sensitive, thinking, and independent. This aim was summarized as a "healthy and creative body and mind" for the student to "develop the skills and knowledge that are essential for responsible

behavior in the adult world." Teachers felt that creativity and new insights are expressed by new images and new relationships and that they are incompatible with a system based on predictability of outcomes. Once these points were established, 60% of teachers expressed approval of computer aided instruction.

While technological inevitability is a fact of twentieth century life, teachers are not accepting uncritically the innovations that are being thrust upon them. They are exercising their professional right to shape, restrain, and direct this new technology in their classrooms. 'Really useful' knowledge is being formulated in the teachers' vocabularies of motive and through their pedagogical assumptions (Esland, 1971). There is no indication of conflict between the dominantly held goals of modern education and computer aided instruction. Teachers are not against computers in education, but they stress qualitative knowing as well as quantitative. Teachers are saying that the most important human problems are not computable, "that besides data and calculation they require understanding, interpretation, and, often, empathy, sacrifice, and restitution" (Teachers College Record, Summer, 1984, p. 547). Only when teachers can establish a link between computer aided instruction and qualitative instruction based on abstract concepts will the computer be accepted by teachers as a basic necessity, and perhaps

realize its full potential in the classroom.

II. For Further Study

The results of the case study showed that discrepancy
exists between what is seen as acceptance of computers in
education and what is actually happening in the classroom.
The first area which needs to be explored is teachers'
attitudes on accessibility. Obviously accessibility did
not mean the same thing to all teachers. Only by
identifying and analyzing the factors which influence the
teachers' interpretations can valid judgements be made on
the relevance of availability to use of computers.

The second but rather puzzling observation is that the
majority of teachers dismissed computer aided instruction
but also admitted that they knew nothing about the programs
available. This could mean that their responses were
idiosyncratic; they could have decided that computer aided
instruction has so little relevance to their work that it
can be dismissed, or perhaps it is a subtle manifestation of
the refusal to incorporate the new technology into their
classrooms. More studies on this aspect would be helpful in
order to implement the very real advantages of computer
aided instruction.

The section of the questionnaire to which teachers
reacted most strongly was the rating question on the

computer teacher. This is a fruitful area for study in light of the professionalism of teachers. Further work could indicate teachers' attitudes on policing themselves, and the influence (if any) on this reluctance to rate by the judgement itself. That is to say, are teachers more reluctant to rate other teachers only when that rating is low; or are they more willing when rating a teacher highly?

Another area of seeming contradiction was revealed in the study of the influence of official policy on computer aided instruction. Fifteen teachers claimed they were influenced by official policy in their use of computer aided instruction, yet all were non-users. Since the official policy of the principal is pro-computer aided instruction, studies could be undertaken to discover why and how teachers feel their decisions are influenced in this way.

Lastly, since in this sample 83% of the teachers have professional expertise in arts/humanities, similar case studies need to be done in schools where the predominant professional concentration of teachers is in science, and in schools where the ratio between scientific and arts backgrounds are more equal. Although this study suffers from all the limitations of the case study method and a small sample, it gives some indication of existing teacher attitudes towards computer aided instruction in the school, and reveals the complex organization of school life and the interaction involved in new curriculum projects. It also

suggests the direction school administrators should take if they wish to facilitate computer aided instruction.

Whatever design future researchers adopt in their studies, efforts should be concentrated on identifying the needs of the teacher in computer aided instruction, the relevancy of computer aided instruction to the present curriculum, and teachers' attitudes on the role of computer aided instruction in the acquiring of 'worthwhile' knowledge and its relationship to professional autonomy. The very real danger here is that the computer revolution will indeed become just another 'technological' revolution (Weizenbaum, 1979), and a technology with immense potential will, like educational television, remain on the periphery of modern education. Little significant progress will be made until these investigations are made and the meaningful adoption and integration of computer aided instruction into the schools can be accomplished.

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APPENDIX

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APPENDIX A

THE QUESTIONNAIRE

Please answer each of the questions included in this questionnaire. Respond as accurately as you can, expressing your knowledge/or professional opinions. These responses will remain completely <u>confidential</u>.

1. Female _____   2. Male _____

2. Which of the age groups are you in?

_____ 20-29   _____ 30-39   _____ 40-49   _____ 60 & over

3. Your education/professional level.

_____ Diploma in Education
_____ Bachelor's degree(s)
_____ Graduate work beyond Bachelor's degree
_____ Master's degree
_____ Graduate work beyond Master's degree
_____ Doctoral degree

4. Please take a minute to read this list and then place a mark (x) against those which were part of your teacher education/training curriculum. Place another mark (x) on the appropriate scale that best indicates your use of that item in your teaching.

		Not At All	Occasionally	Quite Often	A Great Deal
___	1. Bulletin boards	___	___	___	___
___	2. Flannel boards	___	___	___	___
___	3. Filmstrips & Slides	___	___	___	___
___	4. 16mm Film	___	___	___	___
___	5. Charts, posters & graphs	___	___	___	___
___	6. Opaque projector	___	___	___	___
___	7. Overhead Projector	___	___	___	___
___	8. Recordings (Tape/Disc)	___	___	___	___

_____9.   Programmed
         Material
_____10. Video Tape   _____   _____   _____   _____
         Recordings
_____11. Teaching with
         Computers

_____12. Production of   _____   _____   _____   _____
         Educational
         Films
_____13. Production of   _____   _____   _____   _____
         Educational TV
         Programmes
_____14. Production of   _____   _____   _____   _____
         Educational
         Radio Materials
_____15. Computer Assist. _____   _____   _____   _____
         Instruction

_____16. Theories of Mass _____   _____   _____   _____
         Communication
_____17. Psychological   _____   _____   _____   _____
         Foundations of
         Audiovisual
         Materials (e.g.
         Visual Perception
_____18. Simulation &   _____   _____   _____   _____
         Gaming

5.   In which of the following subject areas do you have
college level concentrations?

Business_____ Fine Arts_____ English_____
Mathematics_____
Foreign Languages_____   Social Sciences_____
Special Ed._____
Elementary Ed._____   Secondary Ed._____
Others specify)_____
_____

6. What grade level do you teach?

     1   2   3   4   5   6   7   8   9   10   11

7. What subjects do you teach?

Art and Crafts_____   French_____
Home Ec._____
Geography_____   History_____
Mathematics_____
Science_____   Music_____
Phys. Ed._____
Industrial Arts_____   Language Arts_____
Others (specify)_____

8. How many years of teaching experience do you have?

Less than 5_____   From 6-10_____   More than 10_____

9. Do you have ready access to computers in your classroom?

Yes_____   No_____

Would your prefer to have a computer set in your classroom?___
How often per week do you use computer programmes in the classroom?_____

10. In what form do you use school computer programmes?
Do you make your   Do you use prepared
own programmes?_____   commercial programmes?_____

Which of the above do you mostly use?_____

11. What contributions do school computers make in your lesson planning?_____

_____

_____

_____

12. Do you feel that teaching by computer impairs normal teacher-student relationship created by face-to-face teaching in the classroom?

_____

_____

_____

13 a. Do you feel that the computer programme in your teaching subject area(s) is relevant to your total teaching programme?

Yes_____   No_____   Not Applicable_____

b. Please list brief reasons for your answer to the above question:_____

_____

_____

14. Would you please mark each scale below in terms of how you would rate the computer teaching in your subject area(s).

HU = Highly Unfavorable   UF = Unfavorable   N = Neutral

HF = Highly Favorable   F = Favorable

	HU	UF	N	F	HF
1. Personality of computer lab. specialist	___	___	___	___	___
2. Teaching ability of programmes	___	___	___	___	___
3. Teaching methods	___	___	___	___	___
4 Choice of subject matter	___	___	___	___	___

15. Do these factors influence your decision to use or not to use school computer programmes in your classroom?

Yes_____   No_____

16. How much influence do/does the following persons/establishment have on the use of computers in the classroom?

	None	Some	Quite a Bit	A Great Deal
Board of Education	____	____	____	____
Principal	____	____	____	____
Subject Head	____	____	____	____
Others (specify)	____	____	____	____

17. How much influence do/does the following persons/establishment have on your decision to use or not to use classroom computers in your day-to-day activities?

	None	Some	Quite a Bit	A Great Deal
Board of Education	____	____	____	____
Principal	____	____	____	____
Subject Head	____	____	____	____
Others (specify)	____	____	____	____

18. Please list other factors which influence your decision to use instructional computer programmes in your classroom.

_____

_____

_____

_____

19. If you were setting up a school curriculum, which subjects would you designate as core subjects?

_____

_____

_____

20. Please list brief reasons for your answer to the above question:

_____

_____

_____

_____

21. Please rank in order of importance for inclusion in the curriculum (e.g. #1 for the most important area, etc.) the following subject areas.

Art and Crafts_____   French_____
Home Ec._____
Language Arts_____   Science_____
Geography_____
Mathematics_____   History_____
Phys. Ed._____
Industrial Arts_____   Music_____

APPENDIX B

TABLES

Table 1			
Relationship of Computer use and Accessibility of Computers			
	Computer Assisted Teaching		Total
	Users	Non-users	
Easily Accessible	5	0	5
Computer Not easily Accessible	0	24	24
Total	5	24	29

Table 2			
Relationship of Computer Use and the use of Charts, Posters and Graphs in Teaching			
	Computer Assisted Teaching		Total
	Users	Non-users	
Charts, Posters and Graphs — Users	5	17	22
Non-users	0	7	7
Total	5	24	29

Table 3			
Relationship of Computer Use and The Use of Recordings			
	Computer Assisted Teaching		Total
	Users	Non-users	
Recordings Users	4	16	20
(Tape or			
Disc) Non-users	1	8	9
Total	5	24	29

Table 4			
Relationship of Computer Use and the Use of Programmed Material			
	Computer Assisted Teaching		
	Users	Non-users	Total
Programmed Users	4	15	19
Materials Non-Users	1	9	10
Total	5	24	29

Table 5			
Relationship of Computer Use and the use of Simulation and Gaming			
	Computer Assisted Teaching		
Total	Users	Non-users	Total
Simulation and Gaming — Users	4	12	16
Simulation and Gaming — Non-users	1	12	13
Total	5	24	19

Table 6			
Relationship of Computer Use and Experience of the Teacher			
	Computer Assisted Teaching		Total
	Users	Non-users	
Teaching Experience — Less than 5 years	2	11	13
Teaching Experience — More than 5 years	3	13	16
Total	5	24	29

Table 7			
Relationship of Computer Use to Age			
Computer Assisted Teaching			
	Users	Non-users	Total
20-29 Years	1	10	11
Age			
Over 29 Years	4	14	18
Total	5	24	29

Table 8			
Relationship of Computer Use and the Personality and Teaching Methods of the Computer Specialist			
Computer Assisted Teaching			
		Users	Non-users	Total
Influenced by Personality and teaching methods	Yes	3	9	12
	No	2	4	6
Total		5	13	18

Table 9			
Relationship of Computer Use and Official Policy			
	Computer Assisted Teaching		Total
	Users	Non-users	
Influenced by Official Policy — Yes	5	15	20
Influenced by Official Policy — No	0	0	0
Total	5	15	20

Table 10			
Relationship of Computer Use and the Relevance of Available Computer Programs			
	Computer Assisted Teaching		
	Users	Non-users	Total
Available Computer Programs — Relevant	4	0	4
Available Computer Programs — Irrelevant	1	3	4
Available Computer Programs — Non-applicable	0	14	14
Total	5	17	22

Table 11

Relationship of Computer Use and Teachers' Responses on the Effects of Computer Programed Learning on Teacher-student Relations

	Computer Assisted Teaching		Total
	Users	Non-users	
Has effects	0	1	1
Computer Has no effect	5	23	28
Total	5	24	29

Table 12a

The Relationship Between Computer Use and Those Subjects Teachers Consider Most Important

	Computer Assisted Teaching		
	Users	Non-users	Total
Language	4	22	26
Most Important Subject			
Mathematics	1	2	3
Total	5	24	29

Table 12b

Language	0	0	0
Second most Important Subject			
Mathematics	4	22	26
Total	4	22	26