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THE UNIVERSITY OF ALBERTA

LOGO-AS-LIVED EXPERIENCES OF FOUR TEACHERS IN A FRENCH IMMERSION ELEMENTARY SCHOOL

by

Josephine Hofman

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION.

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled LOGO-AS-LIVED: EXPERIENCES OF FOUR TEACHERS IN A FRENCH IMMERSION ELEMENTARY SCHOOL submitted by Josephine Hofman in partial fulfilment of the requirements for the degree of Master of Education.

(Supervisor)

Date: 23 September 1987

DEDICATION

To my parents, Albert and Valerie Trzopek, my husband John and daughters Jacqueline, Jeanette and Jennifer.

ABSTRACT

At a time when the computer presence is gaining so prominently in our everyday lives, educators are confronted with yet this dimension in their classrooms. How do they perceive its educational merit? Among the multitude of available computer software, LOGO, designed primarily by Seymour Papert, puts forth a child-centered learning environment, intended to foster intellectual growth grounded in one's cultural experiences.

The LOGO philosophy puts to question many of the underlying assumptions governing the day to day activities in our classrooms. This study searched for insight into those assumptions.

Using an ethnographic approach, four educators in Grades one to four in a French Immersion elementary school, were documented as they implemented LOGO for the first time with their children. Once these underlying pedagogical stances were unveiled, they were then discussed within the framework of LOGO philosophy as expounded by Papert in his book Mindstorms. Because these educators were part of a French Immersion context, the bi-lingual effect was briefly explored.

Following a fourteen week period of observation, four conceptions of child emerged: child as passive recipient of knowledge, child as motivated recipient of knowledge, child as problem-solver and child as knower.

Although only the last conception was resonant with LOGO philosophy, intimations of Papert's priorities were present in others. The bi-lingual effect was inconclusive.

Since this study offered no criteria for implementation, it presented to the educators a set of circumstances to derive their own interpretations. Whether these can in fact endure will be contingent on the choices they will continue to make and the realization of those choices.

It was concluded that hardware and software in and of themselves cannot create a philosophy resonant with Papert's vision of LOGO. Only we, as unique human beings can make the "humanistic" choices of which Papert speaks.

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I extend my appreciation to Dr. Daiyo Sawada who gave so generously of his time and wisdom to nurture in me such personal growth. I also wish to thank my committee members, Dr. Ruth Hayden and Dr. Alton Olson for generating such a pleasant ambiance of thought provoking dialogue. This document would not have substance if it were not for the teachers who gave of themselves to participate in this study. I extend my thanks to them. Collaboration is a working together, a sharing and cooperating which I experienced with Ruth Cypher during the course of this research and for which I am grateful.

TABLE OF CONTENTS

CHAPTER ONE

THE NASCENCE OF THE PROBLEM

". . .man is an animal suspended in webs of significance he himself has spun. . ."(Geertz, 1973, p. 5).

It was March 19th, 9:05 in the morning when Daphne poked her head into the lab, looked at me standing in the front left corner of the lab, and whispered "Good morning Josephine". Followed by her flock of Grade twos, she entered about a third of the way into the lab. As the youngsters passed by her on their way to a computer, some stopped to get one of two sheets Daphne held in her hand. One sheet, entitled ARBRE, detailed three procedures which when correctly typed in drew on the monitor a series of six trees slightly atop each other. The other sheet, entitled CARRE, detailed three procedures which drew a staircase with four stairs. At the outset, eighteen children were working on the ARBRE sheet, four on the CARRE one, and two were typing in commands such as AV 2000, AV 4000. As the session progressed some of the students put their paper aside, or turned it over and did other activities. At one point, two boys working together were trying to draw adjacent circles, an activity they began in their last session. Six students were now drawing lines all over the screen with commands such as AV 2000, AV 5000 and so forth. Two others were typing in letters on the screen. Some of these were individual letters, others were words, and still others were

sentences or phrases. Two students who were initially drawing lines all over the screen by typing in the AV command with large numbers, saw those typing letters and changed to that activity as well. During the session some of the students changed their activities several times. There was constant interaction between each pair of students as well as frequent visitations to other groups. Sometimes it was to point out something on someone else's screen, "Ahh" at someone's creation, or to summon a "look" at one's own.

While the students worked at their computers, Daphne walked around the lab, observing and giving assistance whenever the students requested it by either raising their hand, calling out or running to her. At one point, she made her way to my corner where we engaged in the following conversation.

Daphne: I see that the procedure for the trees is going much faster now, so I guess they're getting used to it.

I: What is IT [emphasis]?

Daphne: This [pointing to the papers in her hand]. They are able to type it in now quickly. Before it took them a whole class to do it.

I: You mean follow the directions? [She had mentioned to me in a previous lab session that her goal in using these papers was to facilitate following directions].

Daphne: Yes.

We were interrupted by two girls who had raised their hands and were calling Daphne. She immediately went to them. Momentarily I was called upon by Daphne and asked "Why isn't this working?" I recognized the message indicating an error in a subprocedure. I also noticed that the name of the subprocedure ARBRE was misspelled to read ARBBRE. I asked if what they had on the screen was the same as that on their sheet. Daphne checked and noticed the error which she promptly pointed out to the girls. They all laughed and Daphne immediately typed in the correct name. I left.

A kind of buzzing permeated the lab which amplified over time. On one occasion, Daphne flicked the light switch on and off, put her finger to her lips and said "Sh-h". The noise level subsided.

At the end of class, Daphne flicked the light switch again, and spoke to the class in French. The children handed Daphne their papers, lined up in the lab, and waited for her to lead them out. Once all the sheets were in her hand, Daphne looked at me, said "Thank you Josephine". Some of the children said "Thank you" as they left the lab.

At 9:35, Samantha's twenty four grade threes trickled into the lab. They were not accompanied by their teacher. Immediately they went to a computer and started to work. One computer was shut off and out of order, so those two children looked around and joined two other groups. They

were carrying either folders, papers with their own writing on them, notebooks or nothing at all. Three minutes later, Samantha entered holding some disks. She came over to me, pointed to the disks and said, "These are blank disks they need to save on." She then observed and spoke with the children in French as she went from group to group. One of the boys from a group came to me and said something in French. Samantha noticed and approached us. I asked her for a translation. The boy repeated his statement, and Samantha translated it to be "We need help". She then followed the boy to his computer. I remained in my corner where I recorded what had happened. She listened to the boys as they pointed to several places on the screen and then spoke to them in French while they typed. She did not type anything on the computer rather, had them do it. After a minute or two, I went over to take a look and asked, "Is there a problem?". Samantha answered, "Oh no. They thought the LP [the French primitive for PENUP] wasn't working". I left. Samantha circulated again and stopped to assist some boys who wanted to create a picture. They engaged in a conversation with her while she changed the program commands on the paper which they were following. She wrote down the commands and watched as they executed them. As she continued to circulate among the class, she approached two girls who wrote down all of their commands as they typed them. Samantha asked in French and then

translated for me into English "You are writing all this down so that you can program it?". One of the girls looked up at her and answered, "Yes we are. If we just use our brains, it gets mixed up. So we have to write it down." As she continued her rounds, Samantha asked another two groups the same question. Both replied "Yes". As the recess bell rang, an "Ahhh" permeated the lab, and the children left in much the same way as they had entered. Samantha remained behind with one of the boys because he had requested that she help him to program a circle. She asked him questions, he replied and typed in the commands. I stood closeby and observed. She said to me, "He has been struggling with these eyeballs for several classes now." I watched for a short time and then returned to my corner. They spent the entire recess period together. At the end Samantha said that he could continue it next class and to save it to disk now, which he did. Both Samantha and the boy left together.

It was 10:33. Recess was over. Jonathon led his quiet, grade four class down the hall in two lines. He stopped outside the lab, stepped into the lab, looked at me, then at the paper in his hand and called some names. Some of the students were called in one at a time, some in pairs. In both cases he pointed to the computer at which they were to work. The rest of the students were then permitted to enter and take any computer that was left. The students all carried an identical Duo-Tang folder, which they immediately

opened and from which they began to type. They worked in pairs: one student read commands or directions off a page in one's own folder, and the other one typed in those commands. The results were recorded. At half time, the students switched places and the corresponding duties. At 10:45, two boys were sent out of the lab to their classroom. Jonathon seldom spoke with the students and when he did, it was in French. Little noise, if any, could be heard. Interaction between the various groups was nonexistent. It appeared as if each student knew what he or she had to do. The students were not all doing the same exercises at the same time, but rather following a series outlined by Jonathon. I noticed that a pair of boys were typing in AV with varying numbers following it. This was not one of the exercises, but no attention was focused on that by Jonathon. He circulated and offered help whenever he saw something on the screen to which he wanted to draw their attention, or to resolve a behavioural problem. Jonathon never touched the keyboard. He asked questions, elicited answers, or pointed to the screen or page in the folder. The students often looked at him and then typed. At 11:00 Jonathon flicked the light switch on and off and firmly said, "Vitement". Some of the students came immediately but he had to walk around and gather the rest. They all lined up in the lab. He repeated, "Vite, Vite", followed by three of the students'

names. He then led the class out of the lab and down the hall to his classroom.

Melanie and her grade one class had been waiting outside the lab huddled in the entrance way. Once the lab was empty, the children entered and ran haphazardly to a computer. They immediately paired themselves off and started pressing keys on the keyboard. Melanie entered holding a file folder, out of which she pulled transparencies with black felt pen imprinted mazes on them. She immediately began to tape these on each monitor. There was no parent in the lab today like there had been in her previous sessions. There was a lot of noise and she raised her voice twice in French to ask for silence. Once the mazes were all in place, she asked the children to watch as she demonstrated in front of the lab the order in which the maze was to be completed. Slowly and carefully she followed the outline of the maze, numbered from 1 to 6. She then told the children to begin. Shortly, one child called out in English and asked how he was to get the turtle from one particular point to the next, pointing to the transparency. Melanie answered, "I don't know. You'll have to figure it out." At 11:10 a parent entered the lab and began to circulate. It was 11:14 when Melanie walked by me and said, "This is excellent. I'm really pleased". Once the children completed the first maze, they could elect to either re-do it, or to try another one from the folder. The children

worked and talked with each other. Melanie approached me and said, "I would like to do numbers with them. How can I do that?" I asked what range of numbers she wanted to do. She mentioned 1 to 10. I suggested that she may have them draw using the four commands which they were using in the mazes. She said that would be too difficult. So I suggested perhaps a dot-to dot. Melanie smiled, and said that she would prepare that for next class. By the end of the class, 5 of the 21 children had completed the first maze successfully and had proceeded to the next one. Melanie told the children to line up in the lab, while she collected the taped mazes from the monitors. Once the children had all lined up, she directed them into the hall, told them to get dressed and leave with the parent to return to their class. Melanie collected her things, said "Goodbye, Josephine" and left.

Theoretical Orientation

As this study unfolds we witness four distinct realities each embracing a culture unique unto itself. Four teachers, four "webs of significance" (Geertz, 1973, p. 5) give rise to four interpretations of one computer language. Geertz (1973) tells us that to analyze culture is to untangle the web in search of meanings so quiescently intertwined. Whether it be referred to as culture, understandings, social reality, beliefs, world view or perspectives, its most "fundamental and ubiquitous"

expression is that of meaning (Lofland and Lofland, 1984, p. 71). Perhaps Geertz summed it up best when he said it was at "the heart of our discipline" (p. 29).

John Van Maanen (1983) tells us that we have become increasingly aware that the people we study "have a form of life, a culture that is their own (p. 12). To understand the social actions of these people requires an appreciation and a description of that culture. This study defines culture as how individuals use their acquired knowledge to interpret experience and generate behaviour (Spradley, 1980). This acquired knowledge has much in common with symbolic interactionism which rejects the Stimulus-Response model of human behaviour and the argument that the social world can be understood in terms of causal relationships (Hammersley and Atkinson, 1983), and replaces it with a theory that seeks to explain human behaviour in terms of meanings and perceptions that things have for that particular individual. These meanings evolve from social interaction and are modified through a process of interpretation as events continually unfold and shape actions. In this sense the same physical stimulus can mean different things to different people, and indeed, to the same person at different times.

If social actions are meaningful for the actors then studying them can be approached by searching for those meanings through the eyes of the actors themselves as they

go about their daily lives. Our special interests, motives, desires, aspirations, religious and ideological commitments affect how we define our reality. Schutz (1962) argues that the selection and interpretation of facts, as well as the assumptions we make about the world, are part of our common sense thinking: the taken-for-granted meanings which allow us to function in everyday life. He further suggests that we function in the world by predicating our interpretations and actions on a stock of knowledge, grounded in our own personal experiences as well as those of our predecessors. In this context, the task of the researcher is to observe the actions, as well as the talk of those studied, to more fully understand that individual's stock of knowledge which influences those behaviours. Being cognizant of this, a sincere effort must be made on the part of the researcher to avoid replacing his or her own understandings of everyday life with that of the individual whose culture the researcher wishes to explore.

Given the situation wherein conventional guidelines for implementation are absent, each individual weaves a fabric for the potential of LOGO within the educational milieu, resonant with its own unique texture. Although the four teachers in this study participated in the same initial introduction to LOGO, to be discussed in Chapter 2, and had access to the same resources (Appendix A), their experiences as well as those of their students varied greatly. Because

we are participants in many different social situations, we spin many webs. As a collectivity, each class weaves yet another network generating a culture unique to those participants. How can we more fully understand these differences and how can this ameliorate our perceptions of Papert's LOGO within our educational system as we know it today?

Background to the Study

LOGO owes its emergence and growth to numerous influences, not the least of which are Seymour Papert-its designer; the research firm of Bolt, Beranek and Newman-its place of inception; and M.I.T.-its nurturer.

Papert, a precocious youngster, grew up in Johannesburg where at the age of eight he began publishing an anti-apartheid newspaper. He eventually attended school in Cambridge, England, the University of Paris, and spent five years in Geneva with Jean Piaget. It was during his stay with Piaget (1959 to 1964) that the focus of Papert's "attention was on children, on the nature of thinking, and on how children became thinkers" (Papert, 1980, p. 208). His eventual arrival at M.I.T. provided him with the environment and opportunity to explore that focus. Papert's concern for each human being as unique with a concomitant style of thinking and learning, underpins his view that educators must enable the learner to take charge of his or her own learning now, and we, as educators should support

them "as they build their own intellectual structures with materials drawn from the surrounding culture" (Papert, 1980, p. 32). Only then will they be enabled to develop thinking and coping strategies that they will need, to exist in a world of change (Coon, 1982). Papert's dream was for the child to gain a mastery of the world and a self-confident, realistic image of him or herself as an intellectual agent. For him, all learning is culturally based. It must come naturally; it must be meaningful; it must be fun. He believed that learning to communicate with computers could in fact be such a natural process, by creating an environment in which a child could create his or her own tools with which to learn. LOGO was to become the vehicle for creating just such an environment.

LOGO was designed to be an "object to think with" embodied in the computer-controlled cybernetic Turtle: a carrier of "powerful ideas", the "cornerstone of the LOGO educational philosophy", and a tool by which children could control the computer instead of the other way around (Austin, Logo Memo #23, 1976, p. 4-5). This philosophy manifested itself in the concept of microworlds. The design of this microworld was intended to be a "growing place" of powerful ideas where children could make their own rules and syntax (Papert, 1980). Various learning styles could be nurtured and the rules could be changed anytime by the students themselves (p. 46). It became a philosophy as well

as a programming language that encouraged "kids to experiment with a controlled part of their environment" (Wierzbicki, 1984, p. 51).

LOGO advocates believe that it helps to develop the capacity for "formal thinking" (Papert, Abelson, Goldstein, Bamberger, Logo Memo #22, 1976, p. 20), a thinking that involves problem solving, planning and debugging techniques. While teaching the machine how to "think", the child is developing his or her own reasoning process (Marikuson, 1983, p. 74). LOGO procedures encourage students to plan their work, develop a logical sequence, and then test it. Ultimately it places the child in a setting where he or she is in control of both the learning environment and the technology. Here the child becomes autonomous.

Wierzbicki (1984) states that it is not a tutorial device, rather an exploratory one. Its effectiveness lies in the way in which it is taught and thereby its "benefits run the gamut of having no benefit at all to giving a child a profound sense of self" (p. 51).

Even though Seymour Papert felt LOGO could be a very powerful tool in helping people develop their own intellectual structures, he also had serious doubts as to its acceptance and application in present educational systems. "I think there's a very good possibility it [LOGO] won't be taken up. . .by schools" (as quoted by Kelman, 1983). Dr. William Higginson, a participant in LOGO

research at Queen's University supports this. "We are not optimistic about the chances of an authentic version of LOGO reaching the average classroom" (1982). If indeed,

> Papert's ideas about computers and their role in the educational process are revolutionary compared to the vested interest of an educational system that virtually hasn't changed since the Middle Ages (Nelson and Friedman, 1981, p. 12),

then this study hopes that by allowing teachers the freedom to interpret and implement as they wish, some insight can be gleaned into Papert's concern. For, as Werner and Rothe (1980) put it:

> The degree of implementation generally refers to the match between what program developers intend should happen and what actually does happen in classrooms (p. 12).

Perhaps at this time some insight into my own "web of significance" and experience with LOGO may window the nascence of this study. My interest in computers surfaced while teaching a third grade class at an International School in Japan. Prior to that during my nine years of teaching children aged eight to fourteen I had developed a strong interest in what was then known as the Communication Arts which regarded technology first and foremost. As my teaching experiences were evolving from the complex society of a major Canadian city to the reaches of an Inuit and Loucheux community in the far north, so was my recognition and appreciation of each child as unique. This was

heightened all the more when upon my arrival in Japan I was asked to teach in an International School. It was with this "web of significance" that I found myself amidst a multitude of varying backgrounds. It was here that I was encouraged to probe the varied real life experiences of my students and share with them my own. The curriculum, although still in place, bestowed a flexibility emboldened by the school's administration. Where, for example, the curriculum prescribed North American Indians to be taught as part of the Grade three Social Studies program, I was encouraged to replace that with my Northern experiences and bring to life a very real part of my unique culture.

During my third year of teaching the school was offered a grant to purchase five Apple computers complete with monitors, disk drives and one printer. To enable teachers to gain familiarity with these machines, the vice principal arranged for a consultant to teach a Computer Literacy course to interested teachers, at the school's expense. Upon completion of this twenty hour course, several of the teachers, including myself, decided to investigate LOGO. We were told that this was a computer language for children and a study group was suggested as the means of exploring this language. This involved learning LOGO on our own whenever we had time, using the manual which accompanied the Apple LOGO software package. Casual meetings with the other teachers were held when deemed necessary by us to iron out

difficulties or share our findings. After two months, I had worked through the graphics section. It was at this time that I began to formulate in my mind the educational potential of LOGO. For me, first and foremost it became an expression of personal ideas respecting my individuality. Further, I perceived it to be an avenue for analytical and synthetical thinking. Having always been concerned with that aspect of education, especially in the area of problem solving, I visualized its merit as giving students an opportunity to develop their cogitative faculty: to think, to use the powers of their own minds to conceive ideas, draw inferences and to make judgements. Therefore, my interpretation of LOGO invited the students to experiment with the graphics in very much the same way that I had. It was now that I became interested in its origin, and was subsequently informed about Seymour Papert's book, Mindstorms. Reading that, helped confirm my own perceptions.

About this time in my LOGO development I found out I was to return to Canada. Since I was to take up residence in Edmonton, I decided to pursue my interest by attending the University of Alberta. It was there I discovered that my interpretation of LOGO at the elementary level differed radically from the way it was taught: the focus was more on teaching mathematical concepts as prescribed by the curriculum guide. My awakening to such alternative

possibilities manifested itself in the pursuit of this study: How do other teachers in their everyday worlds visualize LOGO's merit and what are the underpinnings of their choices?

How was I to investigate this? Since we cannot presuppose an understanding of those teachers' everyday lives, that understanding of their social actions must be built on the perceptions of those teachers as they perform those actions. The stress here upon the word action underlines the fact that we are "pre-interpreters" of our social actions and those actions are only a part of our "total behavior". Therefore to seek to understand more fully that social reality is to "understand the subjectivity of the actor by grasping the meaning an act has for him" (Schutz, 1962, p. XLVI). If one's beliefs, philosophy, family, friends and experiences are influential in his or her actions, then this study called for a genre of research which would allow me to experience teachers as individuals: a research methodology which would open the way to their experiences, their sense of meaning and the consequences of their actions.

So how can one get at those social meanings? Since a first requirement of social research is fidelity to the phenomenon under study as interpretations of the same physical stimulus will vary among people and across occasions, that approach must give access to the meanings

that guide that behaviour. Through some form of communication with the individuals in their natural environment, one can hope to arrive at the social meanings which generate their social actions. Participant observation, informal and formal interviews are some of the communication vehicles to enter the everyday world of the individual. These are part of the Ethnographic Research process which enables us to interpret the world in the same way as the participants do and learn the culture of the people we are studying. Ethnography as a social research methodology is founded upon the existence of cultural pattern variations. As LOGO becomes interpreted by each teacher and class, it becomes imbued with these patterns. Discerning these patterns will lead to themes which should help relate my understandings of those four cultural environments and make them come alive for others.

CHAPTER TWO

DESIGN OF THE INQUIRY

If indeed our most salient virtue is our diversity (Spradley, 1980), then an Ethnographic inquiry can help grasp that diversity. Ethnography is essentially one of several social research methods which portrays research as a process of exploration. Its spirit lies in what Hammersley and Atkinson (1983) call "reflexivity": the recognition that we are all participants in the social world that we study and cannot abscond our reliance on common-sense knowledge or the viability of our effect on the social phenomena we study. What they in fact suggest is that:

> We must work with what knowledge we have, while recognizing that is may be erroneous and subjecting it to systematic inquiry where doubt seems justified. Similarily, instead of treating reactivity merely as a source of bias, we can exploit it. How people respond to the presence of the researcher may be as informative as how they react to other situations (p. 15).

All data should be interpreted contextually. The fundamental process of "reflexivity" allows one to participate in a particular social world, reflect on the products of that participation and search for an understanding of the effects of one's role as researcher on that situation. During the course of fieldwork, as the researcher comes into contact with other people, he or she will be identified by such ascribed characteristics as

gender, ethnicity and age. It is however, not merely a matter of physical characteristics, since the researcher also brings into the situation a culture, personal style and manner. As the "research instrument par excellence" (Hammersley and Atkinson, 1983, p. 18), one's behaviour and attitude may influence the context. In this sense the data should not be taken at face value rather, as a source of inference to capture themes. Hammersley and Atkinson (1983) argue that there is no such thing as "pure data" free from potential bias, and that it is therefore important to understand how the presence of the researcher may have shaped the data and interpret it accordingly.

We act in the social world and yet are able to reflect upon ourselves and our actions, as objects in that world. Just as our participation is "reflexive" so is our Research Design. Inasmuch as one researches settings in which one has little power and minimal previous knowledge, the research cannot be fully designed at the outset. That does not imply lack of preparation or expertise rather, that this kind of research cannot be programmed since its practice is replete with the unexpected. In other words, "It puts a premium on flexibility" (Lofland and Lofland, 1984, p. 13). The need for preliminary fieldwork to assess a setting for its appropriateness and accessibility, as well as, a prelude to refining the research question, becomes clear.

My Introduction to the Setting

My pre-fieldwork phase began shortly after arriving at the university when I found myself sharing an office with a teacher on leave from a French Immersion School. Over a period of two months we shared much of our thoughts on education and our research interests. Upon hearing of my interest in LOGO she questioned the eventuality of my doing research at her school. She mentioned the teachers' expressed interest in computers, LOGO, their desire to use both, their "frustration" at not knowing "what to do" and their dissatisfaction with the software available in their school at that time. Some of these teachers had previously participated in a LOGO workshop given at the school by one of the parents, but felt the need for additional assistance prior to introducing it to their own students. Although this had whet their enthusiasm they had become emphatic about the need for a "computer lab" if they were to use computers with their students at all. Since there was at that time, no perceived facility available for such a lab, only a handful of teachers used a computer in their own room. That was the status at the time I was introduced to that setting.

Since the research problem and the setting are so interrelated, we agreed that it would be best if we "cased" the possible research setting for its appropriateness and accessibility (Hammersley and Atkinson, 1983). In effect,

could I get the data that I needed for my research question? At first my colleague casually spoke with some of the staff about their feelings concerning LOGO. Since it had been raised several times in the past it was not new and their feelings had not changed. One consistent echo was the need for a lab. It became clear that without a lab this study would not be feasible and since I was interested in their perceptions of LOGO I respected their decisions. My colleague suggested that she approach the principal with this dilemna: I, as a graduate student, was willing to do research in which the teachers would be able to implement LOGO in their classes, however, the teachers were tenacious about their need for a computer lab.

The principal's enthusiasm for computers to become part of the school environment was evident from the acquisition she had made the previous year with moneys allocated to individual school administrators for the purchase of computers. During one casual conversation I had with her, she mentioned her "impulsive" nature to "jump into everything". She upheld that with "it is better to be on top of everything than missing out". The dilemna she now faced auspiciously gave rise to the inception of a lab. She seized this opportunity to secure administrative support from the board to create a lab out of what was then a store room housing those boxed acquisitions: computers, disk drives and monitors.

Once the idea of a lab became a reality, my colleague made arrangements for me to attend a staff meeting to meet the principal and the teachers. When I arrived she took me to the staff room, and as we mingled made some introductions. Once the principal arrived, everyone settled down. I was introduced as a graduate student who knew LOGO and would be willing to help them set up a program for their students. A barrage of questions flooded the room: with whom would I be working, would there be a lab, how long would I be there, how would this be scheduled since the school was on a six-day cycle and I was on a weekly one, should the Grade ones be included since they were not located in the main building, would this be in French or English and so on. I had indicated a preference for the early elementary grades and that I would be available Tuesday morning and Friday all day. The principal quickly calculated the available number of thirty five minute time periods, number of classes, my options, and concluded that I would be able to work with four teachers. It was obvious from the discussion that a great many teachers wanted to participate in this study.

How were these four to be selected? Amidst the bustling conversation I heard the suggestion that one teacher from each of Grades one to four participate in the study as a representative and relate back to the other teachers at his or her particular grade level. After some

discussion as a collectivity, agreement was reached. These 'representatives' would be scheduled for twice as much lab time, that is, both on Tuesday and Friday mornings. All of the others would be scheduled only once with extra spare periods scheduled for anybody's use. I would make myself available to all of the staff on Friday afternoons. With this devised communication scheme, it was hoped that all of the teachers would eventually become familiar with LOGO. This involved familiarizing another three teachers at least, per grade level. The principal had reassured all that plans for a lab were already underway. The construction and electrical crew would be arriving within days to equip the store room with appropriate wiring and furniture. The discussion then centered on the teachers' preference for French LOGO. I was asked whether this would create a problem for me. I indicated that I had no access to the French LOGO program but that given one I would be able to accommodate. Someone quickly alerted us to the fact that one of the school's magazines published in Quebec, contained an order form for French LOGO. The principal offered to phone and in that way expedite delivery prior to the Christmas break so that volunteer parents could make copies of the manual for each teacher. Those participating in the study, as well as myself would receive theirs first. It was mid November and thoughts were already pre-occupied with Christmas and the next term. A consensus was reached that

it would be best if I came early in the New Year. I thanked everyone and left with the understanding that I would begin in early January. It was also decided that my colleague would continue in the role of liaison and let me know when all was ready.

I remember feeling anxious driving back to the university. I had been warmly received with an enthusiastic audience. They wanted something I could offer and I wanted something in exchange. This notion of "trading. . . technical knowledge and resources" (Hammersley and Atkinson, 1983, p. 81), is not new and can be an effective way for a researcher to demonstrate integrity and deter being identified as an intruder. The Loflands (1984) go so far as to suggest that successful entry into a situation may well rest on the researcher's ability to negotiate, as in this situation, with technical knowledge. It is important however, not to confuse this kind of "expertise" with the researcher's role as "learner". This study negotiated "expertise" in technical knowledge for "learner" in implementation, an area of "ignorance" on my part. It is also important to clarify the parameters of this "expertise" to those involved in the study, as ambiguity may create inaccurate expectations such as my setting up a curriculum for the teachers and cast doubt on my credibility.

I felt that together we had shaped an understanding; a working identity; a beginning to my study. I would commence

with a workshop where further ambiguities could be addressed. The school personnel had made the decisions. My stipulation was only one: that I would not tell or show them how to do LOGO but rather, give them the technical knowledge, that is, the primitives, and offer an array of suggestions and resources when asked. However they chose to use them was their right. This was a conscious effort on my part to avoid imposing my personal interpretations and keeping true to my interest in how they perceived LOGO. It was now that I was able to formulate my Research Question more precisely.

What LOGO interpretations are made by the teachers and how are these implemented?

Aspect (a). What underlying pedagogical stances are inherent in the nature of the context teachers construct for LOGO?

Aspect (b). Do these pedagogical stances and environments reflect any of the priorities expressed by Papert (1980) in his book Mindstorms?

Aspect (c). Does a bi-lingual context affect the LOGO implementation in any way?

My preliminary fieldwork had indicated an appropriateness of the setting and access became readily

available to this "closed setting": one to which access "is not granted to just anybody" (Lofland and Lofland, 1984, p. 22). This was largely due to my colleague, sometimes referred to as a "sponsor", who "cased" the research site, made the necessary inquiries of the teachers, informed the principal of the situation, introduced me to the setting and vouched for me and my research interest. In essence, she provided me with access to the data. Access as mere physical presence does not guarantee availability of the data sought. It is important to establish and maintain a working presence. Once this kind of access was granted, I was able to obtain permission from the "gatekeepers": those with formal power to control entrance into the setting. I was able to get past these "gatekeepers" through the principal who had made all the necessary arrangements for me. As a "known investigator" engaged in "overt" research, my role and intentions were explicit. The teachers, students and the school were granted anonymity by way of pseudonyms. As researchers, our goals are not judgement or reform rather, understanding. Pseudonyms help to focus on the emergence of patterns and not on the evolving potential human interest story. Since I would not be assuming an already existant role in the setting but creating my own, my presence would be "unusual" and therefore alter the original setting.

Yin (1984) tells us that studying cases "allows an investigation to retain the holistic and meaningful characteristics of real-life events" (p. 14). It was in the interest of my research to maintain the integrity of the real-life situation. Yin further outlines three conditions for choosing cases to study a phenomenon. It became apparent the all three criteria were present in my research question:

1. It was a "how" research question.
2. I would have "little or no" control over actual behavioural events.
3. The focus was on "contemporary events" not historical.

Our attention is further drawn to the fact that:

> . . .the case investigated is not isomorphic with the setting in which it takes place. A setting is a named context in which phenomena occur that might be studied from any number of angles; a case is those phenomena seen from one particular theoretical angle (Hammersley & Atkinson, 1983, p. 43).

Since four teachers were being studied, each individual teacher was a case, as well as the primary unit of analysis. The data collected about each would comprise a multiple-case study. The setting was the computer lab in a French Immersion Community School, L'Academie Ste. Marie, located in a city of approximately 35,000 residents. The four cases were Melanie, Daphne, Samantha and Jonathon, 'representatives' of grades one to four respectively.

The first week back in January, I was informed by my colleague that the preparations of the lab had been completed, the French LOGO program had been obtained, some of the manuals were xeroxed and "they were ready".

L'Academie Ste. Marie is a large, one story school building accommodating Grades one through seven. There are four classes of each grade except Grades one, five, six and seven. The Grade one classes are situated on a hill in an annex, approximately a ten minute walk from the side entrance of the main building. They come here for Music and Physical Education classes taught by an "expert". They will now have to come here for computer as well. The classrooms in the main building are arranged in a somewhat horseshoe fashion with the grade levels clustered together. The first time I arrived at the school, I noticed three orange school buses at the front entrance unloading children bussed in from all parts of the surrounding area, as well as from the nearby more densely populated city. As I approached the school from a parking lot across the street, where I was told I could park my car, I noticed the children playing in the spacious playground, many sliding down a huge hill just behind the school. Hovering around the side entrance some were preparing for the bell to ring. As I made my way to that entrance I met the principal snuggled in her fur coat standing near the doorway. We quickly exchanged pleasantries and I went in.

A short, narrow entranceway opened to a much wider hallway to the left. The first door on the left opened to the new computer lab (Appendix B). Upon entering, I sensed the newness of the room: the clean, freshly painted walls, the smooth, shiny, neatly arranged tables, the bright uncluttered counters, the empty shelves and square cubicles, and the natural texture of the bulletin boards prominently displaying a variety of recent computer magazines. Thirteen computers were arranged in a horseshoe with the front part of the lab vacant except for a computer table supporting one moveable system. I was later told that it had been put there for demonstrations. Eleven of the computer systems were "Apple compatible", one was an Apple II Plus and the other, an Apple IIe with Apple disk drive. The first computer on the right counter, nearest the door, was the only one with a color monitor, the rest were all green screens.

As time went on, more magazines and books were brought in, large colored manila tag charts appeared on the wall, a sheet for the purpose of listing all the mechanical computer problems was prominently displayed near the front of the lab, and gradually an array of software and manuals was beginning to appear. Software was stored in a disk organizer, locked in the lower cupboard at the front of the lab; the manuals were either in the upper cupboard or on top of it. There were two sets of keys to the lab and

cupboards: one in the library, to which I had access and the other with a Grade 4 teacher who was given responsibility for the lab. Time witnessed the dawning of an atmosphere charged with activity as books and magazines became disheveled and bent, disks were strewn about, pieces of paper adorned the shelves and floor, chairs, in disarray, people wandered about at odd times and amplified talk and laughter permeated the air. The lab became imbued with a life of its own.

As a researcher, I assumed two different roles.

Role 1: Researcher as Assistant to the Teachers

Now that the study was ready to get underway, I was to conduct an initial workshop in the lab so that all the teachers who wished, could familiarize themselves with LOGO. This was not merely for the benefit of the four 'representatives', but for anyone else in the school as well. A Friday afternoon was designated by the principal as a convenient time. All the staff members were welcome. Those teachers who were 'representatives' in this study were relieved of their teaching duties for the duration of that afternoon and arrangements were made by the principal to get substitutes for them. Other teachers came and went as they pleased whenever time permitted. During the course of the afternoon, nine teachers attended.

I began by introducing LOGO as a computer language whose applicability was reputed to span from Kindergarten to university. Immediately I was deluged with questions.

R: Will you be here Tuesdays and Fridays?

I: Yes.

R: What kinds of books are available?

I: [I showed them the books as I referred to them] Turtle's Sourcebook, LOGO in the Classroom, Apple LOGO for Teachers, Workbook for Learning LOGO, LOGO: An Introduction, and the French LOGO Manual.

R: Is there a curriculum or a guide?

I: No.

R: What do you want me to do?

I: Work through LOGO and see how you would like to use it with your students. I want to watch and see how the program develops, not to judge, criticize, just describe what happens.

R: Where can I get extra help?

I: I'll be here Friday afternoons as well.

R: What about Grades 5 and 6? Can we get help Friday afternoons too?

I: Yes.

R: What if we need help and you're not here?

I: I'll leave you my phone number at the university and you can call me there.

R: Is it Math oriented?

I: It has potential in Math. You have the choice of using it there if you wish.

R: Can you tell us where this is all heading?

I: Well, by the end of May or the beginning of June, I would like to meet with all of you as a group so that we can discuss your feelings, what has worked, what hasn't and perhaps plan for next year.

R: I'm not knowledgeable about computers, should I take a course in BASIC at the same time? [Somebody else in the lab suggested she take a LOGO course at the university].

After the questions had subsided, I introduced the four fundamental primitives: FORWARD, BACK, RIGHT and LEFT by having the teachers experience them physically. After experimenting with these further on each other for a few minutes, they each went to a computer. They asked how to boot up with LOGO and I showed them. Most of them took notes. Some chose to work alone for the entire afternoon, others shared their experiences. One 'representative' worked entirely on his own the whole afternoon requesting from me only the manual and resource books. Occasionally I heard a squeal or laughter. There was considerable sharing of ideas and assisting each other among those who worked together. I helped them as they went along and answered their questions.

One of the teachers from Grade seven, asked about "procedures" and I explained them to her. Soon others were asking the same so I discussed that with the group as a whole. Not everyone listened. As they requested more information, some appeared to be getting more confused. One teacher mentioned reaching a point of "saturation" but

feeling more confident knowing that I would be there during the next few months to help her along. As the afternoon drew to a close, I introduced Big Trak which caught the attention of Melanie, the grade one 'representative'. As they left, they expressed feeling: "good about it", "fine", "just what I needed" and "this is great". We parted with the understanding that I would be there the following Tuesday, January 22nd, for those 'representatives' who wanted to come.

Subsequent to this workshop, I assumed the role of "expert" or "computer lady" as the school personnel often referred to me. I was called upon to "fix" computers that were mechanically malfunctioning, to "figure out" why some procedures were not executing as expected, to serve as a resource person or hear their concerns or complaints. No conscious attempt on my part was made to influence the teachers' selections of methods, approaches or materials. Where I was directly asked for a suggestion, alternative methods or resources were always offered. It was hoped that this would put the onus on the teachers, and not on me to make a choice.

Role 2: Researcher as Ethnographer

In the lab.

The data gathering part of this study spanned a period of fourteen weeks: January 22nd to April 23rd. Although I

was not present for May and June, I did frequent the school for random meetings and in-depth interviews.

I was in a position to directly observe the children, the teachers, and make notes. Most of my time was spent standing at the front of the lab writing field notes. No one seemed to be occupied with me since much of their attention was directed towards the computers, each other or the teacher.

Field notes were the primary method of recording data and consisted of contextual actions, conversation, questions raised in my mind during the observation, directions for further observations as well as my personal reactions or feelings. Concreteness is integral to elucidating a clear and cogent description. Initially that description encompassed a rather large scope, including almost everything I saw or heard, however, as patterns began to form, inferences began to shape the focus of successive observations.

Hammersley and Atkinson (1983) find it "difficult to overemphasize the importance of meticulous note taking" (p. 150). They suggest memory as not a very reliable source and that it is better to over write than not to write enough. For it is the field notes that address auditability - whether this study can be done again, and credibility - how representative it is. The accounting metaphor, auditability, implies a rigor which lies in the

chronological depiction of the raw data. Credibility can be addressed through triangulation of data to confirm patterns, team research to compare findings and member checks to validate. One of the more sophisticated is collaboration with the member being studied. Here the nature of the relationship is reversed and informs the work of its theoretical distortion. As three of the 'representatives' had left prior to this writing, member checks were not possible, but comparing findings was, since this was part of a team research study.

As participants in many social situations, our participation extends from complete participation, where we are wholly immersed in a setting, to complete observation where we have no contact at all with those being observed, somewhat analogous to Loflands' (1984) "convert" and "martian" positions. Adopting either of these extremes would make it rather difficult to engage in "reflexivity". Somewhere between these extremes is where most field research occurs. This in between area can become somewhat nebulous since often times the researcher's role fluctuates along this continuum during the course of the research. However, the Loflands (1984) warn us against losing sight of this "marginality" for it creates a social and intellectual distance: in other words, an analytic space. During the course of my study I never experienced the extreme roles insofar as I never replaced the teacher in the lab, nor was

I ever wholly removed to the extent of having no interaction at all. The range of my participation extended from helping the teacher prepare her materials for the class and observing what she did with them in the lab, to interacting with the children by asking them what they were doing, responding to some of their questions or following directions given to me by the teacher. Spradley (1980) would refer to this as Passive participation: being present, but not interacting with the people to any great extent.

Traditionally participant observation has been the interweaving of looking and listening, watching and asking. This mutuality is central to this type of inquiry, hence the "reflexive" interview. "Informal" interviews usually consist of talk. The majority of mine occurred in the lab, the halls, the staff room and my colleague's office, which became designated as my office as well. These focused largely on activities occurring at that time, or clarification I was seeking. They tended to be more specific and directive. More "in-depth" interviews followed later in the field work when I wanted to get at specific information to confirm observations or inferences. Although I had a list of issues, the actual questions fluctuated from directive to non-directive, specific to open-ended depending on the tone of the interview and the function of the question.

As the study was nearing the point at which I would be withdrawing from the field, I requested "in-depth" interviews with all the 'representatives'. I interviewed Daphne and Jonathon once, Samantha three times and Melanie never, since she suggested a written evaluation in lieu of an interview. Each began with a question pertaining to how they felt about LOGO. The rest evolved. There were definite issues that I hoped to intersperse: their views about LOGO in an educational milieu, what they felt was a good way to acquire it, problems they encountered or could anticipate, issues it raised for them, and the kind of assistance they would recommend for teachers experiencing LOGO for the first time.

In the teachers' evaluation session.

At the end of the study, I asked to have a group meeting with the 'representatives'. It was to be an opportunity to discuss their experiences as a group: to review what had happened during the study, analyze why certain things did or did not work, share their approaches and perhaps draw up some guidelines for the upcoming school year. I was hoping that as these were being debated, some of the underlying perspectives would surface in defense for points of view. All the 'representatives' were present for the audio-taped one and a half hour meeting.

Analysis of the Data

Field notes, as a chronology, have no analytic or theoretical significance. To uncover those deeper underlying structures requires disassembling that chronology and creating a new synthesis founded on a cognitive understanding, not on a mechanical one. Through inspection, comparison and reflection, the deeper patterns emerge and elucidate the taken-for-granted. Analogous to Toto in the Wizard of Oz, this kind of analysis "strives to pull away the curtains that hide the petty mechanisms of impressive social action" (Lofland and Lofland, 1984, p. 120). Once again we witness the pivotal function of "reflexivity".

We act in a world of order: a structure that is not readily apparent. These actions can be organized into patterns which are not visible. This new cognitive synthesis is a way to grasp these deeper patterns. When the taken-for-granted encounters an incongruity, we grasp a theoretical understanding through our reflection upon that incongruity. It is this theoretical understanding that egresses the themes which elucidate those quiescently intertwined meanings in one's web of significance.

According to Spradley, a theme "is a postulate or position, declared or implied, and usually controlling behaviour or stimulating activity, which is tacitly approved or openly promoted in society" (Opler, 1945, p. 198 as cited in Spradley). When a single idea recurs in more than one

pattern, it suggests the possibility of a theme. These may appear as folk sayings, mottoes, proverbs or recurrent expressions. It is these themes that people use to organize their behaviour and interpret experience even though they may not be easily or openly expressed. For the purposes of this study, themes, as the data suggested them, helped provide awareness to the concerns expressed in Research Question, Aspect (a); informed the basis for making the comparison to the LOGO philosophy as expressed in the book Mindstorms, Aspect (b); and provided insight into Aspect (c).

CHAPTER THREE

PRESENTATION OF THE CASE REPORTS

"Just as there is no available neutral language of description, so there is no neutral mode of report" (Hammersley and Atkinson, 1983, p. 207). Presenting the case reports flows largely from the researcher's experiences and preference of writing style. Since the theoretical understanding is rooted in the raw data, one method is to present that data in its cohesive, mechanical form. In this way, the reader is invited to exerience the data as it may be enriched by the presence of the 'representative'. The following four narratives chronicle four such 'representatives' as they implement LOGO with their classes.

Melanie

Melanie, the Grade 1 'representative', is a graduate with a B.A. in Psychology and a PDAD (Professional Degree After Degree) in High School French. Her teaching career began with a four year position at a college where she taught French in Grades 10, 11 and 12 and after which she took an eight year leave from teaching to raise a family. Melanie then resumed her teaching but this time at L'Academie Ste. Marie where she was into her third year of teaching Grade 1.

Melanie's class was one of six Grade ones located in an annex "up the hill" approximately a ten minute walk across

the snow covered playground. For her children to participate in computer activities, it was necessary for her to bring them down to the main building. The clanking outside door and the simultaneous diminishing din of children's voices signalled their arrival. Only Melanie's hushed voice penetrated the lab walls.

The Grade one teachers were eager to have Melanie attend the lab sessions and report back to them. It would be a kind of ongoing workshop.

> They don't want anymore workshops. They aren't really all that good. Rather than going to workshops where it goes over their heads and they can't get to use the stuff, they said that they would like all the workshops to be done that way.

Tuesday January 22nd, was the first lab session for Melanie's class. They were a few minutes early and had to wait for Jonathon's class the leave. I met Melanie in the doorway. Indelibly she expressed her eagerness to get started and how "excited" everybody was about "computers". Stray glimpses caught my attention as two rows of youngsters vied to see past her. As they followed Melanie into the lab I noticed their outer wear arranged in separate piles along the corridor wall, with their boots neatly standing in front of each pile. She stopped in the middle of the room and told them to sit down in a "circle" around her and wait quietly for her to return. She closed the door behind her as she left. In her absence some of the children looked

around the lab and pointed to the computers surrounding them, while others giggled and poked each other, all the while retaining their "circle". In about five minutes Melanie returned holding some xeroxed sheets as well as some of the reference books I had given another 'representative'. She came directly to me and said, "I already spoke with the Grade 1 teachers and they were so anxious to get started, so I got them some material from the book," pointing to the French LOGO Manual. Since they had already established that they were in favor of this kind of ongoing workshop, they had expressed to Melanie their desire "to have one person sort of dishing it out. . . one person goes and gets all the knowledge and passes it on, on a day to day basis". This would enable them to "all start with the same thing" and progress together. They were searching for a "curriculum-type of thing. . . some kind of a structure". Melanie would provide a structure by being that "one person to pass it on" and ensure that "not everybody would be doing different things".

She then turned to the class and announced that I would introduce Big Trak to her and that they were to watch since they would later be able to play with it as well. Although this was the first I'd heard of it, I brought the box from the sideboard and set it on the floor in the middle of the circle, which immediately gave way as all sought a closer look. Just as I removed Big Trak from its box, one boy

yelled out that he knew it and started describing what it could do. I asked him if he would like to help me show Big Trak to the others. Shyly he nodded, came over and began to show how the keys worked. In a matter of seconds Big Trak was weaving a captive audience around bodies and through chairs amid outbursts of laughter. Meanwhile, Melanie asked if I had any written instructions on Big Trak and I offered her the ones which were in the box. She asked if she could keep it for a while and I agreed. She then joined her children. The bell rang, Melanie put Big Trak in its box, told the students to line up, led them into the corridor and told them to get their clothes on and line up.

The next session Melanie cancelled. That morning I received a note from the office saying that she wouldn't be bringing her class down that day, because "her class is not ready". Cancellations occurred several times during the course of the study and for the months of May and June Melanie "quit going" altogether. For her, goals were fundamental. LOGO, as presented in this study, was not accompanied by the kinds of goals that would have mollified her questions:

> Where are we going or what are we doing? What's the end? What's the ultimate? What is the end product? Where am I going? Why am I teaching this?

For without answers to those questions, "It's hard to go anywhere because you don't know what you're doing".

Initially Melanie found those answers in the activities she copied from the French LOGO Manual and from other resources. However, when she exhausted these she,

> kind of dried up [and] just stopped. I could have researched this book and that, but at a given time I didn't know how far I should go and so I just stopped.

Melanie looked to goals to provide, "some kind of degrees or continuation between grades". Fulfilling these "expectations" would [illegible]clude boredom at the next level because "once they've d[illegible] the square, they know how to do it. Would't it be b[illegible]or them?" Furthermore,

> I think with a teacher mentality, and I might be wrong. If you don't have one of those [curriculum guide], I'm afraid this will be treated as kind of an extra curricular or not very serious kind of thing.

The next session was the first of several which concentrated on specific activities or goals suggested by Melanie. As the children entered the lab she gathered them all around her and sent pairs to computers. She waited for silence and then told them all in French to point to the key D and then all together type it, then E and so forth until they had typed the word DESSINE (draw or showturtle). Quickly she scanned the monitors to see if the turtle had appeared on everyone's screen. Reassured, she continued. On a large, green cardboard which she taped onto the door, were written the commands AV, RE, DR and GA with corresponding arrows indicating the direction the turtle

would move on the screen. She went through each one in succession much the same way she had done with DESSINE: pointed to the command, pronounced it, told them to repeat it and then type it. As she introduced the first activity which was to draw a square POUR CARRE, she taped the large, yellow manila tag cardboard on the door. She pointed to each command and together they typed them in one at a time. Two or three children worked together at one computer and it was up to them to decide who typed in what. Melanie, standing at the front of the lab, showed the commands in an isolated fashion uncovering them two at a time using a window type cutout. As she pointed to each command, she read each letter in French, explained it in English, the children repeated it in French and then typed it. For example in CARRE, she read A V 50, explained in English that the turtle would go 50 steps forward, repeated it chorally with the class, and instructed the children to type it in. She checked each group to make sure that everyone had it right. When she stopped at one group of boys I heard her say to them in English, "You said AVANCE but you didn't tell it how far". The boys made the correction. She stood back, smiled, clapped her hands and urged the class to do likewise. Their little glowing faces graciously accepted the applause. To another group she made a similar suggestion but this time the girls did not know how to correct it so she told them to watch as she typed it in and

then explained what she had done. Often, as she checked from group to group, the children became restless and would giggle. Melanie always stopped what she was doing and would "Sh-h" the class. She then returned to her display and referring to the turtle said, "She's ready to learn it again". And so the practice renewed itself. The rest of the session continued in this way until everyone had successfully drawn CARRE or a square on their screen.

Although Melanie missed the next session because she "was swamped", the routine continued during the forthcoming one where the activity was to draw POUR MAISON (house) using a square and a triangle. This time Melanie was accompanied by two parents who were her "helpers". She brought with her the green cardboard from last time, a yellow one with today's activity and a small hand bell which she immediately used to get everyone's attention. She taped both cards on the door. Once she got silence she began working her way through the commands in the same way as she did for CARRE, beginning with the square.

Two boys at a computer decided to go ahead on their own since they already knew how to program the CARRE part of the house from last time. Melanie noticed that those boys were not watching her and were ahead of everyone else. She walked over to them, smiled and said, "You guys are too fast for me". She then went back to the front of the room, asked for silence in French and addressed the whole class saying,

"Please don't go ahead because you'll forget how many times you do it and I'll....."[faded out as she turned toward the activity on the door].

Melanie felt that it was necessary for every child to follow her presentation and keep together to ensure that all completed tasks together. Otherwise,

> The ones who haven't done it, you can't start doing other things because they don't understand the concepts and the directives.

Melanie always asked questions and the children provided choral answers. These questions sometimes reviewed previously presented material such as, "Do you remember how to tell the turtle to turn right?" or, referred to the current activity such as, "How many steps will the turtle go?" The students responded in unison. I noticed that she often referred to the turtle as "La Tortue" and "she". Upon questioning her about it later that session, I learned it was, "because in French everything has a gender and turtle is feminine".

Before Melanie continued instructing the class as a whole, she always insisted on complete silence and attention. For the most part, the English and French languages were intermingled. At times, she would repeat the same statement in both languages, first in French and then in English. To put the finishing touches on "Maison" Melanie introduced the MT and CT commands (Showturtle and Hideturtle). It took almost the entire session to program

MAISON. For the remaining five minutes Melanie told them they could do whatever they wanted. Some of the children tried to repeat MAISON on their own, others punched keys randomly while still others giggled and punched each other.

During these few minutes Melanie gathered her visual aids and prepared to leave. When she was finished she sometimes walked around the lab and watched, or chatted with me or her "helpers". Today she chose me. She told me how if "you sort of do what you want, there is no continuation".

At the start of the next session the children came in first, darted around until they decided which computer they wanted and sat down with whomever they wanted. Letting th[illegible] choose their own partner "had worked a couple of times so [she] let them do it". Melanie followed at the end chatting with her two parent "helpers" (different ones this time). Once inside, the parents veered off toward the children and Melanie toward me. "I want the children to play around for about a month until they feel good about it [the computer]." She turned towards the door and as before began to pin up the colored manila tag boards. She rang her little bell and waited until the children stopped talking and were all facing her. She showed them two displays: one of the "ordinateur" (computer) labelled with "clavier" (keyboard) and "ecran" (monitor), the other of the procedure CARRES, four squares in the shape of a larger square - fenetre. As she spoke briefly about the "ordinateur" she pointed to its

components, "clavier" and "ecran". Today's activity was CARRES and she immediately switched to that. First she questioned the class about the initial four commands and their functions displayed on the green cardboard. She then began the activity exactly the same way as CARRE and MAISON. As she was guiding them through the initial square two boys went ahead and were already beginning their second square. Melanie asked them to wait until the rest of the class caught up which they did. The two parents were moving from group to group helping the children keep pace with Melanie by either repeating what they were to type or telling them to look at the display board if they were stuck. Melanie's dictation was beginning to intensify. By the end of class every group had reproduced CARRES on their own monitor. As before the last few minutes Melanie gave them to do with as they pleased. Once again some attempted to repeat today's activity, others punched keys randomly while still others poked and giggled. As the bell rang the parents organized the children while Melanie continued to collect her visual materials.

The next three sessions Melanie further demonstrated her concepts of doing and understanding and how she used these as building blocks for "other things." The activities were FLEUR (flower), FIDO (dog) and CHAT (cat), conducted in much the same way as before, except for one difference: all

incorporated a subprocedure CARRE. FLEUR, consisted of rotating squares thirty degrees.

```
CARRE
DR 30
CARRE
DR 30
CARRE
DR 30
-
-
-
```

All the children had to first type in the procedure CARRE so that they could use it in FLEUR. By leaving the procedure incomplete, Melanie gave her children the opportunity to work their way through the superprocedure FLEUR on their own. She told them to copy CARRE, and went from group to group to ensure that they had all copied it correctly, every so often ringing her little bell and accompanying it with a "Shh".

The concern for noise level was expressed in her statement, "We need to soundproof that [the lab], to make it pleasant, really, the sound is important." She felt that "The room was adequate but not equipped to absorb the sound of children's enthusiasm (needs more soundproofing)."

Once everyone had finished copying CARRE, she began with FLEUR. She read through the procedure and then told them to "continue this way and finish the picture." When one group finished, she asked everyone to look and they all clapped. She then told them that, "To complete the flower,

it needs a stem. Figure out how to do that." Shortly two boys raised their hand and asked how they could get the turtle back down to the bottom of the flower. She suggested LP (Penup) and PP (Pendown). Momentarily they yelled out that they were finished.

Melanie: [Rang her little bell two times and when everyone was quiet] Mac and Sam got it! [Looking at the two boys] Can you tell us how you got it?

Boys: [Clapping their hands] Oh boy!

Melanie: [The school bell rang] Maybe next time when we come you can tell us how you got it.

She told the children to line up and get ready to go. As they were leaving the lab Melanie was switching off all the computers. She waited until they were all lined up in the hall before she led them outside. The "helpers" walked alongside the class.

This method of presentation was replicated in the following two sessions. The activities CHAT and FIDO became quite complex as features such as whiskers, ears and eyes complicated the design. The children experienced considerable difficulties with re-locating the turtle and drawing triangles and circles. This resulted in frustration on their part as well as Melanie's. As the "helpers'" assistance dwindled due to their lack of knowledge and understanding, it augmented the demands made of Melanie. Two boys went ahead on their own, doing something entirely

different. Melanie walked over to them and said in a loud, firm voice, "You do it right or you don't do it! Do you understand?" The two boys nodded. The next session brought with it a fresh approach.

The last session of February, Melanie asserted to "let them free". Her class began arriving later to an already empty lab, so the children entered and began punching keys on the computers as soon as they had removed their outer clothing. No "helpers" were present today. Melanie closed the door. Today she had brought with her no visuals. A few of the children were re-doing some of the past activities, specifically the square or CARRE. One of the boys asked in English, "Can I make a triangle?" Melanie was encouraging as she responded in English, "Go ahead and try." I observed those boys struggle and finally give up and revert to do a square. Several of the children typed their own names. That appeared to be a favorite activity. Others chose numbers and manipulated them with plus and minus signs. All the while Melanie walked among the children often making facial expressions and shaking her head, disapproving of the noise. The principal walked in to give Melanie a message. Her disapproval of this noise became rather obvious as she placed her hands over her ears and exclaimed "How can you stay in here with all that noise?" After she left, Melanie enthusiastically spoke about an idea she picked up from a recent conference using transparencies for doing LOGO. The

bell rang and Melanie gathered her children, lined them up and left.

In the next session Melanie put into practice her transparency idea. She entered the lab first before any of the children and told me what she intended to do. She said that she had already gone over the transparency in class with them and showed them the order in which to do the maze imprinted on it. She had "DEBUT" and the numbers 1 to 6 imprinted in bold, black felt pen letters for them to follow. While she and her "helper" (only one today) were scotch taping these transparencies onto the monitors, the children trickled in, sat down and typed away on their own. A popular activity was typing in all kind of AV numbers and running to show others. I noticed that they restricted themselves to small numbers such as 1, 5 and 10. The highest number was 20. As soon as all the transparencies were ready Melanie rang her little bell and soon everyone was watching. She taped her own transparency on a piece of manila tag and then on the door. Then she briefly described what they were to do, all the while following the numbers with her finger. She asked if they all understood and when they answered "Yes" in unison she told them to go ahead. As I watched the children, I noticed that most sat and did nothing. Melanie asked them what the problem was and they said that they didn't know how to get the turtle down to the bottom of the screen - the place they were instructed to

begin. Melanie realized that "I should have started it in the middle" and then explained to them the use of LP and PP as both she and her "helper" typed in those commands to start the turtle at "debut". The children were then allowed to continue. They were working their way through very slowly as they typed in numbers such as 1, 5 and 10. About half way through that session one group had worked its way through the six number process and yelled out that they had done it. Melanie clapped her hands, everyone cheered and that group was given lollipops. Suddenly this group was besieged with questions of "What number do I put" and "How do I get it to go there?" It was becoming apparent that they were having enormous difficulties with DA and GA to turn the turtle in the desired direction, and confusing that with the AV command. I noticed that Melanie and her "helper" were beginning to type in the correct numbers for them and eventually every child had successfully reached number six. As Melanie was leaving the lab she told me that she thought they did quite well and would prepare more for the next session-the one narrated at the opening of this document.

The next session introduced two additional mazes. Melanie suggested that the children work through the first one again and then they could either re-do that one, or try the other ones in her folder which she had organized according to difficulty. Almost all of the children were

able to work through the first two mazes. No one was successful with the third. Most of those children returned that maze and took one of the first two. At the end of that session Melanie said that she would have to look for something else for them to do.

As Melanie entered the lab for the next session, she said, "I thought I'd just let them go today". She turned to the children who had by now settled themselves at a computer, and told them in French and repeated in English, "Do whatever you want". As I observed the twenty one children, I noticed that they spent a lot of time running back and forth looking at what others were doing and asking what or how to do something. It seemed as if they did not know what to do. When one girl asked Melanie what to do, she replied, "Whatever you want." A perplexed look dawned the child's face and finally she saw that someone else was typing AV 2000 and did the same. This idea caught on quickly. The children laughed as they diligently tried to "fill up the screen". Meanwhile, three children still hadn't figured out that it was necessary to turn the turtle to get that effect. As we watched those three children, she whispered, "I wonder if she'll figure it out?" No sooner said than done. Wide-eyed, Melanie exclaimed, "Oh look! She's got it!" The bell rang and the children got ready to leave.

After that, coming to the lab was sporadic. With Parent Conferences and the other spring festivities at the school, time was becoming a factor. On April 2nd, I received a memo from the secretary asking me to "bring a lot of Grade 1 material because she's [Melanie] running out." I left a message for Melanie to call me when she had time. She was prompt and we arranged to meet after school that same day. She mentioned that she had run out of ideas and that the other Grade 1 teachers were becoming frustrated with LOGO and she wanted me to give her some projects to do with the kids, "more games and language activities. I know these are available but I didn't have the time to look them up." I referred her to some of the resources I had brought and she indicated that she did not have the time to go over all those. So I asked her what she would like to do with her class. She said that something with numbers or letters. When I suggested their initials she quickly retorted that it would be too difficult for them. She asked if they could add on it and decided that it would be the next activity.

The next two sessions were spent using the AV, RE, DR and GA commands. Melanie told me that she had introduced them in class and that they were to practice using them on the computer. The children showed that AV was the easiest command for them to use. During these sessions the noise made it difficult at times for us to speak. Melanie told me about herself: her five children, financial interests, her

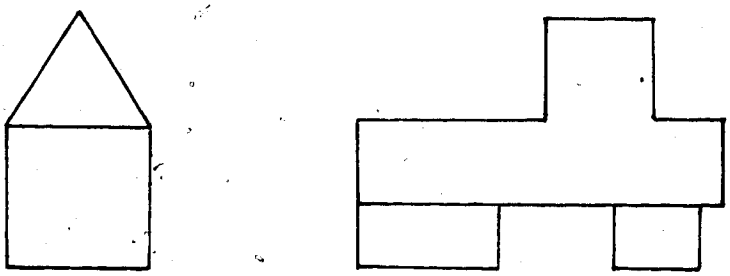
husband being back in school and their experiences of having "freaked out" when things were going well.

By mid April, Melanie had accumulated a file of activities and when she was absent, her substitute came to the session with Mazes which she had pulled out from the file.

The beginning of the next session, April 12th, Melanie rushed into the lab and asked if her "sub" had left the file because she couldn't find it anywhere. As the noise level escalated, Melanie frantically turned to me and asked, "What do you suggest?" I detected a kind of desperation in her voice. "Why don't you ask them to make the first letter of their name?" Without hesitation Melanie said, "la premiere lettre de ton nom." They immediately began. They worked pretty much on their own as Melanie kept me occupied by telling me about their impending move to another province this summer. One of the children wrote his entire name (three letters). Melanie made a point of clapping and showing the whole class. This session the class left earlier than usual.

On Friday April 19th, I called the school early in the morning to advise them of my being late. I asked that the secretary, whom I had come to know quite well by now, inform the teachers that I would arrive about 11:00. When I arrived I returned a book which I had borrowed from Candace, a Grade 4 teacher. On the way back to my office, I ran into

Dorothy, one of the school administrators, who offered me a handful of plastic diskette holders which fit a three-ringed binder "We had ordered these folders for disks for the teachers and these are some extras. I'm sure you could use them." Actually it was just what I needed at that time and I gratefully accepted them and continued towards my office. Shortly I heard the following over the P.A system: "Mrs. Josephine Hofman, please go to the computer lab." My reaction was prompt. When I opened the door to the lab I was met by a bright-eyed Melanie with a big smile on her face. Waving her hand she motioned for me to come toward her. I remember being somewhat surprised with her actions as I had never experienced her that way before. I quickly followed her beckoning to a computer where two boys were sitting. "I wanted you to see this!" she said pointing to their screen.



She continued in a tone of amazement, "They made this all by themselves! Isn't it good?" I shared her enthusiasm. Just then one of the two boys looked up at us, smiled and said, "We're going to take the turtle away." Melanie, still

smiling and staring at the screen said, "I just told them to draw a house and a car beside it." I asked her if she had done any of this in class prior to lab and she answered, "No. At first I did LOGO in class, but not now." This was the last session I had with Melanie and her class. On the final day, April 23rd, I received a message from the secretary saying that the Grade ones would not be coming to lab today.

Daphne

Daphne, the Grade 2 'representative' came to L'Academie Ste. Marie from the province of Quebec. She had little familiarity with computers and none at all with LOGO: "In computers my background isn't developed or anything. I haven't taken computer courses, so it's introduction to me as well and I never heard of LOGO before." Notwithstanding this lack of computer knowledge, she was eager to partake in this study:

> There's so many computers around. Everything is so computer bound these days that it's computer literacy you know. It's introducing them to computers. It's something they're going to need later on in life whether they like it or not. You know, computers are here to stay.

Daphne described her class as:

> A very, very excitable class, very talkative, very high strung a lot of them. You have to [illegible] on them a lot. They love doing things together, [illegible]ng together. When they're finished up, they h[illegible]n activity to do. They always want to know if they can do it with somebody like a friend.

Daphne felt that it was important for children in Grade 2 to work together, to share, and nourished this love for doing things together by making it part of her teaching strategy.

> I have some that alone, they couldn't do anything at all. Some have learning problems and are not as bright as others. Some can work by themselves, but some can't. Those who could work by themselves is okay, but even then, I think they enjoy being with someone else. They share things and at this age it's important. I don't know about Grade 7. I don't know how they react to it, but in Grade 2, I think that's important especially when it comes to the better ones helping the weaker ones. We do a lot of that.

According to the schedule, Daphne's class was first in the lab Tuesday and Friday mornings. On January 25th as I made my way down the hall to the lab, I brushed past the flowing queues of children. When I reached the opened lab door, I saw Daphne frantically booting up the computers. She hadn't realized that "booting up" took so long and as she moved to the next computer muttered that the school should get more LOGO disks. After she finished she hurried out of the lab saying that she'd be back in about five minutes after she read her class some notices.

It was not long before I heard footsteps and Daphne's hushed "Sh-h" in the corridor. After Daphne poked her head

inside and wished me a "Good morning", she led her string of Grade twos quietly into the lab. They immediately surrounded her and asked about a partner and which computer they could have. With her hand she separated the children into twos and pointed to their computer. This was the one and only time she did. Every other time the children were allowed to pick their own computers except the one with the color monitor at which Daphne "rotated them to give them all a chance on it."

During the first session, the students were all trying to make a square. I asked one group why and found out "because our teacher told us to." Daphne believed that it was necessary to have "goals" for her children. In this case it was making a square. She also felt that it was up to her to show them how to do it for, "they probably wouldn't, I don't know if they would have figured it out." As her children typed, Daphne, hands clasped behind her back, walked successively from group to group, looked at what they were doing, asked questions and typed in commands. As communication between the class members increased so did the noise level. There was freedom of movement and the majority of the students were visiting their classmates in all parts of the lab, looking at what they were doing, or showing what they themselves had done. During the first session, there was no attempt made on Daphne's part to restrain the children's excitement or subdue the noise until

the librarian came in and told the children to keep quiet because they were disturbing those working in the library across the hall. From that time onward, Daphne's awareness of noise as a problem, engendered constant appeals for silence: "Sh h", "Trop fort", "Mes amis, c'est trop fort", flicking the light switch on and off and closing the lab door at the start of every session.

For Daphne being noisy was a very real part of being a Grade 2 kid, except for screaming - that was not tolerated: "If they started screaming, no, but just talking amongst themselves, that's okay." In fact, she found it:

> Difficult and unrealistic to expect them not to make noise in Grade 2. I've walked past Lana's class, she's in Grade 6, and was almost total silence, but in Grade 2 you can't expect that. They're excited and when they get excited about something their energy level rises. It's normal.

This kind of excitement was a way of learning:

> It's neat because sometimes they discover something and they get so excited about it, they grab somebody [laughs and uses hand gestures] and bring them over. It's a normal reaction. They're kids. It doesn't bother me.

However, it was now becoming a bothersome issue:

> It's normal, but that sort of bothers me now because of Len's class [next door]. I know we're disturbing them and sometimes the library as well. I can keep it at a reasonably low level but (pause) another reason is, it's easier to teach them things too, cause they're at you a lot, you know, they want to know what's wrong this isn't working or whatever, you'd like to spend more time with them.

By the end of lab time, she had not reached all of the students. By the next class, she had changed her strategy and instead, helped individual groups as they called on her.

When Daphne's class arrived for their second session, three computers had "ne fonctionne pas" signs on them. She told the children that they would have to "triple up" and began grouping some of the children into threes. Those that objected, she did not triple up. The activities which ended the first session saw the beginning of the second. When one group finally succeeded in making a square, they started typing in some large numbers: AV 1000, AV 5000, and so on. It was not long before other groups were trying the same. The enthusiam was overwhelming when someone discovered that if you turned the turtle, you could create some fascinating screen fills. When I asked some of the children what they were trying to do, they told me they were trying to, "fill in the screen". What eventually happened in one group was the disappearance of the turtle from the screen. This raised concern and speculation among the students as well as Daphne herself who called on me to explain to that particular group of children "where the turtle was when he was not on the screen." This first time, she stayed and listened to my explanation however, in subsequent ones she always called on me to explain that problem whenever another group encountered it.

After about ten minutes into the session, the teacher from the next classroom [Len] came into the lab and spoke to the students in French. Immediately silence permeated the lab. When he left I asked Daphne what he had said. She replied that he asked them to talk quietly because his kids were doing a test. Once again, Daphne was reminded of the noise factor and resorted to her appeals for silence.

Seldom did Daphne address her class as a whole, but whenever she did it was in French and almost always began with "Mes amis". Her voice was much like a whisper. At the end of lab time most of her children could be seen gathered around her, smiling, chatting and leaving together. I always received a "Thanks, Josephine" from Daphne, and sometimes from the children as well. At times, some of the students lagged behind at the computers, but Daphne left them and went out into the corridor with the rest of the class, lined them up and returned to her classroom. At the end of this session, she told them all to type DESSINE so that the turtle was be at centre screen ready for the next class .

In the third session Daphne once again paired off the children and they immediately began. I found the entire class trying to fill in the screen. Daphne approached [redacted] and said, "We always talk about this when we get back to class and they tell what they did." Today there was something different about the appearance of the lab.

Someone had put up on one wall huge yellow charts with procedures on them to make a house using a square and a triangle. After about ten minutes Daphne spoke to her class in French and pointed to the charts. When I noticed that she was free, I asked her about those charts. She said that she did not hang them and did not know who did but, "some of them [pointing to her class], are following the charts and trying to make a triangle. They have no difficulty making a square, but with a triangle they reach a level of frustration and just play around" [pointing to the children filling in the screen].

Since Daphne virtually never instructed the class as a whole in the lab, her time was spent mostly helping individual students with their particular difficulties. This often necessitated introducing them to new commands. In this way her students became familiar with much of the LOGO language although she did introduce some commands and procedures in the classroom to them as a whole. Often times, she came to me and we chatted. This particular day, she wandered over and said, "They love coming here. Every morning they ask if they are coming here." She asked me the command for getting color on the color monitor. I said, "CP followed by a number." She walked toward the color monitor and began typing in the command. As I watched I saw that she was typing in sequential numbers to get different colors. Having shown them that, she stepped back and th

two girls made triangles side by side in two different colors. They looked at Daphne, she smiled and moved on. Daphne appeared to be relaxed and enjoying herself. Today she hadn't asked for silence at all. And so ended the third class in much the same way as the previous two.

After pairing off the children the fourth session began with Daphne suggesting to the class in French, that perhaps they could try and make a square. This was something she had wanted them to make since the first lab session, but had not insisted on it. Some of the children took her up on her suggestion, but eventually ended up trying to fill up the screen again. During this session, Daphne showed the new group at the color monitor the color commands. She verbalized as she typed them. This particular group drew a rectangle with a square inside of it.

As she asked them in French how they might get the turtle to draw a diagonal in the square, she outlined it with her finger. She watched as they figured it out. They giggled and quickly ran past her to tell their friends on the other side of the lab that they found out how to make a triangle. Daphne left to see another group. Later she asked me if it was possible to write a story or make up questions and answers. I said that it was possible and that I would have to brush up on the French commands for text processing. Since it was Friday, I spent the entire afternoon doing precisely that. I was surprised to discover

that the French text processing commands were not as easy as the graphics. By the end of the afternoon I had a workable understanding of them and made arrangements with Daphne for the following Friday.

In the following classes, as each new group had their chance at the color monitor, Daphne showed them the color commands. Although some of the children still tried to make a square, most of them still experimented with large AV numbers as well as the RE, GA and DR commands in trying to fill up the screen. By February 12th, the fifth lab class, all of the children had not yet successfully made a square. From this session onward Daphne no longer appointed the partners. The children were now allowed to "choose whomever they wish. . .as long as they're compatible." In other words:

> They could be both in there just to have fun or to fool around. So I tend to put someone who I know will be doing something with the computer with someone that. . .[her voice faded] or a bright one with a weaker one. I won't put two weak ones together, but two bright ones together is okay.

It was during this class that Daphne made a point of going to those particular groups who had not yet made a square and typed in the procedure for CARRE. She explained to them as she typed what she was doing. This was the first time I saw Daphne impose her activity on them so openly.

Although Daphne made sure that every group had finally made a square, she still continued to help them in their own

activities. One group wanted to make a rectangle, she typed it in. Another group said that they wanted to make a circle. At that point Daphne approached me and said that some of the children wanted to make a circle, and asked if it was in the book, referring to the accompanying manual. I said that I thought it probably would be. She thanked me and returned to that group. When it was time to leave she lined the children up in the lab, waited for them to quiet down and then led them out in two lines. Two children who had remained behind quickly joined the others as the next class began trickling into the lab.

February 15th, the students entered haphazardly and most began typing POUR CARRE or tried to make a circle using the REPETE command. Daphne came to me and said that after the last lab they were very excited and talked a lot about the procedure POUR CARRE and wanted to draw a circle. Three of the students were still filling the screen. One group typed REPETE 360 [AV 1] and did not know why there was no circle. She pointed to the screen and said DR was missing. She then typed in REPETE 360 [AV 1 DR 1]. Another group wanted to draw a triangle. This time Daphne told them what to type and they did it. Daphne approached me once again, but this time to express wonder about a group which had circles all over their screen. Today's activities seemed to generate more noise than usual. At the end of the session Daphne lined her children up to the count of three.

By February 22nd, the noise level had risen dramatically. Daphne was calling for silence a lot more now. The majority of the children were still typing large AV numbers, although some were experimenting with the CARRE procedure. Daphne asked if I could suggest some projects for them to do.

> Some fun things. It is important for them to have fun things to do you know. It makes them look forward to coming to school and every morning they ask me if it is computer day and that sort of thing. So it's positive in that sense because it's fun and at the same time they're learning.

I showed her some of the available resource books I had with me. She quickly scanned them and found some projects, but did not know how to program them. I spoke about how procedures could build on others to create the final design. She asked if I would write programs for the two that she selected. I agreed. These resulted in the following projects.

Sheet 1

```
POUR CARRE
REPETE 4 [AV 30 DR 90]
FIN
CTRL C

POUR BOUGE
LP
AV 30
DR 90
AV 30
GA 90
PP
FIN
CTRL C
```

Sheet 2

```
POUR ARBRE
DR 30
REPETE 3 [AV 30 DR 120]
FIN
CTRL C

POUR BOUGE
GA 30
LP
AV 10
PP
FIN
CTRL C
```

```
POUR ESCALIER                    POUR SAPINS
REPETE 4 [CARRE BOUGE]           REPETE 6 [ARBRE BOUGE]
FIN                              FIN
CTRL C                           CTRL C

ESCALIER                         SAPINS
```

On March 8th, the students entered eagerly and as they waited to get their sheet from Daphne, they fidgeted and talked loudly. Upon receiving it, they quickly rushed to a computer and began typing in its contents. Daphne came over to me and said,

> This is good practice for them in following directions. For example, POUR CARRE, you have to AVANCE the right number. If they don't follow it explicitly, it won't make a square, right? So they have to follow steps 1,2,3,4.

As I looked at the two sheets I noticed that both sheets contained names and CTRL C which differed from the procedures I had written for her. Daphne circulated among the groups and helped wherever needed. She asked the students what the problem was and then rectified it by typing in the correct set of commands for them, all the while explaining what she was doing. This was the first time I saw Daphne sit down in one of the student's chairs as she typed in the commands. From this time on, it was something which she did quite often. After a while she approached me and said that they had some difficulty typing these in because they had difficulty following directions.

This was however, a good exercise for them in following directions.

> They're not used to following directions a lot of the time and even in class you'll tell them to do such a thing and it's not done properly and you have to repeat it very often, but this, they really have to follow directions otherwise it doesn't work. If they make mistakes they have to be very attentive to what they're doing. I think it's helping to sharpen their concentration.

I asked her, "How did you decide what sheet to give them?" She responded, "I just asked them and they picked. If they finish one they can get another one from here (pointing to the desk)." At 9:20, one group stopped doing the sheet and did a circle instead. The sheet was not turned in. Gradually, they ended up filling the screen. Shortly after, another group followed suit. Today's class was unusually quiet, and I noticed that Daphne had asked for silence only once; at the end of class in preparation to leave. One child remained and left just at the next class was coming in.

On March 12th, Daphne's class had a substitute who conducted the class the same way as Daphne had done. The students took a sheet, however, some turned it over and continued to fill the screen. The noise level was low. All the children were busily typing or talking with their classmates. The atmosphere in the lab was the same as if Daphne had been there. The substitute had been called on only occasionally for help. At 9:30 she flicked the light

switch on and off once, told them in French to type DESSINE on their "machine", lined them up and led them out.

On March 15th, the children entered as usual, some picked up a worksheet from Daphne, while others just walked by. Shortly Daphne came to me and said, "Some of the children still want to experiment with that", pointing to a monitor which had AV 3000 on it. At this point seven groups were still doing "that" and five groups were following the sheets. She continued saying that she didn't mind them doing that, but it was "interesting" that they wanted to do it for so long. Two girls called Daphne over and told her that they had made a "mistake" when they were typing in SAPINS and made instead what they called a "flower". She immediately came over to me and told me that they were happy with their "mistake" and they wanted to show others the "mistake" of which they were very proud. As it turned out, their so-called "mistake" became a highlight of that class.

On March 19th, the students were more noisy than usual when they entered the lab. Some picked up their sheets, others just walked past. While they typed Daphne walked around the lab. Her assistance was requested very little. After about ten minutes she was called over by a group of girls who had just begun the CARRE sheet. They pointed to the screen and indicated an incorrect entry which they wanted to erase. Daphne did it for them. One girl typed in her name and told me that she wanted to "talk to the

computer". Daphne typed in AF [Bonjour Sally]. When the computer printed that out both Daphne and the girl were elated by the result. As the bell rang, Daphne flicked the light switch and spoke to them in French. Some of the children typed in DESSINE, others shut off the computer, one left it in edit mode and others just left the design. As they were lining up they handed their papers to Daphne.

April 2nd, the children came into the lab quietly as usual, took sheets if they wished and began typing. The children were very noisy today and Daphne was submerging them with "Sh-h". Although the children spoke English amongst themselves, Daphne always spoke only in French. Daphne was called by a girl to help her "draw a circle inside a square". Daphne typed in the command, explained what she had done, and left. As I made my way around the lab, I noticed that two groups had both sheets and three groups were still typing AV with large numbers. Daphne said proudly,

> Before, they had to look on the sheets and now they just know it by heart so they learned fast and I think they learned because it's fun.

This session ended much the same as the previous ones.

Tuesday, April 9th, Daphne's class hadn't come to lab by 9:05 so I strolled past her classroom and heard voices singing Happy Birthday in French. When they finally arrived at 9:15 Daphne apologized and said that they were singing

Happy Birthday to one of the students today. As the children went about doing their own activities, I saw that some were beginning to use the procedures from the sheets to fill up the screen. Daphne mentioned that,

> From the trees they started making squares and stairs. Now they're into making stars and different forms of things. They make these little stars and they want to see if they can make it somewhere else on the screen.

She shared with me her pride in the fact that "They discovered the formula for the stars themselves." She felt that it was discovery that gave her children a sense of:

> Satisfaction. There's a difference between me telling them to do something and them discovering it on their own. They're proud of themselves. Even sometimes like [Lesley] yesterday, she made this design, so I went up because [James] wanted to know what the formula was. They're very proud because I'm asking them what it is.

When 9:35 rolled along, Daphne flicked the light switch and told them to line up.

On Friday, April 12th, I remained in my office. Daphne, Samantha and I had made an arrangement to meet that afternoon to discuss further, text processing. Daphne indicated that she wanted to program some questions to which her children could write answers. Later that afternoon, as I was leaving, I met Sarah, one of the Grade 3 teachers, in the hall. She was quite candid in her feelings about computers (the machine itself), about being expected to learn LOGO and at the same time cope with teaching, and that

in her opinion a "specialist" should "run the lab." She strongly urged that I write in my study that it was "unreasonable" to expect teachers to cope with computers on top of all "this" (pointing to her class).

April 16th was the last session I spent with Daphne and her class. It began the same as all the others. The children were either following the sheets or creating their own designs. No one was doing large AV numbers. Several of the children had modified the procedures on the sheets and were enjoying the outcomes. The designs varied from group to group. One group was drawing stars and asked how they could draw these in different places on the screen. Daphne asked me and I told her about LP and PP (Penup and Pendown). The door was still closed and Daphne was still echoing her appeals for silence. At 9:35 she flicked the light switch, they lined up and she led them out.

Jonathon

Jonathon, the Grade 4 'representative', is a native of the province of Quebec. There he attended elementary school for five years during which time he "skipped grades 2 and 6". After five years of high school he "left school for seven years to work". He then returned to universities in Montreal and Quebec for a total of three years after which he decided to come to Alberta to teach. He is a man who doesn't "like to learn something or to work at something

unless [he is] sure [he is] going to need it". At the time of this study, he was into his fourth year teaching Grade 4 at L'Academie Ste. Marie. Jonathon was eager to participate in this study because:

> It allowed me and especially my students to do something special a bit because they don't function very well, the majority of them don't function well in a regular classroom environment. So that's why I grabbed the chance they offered me.

He was of the opinion that because things were changing so rapidly, you couldn't really teach children "things" rather,

> I think you have to teach them how to learn basically. You can't teach them things or programs, but I'm trying to teach them how to learn by themselves, be independent and be curious. And if they don't know the answers, try to find the answers, be it any problem. You're always faced with problems all your life. Anyway, so I think that's the main thing that schooling should teach-how to solve problems so that you can solve a problem in Math, you can solve it in French, in English and so on.

Jonathon was the only 'representative' in the study who "had a little bit of experience [since he] took a course before and used LOGO just a little bit." At that time his "idea" of LOGO was that it "had a turtle and you draw. That's all basically. It was more of a game type of thing". As the study progressed his "idea" changed:

> Well, I think it's just like anything else, the more you know about it, the more your idea changes about something. Now it's not a game anymore. It's still fun but I don't see it as a game as before.

By the end of the study, Jonathon's "idea" of LOGO had become: "It's main creative function is thinking. The more I work with it the better it is."

On Friday January 25th, as I hurried along the L-shaped corridor to my office, the tread of my boots became increasingly obscured by the pervading serenity of classical music. I glanced at my watch. It was 8:15. I was curious about its origin and found its intensity culminated at the door of Jonathon's classroom. As I poked my head inside, I found him sitting at a student's desks writing. We exchanged smiles as I uttered "Good morning." Immediately he stood up, came over to me and began explaining why he wouldn't be coming to lab until next Friday:

> I have to kind of prepare them. Like I don't want to do any talking in the computer room so I have to do some teaching in class - it's not really teaching but just explain the problem - what the next problem will be.

I remember feeling somewhat uneasy at what seemed to me an uncalled-for justification. As I scanned the room I noticed the record player resting on the window sill and mentioned that I had been drawn by the music. I followed him to the window as he showed me that particular record. He referred to its relaxing quality and how he "enjoyed" it as a working background in school and at home. After a brief exchange about music I left.

The following Friday, February 1st, Jonathon's class came to lab for the first time. By now he had had "a chance to go over things". According to Jonathon that was necessary because he did not want his class to go to lab without a long term preparation in advance: a preparation he wanted to do in the classroom to ensure that they always had enough to do. He availed himself of many resources which he found "very useful". Often he prepared [illegible] at home since that was the only free time he had. Those resources gave him :

> Ideas to know what to do and how to do it [especially Babbie's book] is excellent because they teach you as a teacher what to do, what your goal or objectives are and then some problems that you have to do.

His plan was to "Give them instructions to follow but not tell them what will happen". It was his intention for them to work individually.

> I: Would you say that they're working on an individual basis?
>
> Jon: Yes, oh yes.
>
> I: What would they put in their folders before going to lab?
>
> Jon: Something like, using REPEAT make a square and then more than one square. And then we worked on new commands like, what's missing if you want to draw two triangles?
>
> I: Would they fill those in?
>
> Jon: Yeah, they would do that in class, number 1,2,3. I didn't say if their answers were good or bad or wrong. When they went to the computer lab they checked their answers.

I: Do you put your instructions on the board?

Jon: Yeah, and they copy them down. I prefer them to copy because they learn to be accurate when they'll give the commands on the computer. So when they copy it, they have to copy it once in their workbook and then when they type it on the computer I think they remember it more when they have to copy it.

I: Are all of the children doing the same set of problems?

Jon: Yes, except the ones that go ahead. I have tried to challenge them with bit more difficult problems.

That Friday I was in the lab unaware that Jonathon's class was outside the door until he stepped into the lab, looked at me, opened a folder and began calling names in pairs. Jonathon determined the 'pairs':

> What I usually do, I put two that usually don't get along so they learn to get to know each other. What I'm trying to do right now is to at least change the groups almost every week or every two weeks. There's another thing that I keep in mind when I make the groups. Some already have computers at home so they're really ahead so I don't want to put someone really ahead with someone that is behind. What happens is the one that is good, not the one that is good, but the other one, doesn't do anything or lets the other kid do all the work. So then, that's why too I don't like to have them in groups. I have to, so what I do I try to get the ones behind, to put them together so they don't have the answer right away from the other one in the group.

As the 'pairs' entered he pointed them to a computer. These were allocated sequentially. When two girls strayed he re-routed them. Each child carried an identical duo-tang folder. They sat and waited quietly until everyone had been assigned to a computer. I sensed being observed as my

pencil scratched notes. Once everyone was inside, Jonathon closed the door and began. His instructions were explicit: in French he told them all to type "DESSINE". In a few seconds he asked if they were finished. When they responded "Yes", he continued; "AV 100, RE 100". After several of these commands the students were instructed to open their folders and follow the commands they had written inside. Jonathon, with his hands clasped behind his back, circulated from group to group occasionally referring to the folder clasped in his hands. As I tried unobtrusively to make my way around the lab, I noticed that in each 'pair' one person read while the other typed. The results on the screen were then recorded by the 'reader'. Identical commands were written in each folder; AV, RE, GA and DR with numbers beside them. The children raised their hands to get Jonathon's attention, otherwise they seemed absorbed in their assignment.

Jonathon asked me to tell him when, "the time was half way through - fifteen to eleven", so that they could switch at half time. I informed him that there were only five minutes left before half time. When the time came, the students were instructed to change places with their partners and the process began anew. I noticed that some had finished the assignment, while others had not. A kind of procedure developed as the 'reader' dictated to the 'typist'. Other than that any interaction dealt with typing

errors. As the 'reader' followed intently the contents of the page, and the 'typist' the keyboard, both became engrossed in the exercise. If an error was made by the 'typist', it was quickly pointed out usually by the reader and then corrected.

When some completed the assignment, they began to type all kinds of things; their names, AV and RE with large numbers, or haphazardly hit keys. Voices and laughter escalated as the students began to leave their chairs and visit other classmates. It was nearing the end of class as Jonathon shut off the lights. They remained off until such time as all the students stood up at their computers. They were then eased into the corridor to the echo of "Vite, Vite". Once outside, Jonathon waited until they lined themselves in twos and when they were quiet led them away.

That afternoon as I was leaving the building, I happened to pass Jonathon's room. He was in the process of leaving and was packing the book Learning With Apple LOGO. I asked him what he thought about today's lab. He said that he had, "underestimated their speed and they worked through the material quicker than [he] had estimated they would." He continued to say that he wanted them to learn what the AV, RE, DR and GA commands did and had originally planned to discuss in class what had happened in the lab for "when there is two or three problem that are solved, then I talk about them in class to see how they solved them." Today

however, other things he had planned circumvented this discussion. As I glanced about the classroom, my attention was riveted on the orange duo-tang folders as they lay on the right hand side of each desk. They clearly delineated distinct rows. He mentioned how he liked Dan Watt's book and hoped to get some ideas for upcoming labs. On that note we parted.

At the beginning of the second session, Jonathon stood outside the lab, called pairs of names once again and sent them in. Once inside, they went to successive computers, opened their folders and began to type. Jonathon entered last and closed the door behind him. As I walked about I noticed that this time only the four commands, AV, RE, DR and GA were written in their folders, not the numbers. I also heard the 'reader' call out the command AV in English as two separate letters. As the students tried various numbers, some as high as AV 5000, they seemed to strive to fill up the screen with lines. Only some of the students were recording their results. Halfway through the session, Jonathon asked them to change places. Shortly after, I asked one group of girls what they were doing, "We're supposed to find out what AV, RE, DR and GA mean." I observed Jonathon as he moved from group to group asking questions; inquiring about the meanings of those commands. In cases where the students did not know, he questionned them until they were able to tell him. Jonathon never

touched the keyboard, only the students typed. Often they pointed to the screen and looked at him when he asked questions. When it was time to leave, he flicked the light on and off and asked the students to follow him into the corridor. There he waited for them to line up again and left.

The following session started the same as usual. Jonathon entered past and closed the door behind him. Once the students were working diligently following directions from the folder, Jonathon approached me and said that, "They are supposed to try and get the turtle in [redacted] corners." He continued to say that his idea was to "hel[redacted] discover angles", and that they would discuss the different ways later in class. I asked if angles had been discussed prior to coming to the lab. He replied, "No." According to Jonathon his approach to teaching was one of "discovery" or "problem solving". To that end he used tools: computers, LOGO and curriculum - all tools, not to be used "blindly but just as guidelines."

> I find LOGO very useful in class because I think it's a good tool, just like the computer is a good tool but LOGO, it allows you to work really well in school with the kids, Like in LOGO you can use computers in a way that you can teach the kids how to think, how to solve problems. . . . the curriculum, to me is just another tool, just like the computer.

So how did Jonathon use that tool?

> I found out that using LOGO, my approach is always problem solving. They always have a problem to solve before they go into the computer room. They use the computer to solve the problem. So to me it's not just what I teach that's important, it's how I teach. I don't feel like I'm teaching them LOGO, I'm just using LOGO to teach them how to think. [Although the answer to every problem is the same] there's different ways to do it. What I like about LOGO is there's always different possibilities.

At 10:45 he clapped his hands twice and told them to change places. The students now at the keyboard were told to type DESSINE in order to get the turtle in the middle and start all over again. The students' focus was almost entirely on the screen. The numbers and corresponding designs generated solely from the 'typist'. As unique designs began to appear on the screens, they were met with sighs and giggles. Some 'readers' began offering suggestions but were rebuked by the 'typist' and told to wait their turn. One of the students raised his hand for help and this time Jonathon pulled up a chair and sat down behind him. The rising intonation in Jonathon's voice indicated his questioning enquiry. Both took turns pointing to the screen and folder. They spoke in French. Once Jonathon was finished with this student he went over to a girl and began asking her questions. Although she had not raised her hand he engaged in a similar process with her. It was becoming evident that when Jonathon worked with his students, he did so solely with the individual seated at the keyboard the 'typist' not the 'pair'. This was Jonathon's way of maintaining

individuality in a situation which did not allow for it "100% because they have to share a computer." He very much preferred to work on an individual basis:

> I don't like the sharing. I find it hard to see and evaluate. I like to have one computer, one child because then I could make sure that each individual understands or finds a way to solve the problem. Sometimes they're stuck and they don't know what to do and they're just frustrated and can't think. They're just mad. I can help them.

He left to look at the clock in the corridor and when it was time to leave, he flicked the light switch once and called to them in French to follow him out.

The fourth session began in much the same way as before however, this session generated the kind of behaviour which became characteristic of future ones. Once everyone was seated and working, I heard two 'pairs' talking:

> Group 1: What's the answer?
>
> Group 2: We're not telling [loudly and with facial gestures].
>
> Group 1: We know it already [sneering].

There appeared to be a kind of secrecy surrounding each 'pair': an unwillingness to share or help. The atmosphere was one of competition for a correct answer.

Jonathon continued to make his rounds, still never touching the keyboard, rather insisting that they do it themselves. As usual when 10:45 rolled around, the students were told to change places. When he was free, Jonathon came

to me and said that after last class they had discussed the commands necessary to move the turtle to the corners of the screen. He continued to say that he had picked five commands from those and told the other students to "use these and fix them to find the number of steps the turtle needs to go the length and width of the screen." Since the class had already been in the lab for more than half time, he had the opportunity of observing what they had accomplished. He seemed happy and proud when he said, "Most of the students have discovered 90 degrees and I never told them." Almost immediately Jonathon's attention was drawn to a dispute on the other side of the lab:

> Group 1: You're not supposed to do that [loudly].
> Group 2: We did it! [clapped their hands].
> Group 1: I don't care if you did it.

At that point Jonathon arrived and spoke with the students involved. Although I could not hear or understand what he was saying, I did notice his voice escalating as if he were asking a question. Soon everything was back to normal. Meanwhile, in another part of the lab, a group of two boys had discovered how to draw a circle. Their excitement was quite loud and soon three other boys surrounded them but as Jonathon approached they quickly returned to their own computers. Pointing to their closed folders, Jonathon asked questions and left. They immediately opened their folders

and looked at those of their neighbours. I noticed that their page was blank.

Group 1: Hey! You're not supposed to copy' [loudly].

Group 2: You don't have to be so loud [whispering].

Hearing this disturbance, Jonathon made his way back to them where he pointed to their blank pages, closed their folders, and told them to "attendez". After he left, the two boys looked at each other, shrugged their shoulders and sat quietly facing the computer. Eleven 0'clock arrived and the students were all gathered at the door to the words, "Vitement, vitement."

It was much later, at an interview with Jonathon that I brought up this question.

I: There was an occasion when you closed the folders of two boys in the lab.

Jon: Yeah.

I: Why was that?

Jon: Because the kid was fooling around. I want them to know exactly what to do, so when these occurrences happened, the students, they have the instructions in his book, he didn't, so he didn't know what to do.

The subsequent sessions functioned in much the same way. By February 22nd, the students' folders contained several sets of consecutive building type of activities. In this way the students progressed at different rates and

therefore were not all at the same place at any one time. When they came to lab, they continued the previous day's activities. Jonathon continued to help the same way as before, asked questions but never touched the keyboard and the students continued to work in 'pairs'.

By March 8th, the children were beginning to ask for Jonathon's help more and more frequently. Their competitiveness to get as many 'problems' done as possible, coupled with their restlessness was becoming apparent. As they sat with their arms raised they would chat, sometimes argue in English about where they were in their folders. Some of them experimented with different keys and discovered CTRL S and CTRL T. After Jonathon had finally attended to all, he came to me and said that he felt they were now ready for an introduction to procedures.

On March 12th I had occasion to chat with Jonathon in the staff room at recess, just before his lab time. It was amicable. We shared our enthusiasm for skiing. It was here that I discovered his Montreal roots. His father, a Mathematics Professor at the University of Montreal, had the good fortune to do a lot of research and travel extensively to conferences. He mentioned how some two years ago people from Belgium had come to Edmonton to study our transportation system as it was deemed to be the best in Canada, something he couldn't understand since he personally felt that the one in Montreal was better. Our conversation

ended abruptly as he attended to one of his students who had requested to see him at the door.

In the lab, the students were following the routine. Once they entered the lab, they immediately began to work. Everything appeared so neat and orderly. As I made my rounds, I noticed that some students were experimenting with the SQUARE; building stairs or window-type designs. Others were experimenting with the commands, AV, DR, GA, MT and CT. At the end of lab, Jonathon went into the corridor and waited for the students to come. Today, however, four students stayed behind. Jonathon left without them. When they were finished, they left.

As I passed Jonathon's room at 8:45 on the morning of March 22nd, I stopped to ask, "How do you feel about the way things are going?" I sensed concern in his voice as he spoke about trying to find a way to "deal with" a few of his kids, those "pushing ahead and I don't want to hold them back". Apparently some of them had started going to the library and were taking out books on LOGO. Those who had computers at home and were getting ahead of their classmates he'd, "have to put them together to work at something else." I asked if there was anything I could do. He responded, "Can I borrow that red book for a few days?" He was referring to Babbie's book, Apple LOGO for Teachers. It was in my brief case, so I was able to hand it to him right then and there. I informed him that I had found the printer

command. He said that he wasn't intending to use the printer now but would ask me about it when he was ready for it.

Friday, immediately after recess, Jonathon came to the lab to tell me that his class would not be attending lab that day because they were "too excited after yesterday." The evening before, the school had celebrated an annual festival and many of the children had gone home quite late.

On April 2nd, Jonathon held back three students at the door until everyone had entered. He then sent two to one computer and the other one to another. That session was the only one during which Jonathon ever consulted me about commands. Today it was the CP (color) one. As soon as I explained it to him, he immediately went over to the color monitor to relay that information to those boys. When it was time to leave, he flicked the light switch, called the class together as "mes amis" and lined them up to "Vite, Vitement".

By April 16th, the noise level had escalated dramatically. On this particular day, the students were to draw a circle. This they were to discover on their own. Most had considerable difficulty: This is boring, What are we to do now? I can't do this, How do you draw a circle? Students were talking, laughing, hitting each other, making faces and clapping hands. No one left their chairs. Amid this I approached one 'pair' and asked what they were doing.

They answered, "Nothing. We did it all last week." When the time had expired, Jonathon flicked the light switch on and off, the class gathered and he led them out. This was the last session that I observed Jonathon's class.

Samantha

Samantha, a 42 year old of French Canadian parentage, was born in Ontario. She was one of five children. After ten grades of French schooling, she began her education in English. Upon receiving a B.A. in English from a university in Ontario, she was employed by the Federal Government in Personnel for three years. Following that, from 1971 to 1978, Samantha remained at home with her children. The next year, 1979, Samantha returned to her studies, and in 1981 she received a B.Ed. from a French university in Western Canada. During her two years at that university, she "studied the philosophy of Maritain and Teilard de Chardin: re: education and the child." She was then employed by L'Academie Ste. Marie where she was now teaching Grade 3.

Samantha felt that as teachers, "We get caught up in is this going to give him a livelihood" where we should "think in bigger terms" and strive to give them a "love of learning." Writing was her forte. As creative expression it was something she encouraged in her children.

At the outset of the study, Samantha wanted "to relate it [LOGO] to [her] Math program and use it efficiently" to

help her cover the Mathematics curriculum. Although, by the end of the study she felt that she had not succeeded, she was not disheartened.

> I think that the more I inform myself and learn about it, I'll be able to do that efficiently; use LOGO in a more integrated manner and just sort of know where I'm going with it.

Knowing where she was going was commonplace for Samantha who always had before her "the big lines from A to B" so that she could "bring them [students] along from A to B." In this case however, she didn't know what A to B was.

Enroute to the lab that first morning on January 22nd, I ran into Samantha as she darted out of the lab. Just having "booted them all up" she was taken aback by the lengthy process. Apparently Lana, the Grade 6 teacher, had spent "an hour yesterday booting up all the computers". As she hastened toward her class she stressed how excited they were "looking forward" to computers.

Samantha's classroom was located two doors down from the computer lab. The first time her students came to the lab she had them lined up and waiting quietly outside. Samantha peeked inside, stepped in and said "Bonjour Madame Hofman". She then stood back and, as the students slipped past her, some sat at the first available computer while others darted around the lab before finally selecting one. Once seated they quietly awaited her go ahead. The first thing Samantha did was to close the door, introduce me as

"Madame Hofman", and tell them to say "Bonjour" to me. As their choral greeting subsided I responded, "Bonjour". They were then told to go ahead. Samantha spoke only in French to her class. Immediately they began typing in the AV, RE, DR and GA commands. It was apparent that they already knew what to do. Samantha tried to give them "something more formally" in the class prior to coming to the lab. "Before we went, I told them the commands." Later on, as the study progressed, she told them "how to think about making a square and the thing about the variables and recursion." Although Samantha spoke only French with the children, they however, spoke both: French to her and English amongst themselves. After a while, the children showed signs of restlessness. "I don't know what to do" reverberated through the lab. Some fidgeted in their seats, while still others began to argue with their partners. In one instance, Samantha switched partners at two computers. All the while, the noise level was escalating. Flagging arms and trailing students kept Samantha mobile as she responded to their questions. Two boys approached me with a question in French. I understood and showed them how to get the turtle back on the screen by typing DESSINE. Soon several other children came to me as well. Some I understood, others I did not. Samantha noticed this, came over and rescued me by telling them that I did not speak French and edged them back to their places. I found it interesting that they had

approached me. As it turned out later they were the only ones that did.

As the children finally began to experiment with the commands, their excitement gave rise to entire class interaction. One child ran to join another group to show them on their computer what he in fact had done on his own. Some called other groups to show what they themselves had done while still others went to see someone else's. While all this was happening, Samantha found time to chat with me: "I thought I would just let them experiment the way you did with us". Clearly, her experiences of the Friday LOGO workshop were ones of experimenting, intending "to go on their own ideas and not wait for me to tell them what to do". As the first session drew to a close Samantha focussed my attention on a girl sitting with her back to a computer, arms dangling over her chair and sporting a scowl. Apparently she had requested to return to the classroom to "do some work". Her request denied, she chose not to participate in any computer activities, to the delight of her partner who relished not having to share a computer. As Samantha lined up her class and sent them out, she stopped to tell me that she "thought that was fun". She also inquired as to what she might do next time all the while emphasizing her desire for 'experimenting'. I suggested perhaps she give them an array of pictures. She liked that

and asked where she might get some. I referred her to the books I had brought.

Since Samantha's lab time ended at recess, it gave us an opportunity to continue our discussions enroute to the staff room, or at times, in the lab. Today, as we were walking to the staff room, she mentioned that she and her own two children, (Grades 7 and 9), had spent part of the weekend at the school doing LOGO. They "really loved it" and wanted to come out again. I sensed her zeal right from the start, one which at a later time would subtly put to question many of her everyday practices.

The next time her class came to lab, they entered quietly, greeted me in unison and went to a computer. This time, they were all carrying a sheet with a design on it. Upon closer scrutiny, I noticed that these were three of several pictures from the books I had previously made available to her. She had chosen ones requiring only straight lines, no circles. As before, the students began typing in commands immediately, some ricochetting glances between the keyboard, the picture and each other as they drew and erased, while others did some initial planning before typing.

At about half time, I did not understand what Samantha said to the whole class and each group stood up and changed places. A great many of the children were using the commands LP and PP (PENUP and PENDOWN). I asked two girls

where they had learned these. They replied, "from our teacher". Samantha appeared to have a cheerful disposition which certainly came through in her manner with her students: exchanging smiles and chuckles became quite characteristic of her. Whenever Samantha was afforded a breather, she often came to me and we chatted. Today was no exception.

I: Did you prepare them for today's class?

Sam: I told them the commands LP and PP because they would need them for the assignment.

I: How were they paired?

Sam: I picked their names out of a hat [pause] maybe I should let them pick their own partners. It might work better. I think I'll try that next time.

I: What was it that you just asked them to do?

Sam: I told them to change chairs so that both kids have an opportunity to work directly with the computer.

I noticed that some were not trying to do what was on the sheet, but rather something entirely different. Samantha approached me and said, "Some kids are finding it difficult and don't want to do it." She shrugged her shoulders, smiled and continued to help them. Those sheets had a purpose, "to predict or else to look at a diagram and be able to write down the directions, that sort of thing." Concurrently, that purpose expectated "to make them think and transfer that knowledge onto something else that they

want to experiment with." This was not merely "busy" work but meant to inspire something personally meaningful. When the children refrained from doing the sheets, they rejected her "purpose" and along with it, their opportunity for "transferring and inferring. . . .the higher level of thinking" which was not only "tremendous" but essential to learning. It was the "knowledge" from these sheets that could inspire them to "take off on their own."

Whenever she helped anyone, she asked questions first. Sometimes, she would also ask a child to stand and have that child physically trace the path that he or she wanted the turtle to go. It wasn't long before the recess bell rang and evoked an "Ahhh" from the students. Two of them went to another computer, looked at someone else's sheet and tried to program that. Two others haphazardly pressed keys. The majority of them left individually or in small groups. Samantha remained with the ones that lagged behind. Observing one little girl, she said, "Oh Melissa. Good for you!" Once everyone had left, Samantha and I chatted once again.

Sam: I guess these [pointing to the sheets in her hand] were too hard. I'll have to find something easier next time.

I: How did you feel about those kids who didn't do what you wanted them to?

Sam: It troubled me because it was an attitude problem. I felt they gave up and if they had only tried to draw a line at least. I didn't know whether or not they were learning

anything by doing their own thing.

I: Was it that they weren't doing your thing that bothered you or that you didn't know whether or not they were learning?

Sam: Both. If I know he's learning, then he might as well do his own thing. He doesn't have to do mine.

On February 1st, the third session, I observed only thirteen of Samantha's students trickle into lab. Some worked alone, others with partners. When Samantha entered, I inquired, "What happened to your class?" Reticent she smiled, cocked her head to one side, and explained that she had left them in the class because they hadn't finished work and notes sent home didn't help, so she felt that this was the best way. She continued to say that she left ten alone in class with one child in charge to write down names. "They were disappointed and some quickly finished their work so they could come. You've been a teacher so you know how it is. I tried it and I don't know if it is right." It was apparent that coming to the lab was becoming a "positive thing" for the students. Samantha was aware of this, both in herself and in her children. They were enjoying it, as well as the change from the classroom. The appeal of this combination as a bargaining tool was persuasive. As an educator, I wondered how much negotiating we really did and what made those lab experiences different from the ones in the everyday world of the classroom?

Samantha discussed two children with me. One, whom she felt wanted "total control" and didn't let her partner type; the other, the little girl from last class who didn't want to work on a computer and actually asked to go back to the classroom to work. Today, this same little girl was at a computer all by herself, but this time she seemed eager and "really excited". The only explanation Samantha offered was that "She's happy because she's alone and controls the computer". In this session, as in the previous ones, Samantha had children with programming difficulties physically experience what it was they were trying to do. She brought them into the centre of the lab and together they cheerfully talked and worked their way through. Smiling and laughing aloud were characteristic behaviours of Samantha throughout the study.

While the students were "experimenting", and not requiring her assistance, Samantha and I had the opportunity to dialogue once again.

I: I noticed that some have papers with them.

Sam: I told them to see if they could make a square and steps and the face in the book. I'm just following the green book.

I: Un-huh.

Sam: Some chose to write down the instructions and the others just left it in their minds.

I: Do you think that some will not do that?

Sam: No, they just remembered it. I showed them how to erase using CP.

One boy raised his hand and Samantha went to see him. About five minutes later she returned with an element of pride in her voice, "One of the boys used DR 45 and DR 45 to make a square, and another child used 60 and 28 and got 88." When I asked what happened in the latter one, she said that he "started all over." I followed up by asking, "What did you tell them in class?" She answered, "Only that the square had four equal sides, not the angle." The bell rang and the children trickled out much the same as they had come in.

As she walked towards me flipping the pages of the green LOGO manual, she engaged in a monologue, "I was looking through this book and noticed that they should be ready to go into procedures." The idea of sequence entered my mind. I wondered how Samantha determined readiness? As she continued to peruse "the book", she said that she felt they should be able to do more than just that and that was why she was looking through the book. She finally decided that she'd, "have to discuss this with them in class before they come."

Having put the book aside now, she smiled, appeared pleased and said that some of them had actually "figured out the square and the stairs", and that they had behaved well. She followed the last of her students out of the lab.

The fourth lab session began with what appeared to be a frustrating moment for Samantha. Three of the computers had

"ne fonctionne pas" signs on them. Confronted with that she muttered, "makes you feel like junking them, doesn't it." Nonetheless, the children re-distributed themselves, into groups of three, and began as usual. I mentioned that sometimes static affected computers and suggested that she try re-booting one. As she watched to see if it would re-boot, two children came to observe. She took that opportunity to explain the function of the red light on the disk drive.

Voices magnified as images began to appear on their screens. Some were copying from pieces of paper they brought into lab. These were of various sizes and shapes, some looked like scraps-small and jagged-edged, others were full-sized, lined sheets neatly folded in halves, quarters or numerous small folds. I tried to unobtrusively make my way from computer to computer and satisfy my curiosity about the contents of those pieces of paper. Every piece had written on it the procedure for square, POUR CARRE in their own handwriting (Samantha's "purpose"). Within seconds many of the children had typed in the procedure and were using it to create all kinds of designs on the screen, mostly placing the square in different places or joining several together. Some children were conversing in English others, in French. It was not long before Samantha came upon a group of two girls who were repeatedly typing in DR 78 and CARRE. Laughing and bright-eyed they were taking turns on the

keyboard, without changing their places to do so. Samantha noticed this design and said, "Wow!" She immediately called the attention of the rest of the class. Immediately they were encircled by others. She asked the girls if they wanted to "Tell us how you got it?" They looked at each other, giggled, looked at her, shook their heads from side to side and said that it was a "secret". Samantha respected their wishes and smiling, replied, "Okay". The other children returned to their computers, some of them moaning. Shortly it was recess time and so ended this session much like the previous ones. Samantha and I went for coffee.

February 8th, the fifth session, Samantha led the way into the lab with "Bonjour Madame Hofman" which the children echoed. This time some of the students were carrying notebooks, small square sheets of paper stapled together, or individual sheets. Upon studying these, I noticed that the contents of each differed. One group of boys who were sharing the same notebook had many procedures written in it. Another group had a design drawn in theirs. Others had a smattering of both. Some groups were sharing, whereas others had their own. After speaking with Samantha I discovered that she had given them the procedure for circle, POUR CERCLE, which was the one common procedure in everyone's notes; the one on which to build. One group of boys had completed what they set out to do and wanted to get a printout. I wondered how they knew about a printout, but

that was soon resolved when Samantha told me that one of these boys had an I.B.M. computer at home on which he played all the time. Although he did not do LOGO, he was nevertheless quite familiar with computer functions.

The school had one printer located at the other end of the building. It was in the office which I used on my visits. Samantha asked if it was possible to get a printout. I said that it should be once we found the command. I offered to take the boys with me to try it out. The rest of the time was spent searching for this information. The French LOGO program did not have a command similar to that in English. I discussed my problem with the boys and they decided to return to the lab. I spent the rest of the time calling people at a French university as well as a friend of mine who was using French LOGO in a suburban school, for this information. It wasn't until next class that I was able to get the necessary commands for that final printout. Activating the printer necessitated addressing directly through machine language. The following lab session the boys and I once again went to the printer and successfully produced their design.

By the following class, Samantha mentioned to me that she needed more information regarding saving, loading and printing. Some of the students had reached the point where they were using these commands with my assistance. She approached me and asked if we could meet so that she could

"learn" these. We arranged for 1:00 that afternoon during one of her spares.

From that lab session onward, the children seemed to continue on independent projects. Some experimented with mathematical operations such as AF 3*9 = 27, and the computer would print VRAI; some typed in procedures for designs they created on paper and brought to lab; and some experimented with large AV and RE numbers often resulting in unique designs or screen fills. As I observed I asked some of the children the origin of their designs. I was told that some came from working with their "friends", but that others came from home where they received help from their parents.

It was on February 19th, that two girls stumbled on recursion. They couldn't understand what was happening, so they asked Samantha, who in turn, asked me. As we stood behind the two girls, I explained to her what had happened and termed it recursion.

```
POUR CARRE

AV 50
DR 50
AV 50
DR 50
AV 50
DR 50
AV 50
DR 50
AV 50
CARRE
DESSINE
DESSINE
FIN
```

The two girls gazed at the screen, enthralled by the evolving design. As we left, Samantha expressed to me her feelings: "My knowledge is limited and I'm really conscious of that." I offered to bring her resource materials to which she in turn suggested working together so we agreed on a date and time. Again it was a spare. The bell rang and the children drifted into the corridor.

That day I was wearing a black angora sweater, which attracts lint quite readily. Samantha flicked some lint off the back of my sweater, patted my shoulder, smiled and said, "Let's go for coffee." At that point I knew I had gained rapport. I felt an ease, a beginning informality. It was the first time she had actually asked me to go for coffee with her. In the past it was something we just did. En route to the staff room, she shared with me her experiences at a wine and cheese at her friend's place the previous Friday night.

What transpired during the "working" time we spent stemmed from the preceeding lab session, specifically the "recursion" procedure written by those two girls. We discussed various STOP mechanisms which could have been incorporated into that procedure as well as the use of variables. I was beginning to sense a feeling of urgency in Samantha.

As the lab sessions progressed, so did the children's enthusiasm. The intention became saving to disk their

personally designed activities, the majority of which were in immediate mode, not in procedures. Since most were created in the process this was not surprising. Initially Samantha stipulated that they were to save procedures only and not pictures so as to stimulate the writing of procedures, however, this eventually subsided to, "I would prefer if you would save the procedures." On February 22nd as everyone was occupied with their activities, we witnessed the throes of Lillian, another Grade 3 teacher, as she bared her frustration, "I hate those darn machines! I never have time to follow the green book or meet with you [Samantha]." I detected some complacency in her tone as she spotted me and suddenly became apologetic. I quickly reassured her that it was in my interest to get at the true feelings of the teachers. She seemed somewhat more at ease as she continued to convey her time restrictions and the unrealistic expectations "they" had of teachers in expecting them to learn computers on their own over and above their regular, everyday duties. As I gradually edged my way out of the conversation, they continued their dialogue in French at the end of which they had jointly agreed on a meeting time. After Lillian left, somewhat more relaxed, Samantha apologized to me and explained Lillian's frustration with machines in general which had been further complicated by the introduction of computers. At the end of that session, Samantha expressed how, "I enjoy them being in different

places. It's so much easier here than doing it in class with other subjects."

By March 5th, eleven of the twenty three students had varying kinds of "log books": folders, notebooks, individual sheets, or small sheets stapled together. The following Friday, I noticed that a boy and a girl were partners. After questioning Samantha about it I was told that, "the girl likes boys", and "that they have the same partner until such time as they wish to change." Two boys were having difficulty loading a program from disk. She directed them verbally, without typing herself. They were loading someone else's program and could not understand why the design would not stop once it appeared on the screen. This time Samantha explained in English that there was no STOP command and suggested that they change the program to include one, being mindful not to ruin the original procedure. She continued to say they should write down what changes they wish to make and then make up their own program to be saved under another name. The boy with the I.B.M. computer at home, asked Samantha for the disk with the program STARS on it. He said that he wanted, "to make it stop", as well as, "move it from one place to another." After she gave him the disk Samantha and I chatted.

I: Whose STARS is it?

Sam: I don't know.

I: Interesting how he wants to change things

on STARS.

Sam: Do you feel they're building on it?

I: How do you feel?

Sam: Well today yes, but they don't know how to do it. [In other words, she hadn't shown them].

To "build on things" was foremost in Samantha's mind. She tried to encourage this by giving them sheets, hoping it would inspire experimenting on their own, either "to make another program using that same idea or perhaps start a new one over and build." In this way they would be making progress because "remaining at the same level all the time, there would be no progress."

A lot of the children used that particular program STARS, either changed it or just watched as it continuously made stars. It was definitely a favorite amongst the children.

On March 12th, I met Samantha just as she and her class were leaving for a French play. She took that opportunity to tell me about the upcoming Parent-Teacher conferences on Friday and asked whether I would still be coming. When I reassured her that I would, with a sigh of relief, she uttered, "Oh good, because there might be some parents popping into the lab." As it turned out, no one came into the lab that day. She also mentioned that Laura, a Grade 7 teacher, was having difficulty with variables and would like

to see me. As it happened, Laura was coming down the hall so I ended up talking with her.

On March 19th, five children had sheets of paper and thirteen either a folder or notebook. As usual they were diligently working on their own projects. When one group of boys had a problem with getting a procedure to work, Samantha asked them what was wrong and then typed in the procedure all the while talking it through. When she was free, she came to my corner of the lab and rather in a disturbing voice said that it was interesting that before lab she had shown them variables and she noticed that some of them copied it down. Now that they were in the lab, none of them were doing it. I suggested that, "Maybe they don't feel comfortable with it". She expressed even more confusion as she replied, "Yet they do the recursion (pause). Perhaps this was too abstract." Again I wondered about sequence and the effect it was having on Samantha. After all, in the book, recursion followed variables.

When one group of boys asked her how to make a lot of squares in different sizes, she capitalized on the opportunity to type in the procedure herself using a variable :S. She verbalized the whole time. Once she ran it, they were fascinated just watching it go on and on and on, even after the square had become too large for the screen and the turtle kept vanishing from sight. I watched as Samantha relentlessly repeated instructions on how to use

CTRL G to stop it, which the boys ignored. After what appeared to be quite a frustrating experience for Samantha she turned to me and said, "They don't seem to want to stop the design whereas we seem to. It looks messy to us." She them initiated a conversation about Left and Right brain activity. This was her understanding of creativity which she associated with Left brain and, "we want to control things", she associated with Right brain. As soon as the screen was completely filled with tiny squares, the boys decided to press CTRL G. They discussed what name to give it, and finally decided on WAFFLE. That's exactly what it looked like, a waffle. As they began typing in the command GARDEDESSIN (SAVEPICT), Samantha leaned over and said in a quiet voice and with a smile on her face, "You guys know you're not supposed to save graphics, only procedures." They looked at her, smiled back, and continued typing. Two adjacent groups, who had been observing, now asked Samantha to help them do likewise. It was at this point that the names they chose for their designs began to fascinate me. I asked some of the students about these. They mentioned Star Wars and other such space refences, a combination of their own names, realistic references as well as nonsense names.

For the first part of April Samantha and her children continued to trickle into the lab and carry out their personally selected activities. Even as they moved freely throughout, the door remained opened. By now Samantha spent

most of her time walking around the lab, hands in her pockets, often pulling up a chair beside some group and working with them. Quite often this chair made rounds with her. Types of "log books" as well as the number of children bringing them varied since different students brought different ones at different times. LOGO activites germinated from personal interests, suggestions from Samantha, the home as well as from ideas and activities of other classmates. Samantha's assistance often involved her actually typing, although it was always preceeded by questions and accompanied by a verbal explanation. It was not uncommon to find children engrossed in their activities in the lab during recess with Samantha and I sitting beside them. All this imbued with lab with an atmosphere of pride, personal satisfaction and confidence.

April 13th introduced a new element. As each child trickled into the lab I noticed each carrying pink sheets. Upon closer scrutiny I found they were three consecutive workbook type sheets xeroxed from a source with which I was not familiar. As I observed this unusual occurrence I noticed that although all the children began following the sheets, the majority of them eventually trailed off into their own activities. At no time did Samantha forcibly revert them to those sheets.

The following Tuesday, that same element returned but this time with a slight variation. Xeroxed from yet another

source, the children once again were given a sheet. This one had the diagram of four squares progressively enlarged. The task was to write a procedure for this diagram. As the children set out on this task, Samantha expressed to me her astonishment at the varying ways that they were going about it. Although this was the final session I observed, I did meet with Samantha a few more times during which she gave me copies of some other sheets she had used. She had also asked her children why they enjoyed lab so much and presented to me a sheet with those reasons.

CHAPTER FOUR

UNDERSTANDING THE 'REPRESENTATIVES'

The purpose of this study was to document four teachers as they implemented LOGO, and shed light on three aspects of the research question. Unearthing Aspect (a): WHAT UNDERLYING PEDAGOGICAL STANCES ARE INHERENT IN THE NATURE OF THE CLASSROOM CONTEXT TEACHERS CONSTRUCT FOR LOGO, would help to better understand the interpretations which influenced implementation as each wove LOGO into his or her "web of significance."

Preconceptions

Prior to the study all four 'representatives' were of the opinion that computers had a place in the elementary school and looked to LOGO with anticipation. For Melanie, it would supply "games and language activities" which she "didn't have the time to look up". For Jonathon, it would be a "game": "something special" for a class that did not "function well in a regular classroom environment". For Daphne, it would be an opportunity to familiarize the children with a commodity necessary for "later on in life", and for Samantha, it would be integrated "efficiently" into some area of the curriculum, hopefully Mathematics.

Another commonly held preconception was that their devised strategy would familiarize all the teachers with

LOGO by the end of the study. Melanie put forth great effort in giving the Grade 1 teachers her activities, which those teachers considered to be an "excellent presentation of program and materials". Daphné expected them to come to her and ask for assistance, and when they didn't she assumed that all was well.

> I told them. Like I don't want to go up to them all the time and say, you know what's happening. If you have any questions or anything, maybe I'll know something that you don't know. But they never approached me. They seemed to be getting it on their own.

Jonathon felt that "It hasn't worked very well" because of a mismanagement of time. He knew that the other Grade 4 teachers were having "problems" so had asked the principal to "have some time allocated to discuss problems." For Jonathon this was an adminstrative decision. As it happened, the first meeting was scheduled for the end of May. He hoped that next year they could be scheduled more often. Samantha felt it was "a problem". She tried relating to the other Grade 3 teachers what she was doing, but because it was so individually oriented, it became difficult for them to follow.

> I would say this is what I'm doing. First of all I wasn't doing anything, just letting them go and maybe doing a little bit of formal instruction before we went into lab and if I were giving them a sheet, I would say this is what I've given them. Gee, I think, have I done my job educating these other teachers? It is a problem because we're all individuals. . . I don't want to go and force anything.

Although by the end of the study, none of these preconceptions had actualized, three of the four 'representatives' did interpret LOGO to be positive, with renewed vantages. Melanie felt that it did not "answer all the needs and we'll have to teach something else in Grade 1." A favorable experience for her was that, "My class and I familiarized ourselves with a computer and how it works." Daphne was able to create "fun" things for her class to do and saw its potential to "be integrated to a certain extent into your program. . . Language or Math." She was in fact using it to supplement French Language Arts, and although it may have been a "different type, they have learned a lot of vocabulary and spelling." For Jonathon, it allowed the computer "to teach the kids how to think" and learn "a certain knowledge of functioning of it; the idea of programming, the idea of working out any sort of a problem on the computer" and, for Samantha it became "practical" insofar as "their life is going to be full of computers", and "the elements of geometry. . .knowledge of angles and scales" they will certainly be able to apply. Furthermore:

> It is definitely different. First of all at the Grade three level, we really don't learn that much, 90 degrees, but the 30 degrees and that sort of thing is not even taught. I'm sure even in other grades it has to be a different way of learning, more fun and easy, very personal to the child. I think it has to be a better way of learning than say, taking a protractor.

But, no matter how positive these renewed interpretations, they were not without grievance, skepticism and anxiety.

The Origin of "goals"

The most voiced grievance was the absence of "goals" or "objectives" for LOGO as it was presented in this study. The need for some kind of "guide", "curriculum" or "direction" to maintain the "continuation between grades" was relentlessly put forth by Melanie. To her, curriculum prescribed "activities" such as "a program where the kid types in a word and gets a word or types it wrong and gets a bell". This would have enabled her to better teach, and evaluate her children's progress. These were considered to be "serious" and it was precisely this that was at the root of her dissatisfaction with LOGO and the way it was presented in this study. The absence of serious, curricular activities made the children and teachers "sick of doing circles and whatnot" compelling the children to eventually type "things in just for the heck of it." Initially she found activities in the French LOGO Manual, and as she gradually exhausted those, she asked for others until she finally concluded that she had "pretty well done all that there [was] to do".

Although Daphne advocated this need for "a set program" or "goals", such as making "a square, a circle", she felt it was up to her to make learning those goals "fun" for the children, by creating those activities herself. As it

turned out, those same activities had a secondary benefit: practice in "following directions", something she felt they really needed. It appeared as though the curriculum prescribed the "goal" but not the "activity" or manner of teaching, thus allowing Daphne a margin for interpretation.

Although Jonathon's concerns about the absence of a curriculum were not as unyielding, he did nonetheless voice his perception of it to be that of a "tool", to be used as a "guideline" towards a much greater educational goal: "to learn to think" through "problem-solving". Towards that ultimate goal, Jonathon alone made the decisions about what "objectives" his students would learn and the "problems" they would solve. These were structured in such a way so as to allow the students freedom to "discover" or "find out for themselves" the correct answer. An example: to teach the "objective" angles, he assigned them the "problem" of finding out how many turtle steps it took to reach the corners of the screen. Hopefully they would discover 90 degrees. This type of approach is particularily reminiscent of Babbie's book, which Jonathon considered to be "excellent" because it gave him choice of "objectives" and suggested "problems".

Samantha searched for a way to use LOGO as a means for the children to better learn one of the curricular areas - Mathematics. In this context LOGO became a teaching aid. Through "experimenting" she hoped they would learn what was

on the Mathematics curriculum and enable a successful and efficient integration. Efficacy was necessary because "We are really strapped for time here in French Immersion, especially in French Immersion." Other than that, Samantha was consonant with Jonathon's ultimate goal of learning to think. She did however, take it a step further: to cultivate a love of learning. Her frustration was not lack of a curriculum or goals, rather "not knowing more" herself and feeling unable to guide her children.

Where for Melanie "goals" appeared synonymous with "activities", for Daphne those "goals" incited "activities". Jonathon extended Daphne's notion of "goal" to give the child a sense of success at being able to attain the end product in a personal way, and Samantha, allowed her children to devise their own activities in hopes they would fulfill their own "goal" as well as some from Mathematics.

Teacher Role and the Teacher-Student Relationship

Embodied in these perceptions of "goals" is the teacher role and the concomitant student-teacher relationship.

Melanie viewed her role as having "to teach them what they needed" so that they could progress to the next grade level. These needs were built into a logical sequence of expectations, structured in a manner that would meet the requirements for continuation to the next grade. It was these needs expressed as curricular goals that gave

direction to her teaching. So it was imperative that she knew what these goals were and where they were leading. For the purposes of this study she found some in the LOGO manual and some elsewhere, but as these expired so did her impetus. Perhaps she emphasized this best when she said:

> The worst part of it was that there was no "direction". I, at least, did not know where I was going, what expectations were to be had - I didn't have goals.

These "goals" were to be prescribed by a curriculum and she in turn would communicate them to her children. Implicit in this role of teacher as communicator was the child as recipient. Since the children were expected to complete the activities designated by Melanie in a particular way, their personal expression was negligible and participation passive. In this context the child became a passive recipient of knowledge. Where both teacher and student fulfilled curricular expectations, the student-teacher relationship became characterized by a kind of linearity where extrinsic "goals" depicted the needs and the teacher ensured that her children fulfilled those needs.

Daphne aspired to make coming to school "fun". Making palatable the "goals" prescribed by the curriculum by creating "fun" activities enabled her to actively participate in interpreting those goals. This was a meshing of the curricular needs with the motivational ones of her children. Although Daphne showed sensitivity to her

children's personal interests, those interests did not circumvent her "activities" rather, extended them. Even though her children were allowed to "experiment" in the lab, this was unique and attributable to the newness of LOGO and the computer technology itself. Daphne felt that:

> For the first month or so you let them experience it [LOGO and the computer]. I think that's important. Find out how it works. . . .Right now it's just been a discovery thing because it is their first year whereas next year, the children coming into Grade 2 will have had that foundation, that experience.

Daphne was steadfast in her support of Melanie's position for a "curriculum guide so that they would have to know this and so on" and be prepared for next year. However, for her these were "guidelines to follow" with options for her own input and some for the children themselves to "discover" as well, as in the case of "stars". Discovery was a way to personally extend material already presented, an acknowledgement that her children had something to offer, and an opportunity for them to build. She believed in "showing" them how to do things because:

> They probably wouldn't. I don't know if they would have figured it out. But that is something I showed them [how to do a square and a circle] and from there they discovered on their own.

Her role was similar to that of Melanie, communicator, but at the same time trying to motivate them, as well as encourage and support their discoveries. It is in this

sense that her children were becoming actively involved in their acceptance of knowledge. Daphne's perception of the child was that of motivated recipient, participating in a teacher-student relationship built on encouragement to complete her "activity", and respect for their own subsequent discoveries.

Perhaps what best describes Jonathon is his statement: "I don't like to learn something or to work at something unless I'm sure I'm going to need it." This underlines a preconceived purpose for learning. For him there was one fundamental need: to learn to think, and his "objectives" were in keeping with that need. Jonathon felt that his approach to teaching was "discovery-oriented" insofar as he gave his students problems to solve. For him discovery meant not to tell the answer but, to devise a problem, the solving of which would lead to the desired outcome.

He felt that it was his responsibility to "evaluate" and make sure that each individual "understands". And since he felt thinking was integral to understanding, that became his long range goal. He was the only source of knowledge, hence the need for an individuality where the students worked and thought in isolation from their peers. This was his way of reaching the individual child and creating in that child a personally, meaningful experience, one which would generate feelings of success.

> I think their feelings are not different than ours when we do something, when we succeed or when we solve the problems on the computer, they must have the same feeling as we have. They enjoy more success on the computer because it's easier to work on it because they can work on LOGO more on an individual basis.

Democracy, as in consensus of thought, had no place in his classroom. The "democratic way" was unproductive in that, "You can't have everybody to agree" so, "I think we waste a lot of time". He felt rather than ask "everybody's opinion", certain decisions should be made on behalf of others and in that way time "could be used in a more productive way." Since he already knew what the goal was, and since he was the source of information, this was hardly surprising.

Jonathon saw himself as the ultimate authority, autonomous, superceeding even the curriculum. He felt the curriculum was there to help him along and not to be adhered to religiously. He was conscious of his students and their abilities and wanted to make education a more meaningful experience for them.

"Thinking" was at the heart of his teaching and discovery was the way to it. His kind of discovery imposed a structure where the final product was already pre-determined. He was hoping that this structure would make his students "think". Jonathon saw his role as catalyst, stimulating just such thinking and learning. Concomitant with this catalyst role, was child as

problem-solver with limited decision-making. The relationship Jonathon had with his children was built on a note of skepticism. Given the situation where children were forced to work together in the lab, they were paired according to academic performance, otherwise, the "good" ones would "do all the work".

Samantha emitted an aura of frustration and anxiety throughout the study. When I asked her what kind of experience it had been for her, she responded:

> I think a really good experience and sort of exciting, and it's been exciting to see the kids discover things and to show me things that I didn't know. It's really a positive thing. . . with the kids as well. I don't think any of them were frustrated at all and they all seem to be going at their own level.

A closer look into this response might help unveil the source of these feelings.

Samantha referred to discovery: its capacity for teaching and learning, its ability to cope with children's frustration. There was a synergy between experimenting, discovering and knowing.

Samantha took direction from her own knowledge of LOGO. Since she wanted her children to found in themselves a "love of learning", she searched for varying ways to appeal to their individual preferences. At first, the ideas were mainly their own. "Since the beginning it was always theirs. They discovered and they did it on their own." However, she was never certain whether everyone learned.

Because they were at different places all of the time, she was unable to monitor their learning. Furthermore, Samantha understood learning to take a sequential course, that is, first in immediate mode the making of a square, then procedures, variables, recursion and so forth. When this did not happen, there was an onset of doubt and frustration. Questions of whether they were learning at all began to worry her. She then decided to give them sheets which she hoped would encourage individual extension and expression. In this way they would build their own knowledge. More frustration arose when the children merely, busily worked through the sheets.

> Just in the last month I've been giving them these sheets, and that's okay, but [smacked her lips and sighed], I [pause] I really, I've got mixed feelings about that. They will do it for me, but they don't seem to do it with any enthusiasm. They do it, but they don't seem to try to understand it. They just do it, you know. Um-m and then they want to get to their, their program or whatever.

This gave rise to anxiety and began to challenge her everyday taken-for-granted practices and expectations. These were now coming into question.

> I'm worried about them being able to apply what they're learning. So they're learning problem-solving. I don't know if they're going to be able to transfer it from the computer to something else. I'm sure they will, but often I'm thinking, where's its practical application in all this, and yet there's so many things in the classroom that you don't have practical applications for.

Samantha saw her role as making education practical, giving her children a "livelihood" and helping them develop a "love of learning":

> basically to make them responsible for themselves. . . they'll stay in school longer, they'll enjoy their year more and they'll probably get a better job.

She began to see that role take on an added dimension: that of learner.

> There have been really high points in the lab because where there's Ah-h-hs you see this, you see that, and I'm learning with them and it's this sort of happiness of learning on both parts.

And created in her a sense of positiveness.

> It's almost you as teacher are in the background. They have their own little idea of what they want to do, and that seems to be pretty exciting and the sort of buzzing that's going on in there, working together, and um-m I don't know, that part I really enjoy.

Nonetheless, anxiety about that changing role coexisted with a lack of objectives which she felt she needed to guide their learning: a guidance she felt the students themselves preferred.

> I worry about it. I feel that's perhaps because I don't have any big lines or objectives in my head and I sort of wonder, if I don't, then where are they going. . . .I think they prefer to be working on something and be told verbally, well, what happens if you try this? They seem to prefer that.

And yet. . .

> I was feeling a lot of frustration and really wondering, seeing that I was excited at times and they were excited at times, and trying to analyze what is going on here and just sort of started thinking. I wonder if this is what LOGO is all about. . . .Some little kids that are having trouble in class, they're quite good. Some of those kids that have trouble with Reading seem to do well at LOGO. They get a good feeling about themselves and you as a teacher feel happy for them.

As the lab sessions continued, so did Samantha's uncertainty.

> When I said it the first time, I want the children generating ideas from themselves, but I think, ideally it would be better if it came from the teacher. Here's an idea, work with it, how can you change it, how can you expand on it. That sort of thing.

Why this change? Maybe this can allow a glance behind the exterior. Maybe it can give us a glimpse into Samantha: her LOGO experience, her inner struggle, her ties with the teaching ways she has taken for granted for so long and her difficulties in severing them.

> It probably will be-somebody will have a job up there in the government where they will say, okay, Grade 1,2 and 3, they should know how to make a square or something-the very basics. I'm sure they'll come out with that at different levels.

On the other hand:

> In a way it's been a breath of fresh air [giggles]. We'll just go in there and we'll enjoy ourselves. There won't be any evaluation. That'll be great, a real change. I don't know how that would affect me year after year after year. I'm sure I would want to be more specific. I'm just thoroughly enjoying it.

Samantha shared with her children a relationship built on trust, love and respect: the beginning of a mutuality. She envisioned the child to be at the center, using LOGO to extend one's own ideas, building meaningful knowledge structures from within. In other words, child as knower, experiencing a readiness grounded in one's own autonomy. Samantha felt that:

> This whole project [pause] it's an experiment. I was learning as much as the kids were [pause] a positive experiment. I'm learning with them and it's this sort of happiness of learning on both parts.

Whether these feelings can endure will depend on the choices Samantha will make as she continues to reflect on her everyday taken-for-granted, and on the flexibility empowered to her to make those choices.

Each of the four 'representatives' has brought to light a theme: a conception of child.

In Melanie, we saw child as recipient of knowledge: knowledge as foundation on which to build the next level. Passively both teacher and child strived to fulfill extrinsic expectations. Daphne saw the child as interested or motivated recipient of knowledge. Willing to fulfill those same expectations, her children expressed some individuality. For Jonathon, the child was problem-solver, making decisions about how to fulfill those expectations,

and Samantha saw the child as knower, creator of one's own expectations.

The Road Ahead

Given these conceptions, what had these 'representatives' decided about the following school year? Melanie had previously decided to leave L'Academie Ste. Marie to teach elsewhere. She would take with her a less than favorable view of LOGO. Daphne, who had planned to return to Eastern Canada within the next year for two, felt that LOGO was "good" because it taught them to think, something that was part of her "job". Since it was not "structured" like she was used to doing, she would like to develop that structure for herself in the form of a "sort of booklet or whatever with programs." Jonathon, who also had plans to return to Eastern Canada within the next couple of years expressed skepticism. He felt he would "take them from where they are at" when they come to him in September but, at this point in time he didn't know how he was going to do that since:

> I think it's really hard right now to fit LOGO in. I don't think we can really fit it in the curriculum at this point because we'd have to change the whole school first, the way school is taught. I think LOGO and the schools don't really, can't really work together because school is not thought of in the function of something like LOGO, like you can't [pause], in LOGO you learn to think basically and use that language to solve problems, to think, and you can't learn how to think from A to Z. We all have different ways of thinking.

For Samantha, "Well hopefully this summer I'm going to try to work on LOGO myself, get some more knowledge". One thing was certain, "I can't see myself standing in front of the classroom saying, okay, we're all going to do a square." She had decided to think in "bigger terms". Next year they were all going to have their own diskette and then they would be "on their own". Perhaps they could do a "theme" and in that way, "Everyone will do their own thing and I'll help those kids that are really having trouble, because that'll be my level [laughs]".

How all this relates to LOGO philosophy will now be addressed in Aspect (b) of the research question.

Papert considers today's teacher, "armed with lesson plans and a set curriculum" (Papert, 1980, p. 179), incongruous with LOGO's inherent heuristics as he envisioned them; so incongruous in fact, that he virtually had no hope of it ever actualizing in today's schools unless we admitted "new understandings of the process of learning itself" (p. 186). This "revolutionary" philosophy encompasses new ideas; a "much more ambitious setting of the sights of educational aspiration" (p. 186). Papert contends that since the computer presence in education has created "new gadgets to teach the same old stuff in a thinly disguised version of the same old way" (Papert, 1971, LOGO Memo No. 2, p. 1-1), a redesigning of the educational system and not

"merely improving the existing one" (Papert, 1971, LOGO Memo No. 27, p. 2) would be essential. Drastic as these measures may appear, according to Papert they are necessary because "at the heart of the change is a reconceptualization . . . not a mere change in pedagogy or technology" (Papert, 1980, p. 185).

Are Papert's views concerning an authentic version of LOGO reaching today's schools overly pessimistic? To address Aspect (b), DO THESE PEDAGOGICAL STANCES AND ENVIRONMENTS REFLECT ANY OF THE PRIORITIES EXPRESSED BY PAPERT (1980) IN HIS BOOK MINDSTORMS, it is necessary to first expound those priorities.

The Priorities Underpinning Mindstorms

At the heart of Mindstorms lies the belief that, "The best learning takes place when the learner takes charge" and gets to know (p. 214). This essence of learning gives rise to an intellectual growth rooted in one's personal experience. Papert felt that through the turtle, the child could gain "a sense of the power of applied knowledge and a self-confidently realistic image of himself as an intellectual agent" (Papert, LOGO Memo No. 2, p. 1-1). He saw educator as anthropologist, getting to know child and culture, intervening in a meaningful way to support that child in building an intellectual structure grounded in that culture. It is in this sense that he felt LOGO could enrich

and facilitate a relationship where student and teacher together imbue the intellectual realm.

Since Papert asserts that child participation in today's traditional teaching is tenuous, at best, it is not difficult to see where his pessimism originates. As the computer presence in education continues to pose the threat of pre-packaged software materials usurping control (Emihovich and Miller, 1986), it fuels that pessimism all the more.

Ostensibly the computer and humanness (machine and man) can be perceived as antithetical. Schank (1984) tells us that humanists harbour a great deal of hostility towards computers: a hostility grounded in the fear of potential alienation and dehumanization of a people subjugated by the use of machines. These fears escalate as we become aware of how the computer's "mechanical thinking" can further dehumanize by reducing a human being to think like a machine, making us "automatic, mechanical, lacking significant sense of meaning in our lives, and unable to adopt the type of thinking which can reverse this" (Walker, 1985, p. 8). Thinking is an integral part of being human and should allow for us, as unpredictable, emotional, intuitive creative beings, to probe the complexities of life thoughtfully.

When schools reduce their students to the exercise of "mechanical thinking", it becomes an act of dehumanization.

According to Freire, the traditional educational institutions practice what he refers to as the "banking concept" of education: one based on the relationship of teacher and student being that of "oppressor" and "oppressed". In this kind of relationship, "prescription" dictates behaviour wherein the teacher's choices and decision-making is imposed upon the student who, in turn, behaves or responds in an expected way. To the extent that the student is deprived of making his or her own choices and is subjected to those of the teacher, that student becomes an adapted, passive human being. According to Freire this kind of behaviour is characteristic of animals, and when characteristic of man, it signifies dehumanization. Dubos (1974) elaborates:

> In nature, animals are essentially prisoners of the type of environment in which they have evolved and to which they are adapted (p. 23).

Human beings, on the other hand,

> have transformed their environments to meet their own needs and desires, instead of adapting themselves (p. 23).

A human being assumes an active role, capable of making choices to intervene and shape one's own world. These choices must be personal, stemming from one's own critical perception. Otherwise, "Choice is illusory to the degree it represents the expectations of others" (Freire, 1973, p. 7).

Very often computer use in schools induces precisely these kinds of "illusory" choices generating pragmatic, mechanical thinking as:

> Children come into contact with computers, [and] the computer is used to put the children through their paces, to provide exercises of an appropriate level of difficulty, to provide feedback, and to dispense information (Papert, 1980, p. 19).

One might ask, if educational effects of computers are in fact so dehumanizing, why have them in the educational milieu at all? Perhaps Crichton (1983) said it best.

> The proliferation of computers in recent years has been truly phenomenal. . . . These small, cheap powerful devices will be everywhere, and they will have altered every aspect of human life, from the way we run our societies to the way we run our personal lives (p. 3).

Given this perspective, will the road ahead welcome rich, personalized experiences nurturing each being as unique?

Dubos (1974) tells us that "choosing is an essential factor of the human condition", and as such often involves the bitter ambiguity between choosing the comforts of the status quo, or the dangers concomitant with enriching one's life with adventure.

> For most of us, it is all but impossible to know ourselves by a pure process of reflection or meditation; we know who we are only by examining the choices we make and our responses to new conditions (Dubos, 1974, p. 193).

Although choices have caused much anguish and misery, they have provided an ambiance for humanity's continual rebirth. Conscious, critical examination of past choices and future projections nourish personal and intellectual growth.

Seymour Papert searched for the kind of nurturance that could promote and sustain this kind of growth. He saw its potential in the computer. Mindful of the dehumanizing elements so often associated with this technology, he concentrated on creating meaningful relationships between child and knowledge, child and self, child and teacher.

For Papert learning and reality are inseparable. Respecting and inspiriting the personal nature of educational experience may dawn a communion with nature and a discovery of beauty otherwise lost in abstraction. He searched for a setting which would enable one to come to know an idea, much the same way that one comes to know a foreign language in its country of origin, by living it. Papert wanted to "humanize" learning by making possible more personal, and less alienating relationships with knowledge.

By creating the LOGO language and embodying it in the TURTLE, he aspired for personally designed objects to emerge: ones the children would consider to be uniquely their own. Using the computer in this way would personalize, authenticate, bring forth joy and pride in striving to cultivate one's identity.

We all have the capacity to learn, however, where each child is classified "as a bundle of aptitudes" (Papert, 1980, p. 45), and where there is a "right way", a child may come to view him or herself as having limitations in this capacity. Perhaps it was this perception of self that contributed to the difficulties in Reading alluded to by Samantha. That is not to say that they lacked the capacity to read, rather that they were not acquiring it in a personally, meaningful way. Making it possible for children to deliberately and consciously experience the kind of learning with which they are comfortable and familiar may cast aside these doubts and create in them "a good feeling about themselves". This requires an openness to doing things in a personal way, especially those which have in the past instilled such personal doubts.

Papert (1980) envisions the computer not as an instrument for "force-feeding indigestible material" (p. 53), or for supplying knowledge in the form of processed information but rather, as a means of challenging one about one's own being. In this sense, freeing oneself "from the tyranny of the superficial, pragmatic considerations that dictated past choices about what knowledge should be learned and at what age" (p. 52).

For educators, perhaps the most fundamental relationship that Papert explores is that of student-teacher. At the heart of this relationship,

honesty, respect, love and faith pulsate as one. The LOGO environment brings into being a relationship built on mutual trust, sharing and exploring of ideas, fostering rich and deep interactions: it is a two-way street where children discover the teacher as learner and themselves as teachers. This mutual interaction is not reserved solely for the student-teacher relationship, but has significance for the peer group as well where it nurtures the special social need Dubos speaks of: the need to belong to a collectivity and at the same time maintain one's own individuality.

To discover experientially is an integral part of being human. Dialogue can flourish only if genuine excitement can be shared and if the discovery process is genuine. Synergy of this kind cannot be programmed; discovery cannot be calculated; invention cannot be scheduled. It is spontaneous. Perhaps the most humanistic contribution of the use of the computer will be the real intellectual collaboration it can inspire. Pretense has no place in such a relationship, no criteria of true or false, no cures for poor scores, no reinforcement of dissociated, depersonalized learning, only a place for growth.

According to Papert, one of the most detrimental obstacles to learning is discarding our intuitions when observation or reason tell us otherwise. LOGO allows for the externalizing of these intuitions into a program, and in the process of debugging think about the "error" in

different ways. The emphasis is on the ways of thinking and not on the correctness of a completed product. An "error" can stimulate insofar as it can encourage the child to reflect on the intuitive expectation. This can be examined, understood and changed, if so desired.

Documented studies have yet to reveal the impact of Papert's vision of "humanistic" or "more humane" educational computer related experiences. What can be ascertained though is that it is not the computer per se or the software that can alter the assumptions underlying our educational institutions. After all, as William Barrett (1986) so aptly put it:

> The computer itself is a tool, a machine, that has been created by the human mind. . . .the initial push in the whole process must come from a human mind. . . .beyond its sheer existence, in its most banal operations the computer bears witness to the presence of mind (p. 41).

Whether there be a "renaissance" of thinking about education depends largely on the "choices made by educators, foundations, governments and private individuals" (Papert, 1980, p. 32). Only we, as human beings can make "humanistic" choices. However,

> When the logical machinery becomes embodied in an actual physical apparatus, the temptation becomes all the greater to let the machine do one's thinking for one (Barrett, 1986, p. 154).

Perhaps LOGO's greatest potential may be its ability to create just such an awareness. By deliberately learning

about how the computer thinks, that is, exercising mechanical thinking, the learner can become more articulate about what that kind of thinking is and is not. It is a way of knowing, one of many, characteristic of human intelligence. Restrictive and narrowing though it may be, it is another addition to our stock of mental tools. To choose to exercise the temptation alluded to by Barrett, is to live someone else's reality and deny knowing.

The texture of Mindstorms suggests child as knower. To answer Aspect (b), it is necessary to not only look to see if that theme was reflected but the degree to which its flavor imbued the implementations. Words such as "discover", "satisfaction", "choice", "meaningful", "share", "excited" and "fun" have imprinted the narrative page, with meanings varying accordingly with each 'representative'.

Melanie appeared caring, conscientious, efficient and devoted to her role. Honorable as those qualities may be they do not reflect Papert's priorities. Her commitment to extrinsically prescribed goals cast aside any genuine 'choice' or 'discovery' in the child-centered environment Papert proposed. That is not to question her teaching capabilities but to consider her in light of LOGO philosophy.

Although Daphne's children were allowed to make personal choices and experiment as they wished, this was unusual, and would not be continued the following year.

Even though some of Papert's priorities were present in the lab, their influence was not enough to disaffirm her past everyday practices.

In Jonathon's environment are the beginnings of personal expression aimed at an ultimate goal, thinking. Jonathon felt that given the choice of how to reach a pre-determined goal, the child would be encouraged to think. Papert might argue that choice in this case is illusory to the extent that it may be personally meaningless and therefore the activity could generate mechanical thinking. Even so, the goal itself, as well as Jonathon's problem-solving approach, are reflective of some of Papert's priorities.

Samantha's students experienced genuine discovery and choice. The LOGO experience was built on a personal readiness emanating from the child's culture. It came about with a lot of uneasiness on her part, but her respect for their uniqueness, and perception of learning taking place, eased that tension. Together with "just letting them go", Samantha reflected a great many of Papert's priorities. Hers was the only one where the theme child as knower could apply.

There appeared a sprinkling of Papert's priorities in the implementations. One might wonder, what would it take for an authentic version of LOGO to be nurtured in the schools of today? It is true that we as educators may teach

in a traditional system. It is also true that we are unique human beings within that system, with the capacity to generate the "humanistic" qualities of which Papert speaks. Jonathon saw himself as autonomous, reaping his own cultural experiences within the confines of the classroom walls. He transformed the learning environment to meet his own needs by enjoying classical music as a working background and occasionally bringing his guitar to class and singing with his students. In essence, Jonathon is a learner in the Papertian sense, creating his own knowledge structures, experiencing LOGO culturally. Yet, he cannot see to extend that autonomy, that personal learning style to his own students. One might now ask what will it take for Jonathon to see that capability? Perhaps we have an intimation from Samantha. Samantha was just beginning to see herself as learner; beginning to see her children's quest for autonomy; beginning to see a different kind of learning. These experiences did not come about harmoniously. Coexistent with an inner struggle of frustration and anxiety, she began to pull away the curtains and find those deeper patterns underlying her everyday world of the classroom. Samantha was beginning to see herself; to see her children as autonomous. Although Jonathon seemed secure in his autonomy, he needed to pull away the curtains and throw light on his vision of the child. It would seem that a unification of these experiences would realize an authentic

LOGO. Whether this can in fact occur in the everyday world of the classroom culture, rests largely on the relationship that we as educators will share with the system: the choices each individual teacher will make and the flexibility in place to make those choices.

Papert speaks of a "redesigning" of the system. How does one begin anew? Building is fundamental to Papert's learning, a building which emanates from within and captures personal meaning in its growth. The humanistic potential is already there for reflection, collaboration and the freedom to make genuine choices by keeping in mind the individual cultures of our children. To deny that freedom may well result in the LOGO-as-LIVED to become LOGO-as-PRESCRIBED: "LOGO curriculum guides replete with behavioural objectives, LOGO workbooks, and LOGO multiple-choice tests" (Kelman, 1983, p. 7).

Our system has in place a flexibility for Alternative Education Programs, some which may already reflect much of Papert's philosophy. Given a similar flexibility to an individual educator, perhaps a "true computer literacy" can come about.

> True computer literacy is not just knowing how to make use of computers and computational ideas. It is knowing when it is appropriate to do so (Papert, 1980, p. 155).

To acknowledge that Papert is overly pessimistic in his views of an authentic version of LOGO reaching today's

schools, is to perhaps deny the existence of those "humanistic" qualities or to underestimate their potential for fruition. What this study showed was the possibility for that fruition. There was evidence of a sprinkling of Papert's priorities, a beginning reconceptualization of the teacher role and teacher-student relationship intimating a promising next year. Given the opportunity, encouragement and support to interpret and implement LOGO in their own way, it is possible for an educator in a French Immersion context, within this traditional system to reflect Papert's priorities. This bi-lingual context is Aspect (c) to be addressed next.

Aspect (c), brings into focus Papert's analogy of learning LOGO the same way as learning to speak French in France: by living it. Since both are languages he envisioned learning to speak LOGO in much the same way as learning to speak French. This suggested an intriguing proposition: If French Immersion Programs, intended to immerse the child, and give a sense of learning the language in a personally meaningful way, as if living it, then LOGO might be interpreted and implemented in much the same way. It was this insight that Aspect (c), DOES A BI-LINGUAL CONTEXT AFFECT THE LOGO IMPLEMENTATION IN ANY WAY, hoped to gain.

If one has never lived in a foreign country and acquired the language of that country by living it, it may

be somewhat difficult to culturally relate to Papert's statement./ My personal experiences with getting to know a language in such a way are limited, but I can draw on one. Many years ago, I studied in Salzburg, Austria. Among my many cultural experiences was learning the language, Austrian, not German as the Austrians were quick to point out. Armed with dictionary and map my friends and I struggled through, capturing the language as we needed it to explore, to communicate, to learn, to eat, to buy, to survive. We depended on each other and shared a relationship built on trust and respect. Most intriguing was finding our way back to the university at the end of the day to share those experiences, in Austrian I might add. It was something we welcomed and enjoyed. My interpretation of what Papert means when he refers to learning to "speak" LOGO would mean to learn it in a personally meaningful way, determining one's own readiness as it becomes part of one's lived world. For LOGO to become part's of a child's lived world means that the child would have to determine his or her own goals and evaluate his or her own readiness. In other words, the LOGO experience would be intrinsically motivated, imputed with personal conviction.

L'Academie Ste. Marie provided a bi-lingual context for anglophone children coming from a cultural background where at least one parent spoke French. Parental support was welcomed, mostly in volunteer services to help create an

environment conducive to living the language, often celebrating French festivals and events.

In this study, Samantha's children came to closely resemble that kind of lived LOGO experience. One might expect that living the French language in the classroom context, would inspire one to live LOGO in the same way. That was not the case in the other implementations. Even though three of the 'representatives' spoke predominantly French with their children during lab sessions, only one made it possible for her children to live LOGO in the Papertian sense.

Of course, I have no way of knowing how representative L'Academie Ste. Marie was as a French Immersion School, and how lived the French language was within those environs. Also, the teachers may not have perceived LOGO to be a language. To answer Aspect (c) I would have to say that within the confines of this study, it would be difficult to say whether the bi-lingual context affected the LOGO implementation, since even if the 'representatives' were living the French language in the Papertian sense, but were not aware of LOGO as language, then they would not have interpreted it as such.

Remarks

Each 'representative' interpreted LOGO resonant with the texture of his or her own web of significance.

Melanie looked for direction to an extrinsic source. Unable to find it, she concluded that LOGO did not satisfy the Grade 1 needs. Papert's priorities were not in evidence as she communicated knowledge to her children, in the role of communicator, and they reciprocated by fulfilling her expectations, in the role of child as passive recipient of knowledge.

Daphne looked for direction to an extrinsic source as well, and when none was available, she created her own. As she communicated knowledge to her children, she aspired to motivate them by making activities fun. Although some of Papert's priorities were in evidence in the lab, they would not be the following year. Since Daphne would create her own structure for the next year and encourage her children as motivated recipients of knowledge to exercise it, this would not reflect Papert's priorities.

As the ultimate authority in the classroom, Jonathon made all the decisions about objectives and problems to be solved. With his role as catalyst and the child perceived as problem-solver, he encouraged choice which he felt would encourage thinking. Experiencing himself in an autonomous role, acknowledging to some degree student choice towards his ultimate goal, thinking, there appeared the beginnings of Papert's priorities.

Samantha experienced considerable frustration and anxiety. This was largely due to her desire to let the

children go on their own with LOGO being challenged by her everyday practices in the classroom. This agitation culminated in an image of herself as learner, not only teacher, and in respecting her children's capability to direct their own learning. By leaving them in charge of building their own knowledge, she saw the child as knower. She reflected many of Papert's priorities as she nurtured a child-centered environment.

It was difficult to determine whether a bi-lingual context affected the implementation. This could have been due to insufficient knowledge on how the school culture nourished the French language as lived as well as whether the 'representatives' interpreted LOGO as a language at all.

If education were to be humanized as Papert advocates, then teachers would have to come to know themselves, and the humanistic qualities of the teacher-student relationship would have to extend to the teacher-system one as well. Teachers would have to come to know their children, and the system would have to come to know its teachers. Jonathon may well have been right when he said, "The teachers will make the difference. It's how they will use it" but only partially right, in that they will need the support to make those decisions about how to use it. The process appears long and arduous, but for all its good intentions, unless LOGO can find an environment supportive of its philosophy, it cannot thrive. Kelman (1983) supports this when he says:

> The threat of LOGO standardization. . . presents to educators a challenge of significant proportions, if the hopes and dreams of LOGO's founders are to be realized (p. 7).

By its very nature LOGO puts control in the hands of its users. Its inherent heuristics idealize individuality and a child-centered learning environment. Emergent themes unearthed perceptions of teacher role as well as that of the child. These were the underpinnings of the interpretations the teachers made as they implemented LOGO. If these underpinnings are not resonant with those of LOGO, then Papert's priorities will not be reflected and LOGO will either be cast aside or adapted into the everyday world of the classroom.

CHAPTER FIVE

REFLECTIONS

The pervasive computer is an everyday reality. It touches us all to some extent: be it in our pocketbook or in our concerns for the children of tomorrow and the world they will create. The computer presence has impacted our lives with a vigor with which we are still trying to cope, much less understand. In a relatively short time it has quickly joined the ranks of another taken-for-granted in our everyday lives. Perhaps for the balancing act of our pocketbook this taken-for-grantedness is something we can dismiss lightly, but what about our children who have found themselves in the midst of this invasion?

We as educators share the everyday worlds of those very children. Our influence on their daily lives can only be understated. Maybe it cannot always be evaluated as successful, but its tacitness nonetheless permeates their very beings. Our ontological and epistemological assumptions are the very underpinnings of the educational practices which we actuate, and which ultimately influence the children's perceptions of themselves and their world. We transmit values through unspoken messages such as seating arrangements, age segregation, teacher authority, textbooks, curriculum and so on, which shape attitudes and outlooks. Education can encompass the computer presence as another

tool for getting through the curriculum or, as Papert contends, computers "may affect the way people think and learn. . . .might enhance thinking and change the patterns of access to knowledge" (Papert, 1980 p. 3). Whichever perspective we choose, there is need for documented studies.

LOGO will celebrate its twenty first birthday this year, yet in educational circles it is still in its infancy. LOGO advocates have spanned radical to traditional implementations inciting controversy, with most educators struggling somewhere in between. Fueling the issue is critique precipitated by those whose concerns profile the potential dehumanization of man by machine. As an item sparking a lot of interest in education today, it has kindled the onslaught of bigger and better versions in the software-hardware quest for a greater slice of the school pie. Meanwhile some educators are plagued with feelings of discomfort, fear, lack of knowledge and an unwillingness to use LOGO with their children. It is these concerns that pose the biggest hurdles if LOGO is to reach its full potential as the powerful learning tool that its developers envisioned it to be.

To date little research has been done concerning such aspects of teachers' involvement. Most have dealt with implementation strategies and on the selection of software for corresponding hardware.

Educational journals and magazines abound in reports, primarily anecdotal in nature, from teachers and or administrators, kindergarten to university level, as to how LOGO is being used in, and under what conditions. However, very little research has been done to document LOGO implementation with the focus being on teacher interpretation of LOGO, their selected approaches to using LOGO, and their methodology in implementing it in classrooms of today's schools. The purpose of this study was to focus on an area relatively untouched in past studies: How four teachers in a French Immersion Elementary School interpreted and implemented LOGO without an accompanying curriculum or other guidelines.

Four major LOGO research projects, as listed by Daniel Watt (1982) concerned LOGO implementation; each in a different type of school with different emphases and structures: the Edinburgh LOGO Project, Brookline LOGO Project, Lamplighter Project and Computers in Schools Project. Each of these research projects were set up to prove or illustrate the feasibility of a preconceived idea of how LOGO could (or should) be used.

One of the earliest studies using the LOGO programming language was the Edinburgh, through the Department of Artificial Intelligence (Howe, O'Shea and Plane 1979). This was a structured experiment in which the exploratory and self-directed aspects of LOGO were kept at a minimum. The

focus was the development of mathematical skills and acquiring mathematical concepts. For this study eleven-year old boys from a local school came to the University laboratory for an hour a week throughout the school year. The results of the study were "not very dramatic from the aspect of subject mastery, the main difference noted being that the experimental LOGO group was more willing to argue sensibly about mathematical issues and to explain their mathematical difficulties clearly" (Watt, 1982).

The Brookline LOGO Project in Brookline, Mass. involved a group of 50 sixth grade students who were placed in a computer laboratory in the school, 16 of them being selected for intensive study (Papert, Watt, diSessa and Weir 1979). This cross-sectional group was monitored closely as they learned LOGO, the emphasis being on the learning styles they employed. In contrast to the highly-structured Edinburgh study, this program followed Papert's philosophy of "child programming the computer" and not vice-versa. This was hardly surprising since Papert was one of the organizers of this study. The results of this study were very dramatic in the affective domain but it was not possible to provide "hard data" in the area of objective test results, as tests to measure LOGO-using ability have not yet been devised.

Computers in the Schools Project implemented in 1980 and continuing into 1983, in New York, had a philosophical basis similar to that of the Brookline Project. This

project involved students from grades two to nine, and emphasized the social and interactive development that working with LOGO produced in students, rather that improvements in mathematical achievement and gains in the cognitive domain.

In 1978 an extensive study of LOGO usage was conducted at the Lamplighter School in Dallas,, Texas (Overall, 1981). This study established by the M.I.T. LOGO group, involved all the students and teachers in this private elementary school. For a year, the staff was trained in the usage of the LOGO language. LOGO was then introduced to the children who ranged from three year-old preschoolers to grade four students. The results of tis study indicated that LOGO usage aided in individualization, promoted improvement in an individual's self-concept and peer relationships, aided in the ability to communicate, and helped students see the worth of themselves and of their classmates in new and different ways (Overall, 1981).

All of the above studies had been carried out with a predetermined focus which they wished to prove or illustrate. This research study documented what actually happened when teachers interpreted LOGO for themselves and decided on their own approaches to use to implement it with their classes. Mollie Watt (1982) stresses the great need that exists for all LOGO teachers to share their emerging curricula and approaches. She stresses that this will

enhance the collective understanding and provide more models about the way students can work within a LOGO environment.

All this points to the need for further research into the area of teacher implementation of LOGO. The rationale for this study perhaps best lies in this quote from Joseph M. Scandura (1983).

> Perhaps the greatest limitation of the LOGO movement is that its effects remain undocumented, despite millions of dollars spent to support its development (p. 16).

This study endeavoured to diminish this limitation.

Since this study searched for an individual interpretation, it was necessary to find a genre of research sensitive to capturing the everyday lives of the members. An ethnographic approach was chosen as the vehicle to enter the everyday worlds of those 'representatives', as they called themselves. Ethnographic tools such as participant observation, interviews and documents were used to uncover the underlying pedagogical stances which influenced the interpretation and subsequent implementation.

These pedagogical stances were then related to Papert's philosophy as outlined in his book Mindstorms. Since the study was documented in a French Immersion School, Papert's analogy of learning to speak LOGO much the same way as learning to speak French in France was briefly explored.

Data was collected in a lab every Tuesday and Friday morning over a period of fourteen weeks, extending the

months of January to April. After this time, frequent visits were made to the school to conduct in-depth interviews and an overall evaluative session with the group of 'representatives'. The data was then presented as four narratives and interpreted within the three aspects of the research question.

None of the teachers' preconceptions about LOGO and the communication strategy for familiarizing the teachers with LOGO were actualized.

The most voiced grievance was the lack of "goals", "curriculum" or "direction" especially for Melanie and Daphne at the Grade 1 and 2 levels. Jonathon in Grade 4, used resources I had made available to him to select problems for his children to solve, and Samantha in Grade 3 allowed her children to found their own goals and hopefully fulfill some of those on the Mathematics curriculum.

A theme that emerged was the conception of child and teacher. Melanie saw herself as a communicator of knowledge, ensuring that her children fulfill the curricular expectations and satisfy the needs for continuation to the next grade level. Melanie's children passively received that knowledge as they attentively completed their activities.

Daphne wanted her children to enjoy coming to school and to that end she endeavoured to create fun activities to motivate and sustain their interest. She communicated

knowledge as well, but her children became motivated recipients of that knowledge.

Jonathon had one goal: to teach them how to think. To realize that goal, he devised problems for them to solve. Although each problem had the same solution, the means of getting that solution varied from child to child. By creating a situation where each child could realize his or her own way, he hoped for them to find success. Here the child was problem-solver and Jonathon, the catalyst.

Samantha's inner struggle reverberated throughout the study. The LOGO experience challenged her very role and relationship with her children. It brought to the fore much of the taken-for-grantedness in her everyday world of the classroom. While communicating knowledge to her children, she also learned from them and aspired to create in them a love for learning. Where a child must search within to found that love, he or she experiences a personal way of knowing, rooted in one's own experiences or culture. It is in this sense that Samantha's perception of child was as knower.

Papert's priorities exemplify a "humanistic" education, one rooted in one's personal experience. His pessimism about an authentic version of LOGO reaching today's schools is grounded in the lack of children participation in their own education. In his book Mindstorms, the theme, child as knower encompasses the humanistic qualities that Papert

attests to be absent from the education system of today. This study hoped to gain some insight into these qualities, or priorities and see if and how they were reflected in the four implementations of this study.

Although the theme of child as knower can be applied to the environment Samantha created for her children, some of Papert's priorities were evidenced in Jonathon's environment as well. His ultimate goal was to teach his students how to think and learn for themselves. Even though "choice" may be overshadowed with illusion, he did nonetheless address that capacity. Papert's priorities were reflected in Daphne's environment to the extent that she cared about her children's feelings a great deal and practiced fairness throughout. She showed a genuine interest in their discoveries, however secondary they may have been.

Although the environment Melanie created for her students in the lab did not reflect Papert's priorities, that does not question or cast judgement on her professional abilities, or humanistic qualities, it is just to consider that environment within the framework of those priorities.

This study found Papert's priorities present in the so-called traditional system. Whether they continue to develop will depend on the teachers getting to know themselves and their children much the way Papert advocates getting to know a language. That will depend on the relationship that individual teachers will have with that

system and how that system reflects those same "humanistic" qualities: the choices that those teachers will make and the degree to which they will be allowed to [redacted] them.

It is not the computer per se or the software, LOGO in this case, that can change underlying epistemological and ontological assumptions. It will be the genuine choices that we as educators will be able to realize as we continue to spin our web of significance.

BIBLIOGRAPHY

Austin, H. (1976). Teaching teachers LOGO: The Lesley Experiments. LOGO Memo. No. 23. M.I.T., Artificial Intelligence Laboratory.

Bandelier, N. (1982, August). TI LOGO and first graders: A winning combination. The Computing Teacher.

Barrett, W. (1986). Death of the soul. From Descartes to the computer. New York: Anchor/Doubleday.

Billstein, R. (1983, September). Turtle fever. The Computing Teacher.

Boecker, Heinz-Dieter & Fischer, G. (1982, August). LOGO prospect PROKOP. Byte.

Coon, M. (1982, November). Papert at the faire. The Computing Teacher. pp. 14-16.

Crichton, M. (1983). Electronic life. New York: Alfred Knopf.

Dubos, R. (1974). Beast or angel: Choices that make us human. New York: Scribner.

Emihovich, C., & Miller, G. (1986, April). Verbal mediation in LOGO instruction: Learning from Vygotskian perspective. Paper presented at a symposium at the Annual General Meeting of the American Educational Research Association, San Francisco.

Freire, P. (1973). Education for critical consciousness. New York: Continuum.

Freire, P. (1970). Pedagogy of the oppressed. New. York: Seabury.

Geertz, C. (1973). Thick description: Toward an interpretive theory of culture. The interpretation of cultures. New York: Basic.

Guba, E., & Lincoln, Y. (1985). Effective evaluation. San Francisco: Jossey-Bass.

Hammersley, M., & Atkinson, P. (1983). Ethnography: Principles in practice. New York: Tavistock.

Harvey, B. (1982, August). Introducing LOGO to children. Byte. pp. 196-208.

Higginson, W. (1982, August). Leading fish to water. Early observations in the use of LOGO. BYTE. pp. 328-329.

Howe, J.A., & O'Shea, T., and Plane. (1979). Teaching mathematics through LOGO programming: An evaluation study. DAI Research Paper No. 115.

Howe, J.A., & O'Shea T. (1976). Computational metaphors for children. Paper presented at 21st International Congress of Psychology. Paris.

Jewson, J., & Pea, R. (1982, August). LOGO research at Bank Street College. Byte.

Kelman, P. (1983, April). Seymour, has your dream come true? Classroom Computer News. p. 7.

Leon, U. (1982, August). The group of the turtle. Byte.

Lofland, J., & Lofland, L.H. (1984). Analyzing social settings: A guide to qualitative observation and analysis. California: Wadsworth.

Lola, P. (1981, September). Learning with LOGO at the Lamplighter School. Microcomputing. pp. 42-47.

Mace, S. (1984, January). Where is LOGO taking our kids? InfoWorld. pp. 46-50.

Marikuson, C. (1983, January). LOGO fever. Instructor. p. 74.

Moursund, D. (1983-84, December - January). LOGO frightens me. The Computing Teacher. pp. 3-4.

Nelson, H., & Friedman, R. (1981, Summer). The qwerty phenomenon. On Computing Inc. p. 12.

Overall, T. (1981, September). Learning with LOGO at the Lamplighter School. Microcomputing. pp. 42-47.

Papert, S. (1971, October). A computer laboratory for elementary schools. LOGO Memo No. 1. M.I.T. Artificial Intelligence Laboratory. Memo No. 246.

Papert, S. (1971, October). Teaching children thinking. LOGO Memo No. 2. M.I.T. Artificial Intelligence Laboratory. Memo No. 247.

Papert, S. (1980). Mindstorms: Children, computers and powerful ideas. New York: Basic.

Papert, S. (1976, June). Some poetic and social criteria for education design. LOGO Memo No. 27. M.I.T. Artificial Intelligence Laboratory. Memo No. 373.

Papert, S., Abelson, H., Goldstein, I., & Bamberger, J., (1976, March). LOGO progress report. LOGO Memo No. 22. M.I.T. Artificial Intelligence Laboratory. Memo No. 356.

Papert, S., Watt, D., di Sessa, A., & Weir, S. (1979). The Brookline LOGO Project final report, Part II: Project summary and data analysis. LOGO Memo No. 53 M.I.T. Artificial Intelligence Laboratory. Memo No. 545.

Robertson, M. (1976). Artificial intelligence. Nature. (262).

Ross, P. (1983). LOGO programming. Boston: Addison-Wesley.

Scandura, J. (1983, September). Three roles for the computer in education. Educational Technology.

Schank, R., with Childers, P. (1984). The cognitive computer: On language, learning and artificial intelligence. Massachusetts: Addison-Wesley.

Schutz, A. (1962). Collected papers I: The problem of social reality. The Hague: Martinus Nijhoff.

Solomon, C.J. (1982, August). Introducing LOGO to children. Byte. pp. 196-208.

Spradley, J.P., & McCurdy, D.W. (1975). The cultural perspective. Wiley.

Spadley, J.P. (1980). Participant observation. New York: Holt, Rinehart and Winston.

Statz, J. (1983). The development of computer programming concepts and problem solving abilities among ten-year olds learning LOGO.

Unpublished doctoral dissertation, Syracuse University, Syracuse, New York.

Streibel, M. (1983, October). Educational utility of LOGO. School Science and Mathematics. (86).

Toffler, A. (1970). Future Shock. New York: Bantam.

Turkle, S. (1984). The second self: Computers and the human spirit. New York: Simon and Schuster.

Van Maanen, J. (1983). Qualitative methodology. Beverly Hills: Sage.

Walker, F. (1985). Avoiding a technological eclipse of education. Elements 17 (1), p. 7-10.

Watt, D. (1982, August). LOGO in schools. BYTE. p. 116.

Watt, M. (1982, October). What is LOGO? Creative Computing.

Werner, W., & Rothe, P. (1980). Doing school ethnography. Monograph Series Paper No. 2. Department of Secondary Education. University Of Alberta.

Wierzbicki, B. (1984, January). The success of LOGO hinges on teacher training. InfoWorld. pp. 50-51.

Wolcott, H.F. (1975). Criteria for an ethnographic approach to research in schools. Journal for the Society for Applied Anthropology 34(2): pp. 23-31.

Yin, R. (1984). Case study research: Design and methods. London: Sage.

APPENDIX A

Abelson, Harold. LOGO for the Apple II.

Babbie, Earl. Apple LOGO for Teachers.

Bearden, Donna. 1,2,3 My Computer and Me.

Kwok, Annie. The Workbook for LOGO Learning.

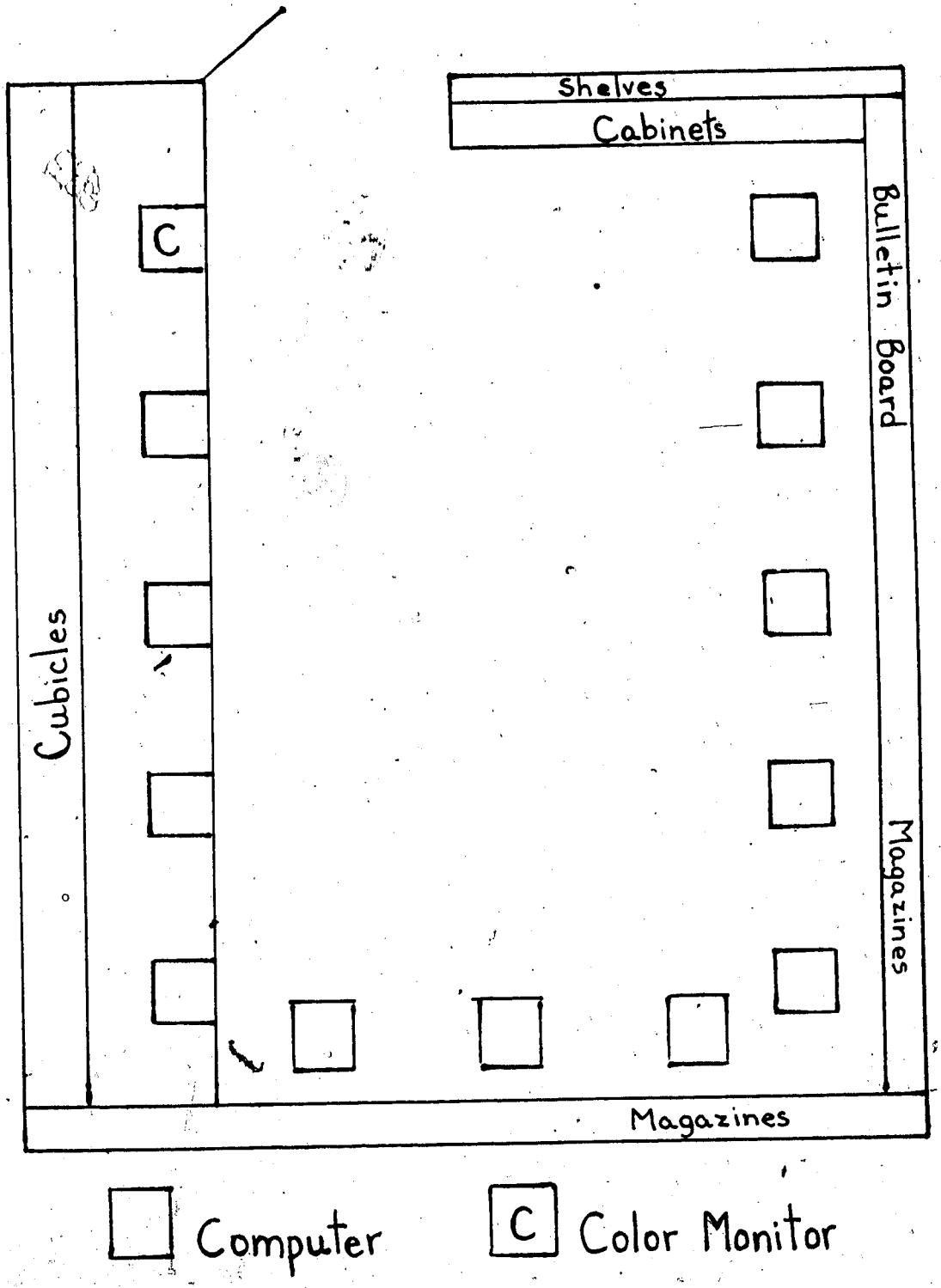
Torgerson, Shirley. LOGO in the Classroom.

Thornburg, David. First Book of Robots and Computers.

Thornburg, David. Discovering Apple LOGO: An Invitation to the Art and Pattern of Nature.

Watt, Daniel. Learning With Apple LOGO.

APPENDIX B


Shelves
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