

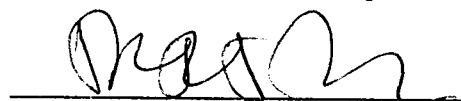
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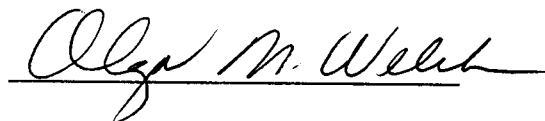


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April 24, 1990

HOW A DEAF CHILD BEGINS TO LEARN

LOGO: A CASE STUDY

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Amy R. McDaniel

May 1990

DEDICATION

To the memory of my grandparents, NaNa and Honey,
with a special dedication to NaNa
for a unique communication with me
as she taught me to never give up
and
To my parents, Marvin and Rebecca McDaniel

ACKNOWLEDGMENTS

I am grateful to Dr. Kathleen Warden for her support, patience and understanding and for serving as chairperson of my thesis committee. Also, I express gratitude for their support to my committee members: Dr. Olga Welch, Dr. Rick Austin, and Mr. Don Ashmore.

I acknowledge with special thanks the support given to me by Melinda Kerr. She gave her time unselfishly throughout my thesis process.

I acknowledge with thanks the support and encouragement extended to me by a number of friends and acquaintances: Sandra Davis, Wendell Barnes, Gordon Cuany, Mark Clark, Katherine Weaver, and Kay Veteto.

I give thanks to Elaine Alexander for her time and to TSD permitting me to conduct my study there.

Finally, I acknowledge with a very special thanks my parents for giving their time, for expressing confidence in me, and for giving me their love and trust. This is not only for my parents but also to my younger brother, Andy, who was very patient as we all worked.

ABSTRACT

Describing how and if a deaf student demonstrates logical thinking while using LOGO language was the purpose of conducting this research. This case study was conducted at a residential school for the deaf with a twelve year old deaf student.

Eight sessions of work with the student using LOGO language were videotaped. Transcriptions of the videotapes were made for analysis. The student completed entries in a journal at the conclusion of each session. Attitude inventories were administered at the beginning of the first session. Due to problems experienced by the student, the validity of the attitude inventories is questionable. Therefore, statistical analysis was not completed on the results of these inventories.

It was apparent that the student did learn to use simple LOGO commands to draw diagrams and figures. These tasks required logical thinking. The subject did not always possess the language to explain what she was doing or to ask questions. In spite of this fact, she completed the tasks. Therefore, it was concluded that the subject demonstrated logical thinking as she learned to use the LOGO commands.

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CHAPTER I

INTRODUCTION

Statement of Purpose

The purpose of this study is to describe if and how a deaf student demonstrates logical thinking while using LOGO language, and to compare the subject's interaction with LOGO to what Papert's (1980) theory of learning as enhanced by LOGO would predict.

Weir, a member of Papert's LOGO group at Massachusetts Institute of Technology, (1987) reports utilizing computers to work with students who have a variety of handicapping conditions. Weir states that observing the approach to learning of special children helps the understanding of children in general. Further, she states that there is a vast amount of hidden intelligence that is not tapped by traditional classroom activities. She encourages using computer models to help understand what the task is that the mind performs. Specifically, she describes LOGO activity as a means for helping a student transform the informal knowledge she/he has about space to formal mathematical constructs. She cautions that the computer will serve education only to the extent that the teacher has gained control over it.

Goldenberg (1979) reported on his work and thoughts on the use of computers with handicapped students to remove barriers from experiences and reduce learning handicaps. He supports programs that enrich rather

than restrict. Such programs must provide the opportunity for a natural, accessible input that allows handicapped students to structure their experiences themselves. These programs must be chosen or written with care to avoid instruction that compounds the English problems of the deaf. He specifically mentioned implications for the use of LOGO with deaf children.

Papert, a professor of mathematics and education, along with his colleagues, invented LOGO at the Massachusetts Institute of Technology (MIT). He states there are few situations that require or develop structured thinking in our culture. Papert describes structured thinking as the process of dividing a large problem into smaller parts or components. These smaller parts can then be handled individually and then can be combined to solve the original larger problem (Sherwood, 1987).

Papert believes that the computer can be used to "concretize" the formal learning situations in the classroom environment and offer opportunity for the development of structured thinking. The computer user would be allowed, by the means of a structured computer language, to solve a complicated, programming problem by taking the problem and breaking it down into smaller parts. The problem is solved by constructing subprograms or procedures to produce a total program. The well known computer language, BASIC, does not possess that kind of structure; therefore, Papert and others do not approve of using BASIC as a first computer language for children to use to learn about computer

programming. They proposed that LOGO be chosen as an alternative computer language for learning computer programming (Sherwood, 1987).

If one believes Papert's theory is correct, then new possibilities exist for students in using computers to develop their structured thinking. Thornburg (1984) stated,

Central to Logo are the ideas that a computer is a tool with which to think, that one learns best by tinkering and experimenting, that as much can be learned from mistakes as from correct responses, and that one should be able to formulate a problem solution on the computer without ever losing sight of the problem being solved. (p. ii)

Sufficient research has not been done to judge if students' thinking is truly changed by working with LOGO (Mawby, 1985), and research based on thinking skills continues to be done. Since this research is in its initial stages, an individual case study approach has been chosen as the research method. Weir (1987) describes case studies as being a prerequisite for studies with larger groups. She states that they suggest appropriate controls in the larger group studies, and they provide working hypotheses about the how and the why of a process.

Need for the Study

A major concern in deaf education has been the development of ways to teach hearing impaired students to acquire structured thinking and problem solving skills so that they may perform more effectively academically on the level of their hearing peers (Moore, 1978). For example, the average hearing impaired 18 year old scores at about 4th

grade level on reading achievement tests (Johnson, 1989). For more than 150 years, numerous efforts by teachers have been made trying to discover methods that would improve language and math instruction for hearing impaired children. Yet, research on the nature of linguistic problems connected with deafness has been lacking (Kretschmer & Kretschmer, 1978). Hearing impaired children often have a variety of information acquisition modalities (e.g., listening, signed English, American Sign Language, and writing). These modalities are not well understood in terms of their linguistic features and in terms of how they interact with preferred learning styles. Thus, no truly adequate, consistent teaching methods have been developed to date.

Deaf learners often have English language delays and/or deficits. Yet, in education programs for deaf students, information is presented in English (Johnson, Liddell, & Erting, 1989). Educational programs emphasizing verbal learning strategies teach toward a deaf child's area of weakness rather than adjusting to his/her language learning style (Diebold, 1987).

To further illustrate what can occur when the needs of the learner are not met by the education program an example follows. Albert Einstein had academic problems and was labeled as an academic failure. He had some language deficits. As a result of this, his theories were often completely nonverbal and were mediated through visualized images. In a letter written to a close friend, Max Werthemier, Einstein said that he believed his thoughts did not come in any verbal formulation. He concluded that he rarely thought in words at all; but when thoughts

came, Einstein had trouble expressing them in words (Diebold, 1987). The verbal problems experienced by Albert Einstein may be similar in nature to those of the deaf child.

The fact remains that deaf students do not achieve at hearing students' norms (Moore, 1978). Because the deaf student is asked to acquire information through a language in which he/she is not fluent, learning is made difficult. In the areas of logical thinking and problem solving skills, LOGO might prove a useful tool in the education of deaf students, since learning LOGO does not depend on English fluency. Thornburg (1980) states that LOGO does not depend on fluency with English language; therefore, it allows the computer to be used for problem solving in mathematics. Using LOGO, a deaf learner may be taught to problem-solve. Knowledge of English syntax is not required for this.

Rationale for the Study

The philosopher, John Dewey, supported the use of experience as the basis of learning and/or the active participation of the student in the learning situation. Weir (1987) and LOGO researchers at MIT agree with Dewey's philosophy. They believe the design of computer-based environments determines the quality of the learning situation. It was inferred that since many deaf students need visual input and individual instruction, the computer should be an excellent instructional tool for them. Riedesel and Clements (1985) stated that deaf children were the

largest group of exceptional children that could benefit from the computer technology.

Weir (1987) supports using the computer to help learners overcome their learning problems, to provide the opportunities for them to begin computer activities, to set their own goals, and to make decisions about possible solutions in the problem-solving process. To accomplish these goals, Weir states that a learning activity should be able to be done independently for long stretches of time. Since the use of LOGO with the computer provides feedback for those who work in a learning activity such as this, it is the learning tool of choice for Weir.

The purposes of the present study are to attempt to describe a deaf child's experience with LOGO in terms of Papert's theory, and to further understand the application and value of the use of LOGO with deaf students.

CHAPTER II

RELATED LITERATURE

How Deafness May Effect Learning

The definition of deafness used by the Federal government is an audiological definition rather than a sociological or psychological definition. For example, a person is considered deaf if his/her hearing loss is in the severe to profound range, even though that person may not consider himself/herself part of a deaf community. The definition of deafness has been altered several times; still, there is ongoing disagreement about it (Rodda & Groove, 1987). Recently the definition of the term deafness has been expanded for educational purposes. Accordingly, deafness now encompasses an ethnic concept. In looking at the ethnic nature of deafness, one considers social institutions, social class structure, social attitudes and values, and the socialization process of people who consider themselves part of the deaf community (Rodda & Groove, 1987).

To be an ethnically deaf person, one uses to form of sign language known as American Sign Language (ASL). Deaf people who are not ethnically deaf use wide varieties of communication modes depending on their abilities to produce and to express the spoken language, on their acceptance by hearing and/or deaf society, and on their decision to be part either of the deaf or hearing culture (Rodda & Groove, 1987).

The sign language for those who belong to the deaf culture in the United States is called American Sign Language (ASL). ASL is a visual-gestural language, unlike a spoken language. It is a distinctive language with its own grammar and rules of usage. Bonnie Mitchelson (1988) called ASL "the soul of the community of people who live with and use that language" and noted that "with their distinctive language, values, customs, history and experience, deaf people have a distinct, vibrant culture known as the deaf community" (Staff, 1989). ASL, a true language in its own right, has been officially recognized in several states and is rapidly becoming an approved means to meet the foreign language requirement in some universities.

In contrast to ASL there is a signed English. Signed English, invented by Bornstein (Moore, 1978), is used by hearing parents of a deaf child to communicate with their child in an English system represented by signs. Signed English is also used by many educators of the deaf to teach exact English. In theory, it is thought that by using a sign system which is a visual representation of English with deaf students, the deaf students will learn English through their eyes the way hearing students learn English through their ears (Rodda & Grove, 1987). However it is possible that using signed English to communicate and then being required to read and write English do not require the same cognitive processing for the deaf as is found in their hearing peers. As a result, a visual representation of English may be an inadequate mode for deaf students to learn English.

Johnson (1989) and other faculty members at Gallaudet University, the only university for the deaf in the world, report that low academic achievement levels of most deaf students are not the results of learning deficits associated with deafness, but of problems in the communication practices of the teachers of the students. Using the traditional communication practices (e.g., Signed English) to teach deaf children in the U.S. has not been as successful as expected (Johnson, 1989).

Johnson (1989) also stated that teachers using simultaneous communication or Sign Supported Speech (SSS), tend to monitor their own speech and present sequences of signs perceived by deaf students as bits of sentences with no obvious grammatical organization. Johnson and colleagues analyzed how teachers communicate to deaf children and concluded that there was no evidence that deaf students learn English grammar from observing a manual representation of it. They suggested that it is unrealistic to expect that exposure to signed English will lead naturally to the acquisition of English grammar, either spoken or signed.

In every area of academic achievement, the work of the average deaf student is still behind that of the average hearing student. The average deaf student graduating from high school has an English reading level between third and fourth grade and a math level at seventh grade (Johnson, 1989). Repeated failure destroys academic motivation and robs the student of feelings of self-worth. Many hearing impaired students experience repeated failure because of their lack of English fluency.

LOGO

LOGO, a structural programming language, was combined with the capabilities of artificial intelligence to allow the learner to expand his/her own intellectual structures through estimation, interaction, experience and revision. From the Greek word, "thought", the word LOGO is derived (Billstein, Libeskind, & Lott, 1985). A British neurophysiologist, Walter, developed an electromechanical device, "tortoise" which rolled around obstacles in 1948. In the late 1960's, the LOGO turtle, a triangular figure, was developed. According to Papert (1980), the turtle is like "an object to think with." A mechanical robot moving around the floor was the first turtle; following that was a graphics screen version. The parameters of this turtle are the position, the orientation, and the state of its pen (i.e., whether or not the turtle's pen is in a position to mark on the paper). Six simple commands: FORWARD, BACK, LEFT, RIGHT, PENUP, and PENDOWN control the parameters. The position of the turtle is controlled by two commands, FORWARD and BACK; the heading is changed by the other two commands, LEFT and RIGHT; and the change of the state of pen is commanded by PENUP and PENDOWN. All these characteristics can be made into numerous patterns and into numerous movements which generate geometric and other shapes (Papert, 1980).

Logo language within an individual microcomputer environment allows the subject to be in charge of setting a problem to solve, making decisions, playing with the problem, experimenting and trying out the

solutions, and building on what she has already done to do something more (Watt, 1982).

Using turtle geometry is not just for drawings. According to Weir's (1987) definitions of LOGO, it is: (1) an interactive graphics system, (2) a list-processing programming language, (3) a philosophy of education, (4) a way of learning mathematics, (5) a collection of pedagogical principles, and (6) a tool for creating and editing stories in picture, words, or both together. Weir states that a LOGO activity can be a window into the mind of the student and that programming is a tool for learning subject matter.

Papert (1980) reports that LOGO permits the learner to explore an abstract idea from a concrete approach for educational purposes. According to Papert, LOGO improves the learning process through creative play, experimentation and trial/error manipulation of the problem and possible solutions. It also allows the learner to understand how to correct the mistakes he/she makes. Observing a student in this LOGO environment would help a researcher gain insight into the student's thinking process.

Researchers have studied Logo with "normal" (or nonhandicapped) and handicapped children (Dalton, 1986; Watt, 1982; Weir, 1982; Olive, 1985; Goldenberg, 1979). The studies indicate that both slow and accelerated hearing students are capable and interested in using LOGO (Dalton, 1986). Children of average academic performance seem to prefer traditional classroom methods for solving problems. Aptitude tests

before and after using LOGO have supported the hypothesis that attitude of the student is a key to effective LOGO use (Dalton, 1986).

Sylvia Weir (1982), a researcher of the MIT LOGO group, noted that handicapped children, specifically learning disabled and cerebral palsy children, who grew up without the opportunity to learn from manipulatory experiences could become vulnerable to the development of spatial deficits. However, she stated that using the computer graphics screen gives them the opportunity to have a form of spatial experience. This provides reinforced remedial experiences. Because the computer is becoming a tool for the provision of least restrictive environment for children with special needs, Weir is an avid supporter of its expanded use in the classroom.

Olive (1985) states that through LOGO powerful ideas that were previously inaccessible due to complex mathematical computations can now be explored. He believes that turtle geometry, as in LOGO, makes it easier for children to explore space. He concluded this based on case studies he conducted.

LOGO and the Deaf Student

Logo's use with deaf children has not been extensively researched. Goldenberg (1979) studied three subjects utilizing a small vocabulary in LOGO, and he noted that the students had gained motivation and improved their feelings of self-worth. He states that the linguistic complexities are greatly reduced in the computer environment. As a

result, the child begins to generate his own problems and these problems are intellectually exciting and challenging. The instruction becomes one of discovery and solutions and the child is not so limited by the instructor's inability to transmit complex ideas.

Mawby (1985), a research associate at the Center for Children and Technology at Bank Street College of Education in New York, concluded that the LOGO program provides a nonlinguistic medium that helps the student develop logic or thinking skills. Since work at this center was conducted with hearing students, further research would be needed to determine how it may apply to deaf students. Mawby does report on what he calls a central flaw. He states that in the extreme version of the discovery learning approach there is an incorrect notion. This notion is that good learning materials make teachers and curricula dispensable. He cautions that LOGO is only a learning tool. Different versions exist that can be implemented in different programming environments and these differences can alter the outcomes. This idea would apply to studies and conclusions concerning LOGO use with any population.

CHAPTER III

METHOD

Setting

The physical setting for the LOGO sessions of this research was at Tennessee School for the Deaf in the middle school computer room after school hours. There were no other students or faculty using the room at this time. A videocamera was placed on a tripod and positioned in such a way as to tape both the subject and the researcher.

Subject

The subject in this study is a 12 year old female with a sensorineural hearing loss in the severe to profound range. With amplification, the subject is able to respond within the moderately--severe range. This subject was chosen by this researcher because she was a participant in an independent study project completed by this researcher the summer of 1989. The independent study assignment was to work with the subject, Amanda, as a tutor and to provide her with a deaf role model. Our work included tutoring sessions in math and language, (reading and writing), and some outside experiences such as shopping at the mall, meeting the staff at Knoxville Area Communication Center for the Deaf, and browsing at an art museum. The independent study was

arranged by a U.T. professor who had been contacted by the subject's foster mother. The foster mother wanted the subject tutored during the summer, and was particularly pleased to have a deaf tutor who could serve as a role model and teach the subject some independent living skills.

This subject is an average, typical student at a residential school for the deaf. Her academic achievement level is what would be expected in that setting. Specific intelligence and academic performance information is not reported in this thesis since TSD refused permission to print it in order to protect this subject's right to privacy. The subject's preferred mode of communication is Pidgin Sign Language, a combination of ASL and English signs. This researcher has communicated with her in this language during the practicum experience. Therefore, prior to this study, a mutually intelligible linguistic register had been established. It is hoped that this will reduce threats to internal validity that could be caused by linguistic differences in the subject and researcher, a problem often faced in research with deaf students.

Written consent forms to conduct this research were signed by the subject and her mother. A letter of consent to conduct the research was also obtained from the subject's school (see Appendix A).

Instruments

Prior to the LOGO sessions the subject completed the Revised Math Attitude Scale (Aiken, 1963) and the TOMA subtest, an attitude toward

math scale (Brown & McEntire, 1984). These tests can be found in Appendix B. LOGO sessions were videotaped. A transcript of the videotapes is in Appendix C. A journal was kept by the subject. Copies of the original journal entries with the researcher's translation into standard English can be found in Appendix E. The LOGO programs used were: LOGO: Principles, Programming, & Project by Lukas & Lukas, Apple LOGO Reference Manual (1982), and Thornburg's (1984) Exploring LOGO Without a Computer. (See Appendix F for an example of the LOGO turtle on the screen.)

Interviews with the subject were videotaped before and after the LOGO sessions. They consisted of questions about learning LOGO, her feelings using LOGO, and her thinking development. She kept a journal about learning LOGO and we went over the journal together using sign language to check the researcher's interpretation of what the subject had written. These sessions were also be videotaped.

Procedure

For this project, the research was a case study. Prior to beginning the actual work with the deaf student using the LOGO program, the student was given two math attitude tests: 1) Revised Math Attitude Scale Aiken (1963) and 2) the TOMA (Brown & McEntire, 1984). The results of the attitude tests will be used in the results section of the paper to provide some index of the student's attitude toward math.

Eight LOGO sessions of at least thirty minutes each were conducted with the subject. The subject was: (1) instructed in the use of LOGO; (2) provided the opportunity to practice LOGO; (3) provided the opportunity to explore elements of math using LOGO, such as drawing shapes. At the end of each session the subject was interviewed about her learning experiences. Each interview was videotaped.

The LOGO language concepts presented to the subject follow. To understand the concepts of LOGO it is not necessary to comprehend all the syntax of English. LOGO uses the "if...then" statement, and by using trail/error the subject should be able to debug her program. LOGO sessions were recorded on videotape.

A transcript of the videotapes was prepared. The transcripts were analyzed in an attempt to examine how the deaf student learns to use the computer environment called LOGO. Interviews with the student were conducted after each of the eight LOGO sessions, and the student was asked to keep a journal about the experience. Interview and journal data were also used to describe the student's learning experience.

The purpose of this case study therefore is to describe how a hearing impaired student uses logical thinking to interact with LOGO language, and to compare her interaction with LOGO to what Papert's theory of learning as enhanced by LOGO would predict.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

Since this is a case study, the results and discussion are intertwined as the examples from the data are compared to the theory. This chapter is comprised of the results and discussion, conclusions, implications, and suggestions for future research. It was the purpose of this study to describe if and how a deaf student demonstrates logical thinking while using the LOGO language, and to compare her interaction with LOGO to what Papert's theory would predict.

Before discussing Papert's theory as an explanation for these data, it is important to note that this study was influenced by the setting for the sessions. There were problems associated with the rooms used and the scheduled times for the sessions. The rooms used were not free from interruptions by staff members, and the observation window in the room became a distraction for the subject. The size of the room limited the activities that could be conducted. In the course of the study, the room had to be changed and different rooms were used on Wednesdays and Fridays. One session was canceled after this researcher had arrived at the site due to a special program at the school. This researcher had not been informed of the special program prior to arrival. Due to feelings and opinions expressed by the subject's teacher, the time of

the sessions was moved from morning to the afternoon so the subject would not be out of her classroom during the regular school hours. The actual session time was also limited due to the closing of the building each day. There were communication problems at the site which led to the first session being rescheduled. In addition, there were communication problems beyond the researcher's control concerning the availability of the camcorder. Although every effort was made to eliminate such problems, they did appear and their influence on the subject's responses is not known.

Amanda, the subject of this case study, did not understand the Math Attitude Scale and the TOMA. She is probably unfamiliar with a test format which requires reading a statement, and then having to process whether or not she personally agrees or disagrees. This researcher had planned to see if the subject could take the tests independently. If this had failed, signing the test was the next option. Unfortunately, the subject did not appear to fully attend even to brief explanations that were signed. She seemed to be confused by the fact that there was no "right answer." She seemed to become more confused from the complex language of the sentences. She asked some questions, then, she would just move her pencil along word by word at a pace that was too rapid to indicate reading. The entire procedure with these tests can be read in the transcript of the first session and in Appendix B. In light of this, I decided to eliminate any lengthy discussion of the TOMA as it measures Amanda's attitude toward math

because the instrument's validity is questionable with regard to this subject.

Results and Discussion

Results of formal tests are reported and described (See Appendix B). No statistical analysis was done.

A detailed description and transcript of the eight LOGO sessions comprising this case study can be found in Appendix C. From the videotape, the subject's behavior is described using categories such as subject noting the error or subject thinking or pausing at times when it would be expected she would be thinking. This transcription serves as a description of how the subject used the concepts presented to demonstrate that she was obtaining knowledge.

In addition, a listing of all the LOGO commands for each session can be found in Appendix D. Appendix D includes a description and discussion of the commands.

The journal the subject wrote was useful for analysis of her attitude (See Appendix E). Journal statements provided clues as to the subjects confidence level in working with LOGO and her feeling toward LOGO. Papert (1980) predicts that students will gain confidence in their problem solving skills and enjoy LOGO. The journal entries made by the subject in this study do show that she had a positive attitude even when the work was unfamiliar or difficult for her. The subject also expressed admiration for the researcher in the journal. Therefore,

it would be difficult to determine whether she continued some tasks because she liked LOGO or because she wanted to please the researcher.

Papert (1980) stated that work with a computer enables the user to approach knowledge that was once only accessible through formal processes in a concrete way. This study would seem to support his idea. The subject appeared not to have words to name things or to explain what was needed to reproduce certain shapes, but she could use LOGO commands to draw the shapes and diagrams. In the transcripts of the sessions, the lack of the concept of the word "degrees" as it relates to geometry can be noted. In spite of this lack of information, the subject was able to use body and hand positioning, the DLM triangular device on the dial (See Appendix H), and the protractor to determine the number she needed to input in order to get the turtle to turn as she desired.

She began to respond to what she saw on the screen as correct or incorrect as the sessions progressed. If she made errors, she would try something else to achieve her goal. At times, she had to be encouraged, but she would continue to work.

Throughout the sessions, the subject would ask for help if the desired results were not achieved. Even when answers were not provided, she would continue to work. For example, in session seven, she pushed her chair away from the computer indicating that she was giving up. She expressed that she was fed up, but with a little encouragement she would continue.

The subject appeared to have some difficulty changing from the plane as it related to her body and the desk top to the plane needed to

work on the computer screen. It is possible that some of this confusion was due to confusion of the concept. For example, in session two, it was unclear to the researcher if the subject understood the concept of the word "forward" from the sign for forward as it would have translated onto the computer screen.

In addition, she had difficulty with the concept of pen up and pen down. This was evident in the transcript of session seven when she had so much difficulty generalizing the concept of pen up and pen down from the paper and pencil to the computer screen. She gave inconsistent responses when asked if she would get a line or not. With pen up in the LOGO program, no line would appear on the drawing.

When writing her own commands for the LOGO work, the subject may have been doing what Papert referred to as learning to think articulately about thinking. For example, in session four, she paused and apparently rethought her steps as she drew the stairs and square. In order to draw the figures, she had to come up with strategies for deciding which commands she wanted to input.

Papert (1980) stated that a programming language was a natural, human language. It would appear that this language does not have to contain the same words for each person. Though this subject was completing very simple tasks in LOGO, it appeared that she understood the use of commands to complete parts of the figure in a task. This was observed numerous times as she responded to the researcher's questions about her expectations of what would be on the computer screen. The researcher would ask before she permitted her to hit the return key. In

addition, the subject demonstrated being able to work with the right angle even though she did not have the concept of degrees. She did not always have the word language to ask questions or explain what she was doing. However, as she was encouraged to continue the task, she would fingerspell possibilities and pause as if she were thinking. This would appear to indicate she was making decisions based on however she was handling the language or thought. She began to acquire some skill in the use of the commands presented even though she could not always express her plans in words. She would move her body or hands to indicate her thinking and plans for the next step. She would express being right or wrong at times. So, it does appear that she was learning the language needed for LOGO.

Further, Papert (1980) stated that LOGO provided the opportunity to think about thinking. The subject appeared to support this notion as she developed her strategies to achieve the desired figure or diagram. The possibility exists that once this skill is developed in one setting or subject matter, it may broaden the opportunity to apply it to other areas.

It was not observed that the subject asked for less help as the study progressed as proposed by Papert. However, this would not be expected since there was new information for the subject in every session, and the time for this case study was limited. It can be noted that when the subject had success she was able to praise herself. She did not demonstrate many attempts to experiment, but it would be difficult to say what she might do with this area if more time were

available. She may have performed differently if another subject had been used in the study. Learning from the interactions and questions of peers often occurs.

Even though both the subject and the researcher were deaf, there were cultural differences between them. In spite of the fact that they were acquainted prior to this study, these differences may have influenced the outcome of the study.

This study was conducted in informal settings and the instruction was presented in an informal, almost conversational, manner. The very fact that more than one setting had to be used may have been a deterrent to accomplishing more during the sessions. However, since the subject was familiar with the surroundings, this is not seen as a major problem. Related to this is the problem of others in the area. The subject was distracted by interruptions and the observation window in one of the settings.

Conclusions

J. S. Bruner (Papert, 1980) stated that knowledge can be represented in actions, images, and symbols. If this is true, then LOGO provides a teaching tool to develop all three areas. In this study, the subject had the opportunity to move her whole body for physical action and to try different commands for mental action. It is difficult to determine the extent that images were used. But, as the subject was observed during the study, it appeared that she used some images to help

her make decisions about the command to use. This conclusion is reached as a result of the limits of vocabulary this subject had. The symbols of the LOGO program became meaningful to this subject. The output on the computer confirmed that she was using them in a meaningful way. She was aware when the desired results were achieved.

This researcher concluded that based on the above concept of knowledge, the subject did indeed obtain knowledge and began to program in LOGO. She was able to input her own commands to achieve results. She was able to determine if the results obtained were the ones she desired. Therefore, this researcher concluded that the subject was developing some logical thinking skills as she made decisions as to which commands she would use to draw desired diagrams and figures. In addition, this subject appeared to be using logical thinking as she input certain series of commands and expressed the expected outcome before she observed it on the computer screen.

The use of these three components of knowledge should be applied to help deaf students become self directed learners. In addition, deaf students need to use their mistakes to develop more strategies in their self directed learning. Papert (1980) stated that the concepts of error and mistake have been taught with negative connotations in the school setting. The use of LOGO by an encouraging teacher in the school setting could begin to change the negative concepts associated with mistakes. The students could be taught to view the mistakes as undesired outcomes that can be changed if the input is altered. The use

of LOGO would give the students the opportunity to direct their own learning.

Based on the amount of encouragement given to the subject to continue some tasks, this researcher concluded that this subject did not approach LOGO with the eagerness that Papert predicted students would. Further support for this notion is the subjects multiple requests for help when she was assigned independent tasks or when she was deciding commands for diagrams or figures that she wanted to draw. It is not possible to determine from this study if there would be less of these behaviors and more independent trial and error on the part of the subject if the study had taken place for a longer time. The newness of the information in the limited time of this study may have produced these behaviors and they may not exist in a longer study.

This researcher concluded that certain prerequisite skills on the part of the subject would have enhanced her achievement during LOGO sessions. For the activities used in this study, the prerequisite skills needed are: (1) an agreement on the signs used, (2) an understanding of the shapes, compass and degrees, and (3) familiarity with the computer keyboard. The deaf student's use of a TDD, Telecommunications Device for the Deaf, would certainly aid in her becoming familiar with the keyboard. However, there are some differences in the placement of letters and symbols in the TDD and computer keyboards. These same prerequisites may not be needed for LOGO work with younger children. LOGO may be used to instruct them in the areas of these prerequisites.

Implications

It appears to this researcher that this deaf student is very dependent on her teacher's responses. Throughout the transcriptions of the sessions, her attempts to have me become involved or to direct her next movement are noted. Personal experience with deaf students suggests to me that many deaf students behave in a similar fashion in problem solving situations. They have had little opportunity to think why their responses are right or wrong and they are limited in their ability to give explanations. Use of LOGO in the classrooms might provide more opportunity for the deaf students to think and to solve problems on their own. It might help them to develop self directed learning and an internal praise system that operates when they have solved a problem.

Furthermore, the use of LOGO in the classroom would allow the student to work, to see errors, to begin to understand why the errors were made, and to fix the errors. The student could do this without criticism from the teacher. In order for this to happen, the teacher would have to provide an encouraging environment, expect the student to achieve, and develop positive attitudes about use of computers and current technology.

Suggestions for Future Research

This researcher would like the opportunity to continue this research. A better design would include longer periods of time for each session, more sessions per week, and more sessions for the total study as the use of sign language slows down the session.

The setting needs to be carefully chosen to avoid distractions and interruptions. The room needs to be of a size to permit movement to act out the LOGO commands.

The LOGO study could be done with different groups of deaf students to derive more information about how these students learn and how they learn to think. Mainstreamed and institutionalized or signing and oral groups could be used. A pair of students might be studied at the same time.

This researcher completed a practicum using LOGO with another deaf student after completing this case study. There were differences noted in the ways the students worked, and there were differences in the communication between subject and researcher. This researcher would suggest the use of a larger sampling of deaf students to determine possible causes for the differences and possible discoveries about the learning and thinking patterns of these students. Such a study would aid in determining the most effective signs to use in presenting the LOGO commands.

It would be helpful if a laminated turtle-like device were used in the research. The base of this triangle representing the turtle needs

to be marked to aid the identification of the vertex that represents the nose so that subjects not familiar with a LOGO turtle can see the turtle's nose more easily. Further research might include more practice with such a device to learn the LOGO commands. This practice might include the subject acting in the role of the teacher and giving the commands.

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LIST OF REFERENCES

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APPENDIXES

APPENDIX A

CONSENT FORMS

PARENT'S PERMISSION
FOR RESEARCH PARTICIPATION

For my master's thesis, I am writing a description of how a deaf student learns LOGO, a computer logic program. For this project I would like to work with Amanda Smith for six 30 minute LOGO and interview sessions after school; ask her to keep a journal; and ask her to complete a Revised Math Attitude Scale before and after the LOGO sessions. Since the sessions will be conducted in sign language, a video record of the sessions is necessary for accurate data recording. All data will be kept in a locked filing cabinet in Dr. Kathleen Warden's office (Claxton Addition 123) at the University of Tennessee, Knoxville. Only Dr. Warden and Ms. McDaniel will have access to the data.

Amanda's participation in this research is voluntary. Refusal to participate will involve no penalty. She may discontinue participation at any time. Your signature on this form will constitute legal agreement for Amanda's participation.

Amanda's mother

Date

Amy R. McDaniel
Director of Project

* Director and Co-Director may be reached at 123 Claxton Addition, 974-2321.

Kathleen Warden, Ph.D.
Co-director

INFORMED CONSENT FOR SUBJECT *

The purpose of this project is to learn more about how a hearing impaired person learns to use a computer environment called LOGO. We expect to work with you for no more than 6 hours total time in a tutor-like session using a micro computer. The sessions will be videotaped for analysis of the conversations that take place during the tutoring sessions. The use of videotape is required because the conversation will occur in sign language. You will be asked to keep a journal about this experience and asked to complete a Math interest inventory before and after the project.

We foresee no risks to you because the tutoring sessions are not substantially different from usual school practices. An expected benefit is that you will learn to use LOGO.

All records and data will be kept in a locked filing cabinet in the co-director's office (Claxton Addition 123) on the UT campus. Only the director and co-director of the project will see the data.

Your participation in this research is voluntary. Refusal to participate will involve no penalty, and you may discontinue participation at any time.

Subject

Date

Amy R. McDaniel
Director of Research Project

* Director and Co-Director may be reached at 123 Claxton Addition, 974-2321.

Kathleen Warden, Ph.D.
Co-director

* Because the subject is deaf, I will explain this form in sign language and answer any questions.



TENNESSEE SCHOOL FOR THE DEAF
and
EDUCATIONAL RESOURCE CENTER FOR THE HEARING IMPAIRED
2725 Island Home Blvd.
Knoxville, Tennessee 37920

February 13, 1990

TO WHOM IT MAY CONCERN:

Dr. Kathleen Warden and Miss Amy McDaniel have permission to conduct a research project on determining how a deaf student learns to use LOGO. Dr. Warden and Miss McDaniel have permission to use the facilities, video equipment and computer labs at the Tennessee School for the Deaf.

Sincerely,

Elaine Alexander

Elaine Alexander, M.S.
Director of Instruction

cc: Student file

APPENDIX B

MATH ATTITUDE SCALES AND COMMENTS
ON SUBJECT'S RESPONSES

TOMA STUDENT BOOKLET

Student's Name _____

Teacher _____

TOMA Subtest 1. Attitude toward Math (AT)

Note to Examiners: These sentences may be read to the students, allowing time for marking the appropriate boxes. Be sure that students mark the box that goes with the sentence. Emphasize that there are no right or wrong answers, and that students should be honest in describing how they feel.

Agree Don't Dis-
 Know agree

(Ex.) ☐ A ☐ ? ☐ D Ex. Spelling is easy for me.

(Ex.) ☐ A ☐ ? ☐ D Ex. I am good at video games.

(1) ☐ A ☐ ? ☐ D 1. It is fun to work math problems.

(2) ☐ A ☐ ? ☐ D 2. It is important to take math every year until you are out of school.

(3) ☐ A ☐ ? ☐ D 3. If I could skip just one class, it would be math.

(4) ☐ A ☐ ? ☐ D 4. Most of my friends are better at math than I am.

(5) ☐ A ☐ ? ☐ D 5. Most people who work need to know something about math for their jobs.

(6) ☐ A ☐ ? ☐ D 6. Math is tiresome and boring.

(7) ☐ A ☐ ? ☐ D 7. I'd rather do math than any other kind of homework.

(8) ☐ A ☐ ? ☐ D 8. Math is my favorite class in school.

(9) ☐ A ☐ ? ☐ D 9. Someone who likes math is usually weird.

(10) ☐ A ☐ ? ☐ D 10. I like to do math number problems, but I don't like to read or talk about them.

(11) ☐ A ☐ ? ☐ D 11. People who have a calculator or a computer don't need to learn so much about math.

(12) ☐ A ☐ ? ☐ D 12. We learn about math in school, but don't often use it outside of school.

(13) ☐ A ☐ ? ☐ D 13. I don't know why we have to study so much about math in our school.

(14) ☐ A ☐ ? ☐ D 14. I already know as much as I need to know about math.

(15) ☐ A ☐ ? ☐ D 15. I have always liked math.

_____ = Raw Score

1.

Aiken, L. R., Jr. (1963). Personality correlates of attitude toward mathematics. Journal of Educational Research, 56(9), 476-480.

AIKEN

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TABLE I

REVISED MATH ATTITUDE SCALE

Directions: Please write your name in the upper right hand corner. Each of the statements on this opinionnaire expresses a feeling which a particular person has toward mathematics. You are to express, on a five-point scale, the extent of agreement between the feeling expressed in each statement and your own personal feeling. The five points are: Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), Strongly Agree (SA). You are to encircle the letter(s) which best indicates how closely you agree or disagree with the feeling expressed in each statement AS IT CONCERNS YOU.

1. I am always under a terrible strain in a math class.	SD	D	U	A	SA
2. I do not like mathematics, and it scares me to have to take it.	SD	D	U	A	SA
3. Mathematics is very interesting to me, and I enjoy math courses.	SD	D	U	A	SA
4. Mathematics is fascinating and fun.	SD	D	U	A	SA
5. Mathematics makes me feel secure, and at the same time it is stimulating.	SD	D	U	A	SA
6. My mind goes blank, and I am unable to think clearly when working math.	SD	D	U	A	SA
7. I feel a sense of insecurity when attempting mathematics.	SD	D	U	A	SA
8. Mathematics makes me feel uncomfortable, restless, irritable, and impatient.	SD	D	U	A	SA
9. The feeling that I have toward mathematics is a good feeling.	SD	D	U	A	SA
10. Mathematics makes me feel as though I'm lost in a jungle of numbers and can't find my way out.	SD	D	U	A	SA
11. Mathematics is something which I enjoy a great deal.	SD	D	U	A	SA
12. When I hear the word math, I have a feeling of dislike.	SD	D	U	A	SA
13. I approach math with a feeling of hesitation, resulting from a fear of not being able to do math.	SD	D	U	A	SA
14. I really like mathematics.	SD	D	U	A	SA
15. Mathematics is a course in school which I have always enjoyed studying.	SD	D	U	A	SA
16. It makes me nervous to even think about having to do a math problem.	SD	D	U	A	SA
17. I have never liked math, and it is my most dreaded subject.	SD	D	U	A	SA
18. I am happier in a math class than in any other class.	SD	D	U	A	SA
19. I feel at ease in mathematics, and I like it very much.	SD	D	U	A	SA
20. I feel a definite positive reaction to mathematics; it's enjoyable.	SD	D	U	A	SA

TOMA INVENTORY

Taken on Februray 7, 1990

- Item 1 - I was curious why the subject marked "agree" as an answer because she complained about working on the math problems, such as measurment. Maybe she meant that she likes to do math when not assigned.
- Item 2 - The subject understood it very clearly and explained the reasons to take math; such jobs like cashier, and to be able to balance a checkbook. Amanda was aware of why we use math in the real world. (I recalled that our trip to grocery store last summer might have helped her gain some insights into using money.
- Item 3 - The subject didn't understand the word, "skip." I explained the meaning and tried to give her some examples.
- Item 4 - The subject defintely understood it, because she mentioned that her friends do math better than she does.
- Item 5 - It was clear to me that she had no problem understanding this item, even though this sentence has the relative clause.
- Item 6 - The subject did ask me what "tiresome" is and I mentioned that it's like "tired." I signed the whole sentence before she marked the answer.
- Item 7 - The subject didn't read this one seriously, but she might have thought she understood it.
- Item 8 - No comments.
- Item 9 - The word, "weird," puzzled the subject and she asked me for a better meaning. I signed "weird" I am sure that she had seen this sign before. I believe that she interpreted the item to mean that math is weird. I cannot judge the validity of this answer.
- Item 10 - She does like to do math problems. She mentioned that she doesn't like to read them, but likes to talk about them.

- Item 11 - It was first time that the subject marked the answer as don't know. It probably was due to the complex sentence in this item. She asked me what a calculator is.
- Item 12 - Amanda did understand the first sentence, but not the second sentence. She might understand the second section if it were written like this: "We don't often use math after school hours."
- Item 13 - I believe that Amanda does understand why she has to study math in her school because she told me that it is so important for her to study math to a living in future jobs.
- Item 14 - Amanda mentioned that she needs to learn more in math, and that she wants to learn new math problems. She is bored with the math review in her class. The answer may not be what the subject intended
- Item 15 - I believe Amanda dislikes math at present because her math class has been review for six months. She has been complaining about it and is tired of waiting for new material to be presented. [This past summer she had practiced addition and subtraction problems, and learned multiplication. After learning multiplication (1 thru 9) the subject asked to learn division and begged me to teach her this concept. I briefly explained to her that she must learn more in multiplication before going on to learn division. She understood and probably was expecting to learn division during this school year.]

REVISED MATH ATTITUDE SCALE INVENTORY (ATM)

Taken on February 7, 1990

- Item 1 - The subject read the sentence word by word and asked me what "strain" is. I said, "I am always under 'pressure'(with a heavy facial expression) in math class. I feel pressure to work in math class." She responded, "yes." Then, I said mark the answer either agree or strongly agree.
- Item 2 - The subject did not understand the second sentence. I said, "I do not like math and it scares me to take math." She paused to think, trying to figure out what I had signed. I would have said, "You do not like math. Are you scared to take math?" She would have responded quicker. Anyway, she disagreed that she was scared to take math.
- Item 3 - Amanda asked me what "interesting" is. I signed "interest." Then, she read the second sentence and she nodded negatively. She immediately marked the answer as disagree, even though she is interested in learning more math.
- Item 4 - There is an error in this sentence. The word, "if," should be "is." It amazed me that this subject marked the answer as agree, but she first marked it as strongly agree.
- Item 5 - The word, "secure," is obviously unknown to Amanda, but she declined to ask me for a better definition. Not only that, she was probably having trouble understanding the second part of the sentence which made no sense to her. I think she realized that the inventory was getting harder to understand and was taking more of our times. It is my assumption that she wanted to hurry up and finish this attitude test so that we could begin to work on the computer.
- Item 6 thru
 Item 13 The sentences in these items are getting more complex for Amanda. She knew that this inventory was not a graded test, and she probably said to herself "why not guess the answer."
- Item 14 - This sentence is a simple one. I am sure it is no problem for her to understand. She answered agree.

- Item 15 - I am not quite sure about this one, because this statement has a clause in it. It seemed to me that the subject knew that math courses can be taught in school, at home, or at other place. She can enjoy studying a math course anywhere, it does not have to be in school. She may not have paid attention to the statement because she was tired of reading long and complex sentences.
- Item 16 - Amanda can't be nervous thinking about doing math problems, because she tells me that she wants to do new math problems.
- Item 17 - The reason Amanda puts "U" as an answer is because she did not understand the two sentences.
- Item 18 - Amanda understood this sentence. She said to me that she was unhappy being in her regular math class right now.
- Item 19 - The subject didn't understand this one because of the word in, "ease."
- Item 20 - This subject may feel a postitive toward math, but she might have a negative attitude about work in her classroom because she is fed up with it.

APPENDIX C

TRANSCRIPTS OF LOGO SESSIONS

There are several conventions that have been adopted in the description of the LOGO sessions. They are as follows:

1. Words like "tell", "explain", "ask", that is, verbs that imply speaking, are used in these descriptions to mean communicate by sign language with voice.
2. Words that are spelled with hyphens in the text indicate that the word was fingerspelled. For example, s-o-m-e, indicates that the word "some" was fingerspelled.

FIRST LOGO SESSION

February 7, 1990

FIRST 5 MINUTES

I, using sign language, explained the consent form to Amanda, the subject, so that she would understand that I needed her permission to proceed with the study and her signature to that effect. The subject asked, "What does the subject mean?" Then, I simply defined it and gave some examples. The subject began to sign as she read. I said, "Don't sign. Just read. If you don't understand the words, ask me." As Amanda read the form by herself, she did ask me to explain six words: subject, tutor-like, session, videotape, substantially, and voluntary. After she finished reading, I briefly went over the form and explained the reason why we were using the videotape. I told her about writing the journal after each LOGO session. The subject immediately signed "easy" and smiled. I interpreted this to mean she thought it would be easy to write a journal. I explained that she would take the math attitude tests before and after the LOGO sessions. Amanda signed that she learned measurement in math and that it was hard (used a severe facial expression which means so hard). I signed to her that she was volunteering to participate in these LOGO sessions and she could quit anytime. I explained that she would not be punished for quitting. Amanda signed "join in" with puffed facial expression. I interpreted this to mean "I will stay and not quit until the LOGO sessions are over."

SECOND 5 MINUTES

When Amanda finished signing her name on the content form, I told her to sign her last name. She was confused about that sign. So, I fingerspelled her last name S-M-I-T-H. I reminded her to make the first letter a capital. Next, I explained the TOMA test (Math attitude test--See Appendix B for a copy of this test) and gave examples of items: Yes, I like math. No, I don't like math. Amanda responded "average" probably meaning that she likes math so-so. I told her to go thru items 1-15. As I handled the test to her, she signed "help me." I responded "I will help you, but first you try to read. If you don't understand, I will explain it to you." I again explained the meaning of the response symbols: A, agree; ?, don't know; and D, disagree. Amanda pointed to the word skip and her facial expression indicated a question. I gave her examples, but it seemed to me that she didn't really understand even though she marked the answer. Again, I explained, "Disagree means no. Agree means yes. Disagree means no or I don't believe that or that is not for me." The subject erased her answer. I had to remind her that "D" means disagree and at the same time she signed "opposite agree" as I signed "D-I-S agree." In item number

4, she mentioned that her friends do better in math than she does sometimes--not always. I told her to mark "A--means yes." Amanda told me why on the next item, and explained to me that when you grow up, you need to know how to do the balance your checkbook. She pointed to the word, "tiresome," and wrinkled her nose indicating that she did not understand the word. She noticed "tire." I signed "tired" and fingerspelled S-O-M-E, and then, signed the whole sentence in item 6: Math is tiresome and boring. She signed "grade," and I signed "no grade, J-U-S-T fun."

Researcher's Impressions: Amanda did not understand the Math Attitude Scale, and the TOMA. She is probably unfamiliar with a test format which requires reading a statement, and then having to process whether or not she personally agrees or disagrees. She seemed to be confused by the fact that there was no "right answer." In light of this, I decided to eliminate any lengthy discussion of the TOMA as it measures Amanda's attitude toward math because the instrument's validity is questionable with regard to this subject. On the item number 7, Amanda did not appear to seriously read the sentence, but she just glanced at it and marked the answer as "A." I reminded her that if she do not understand to please feel free to ask me. She replied, "I know."

THIRD 5 MINUTES

Amanda immediately answered number 8. She asked about number 9: Someone who is weird likes math. I attempted to simplify the sentence and give her the meaning: Someone likes math and he is weird. She told me that was not always true. She asked me what does "?" stand for, and I told her that it means that you don't know or you are not sure. She marked A for the answer. While she was reading item number 10, her head moved indicating that she meant "so-so." I got her attention and asked her if she liked to do math numbers like addition, subtraction, division, and multiplication, but she did not like to read problems or talk about them. Amanda said that she liked to talk about them but not read them. Amanda was about tired of reading the sentences and appeared fed up while trying to read the sentence in item number 11. She asked me what a calculator is. I responded it is a device for computing. She moved her pencil word by word while reading the sentences in items 12 through 15. By watching her read, it gave me the impression that she was not really concentrating. She started messing up by marking the answers on wrong place. I had to move the disk drive on the computer table so she could have more room and be more comfortable. Amanda told me that she knew why she has to study so much in math according to item number 13 and explained that you must understand how to use math because when one grows up, one has to know how to balance a checkbook. Then, she stopped explaining and said, "I don't know." After she finished the test, I asked her if she wanted to look at it one more time and check to see if you want to made any changes. Her facial expression told me

that she didn't want to. I told her thank you and that we had to do one more test. I put the TOMA and got the ATM out. I explained to her that the new test was almost the same as the other, but it was a little different. I went over the possible responses: strongly, disagree, SD; disagree, D; undecided, U; agree, A; and strongly agree, SA. I told Amanda that U meant not decided--almost the same as "I don't know."--like on the other test she took. I intended to make the meaning of strongly agree clearer by saying, "Yes I agree." while using a heavy facial expression. While Amanda read the sentence in item 1, she moved her pencil along word by the word and signed, "Sometimes? Where, sometimes?" as she looked for it in the answers to be marked. I told her that sometimes was not a choice. She then asked me for the meaning of strain. I explained, "I am always under pressure (using a very heavy facial expression) in math class and I can feel pressure to do some work in math class. She immediately said, "Yes!" and she marked the answer as SA. Amanda's facial expression indicated to me that she was not sure that she understood the sentence in item number 2. I told her "If I do not like math and scared me to take math." Amanda paused for a few seconds and then moved her head in a negative way. I asked, "Does that mean you are saying no? Then, mark SD or D." She immediately marked D in item 3. She appeared to understand the sentence and shook her head in disagreement.

FOURTH 5 MINUTES

I had to remind Amanda of the meaning of SA. She declined to ask me for any more help and completed next 16 items as if she were not thinking. After she finished the test, I asked her, "Do you want to read it again?" Her facial expression seemed to mean, "Nah, nah. I don't need to." I asked her if she were really sure and she said, "No thanks." As I put the test away, she tapped my shoulder to get my attention and told me that she wants us to start the computer now. I said, "Oh, yes!" Amanda appeared thrilled and moved her chair closer to the computer table. I told her please to move the chair back a little so both of us could be seen in the videotape. I told her that I would show two or three examples as I took my diskette out of the jacket. She asked me if the videotape was really recording, and I said, "Of course. Nothing is wrong. So, no need for us to be worried about it." I waved my hand toward to the camcorder and Amanda laughed. I told Amanda that I did my L-O-G-O work in a class that I took three years ago and I am happy to show her two or three examples so she can see what LOGO looks like. I also told her to be patient while I put the DOS disk into the disk drive. I removed this disk after the computer was booted. I rebooted with the LOGO disk. We were nervously waiting because there was some trouble in the disk drive and I couldn't see why it had been making a noise. The red light on the disk drive had been on for a long period. Finally, it worked. I typed, "CATALOG" and hit the return key so I could look up the file name. Amanda was

fingerspelling to me, C-A-T-A-L-O-G-O and I fingerspelled back to her, L-O-G-O without realized she had not understood the work catalog. Amanda appeared so thrilled and could not wait to type something on the keyboard, but I told her, "Not yet."

FIFTH 5 MINUTES

I was about to panic because the red light on the disk drive was still on and I said, "Hope it will work or I'll be in trouble." Amanda told me that she can look at the disk drive and check to see what is going on. I refused to let her do that. I told her that we might have to move to another computer because this is not working right. She mentioned we could use that computer over there or that one. We were waiting for the red light to go off and we were trying to relax. Boy, it took so long that Amanda was playing and signing toward the camcorder, "Hi, Amy." I finally said that we needed to do something. Amanda told me to reboot again. I responded to her that I didn't know what to do. I decided to turn the computer off and to open the disk drive. I was trying to get my diskette out of this disk drive and Amanda asked me what is wrong. I tried to calm myself and I laughed. I told Amanda that the disk was stuck in the disk drive. I wondered why it was stuck. I decided to close the disk drive and turn the computer on. I said, "I can't believe this has happened." I told Amanda we were doing fine as I pretended nothing was wrong. I turned the camcorder off because we were going to use another computer and the camcorder was out of our way. I put another disk in the disk drive and it worked quickly and beautifully. We saw a LOGO example, a star. Amanda opened another disk drive without asking me and tried to get my diskette out. I tried to get her attention, but I was too late. Guess what? She got my diskette out of it. I almost fainted! Not really! I wondered how she got it out of the drive. More than that, I was much relieved that she did not destroy my diskette or the computer. My diskette was kind of bend and I questioned Amanda how to get it out of this drive. She explained that the disk was not straight, and it was sticking on the top of the disk inside. I turned the camcorder back on. We did try another diskette in the same computer. I was cheering as the red light on the disk went off, but nothing appeared on the screen. I put my thumb to my mouth as I was thinking, "Not again, please do not do it to us." I then began feeling so embarrassed and nervously laughed. Again, the red light went off and I clapped. Meanwhile, I asked Amanda if she remember seeing the example on the other computer and if she thought it was pretty. Her facial expression indicated to me that she agreed. I asked her if that was interesting and her head moved as if she meant yes. I showed her another example. I then asked her to see if she has seen it before. Her head moved in a negative way and I said "No?" I told her that I would teach her how to use it later and would show her more examples later. I told her we would type something on the

computer on Wednesday, because we did not have enough time left today due to the computer trouble. Amanda told me that she could type fast, but she wants to learn how to type faster. I laughed because I thought it was so cute! I replied, "Practice makes perfect." I looked at the disk drive and Amanda tried to type on the keyboard, but luckily I stopped her.

SIXTH 5 MINUTES

I got Amanda a notebook to write the journal and gave it to her. She fingerspelled J-O-U-R-N-A-L before I told her that it was for journal. I told her just write what you have learned today and how you felt. Amanda asked me if she was just to write a paragraph, and I said, "It doesn't matter. 1, 2, or 3 sentences. Fine. 10 sentences, fine. Just write what you have been feeling." She said, "I and...me and Amy have problems." I told her to write it down on the paper. She responded, "Me?" I encouragingly said, "Just write. Don't ask me, and don't worry about the grammar. Just feel free and relax." Amanda wrote several sentences and paused. She asked me if she needed to write more. My facial expression was probably telling her that she better know that she can write more. As she continued to write, I told her to put the notebook on the computer table rather than on her lap so she could be more comfortable. She replied, "Don't worry. I am doing fine." Amanda was trying to spell a word. She quit as she signed it several times, then fingerspelled Q...,Q-U..., again signed the word quit and finally spelled Q-U-I-T. I watched her struggling to spell the word quit and immediately praised her. Amanda was continuing to write. I misunderstood when she asked me to spell computer because I thought she was signing paper. She then fingerspelled C-O-M-L-P and I correctly spelled C-O-M-P-U-T-E-R. She asked me if I had a problem with what word she meant. I thought she wanted me to spell another word. She said, "Do you understand this word?" I replied, "I do know what you mean. Don't worry." She handed me her journal as she grinned at me. I asked her if she had really finished, and her head moved in a positive way. I told her that she may leave to go back to the cottage.

SECOND LOGO SESSION

February 9, 1990

FIRST 5 MINUTES

I asked Amanda if she remembered what happened two days ago when we had some trouble with the computer. I was anxious to show her an example of the graphics I made three years ago. Amanda smiled and seemed excited. I typed the procedure, STAR, and a star appeared on the computer screen. Amanda looked so amazed and questioned how it worked. She was really in a hurry to try something herself. She asked me to show her an example of a square. I typed CS to clear the screen and looked up the filename for the procedure to draw the shape called square. While loading the filename, Amanda tried to type on the keyboard and I told her, "Not yet." After the file loaded, I let her type SQ and hit the return key. The drawing of a square appeared on the screen. I then changed the diskette. I had already explained to her that we needed to exchange the diskettes so she can have her own diskette. As I put my diskette away, Amanda tried to type, but quickly reminded herself that she could not do anything on the keyboard until I said so. It seemed that she could not wait to get started! After I put her diskette into the disk drive, I told her that the little thing on the screen was called a T-U-R-T-L-E. I told her to look at the triangle and to sign the word, turtle. Again, I fingerspelled T-U-R-T-L-E. Amanda smiled. She appeared to think it's neat. I told her that I know it is cute and smiled. After getting my LOGO book, I told her that the first thing we needed to go over was on page 16 in this book. I said, "I want you to understand how to print letters, sentences, or whatever you want." I said that it was just for fun and I just wanted to show her something new. After that, I told her to type PRINT [HELLO]. While she was trying to find the [, I helped her. I reminded myself that the computer keyboard was not the same as the TDD, Telecommunications Device for the Deaf. She typed HELLO and signed, "Stupid me." I saw her signing and told her she was not stupid. I reminded her that she was just learning. Then, I typed the] for her. I discussed with her what <RETURN> meant. I said, "Whenever we see this command, it means to hit the return key." After Amanda hit the return key, LOGO responded: HELLO. I told her that it was saying hello. She started to type but I stopped her. I asked her to type PRINT [GOOD MORNING]. While she was typing, I signed to her to use brackets and then type GOOD MORNING. She had to look at the book for the spelling of morning. While looking at the book, she spelled M-O-R-N then I moved the book from my lap to the computer table to save her neck pain. She typed MORNING. During her typing, she was saying that she was dumb and I told her that she was NOT, and she was doing fine.

SECOND 5 MINUTES

I typed MORNING] because there was no space between GOOD and MORNING. I hit the return key. LOGO responded, "GOOD MORNING (? on second line)." Amanda appeared to think it was neat. I discussed that we needed to see the difference between the two commands, PRINT and TYPE. I had her type the next input straight from the book and she started typing T and had to look at the book to type the rest of the input. The input was: TYPE [GOOD MORNING]. I helped her find and type] and told her to hit the return key. LOGO responded, "GOOD MORNING?" I asked Amanda to notice the difference between these two responses and explained to her that the first response had no question mark on the same line after good morning. It was on the second line. The second response had a question mark on the same line right after the g in morning. This was because the command TYPE puts the ? right after the last letter and the other command PRINT does not do that. I asked her if she saw the difference. Her head moved in a positive way. Then, I asked her to type just like the one from the book: TYPE [GOOD MORNING?]. Amanda typed this command. She looked for a ? on the keyboard. I helped her hit the shift key and press the ? key at the same time and told her to press the return key. LOGO responded: GOOD MORNING?? She said, "I know." Then, I asked her if she noticed the two question marks and I explained to her that they were due to the question mark typed inside the bracket, not outside I said, "Let's try this one." The input was: PRINT [HELLO] PRINT [GOOD MORNING]. Amanda asked me if it was a different one. She typed it and pressed the return key. LOGO responded with HELLO on the first line and GOOD MORNING? on the second line. Amanda noticed the print on both lines (even though she had typed the commands on one line). She smiled and told me that she understood. At this point, Amanda told me that her DHS caseworker had told her that if she wanted to move into her foster home, and not live in a cottage anymore, she could move out of the cottage where she lived during the week. I said, "Wow!" She told me that she liked living in the big house where she stays on the weekends. She had her own room. I said, "That is so nice." Then, I told her to look at the book and type this command: [HELLO] TYPE [GOOD MORNING]. She typed it as she looked at the book.

THIRD 5 MINUTES

Amanda typed the input and hit the return key. LOGO responded: HELLO GOOD MORNING. She signed what was on the screen and said, "Oh, I see." She appeared to think it was neat. I gently patted her upper arm to get her attention and told her, "If you want to see the other input on the screen, use the control key and the T key at the same time." This would show all the input she recently typed. Amanda tried to press CTRL-T, but she did not hold both keys at the same time and I told her not to press them at different

times. She responded, "Oh, I understand." and spaced it. I said, "No!" and helped her put both her fingers on both keys and hit them at the same time. I told her that using the PRINT command separates the LOGO responses into the two different lines, but the TYPE command does not. As she swung her legs while sitting in the chair, Amanda said, "I understand." I said, "Let's do this one on page 19: PRINT [PRINT]. She typed in and pressed the return key. LOGO responded: PRINT on the first line and ? on the second line. After she studied the LOGO response, I explained that it printed PRINT because it was inside the brackets and anything inside the brackets can be printed. Amanda typed the next command: PRINT "HELLO. I helped her find a " and explained how to press the shift key and the " by holding both keys at the same time. After she pressed the return key, LOGO responded with HELLO on the first line and ? on the second line. Amanda signed, "Hello," opened her mouth, and then signed, "Oh I see." I explained that so far we had been using the brackets, but this time we used quotation marks instead. She then typed this statement: PRINT "HELLO" and pressed the return key. LOGO responded: HELLO" on the first line and ? on the second line. I told her to type the input like it was in the book: PRINT HELLO. I informed her that it was a little different from the other commands. After she pressed the return key LOGO responded: I DON'T KNOW HOW TO HELLO on the first line and ? on the second line. She signed the message and turned toward me with a facial expression that indicated she did not understand. I explained that happened because we did not use either brackets or the quotation marks. So, the computer I meant LOGO doesn't know/understand how to say HELLO or to print HELLO. I looked at the book for more examples, but I decided that we did not need to go through all the examples, because we had enough for Amanda to see what happened using the commands, PRINT and TYPE. I asked her if it were alright if we did not go through the other examples. She shook her head in a positive way. I told her that we can try new input that was different from the other because it had a math part. She typed the statement, PRINT 2 and hit the return key. LOGO responded with a 2. She saw that it printed 2, and I told her that this PRINT command does not need either brackets or quotation marks. The computer knows to print because there were no words in the command, just the number. She replied that she saw it. She was thrilled and wanted to try another one. I gave her another example from the book: 2 + 2. While she was typing the example, she looked for a plus sign to type. She signed, "I forgot." I helped her find it. I tried to prevent her hitting the return key, but it was too late. I had wanted to ask her what she expected the output to be. She responded, "Oops! I am sorry." I smiled and said, "It's okay." LOGO responded with a 4 on the first line and a question mark on the second line. I asked Amanda if she understood why it responded that way. She appeared excited and said it was an addition. I was shocked at the moment, because I had not expected her to answer that quickly. I said, "Right." She said, "It was so

easy." I was looking at the book when Amanda tapped my left arm and said, "2 + 2 is 4."

FOURTH 5 MINUTES

I asked Amanda to try another command from the book and she quickly shook her head, "yes. She typed `PRINT 34671 + (834 - 657) + 562`. I put the LOGO book back on the computer table right next to the monitor so Amanda could see it easier as she typed. I had to help her identify a + and tell her how to type it by holding the shift and + at the same time. I had to help her type the (). Amanda used her fingers to spell out the numbers, 8-3-4, and I helped her find the subtraction sign. Amanda typed the rest of the statement, but she left out the + between) and 562. I backspaced for her and told her that she needed to add the plus sign. She pressed the + key, but she did not press the shift key and the equal sign appeared. I gently signed, "No, you need to press both keys, shift and plus sign at the same time." She had to backspace and did it correctly that time after asking me if she were doing it the right way. After she retyped the number 562, she was allowed to hit the return key. LOGO responded with 35410 on the first line and a question mark on the second line. Amanda appeared to be amazed that the computer did the computation. I briefly explained to her that it added, subtracted, and decided not to explain how it worked the algebraic operation rule because it would be meaningless to her. She used her fingers to spell the numbers 3-5-4-1-0 as she copied the response from the screen. Her facial expression indicated that she thought it was unbelievable. I demonstrated another example from the book and asked Amanda what the response would be.

FIFTH 5 MINUTES

Amanda took some time to think and replied, "Hello + 2?" I told her that she could press the return key. She had signed almost the same thing as LOGO: `+ DOESN'T LIKE HELLO AS INPUT` on the first line and ? on the second line. Her facial expression indicated a question as her head turned toward me and she asked, "When did I get the same LOGO response? I reminded her that this command had the brackets just like the quotation marks. I briefly explained that the computer cannot say HELLO to add with 2. She said, "Math tells you...Oh, I see." I let her type `PRINT 2 -`. She signed it, typed it, and signed, "Where?" She was looking for the subtraction sign. I was going to help her but I paused, because I wanted her to find the keys herself. She signed, "Oh, I know." She found the shift and the keys. I allowed her to press the return key when she finished typing. Logo responded: `NOT ENOUGH INPUTS TO _`. Amanda responded to me as LOGO had responded. I explained that the input had asked for subtraction but there were not enough numbers in the input. She was distracted by a noise. It bothered her. She

thought someone was yelling. I looked around the computer room, but I did not see anything. Then, I said, "Oh, it must be you Telex that bothers you." She voiced, "YES!" I said, "Why don't you turn it off?" She said she could hear her teacher walking around the room. I told her just turn it off for me, please. After she turned it off, I told her not to worry about it. I asked her to type $2 + 2$. She said, "I know ...2 plus 2 equal 4." I just told her to do it on the computer. When she began to type, she asked me if she needed to type PRINT. I replied, "Right." I stopped her from entering the command. We saw the turtle appear on the screen. Then, I told her to type another command, CLEARSCREEN, and hit the return. I said, "Wonderful." I had her wait a minute as I looked at the book for the example I wanted to use. The examples have two commands on each line. I decided to let Amanda type one command at a time because I wanted her to see what the turtle did. As I tried to tell her to type FORWARD, but I had to pause to decide what sign to use. I did not want it to be confusing for Amanda. I signed forward by moving the B hand out from my face. She asked me to spell the word. I showed it to her in the book. She typed it and spelled it, F-O-R-W-A-R-D. She typed FORWARD, and I gave her the number 40 to type. We saw the turtle move 40 steps forward vertically. I showed her another command to be typed from the book: RIGHT. She typed it and input 90 before hitting the return key. The whole input was RIGHT 90. After Amanda typed it, I had her stop for a while. I spelled F-O-R-W-A-R-D and showed her what it meant by leaning my torso forward at the same time as my right finger moved horizontally forward and away from me. Amanda imitated me and I said, "Yes, good." I next explained what 40 meant. I grabbed the graph notebook. After I showed her the blocks on the grid, I told her that for squares, the blocks on the grid, we would use the word units. I noticed that I spelled it with an s on the end. Also, I told her that 40 meant 40 units. On the graph paper, Amanda watched me count units with my right finger and move up. The next task was to use both my hands with the palm orientation down and move step by step.

SIXTH 5 MINUTES

I told Amanda that the definition for the RIGHT command was to turn right. As I said this, I moved my right hand with the palm orientation vertical and turned 90 degrees right away from my body. I said to her, "90...Do you know what a degree is?" She replied by signing diploma. As I got out the protractor I said, "Well ... D-E-G-R-E-E is." Amanda had to lean her head toward me so she could see the protractor better. I pointed out the 90 on the protractor and I used my right hand to turn 90 degrees. I told her she could hit the return key. Her expression indicated that she thought it was neat. This was the first time she saw the turtle move vertically forward and then turn 90 degrees to the right. I

explained that the turtle went up the length of 40 and then turned 90 degrees to the right. As I communicated, I demonstrated this with my right hand. I asked her to type F-O-R-W-A-R-D 40. She asked if that were all. She typed it and waited. I had her answer me about what she thought the turtle would do. Her right hand moved backward horizontally. My left thumb copied Amanda a movement and I asked her if that was what she wanted to answer. Her head movement confirmed yes. I told her to hit the return key. After that, she smiled and I moved my right thumb horizontally forward to the side because the screen turtle had pointed its nose on the side to appear that it was going right. I instructed Amanda to type the next command, RIGHT 90. After she typed, she indicated that she thought it would go moving her thumb until she hit the screen. She said, "Oops! I am not supposed to touch the screen." I replied, "Right. We aren't supposed to touch the screen." I let her press the return key. Then, she said, "Its nose." She was watching the turtle turn 90 degrees to the right and the nose was pointing down. I slid back into the chair and pretended to drive. Then, I stood up and pretended I was driving in my car and signalling a right turn. I made a right with my body. I sat down on the chair and spelled F-O-R-W-A-R-D 40 letting her know that she needed to type it on the keyboard. While Amanda was typing, she said, "I know how to spell it," but she really signed it. She used both hands spelling F and moved them forward. I wondered if it were a school sign. I did not like it, but I did not mention anything about it. I asked her where would the turtle move. Her response was to move her right finger forward horizontally. I copied her motion with my right thumb. I indicated a question by my expression and she responded yes. I said okay and let her see the turtle move. Her right finger went down vertically as the turtle forwarded down. I slid back to the chair and said, "F-O-R-W-A-R-D goes down." I told her to try RIGHT 90. After she typed it, she communicated that the turtle turned right 90 degrees as her right finger pointed on the screen and turned at a right angle. I questioned her by imitating her movement. She nodded her head yes. She was then allowed to hit the return key. I hid my expression so as not to confirm that she was right. I was so excited, but I was able to keep my emotions from showing. She said, "I am right." I clapped and confirmed this. I told her we would try another input. The diagram looked like a table. So, I decided to tell her that. I asked her if she agreed. She had to turn her head to look at the screen and her facial expression indicated that she agreed. I then said that we wanted to make a square. I asked her what we would need to do in order to make a square. She quickly spelled F-O-R-W-A-R-D 40. Boy, that was fun and exciting! I told her to type the input and we would see what happened to the turtle. I reminded myself that I had not given her this input and it made me so happy. She asked for permission to hit the return key. I signaled yes. After she hit the key, I clapped and she signed, "Smart me." (This is ASL for "I am smart.")

I had not asked her where the turtle would move. I responded, "Yes, you are smart. Right." (The sign for right is the same as the one for correct and not to be confused with the command RIGHT.) We saw the diagram of the square. With her facial expression, Amanda indicated that she thought it was beautiful. Next, I told her that we needed to erase the screen by using a new command, CLEAR SCREEN. I told her to use a CS. I had to tap her right shoulder to get her attention and ask her to please wait until I said to type. I did not want to sound mean, but I had to remind her to wait even though she gets thrilled or excited. The actions may make her forget something. I explained the C-S was an abbreviation for CLEARSCREEN. After she typed it, she asked if she could hit the return key. I nodded yes. While she was depressing the key, she smiled at me. Next, I explained F-D as the abbreviation for FORWARD. Amanda just typed it. I did not comment since she was so excited. Then, I told her to wait and I instructed her to type 200. I was not thinking. This would make the turtle go out of bounds. She typed it. She sounded it out. I was not sure she could pronounce the words for the number though she may understand place value. I said yes. I was copying her in my mind. I questioned her as to what would happen with the turtle. She responded that she did not know and asked to hit the return. I told her to wait and give me a better answer. Immediately, she said, "I know." Her right finger moved vertically downward. I said, "Well. Okay. Go ahead and try it. Hit the return." I wanted to explain the FORWARD command to her, but I did not because I wanted her to learn to fix mistakes. My telling her would not help this. She saw the turtle go out of bounds. Apparently, she thought that was fine. You could see the turtle trail forward vertically, then it wrapped around and left a trail at the bottom of the screen because the input of 200 was too much. It made Amanda think it went backward vertically. Too bad. It was my fault. I gave her a bad example. She put her finger on her nose. I explained that the turtle did wrap by using the sign for go around because 200 was too much. It caused the turtle to go out of bounds. I asked her to type C-S. I thought and commented that we needed to see the turtle go backward. I spelled B-A-C-K-W-A-R-D. She smiled, typed it and turned her head expecting me to give her more input. I said space. She questioned "Space?" I helped her hit the spacebar.

SEVENTH 5 MINUTES

Next, I said the number 20, changed my mind and said 4, and then went back to 20. Amanda typed it and waited. I asked what she thought would happen. She said, "Like...the turtle will go up and then go back down." I attempted to get her attention. She said, "I can see you." She meant she could see me in the monitor. I said, "Okay. Fine. You hit the key." She signed fine and hit the return key. The LOGO response was: I DON'T KNOW HOW TO BACKWARD

on the first line and a question mark on the second line. I was puzzled, checked the spelling, and turned to the pages in the LOGO book to check the word. Amanda said "Cheating." and laughed. I said, "Something is wrong. I don't know." I typed BK 20 and returned. It worked. I was puzzled. B-A-C-K-W-A-R-D, maybe the spelling was wrong. I said, "Let's try again." It was entered. Boo! This was strange--possible a spelling problem. I said, BK is an abbreviation and F-D for F-O-R-W-A-R-D." I typed CS and cleared the screen. Then, I told her to try F-D. After she hit the return key, "NOT ENOUGH INPUTS" came on the screen. I typed FD 40. Amanda moved her hand up and then back down. I tapped Amanda on the arm. She said, "I can see you." She laughed. I smiled and said, "Well, please look at me. She turned to me. We briefly discussed FORWARD and the abbreviation FD. I moved my right hand forward horizontally and then I said, "Or." I moved my left hand backward horizontally. She moved her thumb backward. I gently said no and put the book on the chair. I said, "You think forward means straight?" I moved my right hand from my head. Amanda replied, "Dumb me." She moved her right hand. I continued, " But, when you go backward, the right thumb goes back, B-A-C-K." I moved the right finger backward and left thumb goes backward horizontally. I said, "Okay. Now see the turtle corner." I made the sides of an isosceles triangle with my two pointer fingers. When you see the point, it shows which way the turtle goes. She expressed disagreement and showed that the right thumb goes backward. I asked her, "What does forward mean?" She responded by demonstrating her right finger in vertical movement. I said, "Okay. So, do you think the turtle will go the same way?" She responded, "I think." I hit the return key. Amanda looked and turned her head toward me. I said, "Right! Now, type B-K 40." She did. I reminded her to space. She spaced and then typed 40. I said, "Wait, what do you think will happen?" She responded by moving her right finger up vertically. I inquired, "What does B-K mean?" She fingerspelled B-K. I replied, "Well, it is an abbreviation, a shortword for B-A-C-K-W-A-R-D." I indicated the motion of the command with my left thumb moving horizontally. Amanda twisted her hair, yawned, and nodded her head yes. I asked her to think about what happened. Quickly, she responded by moving her right thumb backward. I replied, "Okay, the turtle on the screen goes back." I moved my left thumb backward. Amanda shook her head no as she twisted her hair. I replied, "NO?" I smiled and hit the return key. Amanda looked. I said, "It goes back same place as before." She moved her right hand to her mouth and made an /oo/ sound. I said, "Let's stop here. But you need to write in your journal. Right?" She nodded yes. I placed pencil and paper by the computer on her left side. Amanda said, "Get it. How I feel?" I responded, "What you have learned. Something like that. Feel free." She said, "I know." She tapped my arm and asked, "It's fine if it's short?" I said, "Fine. Doesn't matter." Amanda wrote. I got paper, pressed CTRL-T, and wrote commands 26

through 41. Amanda tapped my hand and said, "Learned how to do cursive writing. I asked, "Do you want to see how it works on the computer? Or monitor? Wait a minute." Amanda fingerspelled C-R-E-A-T and said, "I don't know." I said, "Wait. Let me understand." Amanda fingerspelled C-R-E-A-U-T. I responded with C-R-E-A-T-U-R-E. She said, "Know color. Blue. Now that's" We were interrupted by Amanda's teacher. She asked me to go out of the room because she needed to discuss the matter with me in private. I said, "I have to go and let you write in your journal." Amanda continued to write. She tried to understand what her teacher was expressing. She gave Amanda the meaning of ground and told her that static electricity destroys the disks. She wrote and then told me she wanted to play with the computer. I told her, "Fine but not now. Just write in your journal." I left the room and got back after the discussion. She fingerspelled to herself as she wrote in the journal. She finished the journal and got up to leave.

THIRD LOGO SESSION

February 14, 1990

FIRST 5 MINUTES

Amanda started by saying that her hair was put up in a different way. I just told her that she looked fine. She complimented herself that her hair is pretty and asked me if I how to fix it. I answered no and said to her, "Let's talk about LOGO. I put the disk into a drive after taking the DOS disk out, and she asked me if it's hers. I said yes and had to get up to reach a notebook and pencil from the table behind us. I asked her if she remembered what we worked on last Friday. Her head moved upward indicating yes. I asked her, "What did you learn?" She answered, "I remember to learn how to use PRINT HELLO. Ugh. It's hard to explain." I said to her, "Well,...what about others?" Amanda did not say anything else. I said that we would review some today to see if you remember. I got a LOGO book and put it on the computer table by the computer on Amanda's left side. I told her, "The notebook is for you to use when drawing. If you don't understand something or you need some practice, you use it." I asked her please to type S-T. When Amanda was ready to type, she asked me if the camcorder can see her. I moved the computer to the side. She typed the command ST and hit the return key. I briefly discussed with her about the abbreviation of SHOWTURTLE (ST). Amanda then looked at the screen. Her facial expression showed me that she completely understood the meaning and the abbreviation of SHOWTURTLE. I asked her to see that the turtle was designed as the triangular device and she rapidly responded that she knows. I explained to her that the top of the corner means for the turtle itself to move that way. I got the LOGO book from the floor and asked her to determine if she remembered the command, R-T. Amanda paused. Her facial expression indicated that she did not. I next said that R-T means RIGHT. She asked me if that was a RIGHT and I spelled R-I-G-H-T and said again R-T is the abbreviation for it. I told her to type it. After typing it, she was told to press spacebar and was about hit the return key. I told her to wait and not to use it until I say so. Her facial expression indicated that she will try to obey me. Next, I gave her the number 45 to input. Her right hand turned to the left at 90 degrees. I pointed toward the keyboard and showed her to type 45 it. She turned to me and wanted to know if she were allowed to press the enter key. I picked up the pen and asked her if she did see the turtle turn 45 degrees to the right. Both hands together turned RT 45. I wrote the command she had input on the yellow sheet pad and she watched me. I asked her to type F-D. She signed, with her both hands which was shaped a F, FORWARD as they slid horizontally forward. I said, "Yup," and signed FORWARD as my right hand moved forward horizontally from my head into the air. I then stated F-D as a shortcut for FORWARD and

choose it for her to input. After inputting the command, she was told to FD 40. I asked her what does that mean. She said that she remembered and smiled. Her right hand turned RT 45 to the side and moved itself forward. I said, "Right it means that and goes 40 steps." Amanda asked me if she can press the return key. I said, "Yes, you may." After striking the key and seeing the turtle move 40 steps forward horizontally, she signed, "Me, right." I was concerned by her saying, but decided not to interpret the meaning of FORWARD 40 as my head was down, and said, "Right. good." She repeated showing her right hand turned RT 45 and said, "It goes up." I responded, "Right." After she was told to type RT 90, I picked up the pen to write down the commands. As she was typing the command I gave, she asked me how to spell right as she spelled R-F. I put the pen down on the computer table and said, "No." I spelled R-T. She quickly said, "I know," as her left hand rotated RT 45. She said, "It goes up." I told her to wait so I could get up and walk to the camcorder to check if her hands are being taped so I don't have to write down everything she typed. I quickly illustrated the meaning of RT 90 and asked her where the turtle would go. She pointed her finger on the screen as her left hand turned RT 45 and moved forward. I copied her hand movement.

SECOND 5 MINUTES

I asked her if that was what she wanted. She gave me a yes. I hit the return key. She signed, "Me, wrong." I told her that was alright as she are learning from mistakes, and that was fine. She laughed and I continued telling her not to worry about it and joined her laughter. I pointed out that RT 90 changes as my right finger turned 90 degrees right. After I typed C-S, I asked her to type all three lines from the prepared yellow sheet. They are: RT 45 FD 40 RT 90, FD 40 RT 90 FD 40, and RT 90 FD 40 RT 90. I was busy writing her functions down on the sheet, and Amanda was very quickly typing these commands and hitting the return key after each command until I was able to stop her after the fifth command, FD 40. I explained to her that she does not need to press the return key after each command. Just go ahead and type them all. After Amanda input the sixth command, RT 90, she pressed the spacebar. I said to her, "NO! NO! RETURN!" She said, "OK!" She finally typed the next four commands without hitting the return key. She made a mistake on the second to last command which was FD 90 instead of FD 40. She put both of her hands to cover her mouth when she saw the mistake and I informed her that she could backspace and fix it. She was ready to press the key after each line. Her facial expression, her mouth opened tiny and her eyes arose, showed me that she thought it was neat. I asked her what shape she saw. She answered, "It's a triangle." She used a sign for this: both hands spelling T drawing a picture like the triangle. I asked her if she thought it was a triangle. She used both her right and left pointers drawing a diamond shape. I paused

and said, "Well... almost," as both of my hands were holding the sheet of paper. Then, I moved both my hands in a cupped fashion and asked her what the shape is called. Amanda quickly said, "It's baseball B-A-S-E." I repeated the question to determine if she really was thinking a baseball B-A-S-E. She said, "Why?" and then showed me on the screen. I said it is a good idea. I encouragingly expressed that we needed to call the S-H-A-P-E S-Q-U-A-R-E. Amanda played with her hair and interrupted me and said, "O-h!" I had to say that the S-H-A-P-E is a S-Q-U-A-R-E. I picked up the pen to draw a square on a piece of paper on my lap. After drawing the square, I moved the paper. Amanda's facial expression showed me hmmm.... (It was so interesting.) I declared to her that it was a very good idea that she thought it's a baseball. I did say, "Yes, it is right. You can create anything. It is fine." I put the pen back on the table. (Of course, I signed with this pen!) I exchanged the yellow paper and almost signed to her to type, but first I wanted to quiz her to determine if she remembered the meaning of C-S. (I love to watch Amanda thinking.) She signed clear and then abbreviated it as C-S. She did not need to say screen since the sign clear was enough to be implicit. I asked her to input it and return the key. I commented to her that the turtle went back to the original place. Amanda spelled out R-T when she saw this command on my paper. She was told to wait after she input it. As my right pointer directed her attention toward the screen, I examined her by asking a question, "What do you think will happen to the turtle?" Amanda's right hand was already positioned at RT 90 when she said, "It goes that way." (She meant it moved forward.) I imitated her questionally. Moving her head upward signaled to me that was a yes. I said, "Well," and thought, but decided to let her to hit the return. After hitting it, she was smiled and slid back into her chair as she figured out that she did not give me a correct answer. I put my left hand upward and my right hand shaped with a R moved sideways in which I meant the term of RIGHT, not FORWARD. At this point, my left hand turned 90 degrees horizontally to the right as my right hand moved 90 then again 90 D-E-G-R-E-E-S. My left hand moved back to 90 degrees left for the purpose of demonstrating RT 45. Again, my left hand moved 45 degrees to the right and I said, "45, and we'll get you to understand what a D-E-G-R-E-E is. I stated to her to type C-S and press the enter key. I told her to type LT 90 and wait for me.

THIRD 5 MINUTES

Amanda's head gently moved as if she were saying, "Ok. I'll wait." She fingerspelled L-T and I showed the command from the sheet I had prepared. I questioned her, "What would happen to the turtle after she typed L-T 90?" I told her to look at the turtle. She turned her head back to the screen so she could look at it. While looking at the screen, her left hand rotated 90 degrees to the left. I

imitated the movement with my right hand and quizzed her. Her head signaled a yup. I said, "Well, let's see" as my right pointer moved toward to the screen and I told her that she may press the enter key. Amanda declared to herself that she was right. I cheered her and said, "Yeah! yeah! yeah!" Next, she was told to type CS and hit the return key. When I began to say, "Do you remember...", she moved her head like a yes. Maybe she was indicating that she was ready to listen. I continued and said, "We spelled B-A-C-K-W-A-R-D. It was wrong. The computer (meaning LOGO) did not know how to backward. Now, we just use B-A-C-K instead of B-A-C." Amanda did not pay attention to me because she was ready to type something and I spelled B-A-C-K 50 while I had my eyes on the paper I prepared. I did quiz her as to what would happen to the turtle. She vertically moved her left hand backward. I express a yes even before she hit the return and saw the turtle moving. She stated that she was right after hitting the enter key and seeing the turtle positioned 50 steps backward. As my right thumb moved down, I praised her and talked about it going 50 steps down. After I gazed at my paper, I told her to type F-D 45. I examined her by the question, "What happened to the turtle?" Amanda's facial expression was like a hmmm...., and her left hand shifted upward vertically. My right pointer duplicated hers to quiz her. Amanda's expressed a yup and she was going to hit the return key, but I told her to wait until I finished. I inquired if the turtle would go up at the same place as before. With left pointer, I showed her the movement on the screen. Her response was that she didn't know. I said to her, "Let's look at the number 50 (in the command of BACK)" and again put my left pointer on the screen. She cut in by saying "or", but I kept saying the number 50. She wasn't paying attention to me, but to the computer. She then said that she thought the turtle will go down while her right pointer was vertically shifted downward. I had to pause before saying something. I then replied, "Well...we saw the turtle originated at that position," as my right finger was placed on the screen, I said, "Right? We did see the turtle backed 50 steps." My left thumb moved horizontally to locate downward and then using both hands, with the palm orientation down, stepped backward just like you do some dancing with your hands and said, "Now we want it," as again my left pointer toward the screen and my right hand spelled out F-O-R-W- A-R-D, and "where F-D goes?" Amanda's left pointer finger goes forward horizontally. I said that was right and asked her how many will it go. Her response was 45. Both my hands signed a yes at the same time. I said to her that we are going to look at the screen and see what has happened. Amanda pushed the key. I informed her that it was almost the same place as before except it was five steps shorter. I noticed myself that I signed that word in a wrong concept. I used it like it was a short time, not the height. I expressed to her to clear the screen. After she input CS and struck the enter key, I began to sign F....F, was able to think a better sign quickly, and then signed

FORWARD as my right full hand moved from my forehead to the air outside. Then, I said 45 and asked her to press the key. Soon after she typed FD 45 and struck the return key, I asked her if she saw the turtle trace. Her head quickly nodded a big yes. I asked her to type B-A-C-K 45 and to wait for me. While she was inputting the command, she questioned me that was 45 or not. I nodded affirmatively. Amanda said that she was finished. I informed her to wait as I picked up the pen to write down on the same paper that I prepared and she was watching me. I then quizzed her right after I finished writing. Her left pointer vertically moved backward. I informed her that was at the same place as before. She shook her head yes and said, "You know that, Amy." I said, "Right?" and I smiled. She shook her head hard indicating yes. I said for her to return. She returned and said, "Me right." I looked at the paper. Amanda looked and said, "I know." I said, "Right. Now abbreviate B-K for B-A-C-K 30 and wait." She typed. I questioned what would happen. She moved her finger forward vertically. I copied her motion, made a face, and said, "Amanda, you know better. Wait a minute. What does B-K mean?" She said, "I forgot about B-A-C-K." She moved her left hand down. She made a face and blew air out. I said, "Wait a minute. Tell me, what does B-K mean?" Amanda replied, "B-A-C-K." I said right and asked her what happened. She paused while looking at me and her left elbow went down as her finger went up. I copied her motion as if asking a question and said, "Will it go down?" Amanda looked at the screen. I nodded and said, "You may return." She spelled a word so quickly that I only saw D-G-E. I smiled as I thought what the word meant. She hit the return key. I then realized she meant degree. So, I explained, "Not 30 degrees. 30 U-N-I-T-S. When you are using LT or RT, that's D-E-G-R-E-E-S. Not the same as." Amanda yawned and twisted her hair. I picked up the paper, asked her to think, and instructed her to type F-D. She typed it. As I pointed to the screen with my finger, I said, "I am going to ask you how many more steps will it go?" She responded 45. I told her to wait a minute and to think. She nodded in agreement. I said, "Think slow. Fine. Want it to step down. How many will it go?" Amanda responded 45. I told her she could hit return. She hit the return key. I instructed her to wait and I picked up the pen to write.

FOURTH 5 MINUTES

I said, "It's alright. Don't worry about it." I depressed CTRL-T and said, "Remember we started F-D 45. It went up." I demonstrated this with my left finger. I waited for Amanda to look at me after she looked at the screen. I said, "Goes B-A-C-K 45. Backward, which is still 0. B-A-C-K, backward 30. Then, we want it to go back. I demonstrated this with my finger. Add. 45 and 30 equals what?" Amanda said, "45 plus 30." She paused then said 75. I said, "Right. You already put 45 in it." I typed ST and said, "Suppose you typed F-D 75. It will go up. You typed F-D 45.

Alright. You are still learning. Want it to reach top of line as shown on screen. You already added 45. Then, how many more?" Amanda responded 75. I said well and slid chair back. I told her to try it. She questioned, "F-D?" I told her to try herself. She nodded and said, "Okay, I will." Her body movement indicated that she was not satisfied. She typed FD 75 and pressed the return key. She said, "I don't see. Why." I repeated, "Why?" She replied, "It's too long." I responded, "It's because you added 45 plus 75. Alright. Wait. (I picked up the pen.) Write it down." Amanda was playing with her face toward the camcorder. She signed Amy. I tapped her arm and said, "Let's not do it." We both smiled. I said, "We already did F-D 45 and you added F-D 75. It was supposed to be F-D 30. Think 45 plus 30." Amanda laughed. I asked, "Why are you laughing?" She grinned. I said, "Okay. pick up pen. Write down." She looked at me. I told her to write and I depressed CTRL-T so I could review what happened. I typed CS then ST. I said, "Let me show you what we already did. Let me type." I typed FD 45, BK 30, BK 45 and FD 45. I said, "It was your mistake. It's alright. We need one more." I pointed to the screen and asked, "How will we know?" Amanda interrupted and said 30. I paused and then said, "Right. Good. You may type." She fingerspelled F-D, typed FD 30, and hit the return key. She asked, "F-D again?" I told her to try FD 30. I asked if she made a decision. I told her to wait. I picked up the pen and began to record. I saw Amanda on the videotape. She called, "Amy, Amy. Hello, Amy." Her facial expression showed she got no response. She moved her face under mine while I was writing and asked, "Do you understand what I say?" I responded yes and told her to wait a minute. She laughed. I told her, "Wait a minute. I am trying to think." Amanda tested me, "Hello, Amy." I heard nothing at this point. Amanda said, "Amy McDaniel." I ignored her and wrote. She inquired, "Hear that?" I responded no. She said, "I am kidding you." I smiled and said, "That's enough. Thank you." She said, "I was just playing with you." I typed. Amanda said, "Are you serious?" I asked, "What do you mean serious?" She said here. I responded, "I am trying to learn what way you learn. Don't play and fool with me. Okay, I am serious. Yes!" She said, "What for?" I replied, "My project. I am studying to see if you can do abstract thinking. We'll see as you proceed. Okay. What do we do to get turtle home?" I typed HOME. Amanda was puzzled. I picked a pen up and wrote, "HOME means same place as before (origin). HOME means same place as 0,0." I said, "Now, we want to clear it." I typed CS and hit the return key.

FIFTH 5 MINUTES

I said, "Now, I want you to try to draw a T." I picked up my pen and drew a T on the paper. Amanda asked, "Capital?" I replied that it did not matter. It just needed to look like a T. Amanda got her pencil and notebook. I told her, "It was not necessary to

draw. You may type on the screen." She appeared ready to type. I tapped her right shoulder and told her to put them away so she would be more comfortable. Amanda typed T and hit the return key. LOGO responded, "I DON'T KNOW WHAT TO DO WITH T." I recorded. Amanda stretched her body. I explained, "No, I am not asking for the letter T. I want you to draw it to look like a T. Try." Amanda typed BK 45. I said, "You did it back." She nodded her head yes. I asked, "How would you make a T?" Amanda got up and drew with her finger horizontally. She said, "Gosh! It's hard." I said, "You try." Amanda fingerspelled F-D 45. I told her to try. She typed and returned. I said, "Yes, it's good." Amanda fingerspelled L-T. My facial expression indicated hmm. She fingerspelled F-T, then typed LT 45, and hit the return key. I questioned 45. I told her to wait a minute. I was going to move the book. Amanda questioned, "75?" I replied, "Wait a minute." I got up and put the book in the chair and went to my bookbag on the table behind us. I looked in the bookbag to get a protractor. I walked back to the chair, picked up the book from it and sat down. I said, "90 D-E-G-R-E-E-S." We looked at the protractor on my lap. Amanda said, "180." I corrected her, "90." We looked at the protractor and I pointed out 180. I said, "Look. This is 90. This 90 and this 90 equals what?" Amanda pauses and responds, "180." I said, "180, right. Two times. You say 45." I show her 45 on the protractor. I said, "That's why you see the turtle turned LT 45." Amanda inquired, "Want to start over?" I replied, "No, You don't start over. Fix the mistakes. This is 45. How many more to 90?" Amanda looked on the protractor and said 70. I questioned 70. Amanda shrugged to indicate she did not know. I said, "You try it on the computer." She said, "I am getting more mistakes." I said, "It's alright. Listen, this is a good purpose. You are learning from the mistakes. That's fine. But, you can learn again and you will realize what has happened." Immediately, Amanda fingerspelled L-T 70, said, "70, I don't know", typed it, and hit the return key. I was recording. Amanda said, "Must be 180." I waited and looked at the protractor on my lap. I said, "20, 30, 40, 50, 60, 70. From 45, add 70. 1, 2, 3, 4, 5, 6, 7, . It's 115."

SIXTH 5 MINUTES

Amanda asked, "47?" I said, "Wait. It's hard to know, but you need to understand." Amanda interrupted and questioned, "4?" I responded, "Wait a minute. You are not thinking. But, if you don't understand, just ask me." Both of us looked at the protractor. Amanda yawned and played with her hair. I said, "Let me show you what I would do." I typed CS and FD 100. I looked at the protractor and questioned 90. Amanda said, "I don't know." She typed LT 90. I told her to wait and look at what happens as I press the return key. I said, "You did great. Now, we want to make a T." Amanda questioned, "R-T 90?" I repeated, "R-T 90?"

Okay, you may try." She typed RT 90. I asked her what happened. She moved her hand forward horizontally. I copied her. She nodded yes. I asked, "What happens if I want to draw this (I pointed to the right top horizontal part of the T on the paper.)" She made a face and said, "Hmm." I told her she could depress the return key. She did and made a face. I said, "It turns RT 90." I showed her on the protractor and told her that she had entered left 90. I turned the protractor to left 90, then right 90. She said, "Oh! Practice protractor. Now, I know. Want to type L-T 90" I responded, "Yes, please." She typed LT 90 and returned. I interrupted and asked what she wanted. She said, "L-T 100." I reminded her that LT and RT had nothing to do with drawing a line. Those commands just change the direction of the turtle. She said, "Oh!" I told her, "Use FD and BK to draw a line. We finished drawing with FD 100 and LT 90. I said, "Fix the mistakes. Now, what would we do next?" She said 100. I said "Hmm. (and looked at the screen) We saw the turtle draw a line." She replied, "Right." She took her hand and moved forward horizontally. She seems to think it needs to be RT.

SEVENTH 5 MINUTES

As I pointed to the paper, I said, "We want to draw a line." Amanda moved her hand forward and back. Apparently, she thought it is the same as right and left. I asked her, "Which command now? LT? RT? FD? BK?" She fingerspelled L-T. I questioned, "Left?" She nodded her head yes. I reminded her, "L-T or R-T only changes the turtle." She paused and fingerspelled B-A-C-K. I replied, "Try B-A-C-K on the keyboard." She typed BACK and asked what number. I told her, "Whatever you want." She typed 100 and hit the return key. I drew on the paper to indicate what she had drawn and what she needed. Then, I asked her, "How will you do it?" She fingerspelled L-T 100. I asked, "Why do you want L-T 100? She replied, "Because it goes right (moving her right hand forward) and it goes left (moving her left hand backward). I said, "Oh! No! No! Type L-T 100." She typed LT 100, hit the return, and said, "Wrong me." I said, "I'll show you how." I typed RT 10, LT 110, and Lt 10 and told her to notice that only the turtle changes. Then, I typed FD 100 and said, "See, it draws a line." I then typed LT 90 , FD 50, and told Amanda to notice. I said, "Because F-D and B-K draw lines. L-T and R-T have nothing to do with lines. They just change the turtle." Amanda responded, "Oh!" I started, "We want..." She interrupted and fingerspelled B-A-C-K 50. I asked her to wait a minute as I recorded commands. I finished recording the commands, and Amanda said, "My foster parents and sister are coming to watch me in the play at 1:30 until 2:00." I replied, "That's really nice. Try B-A-C-K 50 if you want to." She typed it, hit the return key, and showed disappointment on her face. I asked, "How many?" She replied 40. I told her to try. She tapped my shoulder and said, "No. 60." I told her to try. She

yawned and asked, "What did you say?" I replied, "You try." She typed BK 60 (It should have been BK 50). She hit the return key and said, "Me right." I said, "Right! It's a little bigger, but you did fine." She measured the line on the screen with her finger. I typed FD 60 and BK 50. I said, "Should be 50, 50, 50. 60 too big." She said, "Oh." I told her, "We have to stop. Will you please write me a journal?" She picked up her notebook and began writing. I was busy recording commands. She said, "At 4, M. S. (who is Amanda's Counselor) will visit me at the cottage."

EIGHTH 5 MINUTES

I did not say anything, because it was after four and he had not informed me. She finished the journal in less than two minutes. We went over the entries. I asked about the first part on the first sentence, "I like to be in computer, what?" She replied, "I like play around here." I read the last part of the sentence, "But I am not skill in computer." She nodded her head up and down. I continued, "I love computer. I will stay in computer with Amy until it's finished." She said, "Like five weeks." I corrected her, "Around three more weeks." She had a surprised facial expression and said, "Really?" I said yes. She questioned why. I replied, "Well, it's already set up. You feel you need to write more?" She made a face and said, "No thanks." I asked, "What about how you feel?" She started writing. Then, she looked at me. I said, "Just write your best." She replied, "I still don't know how to spell interesting." I encouraged her, "Just write your best. I will understand." She said, "It's too long." I replied, "Are you making something up? Right?" I watched her write. She fingerspelled L-E-G-O. I said, "Yes. L-O-G-O." She wrote, "L-O-G-E." I read her entries, "It's good to learn in computer room. I love is LOGE." I asked if she wanted to write more. She continued writing. I read what she had written, "I feel good than my math." She nodded her head up and down. I said, "Hmm. What do you mean?" She inserted "in LOGE" over "good." I said, "Oh. Okay. It's fine. Write more?" She made a face and replied, "No thanks! It's enough for me!" She handed me her notebook. I asked her, "You want to write your name?" She replied, "Please." I gave her the notebook and she wrote her initials.

FOURTH LOGO SESSION

February 16, 1990

FIRST 5 MINUTES

Amanda wanted to discuss weekend plans with me. I said "Okay... let's stop now. We will discuss it later. Right now we will discuss L-O-G-O." She smiled and she agreed. I told her that we have to stop and to think about what we did last Wednesday. I reminded her that she had been so tired and I understood that. She stated that was because she had been sick last Wednesday. I said, "Yes that being sick made it harder to understand a degree." Amanda's facial expression scared me for a moment. She was looking at the clock and she was puzzled. I asked her if anything was bothering her. She said, "What?" I replied, "What is bothering you?" She explained to me that the clock was wrong and it was 6:30. I said, "Yes, the clock is wrong but do not worry." I asked her if she had learned the concept of degree. Her head slightly moved a bit upward. I was not sure if that really was a yes or if she wasn't sure. I again asked her if that was a yes or a no. This time she used a facial expression and moved her head stronger which told me a "big yes." I quizzed her, "What is a degree?" Amanda said "Like(pause)..I don't remember," and smiled. I then said, "Okay, I don't know if you learned it in your math class." She interrupted me by saying that she knows for sure. I said "like thermostat... T-E-M-P (temperature)." Amanda responded that she learned it last year, but has not had the concept again. I had to double check her by saying "temperature" and all she said was "last year." I picked up my protractor and asked her if she had seen one before. She nodded a negatively. I said, "Use this before?" She interrupted and said that she used it for cooking. I questioned her about a protractor used for cooking. She responded that it was for measurement. I paused and tried to think, because the idea of using the protractor in cooking was a mystery to me. I told her that it was not for cooking. She said, "It was different" or something like that. Again, I had to say, "This is not for cooking." She implied that her uncle has one for work and she pointed at the protractor. She then told me that she learned how to round-off between 5-100 and it was hard. I said that I know what she meant. She explained to me that she had to round off to the nearest number and it was a little confusing when she tried to round off to 100. I then informed Amanda to look at the example which I had found from Thornburg's. The example was drawn on a grid and was a drawing with written LOGO commands. I told her, "Why not try to write LOGO commands here on the graph paper grid so we can practice?" I noticed Amanda was not thrilled. I encouraged her to try it and told her if she made mistake, it was okay. I continued to tell her it was good for her to learn from the mistakes. Amanda said the command, FORWARD 4. I demonstrated to

her how to draw it on the grid and asked her to use a pen instead of a pencil because it was hard to see the drawing when she drew it with a pencil. I asked her, "What is a short word for F-O-W-A-R-D?" Amanda's head nodded affirmatively. I said, "Remember?" Again, her head showed the same response. A second later, Amanda was puzzled and then pointed her finger forward. I gently said, "No, no. Okay, you are right, but remember F-D." Amanda again nodded positively and signed the abbreviation. I told her that she could use FD to save time. Amanda signed RIGHT and I said, "Wait a minute. RIGHT at what number of degrees?" She replied that we need to look at the grid as she tried to explain. Then, she looked for a better example on the other paper with a drawing. I told her to try. She wanted to look at the example just once. I said, "No, no, not...." and was interrupted by Amanda when she tried to persuade me with a facial expression that said to me "Come on, let me look at" Amanda finally paused to think, looked at the graph paper, and said 4. She looked at my face and tried to read it. I had to hide my expression and told her to try it. Amanda drew the line on four blocks while she counted 1,2,3, and 4 (Drawing in Appendix G).

SECOND 5 MINUTES

I asked her to let me show her how to do it. She let me do so. I did a demonstration on another sheet as I discussed with her how to do it. Then, I asked her if she wanted me to draw using the commands that she had written on other paper. I wrote FD 4 and drew it on the grid. Amanda's head nodded affirmatively. I signed RT 90 and drew it. I explained to her that the turtle changed to 90 degrees at the same time that my right hand turned RIGHT. I said to her, "Suppose we want to go that way (I meant forward horizontally)." My right thumb moved forward. I said, "I am sorry if I confuse you," signed FORWARD from my forehead to the air, and continued, "Then, we can go forward on the right side. I began to draw FD. Amanda asked me if that drawing was from the command, LT or was the line going down. I told her to let us stop here and to see the difference. I handed her both papers (hers and mine) to compare. Again, Amanda moved her head in a positive way which meant a yes. I questioned her to see if she knew why. She signed "Wrong, me" as she moved back in her chair. I asked her if she thought she understood that. I knew it was difficult, and it was okay to be difficult, because we could understand it. I then moved back in my chair just like Amanda did. She discussed it with me. I said, "Let's stop here" as I found in some difficulty trying to explain these differences to her in a simple way, especially with signing. Amanda yawned and her body relaxed. She indicated that she wanted to type something on the keyboard. I thought that she was not interested in the paper and pencil task. I paused and said, "Not yet." She replied to me, "Better fast" Her meaning seemed to be that she wanted to hurry up finishing the paper task

since she like to use the computer better." I spelled D-E-G-R-E-E, and she nodded yes meaning she understood the word degree. Then, I spelled A-N-G-L-E D-E-G-R-E-E and said it is not temperature, but different. I lipread her saying okay. I said to her, "When you use F-O-W-A-R-D or BACKWARD," paused for a second, and decided not to discuss this because I thought about hands-on experience without using the computer. I mentioned to her that we were going to practice our walking to understand what we were talking about. As soon as I got up from the chair, I told Amanda to watch me and told her that I, pretending to be the turtle, needed to do "F-O-R-W-A-R-D 4." I stepped forward and counted the numbers 1,2,3, and 4. I looked at her to inquire would she say if I wanted to turn right. She responded nothing. I briefly discussed about changing the turtle. I told her that we must say R-T 90 as my body turned 90 degrees right. I told her that I was going to step FD 4. After stepping four steps forward, I questioned Amanda, "How would I go that way back?" (My left thumb moved backward.) She responded 4, and I asked her which command. She then responded 8. I said, "No". I fingerspelled to her B-K and F-D and signed LT and RT. Amanda immediately nodded yes. Perhaps, she meant that she recalled the commands. I asked her which one. She paused and apparently thought about it for a moment and answered BACK 4. I backed up 4 steps. I then said that I wanted to go that way (RT 90). Amanda did not say anything. I asked her, "How many?" (as my right finger turned RT 90). Amanda appeared to be thinking and had a tired look on her face. Then, in a short time, I said that C-O-M-M-A-N-D means LT, RT, FORWARD, or BACK. I then questioned her as to which one. She answered BACK 4. I paused and tried to reinforce her understanding and thinking. I next said, "Okay, I want to go back. How many do I need to go?" Amanda answered 1. I stepped back one. Her facial expression quickly showed me that was a big no. She replied that she wanted me to go that way indicating that needed to have said RT 90. I told her that I already backed up one step and she needed to change the turtle. "But how?" I asked. She immediately signed RIGHT. Then I said to her, "How many degrees?" She answered 4. My body moved and positioned at RT 4. I communicated to her with both of my hands with the left hand staying stationary and right hand revolving at 90 degrees right. Amanda shifted her right hand to the right at 90 degrees while she appeared to be thinking for a few seconds and was signing RT 9...90 ...90 ...90 . I positioned my body right at 90 degrees. While positioned my body, my right hand fingerspelled R-I-G-H-T, signed RIGHT, and then signed right which I meant that Amanda was correct.

THIRD 5 MINUTES

I asked Amanda how would I go forward. She responded 4. I said, "Well, suppose the computer doesn't know what to do with a 4. Then, what would you do?" I pointed my finger in a horizontal

forward motion. Amanda questioned me, "90?" I had to stop her from responding so quick without thinking first. I mentioned the commands: RT, LT, FD, and BK. We were interrupted by an unwelcome staff who came to inform Amanda about her medicine and her cottage situation. After the staff member left, I tried to recall what we have had done. I said, "Okay, Move...", and was again interrupted. This time it was Amanda wanting to tell me that move RIGHT. I asked her what about the number. She replied, "90." I turned my body another 90 degrees right. Guess what, she said, "NO," and she pointed her finger and moved the way in which she meant FD without knowing it is really FORWARD. I sighed, said, "Okay, let's relax," and sat down on the chair. Amanda tapped my shoulder and asked me to tell her the commands because she wanted to try some walking exercises. "Wow!!" I thought. I told her that was a good idea. Amanda got up and waited for me. She did position herself on the origin just as the screen turtle does. I relocated myself on Amanda's chair and commanded her F-O-R-W-A-R-D 2. She did step FD 2. I gave her a command to step forward, but she stepped back and turned herself 90 degrees left. She did some movement, but I could not get the command I gave her from the videotape due to it being out of focus. She went back to the original position as it was the same idea you use the command CS on the screen. This command clears the screen. Amanda stepped 2 units forward from the original even though I did not command her. Next command was LT 90. She questioned me how to turn RT and I asked her where LT was. She watched me as her hand turned to the left. My eyebrows were up and rolled side to side to indicate a yes. She turned 90 degrees left. I asked her to stay there. I signed, "Use LT.", as I pointed my finger to the computer where screen turtle was, "LT, RT...turtle does not...", changing my mind, "turtle changes body changes position like that on the screen, does not step F-O-R-W-A-R-D or B-K." Amanda began to swing her body. I stopped her from swinging. Her swinging gave me a clue that she was not listening to my explanation. Perhaps, she wanted to do some other activities. I next commanded her to do B-A-C-K 4. She just began to turn to the right at 90 degrees, but I tapped her shoulder to tell her that was a no. I told her to come back and start over. After Amanda moved back I repeated. She just stood there. I asked her to show me RT. She began to turn RT at 90 degrees. I told her that was 90 degrees and I pointed my finger rotating to another 90 degrees. Amanda then turned her body another RT 90. I told her that was 180 as she turned 90 degrees to her original position before she turned RT 90. I informed her that movement was LT 90. She said, "Oh, back," and I said, "Right." She asked me how many even though she did not say steps. I answered 4. She corrected it by backing up 4 steps. I said, "Right. Stay." I spelled F-O-R-W-A-R-D 4. She had no problem doing this. Her body blocked my view. So, I could not get the information from the videotape until she turned 180 degrees. I had to get up and position Amanda back at 90 degrees. The command had been Right 90, not 180. I

demonstrated turning right at 90 degrees with my hand. She said okay. I tapped her shoulder and she turned around. I told her to go back to the original position. Then I commanded her to try RT 180. She was not paying attention. So, I had to repeat the command. She just stood there. I asked her to show me RT. She began to turn Rt at 90 degrees. I told her that was 90 degrees, and I moved my finger rotating another 90 degrees. Amanda turned her body another 90 degrees. I affirmed that was 180 degrees when she turned 90 degrees twice. Her head nodded affirmatively. I gave her another command, LT 180. She had no problem with it. I said, "Better." Next command was RT 180. She correctly did it. She rotated RT 90 and I told her one more as I moved my finger 90 degrees. Next, I asked her where so would go for LT 180. She apparently misunderstood. I signed left then 180. Amanda started right, but I corrected her movement. She then quickly turned Left 270. I gently said, "No." Then, she turned RT 180. I said, "Okay, stop. Let's sit." Both of us sat down. I moved my chair closer to Amanda and picked up the protractor. I used my finger to move from 0 to 90 and I asked her, "How many degrees?" Amanda yawned. I asked her about degrees. She looked at the protractor and said, "40,40,40. I called her attention to the line at 90 degrees. She looked at it closely. I tapped her shoulder to get her attention. She responded 45. I said, "No, 45 is here." (I pointed to it.) I moved my finger to 90 and asked her to tell me how many degrees it was. Immediately she responded 90. I said, "Right." I moved my finger to 70 degrees and asked her how much it was. She responded 120. I said, "Almost."

FOURTH 5 MINUTES

Amanda said, "almost 170". I said "No, 70", but she did not see me say 70 because she moved her head right after I said no so she could look at the protractor. She quickly responded 70 twice. Her legs began to swing while sitting on the chair. She yawned. I put the protractor away, got the LOGO book, and asked her if she was tired. She looked puzzled and said that she was fine. I asked her if she really was sure. I said, "Tired?". She said, "Little". I told her that we could stop the LOGO session for today, but she insisted that she wanted to use the computer. Her facial expression and body language indicated that she was very serious. So, I opened the LOGO book and asked her if she remembered the diagram of square as we saw it on the page 26. All Amanda said was that she knows and she wanted to do something like(I couldn't get it from the videotape). I said, "No, you just give commands to the computer." I meant for her to try anything on the computer. She asked me for help. I showed her the second picture on the same page. Both commands, FD 100 and RT 90, were given by me directly from the book as I explained that the turtle changes at RT 90. I told her to wait so I could put the disk into the disk drive. She said, "Wait. FD. RT." and yawned. She moved her chair upward

while I put the DOS diskette into the disk drive. I took all things off the computer table, put them on the floor, and moved the computer closer to us. Amanda appeared eager to type, but I told her to wait. Afterward, I took DOS diskette out of the disk drive and got the disk protection box. I explained to her that I didn't want to destroy the DOS diskette. She fingerspelled O-H. I understood that she was excited to use the computer. Really, she appeared to be losing her patience easily. She watched me while I looked for the program disk in a box and signed, "I understand, I understand." I put the program disk into the same disk drive and the disk box on the floor. Then, I picked up the book, opened it, and put it on the computer table next to the computer on the right side. We waited for the red light on the drive to go off. I tapped Amanda's lower arm and asked her what would she do to see the turtle. She turned her head back so she can look at the screen while apparently pausing to think. She said, "Hmmm...A-T". I signed, "Show. Turtle". Amanda's body leaned toward the computer as she was ready to type and turned her face to me. I spelled, "S-T" and signed right. I showed her to type F-D according to the book. She spelled F-D twice before she input it into the computer. I said to her, "Wait. I want you to watch this turtle on the screen." She then turned her face so she could watch the turtle. I tapped her right shoulder so I could continue. I then said, "When I hit the return key, I don't want you to miss seeing the turtle movement. So, watch it carefully". After I hit the return, she did watch and nodded affirmatively. I signed to her RT 90 for her to enter. Again, she put her fingers on the keyboard and turned her face to me and spelled R-T three times with a questioning look. I nodded affirmatively. I informed her to watch the screen. She moved her head to watch the computer, but I was not finished telling her. I had to tap her shoulder. I asked her if she remembered the turtle changing. I told her to watch what happened with the command RT 90. She showed me by putting both hands putting together and turning them RT 90. I told her to see if the turtle make the line or not. I told her to watch the screen while I pressed the enter key. She signed right. I praised her. I pointed my finger to the book at FD 100. She spelled O-K and put FD 100 on the keyboard. She asked me if she was allowed to press the return key and I allowed her to do so. Amanda said, "Down." It did forward 100 steps horizontally. I closed the book and grabbed the tablet and pen. I informed her that she could do any drawing form that point. She paused and I lipread her saying square as both her pointers drew a squared-shape.

FIFTH 5 MINUTES

I copied her motion by using my pointers to see if it was really what Amanda wanted to draw. She nodded affirmatively, I said, "Fine". Amanda twisted her hair. I questioned her to find out what would she like to draw. She spelled B-A-C-K-W-A-R-D. I told

her to try it on the computer. She slowly typed BF and opened her mouth like she was going to say gosh after hitting the return key and seeing the LOGO response which was: I DON'T KNOW WHAT TO DO WITH BF. I tapped her shoulder and informed her that the LOGO doesn't know what BF means. She replied that it should be B-A-C-K and typed BACKWARD. I communicated to her to wait a minute and reminded her what we had discussed about B-A-C-K-W-A-R-D during a previous lesson. LOGO doesn't carry that command. I told her to use either B-A-C-K or B-K. She backspaced through the word and asked me if it was okay to type the number 100. I saw that Amanda did not make a decision by herself. I said, "Whatever you want". She typed 100 and I informed her to wait. I was in a hurry to write down the command she had input. She waited. I questioned her as to where would the turtle would go. She said that it would go down and at the same time her right pointer went downward. I questioned, "You want it go down?" She replied, "Nah, it go left. I was wrong." I quizzed her to see if she really wanted the turtle to go down. She said that she guessed so and hit the return key. After hitting the key, she said that she was wrong and asked me how would to make the turtle go down. She then spelled D-O-W-N. I informed her there is no word D-O-W-N in LOGO. I told her that when she wanted to make the turtle change... She interrupted by moving her right hand to the left at 90 degrees. I said, "Which command?". She answered LT three times. I told her to try it and to see what happened. She appeared puzzled while she paused as if thinking. She moved her body to sit at 90 degrees and then her head shook no. She next looked at the screen. Her facial expression indicated to me that she was becoming frustrated. She asked me for help. I encouraged her to try it by herself. She typed LT 100 and hit the return key. She said to me, "See." I encouraged her that was all right. She signed, "R-T, right?" I signed, "RT?" as my eyebrows were curved to indicate a question. She typed and tapped her shoulder. She turned her head to me and I changed my mind not to explain because I just reminded myself that she needs to learn how to do this all by herself. I then told her to go on. The command was RT 100. After she hit the return key, I told her that to wait so I write down the command and explain what happened. Instead, she spelled F-D to me. I paused and decided to let her try and see the turtle. As she looked at me for my response, I informed her that she could it herself. She did and next typed 100 as I lipread her saying it twice. She smiled and pressed the return key. She said, "Found? Why?" I expressed to her that it was because she said FORWARD and that meant for the turtle to go up that way. I made the sign for turtle and moved forward. I also informed her that the body does not change. Amanda asked me if it was alright for her to try. I permitted her to try. After she input it and hit the return key, she realized what had happened and informed me that it went back to the same place as before. I signed right. Amanda appeared excited. I told her that I wanted the turtle to go down. I said, "But..how would

you change the turtle?" She looked at my face. Then she said, "I don't know." I said, "Which command?" and spelled F-O-R-W-A-R-D with a questioning expression on my face. She said "FD? You decide, not me." I did not say anything, but I waited. She next spelled D-O-W-N. I reminded her that LOGO does not know how to DOWN. She played with her hair and yawned. No luck! I decided to turn my body to the right at almost 180 while I said, "Go down. What to do?". She again spelled B-A-C-K. I reminded her that she had done that. I then said, "Let's stop and think". Amanda signed LT and said to me that we already tried LT. She continued to say, "Remember, it didn't work. Why?" She demonstrated to me on the screen that it went another way. I signed right and said that it needed to be the opposite way. She signed LT. She kept saying that she wanted the turtle to go that way meaning to turn the turtle to the right at 90 degrees. I said, "Right. We can't use it (LT) because it did not work." She questioned "Right?" I said "Try." She hesitated. I informed her not to worry about getting wrong answers. It was good to try.

SIXTH 5 MINUTES:

She did try typing RT 90. I asked her if she understood what would happen. She nodded affirmatively. I briefly explained that it turned RT 90 as I heavily emphasized the word turn. I asked her if she still wanted LOGO to draw a square or not. She replied yes. I said to her, "Go Ahead." She said, "Again, go down." She typed another RT 90 and signed "Oops. I don't want it." She began to erase it, but I stopped her and asked if she understood why it moved that way. She said, "No." Again, I stopped her. We slid ourselves down to the chair. I said to her, "You are doing fine. You are improving. That is wonderful! It's okay. It's alright. You are trying to learn how to use the turtle." I signed RT 90 and explained that the turtle turns RT 90. Amanda was distracted. I asked her if someone was back there. She said, "Yes, someone was at the window, but now she is gone." I moved my right hand by turning RT 90 and showed that the turtle does not draw the line as my right finger moved down on the screen. She turned her head quickly to look at the computer. I asked her which one, "Yes or no?" She typed RT 90. She opened her mouth. It appeared that she did not like that she was wrong. I told her to try again and to think. She typed another RT 90. I believe that she assumed I said for her to type RT 90 again. She signed again in a questioning manner after hitting the return key. I said well and paused. She finally fingerspelled L-T. I paused and mouthed well with no voice. Then, she asked me if it were L-T or not. I told her to try. Her hand turned RT 90. She then said, "No, not LT." She paused and then typed RT 100. I said, "Well, what happened?" Amanda ignored me and typed another RT 90 as she fingerspelled R-T. I explained to Amanda that we wanted to draw the line as my hand moved forward from my forehead. It was opposite what was on the

screen. That confused Amanda. She fingerspelled B-A-C and lipread me as I told her to try. Her facial expression seems to say, "Come on. Tell me." I said, "I am not telling you. No. I will not answer, but you answer." She replied, "Fine." Then, she typed BK 100 and pressed the return key. I said, "Now, you see the line. Try FD 100." Amanda input FD 100. I asked her if she still wanted to draw a square. She said that she did. I said, "What to do?" She moved her body position and positioned her hand like the turtle on the screen. I lipread, "I don't know." I encouraged her by saying, "Yes, you do know." She had to think for a moment. After a while, I said, "Okay, we saw RT 90 move. It did not give us a white line. Right?" She nodded affirmatively. I fingerspelled F-O-W-A-R-D and B-A-C-K, and said, "Gave you a drawn line, right?" Amanda answered B-A-C-K. It appeared that she thought she had to choose one of the words for the response. I told her that she had recently tried BACK. I told her to watch as I showed her. As my right pointer finger moved toward Amanda from my left side, I said, "See this turtle. Right? I want the turtle to move that way." Finally, she responded F-D. I praised her. She said, "Let's see." She typed FD 100 and hit the return key. She said, "Right. Me right." She continued, "Now, L T." and typed LT 100. After hitting the key and seeing the turtle relocated, she said, "No, me wrong me." I asked her to wait as I wrote the command on the tablet. I correctly typed RT 100 and briefly explained to her that the turtle changed back to the same place. I said, "Now, you typed LT 100. 100 is the same as FD. You do not need to type 100. It needs to be a perfect angle. (Perfect was the word I used for right angle since she did not have that concept.) Amanda entered L and said, "No, wrong me." She erased it by using the back space key and retyped RT 90. As the turtle changed its position as soon as she hit the return key, her facial expression appeared to indicate, "Oh, I see." I said, "Now, you see it changes." She next input RT 90. I said, "Amanda, if you type RT 90 again, think where it will go." She responded by turning her hand to the right at 90 degrees. I told her to try. She typed RT 90 and after seeing the turtle move, she said that she was wrong. I said, "Wait a minute. We want to draw a line on the screen. RT 90." Then I drew how the turtle changed to the command RT 90 and said, "NO." The intended meaning of using no was to indicate that using RT 90 was incorrect. Apparently, Amanda did not understand it, because she typed another RT 90.

SEVENTH 5 MINUTES

I told Amanda to try again. She typed RT 90. I said to her, "Now, finish, changed, finish. Now, what to do?" She responded L-T. I said, "No. LT changes the turtle." Amanda said, "Oh!" As I moved my right hand forward horizontally toward Amanda, I said, "We want to draw a line." As her hand moved vertically toward the computer, she fingerspelled F-D. I told her to try. She asked me if it was

all right for her to type FD 100. I told her it was fine. After she typed FD 100, she said, "It didn't match." I told her to wait and I typed HT, the command to hide the turtle. This was to make it easier to see the diagram. Then, I told her it was time to stop. She asked me to take her to the infirmary to get her medicine and then to her cottage. I said, "No, you have to go back to your cottage, and your father will pick you up and will get the medicine for you. Now, I want you to write in your journal, but not now. Bring it to me on Wednesday. Okay?" She asked me about the weekend. I told her that I would talk to her mother about it. Amanda tapped me as I got up and told me that she wanted to write in her journal now. Also, she mentioned that it was no problem for her. I said, "No, we have to stop the session at 3:30." I gave her a piece of paper and told her to use it for the journal entry. She said, "I write now." I said, "No." She responded that she would write anyway. I said, "Amanda, I do not want Mrs. W. (the supervisor teacher) to get mad at me. We must stop at 3:30. Write the journal for me later and give it to me on Wednesday. Don't worry"

FIFTH LOGO SESSION

February 21, 1990

FIRST 5 MINUTES

I told Amanda that we would practice the walk just as we had done last time. I wanted to see if she remembered. Amanda got up and appeared ready for me to command. I gave the command F-O-R-W-A-R-D 4. She took 4 big steps forward. I explained to her that we did not have much room in this computer room and for the camcorder to record her she needed to take little steps. She started over and repeated 4 tiny steps forward. I said, "Good. RT 90." Her right finger pointed to the left. She appeared puzzled and waited for my response. I said, "Hmm." I turned my body around to be in the same position as Amanda's and demonstrated where my right and left hands were. As she turned her body to the right 45 degrees, Amanda said, "Oh, not much room there." She did know that it was not 90. I just turned my hand to 90 degrees to make sure she understood this. I signed, "LT 90." She immediately turned to the left 180 degrees. I asked her to please move back to the place she started. I asked her to try LT 90 again. She started to turn to the right, but she said, "Nope." Then, she turned to the left at 90 degrees. She decided to turn back to the RT 90 and try again. She asked me to command her. I said, "LT 90." She turned correctly. Next, I fingerspelled B-K 4. She did step back 4 times. The next command I gave was F-D 5. She moved forward 5 steps. I said, "Okay." Amanda was distracted. She said people were looking at us through the window on the door. I told her to stop looking at the door and just ignore the people. She responded that she was kidding. I signed, "RT 90." She asked me if that was RT 90 or not. I said, "Yup." She had no problem turning herself to RT 90. I said, "Then, F-D 5." Her left arm straightened out forward. She appeared to mean to turn LT 90 back and the step five times forward. I said, "No." I demonstrated the forward movement with my left arm. She said, "Oh, sorry." She informed me that there is not much room for the FD 5. I said, "Okay, F-D 2." Then, she moved forward twice. Next, I said, "Okay, B-K 5." Amanda started to turn left. I assumed that she may think she needed to turn LT 90 then take steps backward 5 times. But, she said, "Nope." I said, "Stay there." As I tried to position my body to be like hers, she said she was going to move back. I spelled B-K and moved my hand backward. Then, I fingerspelled B-K 5. She backed up 5 steps. The next command was RT 90. She questioned me if that was RT 90 or not. I said, "Yup." She tried to turn her body to the right, but she appeared to want my response before she did. I asked her, "Where is you right hand?" She replied by raising her right hand. I said, "Then, turn." After Amanda turned at RT 90, I said, "Good, F-D 5." She asked me if it was this way or not. I slowly nodded a yes. She took five steps forward. B-K 5 was the

next command. She stepped back 5 times. I fingerspelled L-T 180. She appeared to be trying to determine if it was left or right. She then turned left at 180 degrees. I praised her by saying good. I instructed her B-K 4. She stepped four times back. I signed, "Good. R-T 180." She asked if I signed 18 or 180. She said, "Hmm." I positioned my arms down along my body. Amanda and I turned RT 90 together. Then, we turned another RT 90. I explained to her that the 180 was twice as much as the 90. I asked her to try another RT 180. She turned RT 90 and then again turned RT 90 demonstrating that she needed to complete two 90 turns for 180. The next command was F-D 5. She appeared to be thinking for a few seconds. Then, she stepped 5 steps forward. I said, "Wow! I think it's the turtle. That how it moves FD, BK, RT, and LT." Next, I got out the new compass. I demonstrated it to Amanda and signed, "This is a C-O-M-P-A-S-S." Three times, she signed, "Oh, I see." I showed her right on the compass. I said, "Pretend we are on the right. Go to the opposite side and that is left. We see 90 degrees here." She crossed her legs, and I asked her if she needed to go to the bathroom. She nodded affirmatively. I said, "Go to the bathroom, now."

SECOND 5 MINUTES

While Amanda was in the restroom, I observed myself on the video. I began to worry about Amanda, because she had been gone so long. Amanda finally returned. I questioned, "Feel better?" I lipread her saying yep. Then she said, "Ask me why?" meaning why did you ask me that. I answered that I was worried because she had been gone too long. Then, I quickly picked up the compass, because I wanted to get on with the lesson. I was holding the compass with my left hand and signing to her, "See the 90 degrees." While we were both looking at the compass, she said, "yes." I said, "Then, that is 180 degrees, then 270 degrees, then 360 degrees. Okay. All around (with circular motion), that is always 360 degrees." Amanda started to swing her body back and forth, but I stopped her. I discussed with her how we wanted to move as my right hand went from the left side turned RT 90 to my face and moved around with the compass 90 degrees. Then, I moved another 90 degrees. I repeated this. She told me that she wanted to try herself. She asked me to tell her to try. I said, "Okay, go that way (as I demonstrated RT 90 from the left side.) See it." But, Amanda looked at it for a while. I said, "Okay, let's do it on the computer. She responded, "Okay." and appeared thrilled. Amanda imitated the statement on the screen by signing, "Welcome to L-O-G-O." I laughed and said thank you for enjoying this. I signed, "Now, what to do." She paused before asking me if she needed to press the return key. As she looked at me, I said, "Okay, we want to see the turtle." Amanda immediately interrupted by saying, "I know." She kept her mouth open and fingerspelled the letter T. I told her to type it in and we will see what happens. She said, "Hmm." and smiled at

me. After she typed T and depressed the return key, she said, "I told you." I said, "Alright," and began to draw on the paper.

THIRD 5 MINUTES

Amanda told me she had been using the computer three times today--this LOGO session, in her math class, and in her language class. I just laughed. She fingerspelled T. I fingerspelled T with a questioning expression on my face. She then fingerspelled T and S-T. I told her to try. She typed S-T and clapped after she hit the key and saw the turtle appear. Right after she clapped, I clapped and said, "Good to remember." She signed, "I remember." She continued by fingerspelling S-T ten times. I interrupted her by telling her she was silly. I told her that I wanted her to type RT 90 and then wait. She said, "Okay," and smiled. I continued, "Remember the face," but was interrupted by Amanda saying, "I know." I said, "Okay," and smiled. Then, I told her to watch the screen while I hit the return key. Amanda watched the turtle as it turned RT 90. She said, "Oh, hmm. L-T 90," and then turned her right hand to the left at 90 degrees. I just smiled and told her to try RT 90. She replied, "I know where," and smiled. After she input RT 90, I informed her to wait because I wanted to quiz her about how it would look. She pointed her finger on the screen turtle and turned it to RT 90. After she was allowed to hit the key, she signed, "Me right." Showing her from the sheet I wrote, she typed, and then depressed the return key. She continued by typing RT 100, but I said, "No, I meant 180." She corrected it by backspacing and retyping. She knew she had to wait to hit the return key because I was going to quiz her. I quizzed her by asking, "Where does it go?" She put her right hand on her nose and moved her head to the right. I said, "Right to where?" She moved her hand out to the screen turtle and turned it RT 90. I said, "Yes, one more." She positioned her hand on the screen RT 90. I said, "Hit the return." After hitting the key and seeing the turtle turn RT 180, Amanda signed, "Me right." She typed RT 90 straight from the sheet. I said, "Where does RT 90 go?" She put her hand toward the computer, but she did not seem to be aware that she needed to indicate some movement. I said, "Let's move the body around where the turtle is." I got up from the chair and turned around as the turtle on the screen. I put both of my hands together out in the air. Then, I questioned Amanda, "Where is RT, and what do I need to do?" She moved my hands to the left and said, "That is left." I nodded my head to inform her it was correct. She lipread me since I could not use my hands to sign. She then moved my hands to the right at 90 degrees. I praised her. Then, we sat down in the chairs. She hit the return key, and said, "Me right." I clapped and she made a face at me. Amanda copied L-T from the sheet I had prepared and typed L-T 90. After typing, she said, "I know where." I asked her to please tell me where. She insisted that I stand up. I stood up and positioned myself in

the position of the screen turtle. She quickly turned my shoulder to the left at 90 degrees. I signed, "Right." Proudly, she said, "Me. right." She was told to type LT 90 again. While she was typing, she said, "I know where." I asked her to tell me where. She continued to say, "I know." I said, "Please." She got up and I had to get up. She moved my left arm to be positioned. Then, she said, "No," and correctly positioned me as the screen turtle was positioned. Immediately, she turned me to the left 90 degrees. I sat down. She pressed the return key and bragged, "Me smart." I said, "Okay," and smiled. She typed LT 90 by copying the command straight from the sheet. I asked her to wait and questioned her about where it goes. She got up, positioned herself as the screen turtle, and rapidly turned LT 90. I was happy about this because I was exhausted from getting up and down. I felt like we were having a P.E. class. I signed, "Right." She hit the return key and saw the turtle turning LT 90. Then, she sat down and tapped my shoulder. She said, "Know cheerleader." I was puzzled. She then explained that she wanted a cheerleader jacket. Then, she said, "Not a basketball jacket, but I want to be a basketball player and/or a cheerleader or something like that." Too bad, I wasn't paying attention that much. I just laughed and told her she has to wait until she is in a high school. She smiled and signed, "Varsity." I told her to focus on the computer, not cheerleader. I asked her to type R-T 45. She said, "I think about it," and typed R-T 45. I was not sure what she was thinking about the cheerleader or the computer. I did not question her. I let her type the commands I gave her.

FIFTH 5 MINUTES

I asked Amanda to think where it would go. She said, "Let me see," and picked up the compass. She did get up and motioned for me to get up. I said, "Okay," and got up. I took the compass from Amanda and tried to set it right. She said, "Then it's ... turned RT 45." I replied, "Hmm, let me think," and practiced with my right hand. Amanda watched. Next, she tried it. I was pleased that she responded well. I said, "Yes," and clapped. I got excited. It seemed that she may be quicker than I am in figuring out the compass. Both of us sat down and continued to clap. I asked Amanda to do R-T 45 again after she pressed the key. She told me where the RT 45 would be, typed RT 45, and hit the return key. She smiled and signed, "Me right." I informed her that 45 and 45 make 90. I showed her to type RT 45 from the paper. After she completed the typing, she said, "Hmm, R-T...R-T," an decided to get up and turn herself to the right at 45 degrees. Then, she said, "easy, easy, easy." I clapped and exclaimed, "Yea!" I told her to enter R-T 45. She correctly demonstrated where the turtle should move. She turned to the right at 45 degrees. I clapped and said, "Now, one more." I pointed my finger at the sheet to show her to type LT 180. She typed LT 100. I corrected it by

backspacing and changing it to 180. Amanda said, "But on your paper, 100." I told her that I was sorry that my handwriting was lousy. I spelled 180. She fingerspelled O-K. I asked her to show me where the turtle would go. She yawned as she got up. She appeared confused. I repeatedly asked her where the turtle would go. She replied that it was down on the screen. I said, "Wait a minute." I got up and positioned her in the position of the screen turtle. She said, "I know ...L-T 180." I said, "Yeah?" She turned to LT 90, but then paused and moved back RT 90. She moved her arm to the left at 100 degrees and asked me if that was right or not. She continued to look at me closely as if she were studying my facial expressions, but I gave her no response. Then, She moved LT 180 and signed, "Me right me." I smiled. She exclaimed, "Me, right!" I returned her exclamation, "Yea!" She hit the return key and I clapped. We did the high 5 and sat down. Amanda tapped my right shoulder and said, "I want to draw square." I questioned, "Rectangle?" She nodded affirmatively. I said, "Go ahead, but first what to do?" The, I told her, "Never mind." She spelled R-T 90 ...R-T 90. I said, "Fine, you decide. I don't care. Whatever you want to draw." She fingerspelled C. I questioned her if that was the letter C. She nodded positively. I said, "Oh, that's hard." She said, "Come on." I made no reply. Then she said, "Better not." I was relieved! She signed, "I want to draw," as she used her fingers to draw a shape like either a square or a rectangle. I inquired as to which it was by moving my fingers in the shape of a square and then a rectangle without using the name of the shapes. She indicated the larger one, and drew a box with her fingers, not on the paper. I drew a rectangle on the paper as Amanda retraced the shape she wanted with her fingers in the air. She started to spell R after I completed the drawing. I asked her what to call that. She fingerspelled R-E-Q and then signed, "I don't know." I informed her of the name by fingerspelling R-E-C-T-A-N-G-L-E. She asked me for numbers she could use. I just responded for her to go ahead and type, because I wanted her to make decisions. She begged me to tell her. I said, "No. Doesn't matter." She finally decided to type RT 90 and to hit the return key. She put her right hand forward to the computer and said, "I want to go forward." I said, "Right. What to do?" I got up. I positioned my body as the turtle sits and as my right hand moved forward from my forehead, said, "I want to go that way." She spelled R-T 45. I told her to remember steps. She then spelled R-T 100. To try to give her a clue, I said, "Steps, steps, steps." She opened her mouth and spelled R-T 45.

SIXTH 5 MINUTES

As I turned my body to RT 45, I said to Amanda, "I told you R-T 45 means this." She said, "Huh?" I turned back to the position where I was before turning RT 45 and said, "I want the turtle to move. Turtle runs." Amanda had her thumb in her mouth and chewed on it

for less than a minute. Then, she nodded negatively. As I showed her where to draw the line on the screen, I said, "Okay, I want to draw a line." Again, her thumb was in her mouth bumping between her teeth. I waited at least 30 seconds for her response. I said, "Okay, I will let you think." Then, I sat down. She started to stare at me. I rolled my eyes down and in a second, I rolled my eyes up. She said, "Hmm...tell me. I don't care." I said, "No, You try." She said that she is trying R-T 90. I paused as I planned to tell her something needed to be corrected, but I decided to tell her to try. She said, "Nah, never mind." I had to roll my eyes down and wait for Amanda to try herself. She finally decided to type RT 180. She probably knew it was not right. After she hit the return key, she looked at me and said, "Wrong." She paused for almost a minute. She quickly typed CS and again typed RT 90. I said, "Amanda, remember commands LT, RT, FD, and BK?" She immediately spelled F-O-R-W-A-R-D. While she was typing, she asked me if it was fine with me if she uses FD 90. I just said, "Go ahead." After Amanda input FD and hit the enter key, LOGO responded, "NOT ENOUGH INPUTS TO FD." Then, she asked me if it was alright for her to type FD 5. I said, "Fine." She decided to type FD 45 and questioned me if 45 was alright. I said, "Doesn't matter. 45 fine." After she pressed the key, she looked at her drawing on the screen and said, "More." I told her it was not necessary. She continued typing FD 45. She told me that it needs to go down and said LT as she moved her body. She got up. I asked her how will it go down. She answered me by signing, "LT 180." I asked her, "To where?" She said, "Oh, LT 90." I said, "Try." She did not take a turn with her body. Instead, she walked back to the computer, did not sit down, and input LT 90. As soon as the turtle turned LT 90, Amanda said, "Right. R-T 90 degrees," and typed RT 90. She said, "That now, RT 45 and RT 45." She was still standing up. I had to move Amanda over and told her to go wherever she wanted.

SEVENTH 5 MINUTES

Amanda turned herself to RT 90. She commanded LT 90 by herself and moved her body back to the position where she was before turning RT 90. She said, "I didn't think." I asked her if she remembers LT 90 and where it goes. She did some thinking and did take a turn to the left at 90 degrees. I said, "Right." I told her to go back to the same position as the screen turtle is. I questioned her as to what would happen if she would go that way as I thumbed RT 90. She asked me whether L-T or R-T is right. I said, "Try. Try to answer your best. You are learning. Right?" She spelled R-T, and asked me if that was right or not. Again she spelled R-T. I informed her to try on the computer. She turned her body to the right at 90 degrees. She paused and then told me that it was definitely RT 90. I continued to say for her to try on the computer. Amanda walked to the computer and signed, "Again, again,

again." After she typed RT 90 and hit the return key, she exclaimed, "Right!" She jerked her body. She next said, "I know FD 45" I said, "Hmm.," paused, and then decided not to discuss with her about typing FD 45 twice to get FD 90 since Amanda needed to do it herself. I continued by saying, "Well. Okay. Fine." She did type FD 45. After returning the key and seeing the turtle forwarded, she looked at the 45 steps, looked at the picture, and she drew on the paper. While I showed the picture to her, I informed her that she needed one more line the same length as the opposite side. Amanda positioned her body where the screen turtle is and told me that it needs to be R-T 45. I only said for her to try. She typed R-T 45. As soon as she saw the turtle altered RT 45, she signed, "Right." I pointed to the turtle's nose on the screen and she said, "Oops. Sorry." I said, "You forgot to add." She signed, "45, 45." She typed another RT 45 and signed to indicate that she was right. I clapped. She tapped my shoulder and spelled F-D 90. She looked at me and appeared to study my facial expression. She did not get a response from me. As long as I said nothing, she said, "Sorry, sorry." I thought she might change her mind. Then, I did tell her to go ahead and type. She spelled R-T 45 and then she typed it. I lightly tapped her arm to inform her to wait. I encouraged Amanda to try FD 90, but she refused. I did backspace RT 45 and typed F-D 90 as I spelled. I told her to hit the return key. She said to me, "But recently, I said..." I interrupted her by saying, "Please." She finally hit the return key. I asked her if she did see where it goes and briefly explained about two FD 45's to be FD 90 to save her some time. Amanda finally sat down after standing five minutes. She appeared to be deciding what to do next and got up quickly. She did some practice with her body and then positioned her hands turning RT 90. She spelled R-T 90 afterwards. She typed RT 90 and returned. I became so excited! She told me that she was right, and in a moment her facial expression looked like she was lost. I told her to remember the line I demonstrated on the diagram to her. My finger was on the right side of the rectangular diagram. She spelled R-T 45. I did stop Amanda from typing the next command. Then I got up and said, "Here I am. Same as the turtle on the screen. What to do? What do you want?" As her hands moved forward, she replied, "Forward to the corner." I told her to try. She kneeled down. I was still standing up behind her and I crossed my arms. She turned her head toward me to see and asked if it is okay to use F-D. She paused and then said "45." She finished typing FD 45. I was thrilled and put a smile on my face even though Amanda did not see me, because I was still behind her. I felt like I was going to cry. She keyed the return and turned her head to me. I clapped and said, "Good." I did not want to jump. I clapped excitedly instead. Amanda just smiled and got up from kneeling. I pointed my finger to the screen turtle and signed, "Hide turtle." I did notice that the two signs, hide and turtle, were very similar and in the same position. Therefore, I thought

the signs may not be giving her both concepts. So, I spelled H-T and signed, "Means hide turtle." She spelled H-T, typed it, and hit the return key. She clapped. I was busy writing down the last few commands she typed. She tapped my shoulder and said, "I want to show it to MS (a name sign for her counselor)." I said, "Finally." She said, "Show to MS, please." I looked at the screen. She tapped my shoulder and said, "I check to see if he is there or not." I paused and looked at the time. I pointed to the clock and said, "Not much time left. Why not write in J-O-U-R-N-A-L now?" I hated to say she could not show her counselor now. Amanda said, "Me fast. Three sentences. Fine?" I said, "Try to write more than three sentences." She said, "Five?" I told her it doesn't matter. She said, "Four?" I quickly signed that it did not matter, but I realized my body language said, "Come on. You know you can do better than that." Next, I signed, "Feel free to write what you learned. What is up here (indicating my brain). Go on." She got her paper out and sat in the chair. I was at the computer with the LOGO. She tapped my shoulder and signed, "Familiar, familiar, familiar." I was puzzled, because I lipread her and did not understand since the two did not match. She spelled F-A-M-O-U-S-E. Still, I was puzzled and signed, "Famous? What do you mean?" She said, "recently," and then signed something between famous and familiar. I then signed, "Finally," and quickly followed up with spelling F-I-N-A-L-L-Y. Both of us spelled F-I-N-A-L-L-Y at the same time. I continued with the LOGO.

EIGHTH 5 MINUTES

As Amanda watched me type LOGO commands, she signed, "How?" I turned my head to her and told her I was just playing. I typed a few more and stopped. She returned to her writing and I began to write. Then, I got up from the chair and walked to the air conditioner, because I needed to check it before we left. Amanda was still writing. I walked past my seat to the camcorder as I was curious if it was recording well or not. I observed Amanda through the camcorder. I returned to my chair and moved it from the computer. I began to drink a Sprite. Amanda put her hand to her mouth to indicate that I was not supposed to drink the Sprite. I told her it was okay since I was very thirsty. She said, "Here?" I told her to finish her writing. She looked puzzled. I told her I brought the Sprite from home. She handed me her journal as soon as she finished. I asked her when she wrote the other journal. She replied, "Sunday night. Nope, Sunday afternoon." We went over the journal that she wrote on Sunday afternoon. As I copied her entry from the journal, I said, "I like L-O-G-O better than math." I turned my head to Amanda and she smiled. I next signed, "I love computer lab very much. I am sure it is fun. No problem in the L-O-G-O." I paused. We did go over today's journal, "I feel finally in the L-O-G-O. I am proud of my try the L-O-G-O." I clapped. I continued to sign, "I feel good. I will no quit the

computer L-A-B. I will stay for five weeks. I am lucky to be in L-O-G-O." Amanda pointed her finger to the sentence after the word lab, and spelled L-O-G-O. I let her borrow my pen. She added to the entry. I signed, "Bad news. We can't stay here for five weeks." She opened her mouth and appeared to wonder why. finished?" I said, "Well, one more week. See if..." Amanda interrupted by signing, "Definitely finished?"

NINTH 5 MINUTES

I said, "Yes, but we can try to add two more sessions. I will ask for permission." She asked me if I am going home on Friday. I replied, "Yes, but I will see you here this Friday and go after the session. Okay, I will take you to cottage 303." Amanda signed, "303?" I said, "Yes, they told me." She tapped my shoulder and said, "Cottage 303, why?" I answered, "Well, someone told me to tell you to go to cottage 303."

SIXTH LOGO SESSION

February 28, 1990

FIRST 5 MINUTES

I began to say, "Now..." and Amanda interrupted me by saying, "I know...I know. know. I know." I asked her what. She spelled T-S-T. I told her to try and picked up the pen to write down the command Amanda made. She tapped my shoulder and said, "I forgot...it's S-T...S-T." She typed it. After she returned the key and saw the turtle appeared on the screen, she clapped and said to me, "I told you." I said, "Now what would you like to do?" She replied, "Hmm...I want...know..." as she wiggled her hand while she was trying to draw a triangle in the "air." I said, "You mean..." and was interrupted by Amanda. She was telling me that she wanted to draw something and was asking for my pen and pencil. I informed her to use hers over there on the computer table by her side. Therefore, she drew a triangle on the piece of the paper. I told her that was fine and for her to practice the DLM compass-like device. I showed her the triangular paper by saying this is left and this is right as I pointed my right finger to each side while my left hand was holding the device. I was telling her this is RT 45, RT 90, and so forth. Then, I said, "This is nose. Same on turtle in the computer." She pointed to her nose. I told her that the picture she drew was called T-R-I-A-N-G-L-E and informed her that she can begin her work at the computer. She said, "Let me think." She expressed, "Whew," and got up from the chair. She appeared somewhat puzzled. I patted her arm to get her attention to instruct her to look at the picture she drew. I just reminded her that when she started to draw a picture, it did not matter where she started. I showed her all three corners of the triangle as possible places to start. She sat down. I said, "Suppose you wanted to start right here (pointing to bottom of left corner), you move the turtle..." Amanda just picked up the DLM dial even though I had not finished the discussion. I helped her move the triangular paper on the dial. It was in the same position as the turtle on the screen. As her left arm moved down, she said, "I want ... to go down." she looked at me. I paused and thought. I said, "Well, it will be hard to do it that way..." I was again interrupted by Amanda. She signed, "Better not." Then, I said, "But let's start..." Again, she interrupted me and said, "Better to start over." I replied, "No, let's leave the turtle here (meaning on the screen). You have to learn how to move the turtle over there. It's okay if you make some mistakes, and you can learn from the mistakes. It will make you feel good if you fix the mistakes. Start right there." I pointed my finger on her paper to the bottom of the left corner of the triangle. She asked me if L-T 90 was okay or not. I told her to try. She typed it and returned while I wrote the command she used. Her facial expression

with her nose up indicated that she did not want L-T 90. She signed, "Wrong. Better R-T 90. Right?" I inquired why she thought that. She said, "I think RT...LT...RT 90. Now I think RT 90." I said, "Well, what do you want the turtle to move?" She replied, "I want R-T 90. Easy way." She typed it and hit the return key. Her facial expression indicated a thought like "Gosh!" after she saw the turtle turn to the right at 90 degrees. Then, she looked at me. I said, "Remember. Change to LT 90." I got the DLM compass to show her the triangular paper moving to the left at 90 degrees and then RT 90. She asked me if she should type another R-T 90. I said, "Okay."

SECOND 5 MINUTES

Amanda typed RT 90 and hit the return key. She said, "Okay, go FORWARD." I put the DLM away and wrote down the commands on the paper. I was not paying attention to Amanda. She spelled R-T 45 and repeated it. Then, she looked at the DLM compass. I finished recording the information and was asked by Amanda to see if was right to use R-T 45. She moved her hand forward smoothly. I said, "Let's see the DLM compass. This is RT. This is LT. Suppose you want it R-T 45. Where will it go?" Her left hand moved from the point of the triangular paper forwarding into the air. I did not want to say something as I wanted Amanda to learn independently, see the consequences, and have experiences for a better understanding. I told her to try RT 45. She typed it and hit the return key. Her hand turned to the right side. She looked at me. Her facial expression indicated that it was no good. I sat back in the chair. I said, "Let's stop here. What happened to the command? Okay, you have learned LT. You have learned RT. What else?" She answered, "FD and BK." She clapped. She exclaimed, "Oh!" I nodded positively. She signed, "FD and B-A-C-K." I said, "Remember the nose. Now, where to draw?" Amanda moved her right hand forward. She spelled R-T 45. While remaining in the chair, I moved my body closer to the computer. I started to record a command she had used. She typed RT 90 and hit the return key. She frowned, but I ignored it. Next, she input RT 90 and hit the return. She sighed again. I had not noticed this as I was writing. She did the same thing again. Then, she typed another RT 90. She signed, "Again." She input RT 90 and pressed the enter key. She signed why to me, but I was still busy writing while keeping an eye on her. I put my pen on the computer table and signed, "Why? You are asking me. Okay. Well." I got out the DLM dial. I hit both keys, control and T, and looked at the commands Amanda input. I said to her, "You kept using RT 90." I moved the triangular device at 90 degrees three times. She signed, "Okay, okay, okay. Try again." She was ready to type, but she appeared to wonder which command to use. I waited. I typed ST so the turtle reappeared on the screen. I positioned the triangular device as the turtle was on the screen and said, "Now, here we are."

Where do you want to go?" She replied, "I want...", and then moved the triangular device to the left at 90 degrees. I asked her how. Her finger went in a circular motion to make one circle to the right from the triangular device. I told her that there was no need to go around. I turned the DLM dial since the screen turtle was on a different plane. She said, "Oh! I want to L-T 90." I said, "Right." I meant she responded correctly, but it would not help her with the drawing. Amanda input LT 90. I tapped her shoulder, but I let her go ahead. She signed, "A little more." After she entered the key, I said, "Right. We'll figure it out. We want to mover like more left." She opened her mouth and said, "Hmm." My guess is that she was trying to think LT first. She looked at me and I waited for her to finish saying something, but she did not continue. Later, she spelled R-T 90. As I used my right pointer on the triangular device, I said, "Okay, R-T 90. Where does it go?" Both of us moved the DLM compass back and forth trying possibilities. Amanda said, "R-T 90." I told her to try it. She typed RT 90. Then she said, "Yeah! R-T!" She closed her eyes as she hit the return key. She said, "Better do a shortcut." I got the DLM compass because she needed practice. She spelled L-T 45 even before she got the compass from me. I was surprised and said, "Yeah!" She typed LT 45 and hit the return key. I was recording the information. After she hit the return key, she exclaimed, "Right!" Then, I exclaimed, "Right!" As her body moved left, Amanda used both hands and shaped an F. Amanda said, Now, I want to go straight F." She typed FD and pressed the return key. LOGO responded, "NOT ENOUGH INPUTS TO FORWARD." She opened her mouth as if in disbelief.

THIRD 5 MINUTES

She asked me if F-D 45 was right. I replied, "Doesn't matter." I did not want to make the decision for her. Amanda typed FD 45, hit the return and clapped. I was busy recording. Amanda protruded her tongue and clapped. She paused. I said, "Let's look at the DLM compass. Amanda said, "Hmm. L-T 90." I said, "Let's stop for a minute." I moved the triangular device a few degrees and told her it represented ten degrees. Then, I moved it some more. Amanda picked up the DLM compass and compared it to the computer. She moved the device. she said, "L-T 20?" I wanted her to make the decision so I told her it did not matter and encouraged her to do whatever she wanted. Amanda typed LT 20, hit the return and signed, "More. More. More." She typed LT 20 and hit the return. She asked, "More?" I said, "Wait." Amanda fingerspelled R-T. I got the DLM device. Amanda fingerspelled L-T 40. I kept my facial expression from her view. Amanda clapped and said, "More." I got her attention and wrote down LT 20 two times and LT 40 once in a column. I added to show her the total of LT 80. I then demonstrated this on the DLM device. Amanda said, "80?" I replied to add the numbers and indicated a little more was needed. Amanda

asked me. "L-T?" I replied for her to try. Amanda typed LT 40, and said, "Wrong me. Wrong." I indicated for her to wait so she could tell me why she thought it was wrong. She pointed her finger at the nose and said, "See...Oh! Right. Me right." I responded that she was. She said that she wanted FD 45 and paused. I told her to go ahead. She typed FD 45, hit the return key, and said, "Right, I remember." She put her hand on her head as if she were thinking. She massaged her head. She slapped her hand and looked at the diagram on the sheet. She fingerspelled F-T 90. She looked at me. I had no expression. She slapped her hand and fingerspelled R-T 90. I tried to give her the message that I was not making the decision. Amanda typed RT 90, hit the return key, and said, "Wrong me." She then typed LT 90, hit the return key, and clapped. She said, "Right?" I encouraged her to continue trying. She looked puzzled and said, "Nose. Wrong me again." She typed LT 90, hit the return key, and looked as if she did not understand the results. I asked, "Where is the nose? Now..." She interrupted and pointed to the screen at the head. I responded that she was correct.

FOURTH 5 MINUTES

I said, "You were right before you typed another LT 90." Amanda typed LT 90 and hit the return key. I stopped her to show her another command, CTRL-T. She interrupted by fingerspelling S-T. I told her to wait as I was recording. When I completed that, I typed ST. Amanda typed LT 90, returned, typed RT 90, moved hand on the screen, returned, typed RT 90 and returned three more times. Then, she said, "Me. Innocent me." She typed another RT 90 and asked, "L-T 90?" I moved my body closer to her as I made my nose appear to lead. She got up and twisted her torso to move her nose toward her left hip. I laughed a little. She asked me, "L-T 45?" I replied, "You think R-T 45?" She answered, "No, L-T 45." I said, "L-T 45, where does it go?" She put her hand on the screen to show where it would go. I instructed her to do it and not ask for more help. Amanda typed LT 45, closed her eyes, and hit the return. She tapped on the paper and then she typed LT 45. She closed her eyes, and hit the return. She quickly typed RT 90 and hid her face as if she were not satisfied. I told her I was trying to catch up with the recording of what she typed. Then, I said, "Let's think for a minute how you would do it. Look at the screen. How would you draw the line?" She chewed on her nail and tapped my arm asking, "L-T 20?" I replied, "Wait remember how to draw the line." I moved my finger forward and pointed to the turtle on the screen. I asked, "How would you draw the line?" She replied, "I forgot." I said, "Okay, if you forgot, you can find out by pressing CTRL-T, all at the same time. I will show you how." I let her press CTRL-T. I had to help her press them at the same time. Amanda moved her shoulders to indicate that she did not know. I told her to look at the screen. She showed me FD 45 on

the screen and said, "Now, back. Back?" I fingerspelled S-T, which she typed. She typed FD 45 and hit the return and clapped. I said yes. She put her finger on the screen while telling me that the line was not connected at the vertex. I inquired, "What do you want?" She responded, "Want a perfect triangle like the drawing." I suggested that she use the same number of degrees at all three vertices to make it perfect. I showed her the three vertices and told her if each had the same number of degrees, it would look like hers. Amanda said, "Oh." I asked if she wanted to try again or if she wanted to try another drawing. She responded that she wanted to try again. She fingerspelled C-S three times. Then she typed it and hit the return. She said, "Oh! Stupid me! I want to change." I showed her the worksheet with other choices (see Appendix I).

FIFTH 5 MINUTES

Amanda chose the staircase. I showed her the diagram of the staircase on the paper. She moved her right hand to her mouth as if she were thinking, moved it toward me, and then typed LT 90. She paused and then typed LT 90. She spelled F-D. She said, "Oh, I made mistake. Right? Right?" I replied to not ask me. She said, "Better help me. I haven't learn to do this. It's new. Better help me." I signed, "You have already learned LT, RT, FD, and BK." She interrupted with "Better back." I thought she was going to type BK, but she meant to start over. She typed CS and returned. I was going to stop her, but I was too late. I wanted her to learn to fix her mistake, not start over. Amanda typed LT10. The LOGO response indicated a problem. I wrote down for her to see that she had omitted the space and needed LT 10. She typed LT 10 and appeared to be trying to tell me something. I moved my eyebrow up to inquire. She typed something, looked, and slid her chair back saying, "It's hard." I tried to encourage her by getting paper and asking her if she wanted to draw it on the paper. Amanda showed that she had planned to start from the top of the staircase. I explained that would be harder and suggested that she start at the bottom. Amanda typed CS. I was holding the paper up as I was recording. Amanda looked at it. She typed FD. I finished recording, and put the paper down beside the computer. Amanda looked at it. Then, she typed 20 and pressed the return. She fingerspelled R-T 20. I got her attention and asked where the nose was. She indicated the wrong place and I corrected it. I directed her attention to the paper with the drawing. Amanda said, "Hmm." I pointed both fingers at the corner of the step and said it was always perfect. I used the DLM device and moved RT 20, FD 20, then another 20 and RT 20. I put the device beside her. She said, "Please let my mind be on LOGO. Then, she used her left hand to hit her head. I asked if she were okay. She replied, "In my class, I was doing computer. I was confusing. So, need my mind on LOGO." I said okay and told her she could start again. She used

CRTL-T and look at the screen. I said it was old. She said, "New. New." She wasn't paying attention to me. I told her she could think about what happened and start over. She typed CS and pressed the return key. She said, "Now, I remember." She paused and looked at the paper. I reminded her to start at the bottom.

SIXTH 5 MINUTES

Amanda typed FD 20 and hit the return key. Sh asked, "R-T 20?" I shrugged. She tried RT 90, hit the return, and clapped. I said, "Yeah!" Quickly, she fingerspelled F-D 20. I told her to do it and hid my smile. She typed it, hit the return, and clapped. She looked at the paper and moved her left arm to left 90. She typed LT 90, returned, clapped, and looked at me. I clapped. She continued by typing FD 20, hitting the return, and clapping. I asked how many more steps she had. She responded, "Four steps?" I told her that four more would be fine. It did not matter. Amanda moved her hand indicating RT 90, LT 90, RT 90. LT 90. and RT 90. Finally, she typed, returning after each, RT 90, FD 20, and LT90. After that, she said, "Oops! Sorry!" LOGO responded and I asked her if she knew why. She responded that she did not. I started, "Because you forgot to...." She interrupted, "I know why." I said space, but she was busy typing LT 90. She hit the return key and clapped. Next, she typed, returned, and clapped after FD 20, RT 90, and FD 20. She looked at me, but I was still recording. She continued to type, return, and clap after LT 90, FD 20, and RT 90. Then, she asked, "More...FD?" I indicated that was fine as I continued to record. She typed FD 20, hit the return and clapped. She quickly continued to type LT 90, FD 20, RT 90, and FD 20 without seeing turtle turning after each return. She knew what to do type next command since it was a pattern. She said, "Let's look at it." I clapped and said, "What did you think about that?" She replied, "I complained. Now, I understand." I praised her, "You did work well. You do know how to move RT, LT, RT. It was so good. Let's try this. I'll teach you this (pointing in the book to PU and PD)." I demonstrated the commands on the screen calling her attention to what they did. Amanda said, 'I know F-D.' I told her to wait so she could learn P-E-N-U-P. Then, I permitted her to type the first line with PU. I asked her if she saw the line. She did not. I explained to her that is the meaning of pen up. I demonstrated this again.

SEVENTH 5 MINUTES

I let her type and compare PU and PD. I asked her if she knew why she had no line at times. She responded, "No head." I told her it was because she was using the commands PU and PD. She asked if we could do more on Friday. I told her we had two more sessions. She did not seem pleased. I asked her to write in her journal. She did. I encouraged her to write a lot. Amanda inquired, "Six or

seven?" I told her it did not matter but to write a lot telling me what she had learned or what she wanted to think. She wrote in her journal. I wrote a comment on the staircase paper and she smiled. She asked me to spell interest. I encourage her to try, but she told me that she had forgotten. I told her to write. I would understand. Amanda put and "i" on her paper and said, "That's all?" I told her to try to spell the word as I fingerspelled I-N. She fingerspelled I-N and then said she did not know. She asked me to tell her.

EIGHTH 5 MINUTES

I fingerspelled I-N-T-E-R-E-S-T-I-N-G. I tapped her arm to inquire if I would bother her on the computer. She indicated that it would not bother her. She tapped her forehead as if she were thinking. As she moved her finger to indicate the staircase, she asked, "What's the name? Recently? Know?" I fingerspelled S-T-A-I-R-C-A-S-E. She responded by fingerspelling S-T-A-I-R quickly and C-A-S-E slowly. She tapped my arm again and fingerspelled S-T-A-I-R. I told her it was correct. When she finished the journal, we went over it. I asked her what she meant by "I feel good at the computer?" entry. She indicated that I knew. I asked her what she felt good about. She got a pencil and wrote "apart the Logo."

NINTH 5 MINUTES

I inquired what that meant. She said she felt good being involved in the L-O-G-O. I continued reading her journal, "I try now I will do my best. I understand now I will do best try. I really love play on computer. I learn about staircase today. I will not quit Amy's computer. I will still learn more and lot in L-O-G-O." I finished and told her we could quit. She questioned that and I told her I meant stop for the day. Amanda said she wanted to do more. She asked what I had done. She looked and we concluded the session.

SEVENTH LOGO SESSION

March 2, 1990

FIRST 5 MINUTES

I started the session by reminding Amanda two days ago that we were going to learn new commands, P-E-N-U-P and P-E-N-D-O-W-N. I told her we would draw a line on the paper for a clearer understanding. I gave Amanda the paper to hold and fingerspelled P-E-N-U-P. Then I decided to fingerspell P-E-N-D-O-W-N and explained to Amanda that may be the better one to do first. For this, I told her that the pen must be down on the paper. She was to move the paper to touch the pen. When it is PU, I reminded her that the pen would not touch the paper. So, you would see no lines. Then she gave PU or PD directions by signing with her left hand while holding paper with her right hand. It was awkward, and I told her to move the paper down. She said, "I understand. I understand." Next, I told her we could do an exercise. I indicated for her to type from the paper I prepared. She typed FD 20. I tapped her shoulder and asked her to wait and look at the computer. She signed exactly what was on the screen, "Welcome to L-O-G-O." I asked her what she would type. She typed welcome. I waved to get her attention and tell her it was not needed, because it was already there. She said sorry. I asked her if she remembered what to do. She paused to think and spelled S- and S-T. I encouraged her to try and go ahead. Amanda typed ST, returned, and clapped. I had written LT 90, FD 20, PU, and FD 50. I showed her to type LT 90 and FD 20. Then, I instructed her to wait, because she had not spaced between the FD and 20. She did not pause. I corrected it and pressed the return key. Next, she typed PU FD 20. I told her to wait after typing and asked her what she thought would happen on the screen. She replied, "PU, no line." I told her she was right. She also said that it meant HIDE TURTLE. I told her to watch the screen. I hit the return key. Amanda looked and said, "That is what I meant. Hide turtle." I reminded her that FD meant forward steps. FD 50 means forward 50 steps. I instructed her to type CS. She made a mistake and typed SC.

SECOND 5 MINUTES

The message on the computer screen alerted her to the mistake. She said she was sorry and typed CS. Next, she typed FD 20 from the paper. I asked her what the turtle would do. She replied, "Twenty steps." I said, "Yes, but here?" She made the letter F with her right hand and moved it forward. I said that was good. She hit the return key. I asked her if she knew why there were no lines. She responded that she did not know. I showed her PU in the instructions and asked her to type CS. She typed CS. Next, I asked her to type P-D. She said, "That's all?" I said for her to

go ahead and type. She did. Then, I instructed her to space and type F-D 20. She questioned the number and then typed the command after I repeated it. I asked her what she thought would happen. She said, "Down 20 steps." This was an error. I told her to wait. Amanda interrupted and demonstrated how it would go. I said, "Oh, first you said down 20 steps." Amanda said, "Goes up." I replied that was correct and asked her if it does draw a line. She nodded affirmatively and questioned, "Right?" I clapped to indicate that I was pleased. I asked her to do the tasks on the sheet as I pointed to PU, then FD 40, and PD. Amanda typed these. I stopped her to inquire what she expected to happen. She paused and said, "No line." I said, "No line. Then, what do you mean F-D 40?" Immediately, she moved her hand forward. I inquired, "Move. How many?" She responded that it would move 40. I praised her. Next, she typed PD FD, said "I know" and typed 20. I asked her what it would do. She signed a back sign, indicated she was sorry, and signed, "FORWARD, move up 20 steps." I asked, "Will it have a line or not?" She paused, said "Will," and pressed the return key. She looked at the screen and said, "Me right." I clapped and asked her to get the book. I opened the book and asked her to type the commands on page 5. I cautioned her to type CS first. The commands were not abbreviated. She typed PD FD 40. After she typed, I asked her where it would go. She said the P-D moves the line. I said, "P-D?" She responded, "Have a line." I asked her how many and she told me 40 steps. I let her know that was correct. She pressed the return key and said, "I told you." I said, "Good! Great! You did fine. You think good." Then, I showed her the next line to type. She typed PU RT 90 FD 20 while she read from the book I recently showed her. I questioned her what would she think what it does. She signed like the word, "protest" as the turtle turned RT 90. My finger turned to the right at 90 degrees. She exclaimed, "Yes!" Then, her right hand forwarded on the RT 90 side. I quizzed her if that does have a line or not. She replied, "Yes, a line." I repeatedly said, "Will it draw a line?" She again replied, "Yes. it will draw a line, then no line. Let's see" as she pressed the return key. She was nervously smiled. I pointed my right finger on the screen where PU is and briefly explained what does P-U means. I told her that she did good close enough. She said, "Ok. I forgot." I replied, "No. it was because you are learning new thing. you will understand better as you practice." Next, Amanda input PD LT 90 BK 40 as she copied straight from the book. While she was typing the commands, she was saying that she does know. I asked her to tell me what would happened to the turtle. She answered that it was the same recently, but it turned left and had no line. I inquired her where. She answered that it was at the right side and does have a line. I told her that it will have the line and asked her where will the turtle go and where is the nose. She was figuring out by practicing her hands. I said, "Ok. where BK 40?" She said, "Sorry" and finally turned her hand to the left at 90 degrees and then went

down. I clapped. After Amanda hit the return key and saw the turtle made some move, she signed, "Me, right." I informed her to try PU RT 90 FD 20. After she typed the commands, she told me that it will have a line. She tried to figure out with her hands while she thought about where would the screenturtle go. I sighed. I pointed my finger on the screen where PU is. I spelled P-U and asked her if it will have a line. She spelled P-D and said, "No." Then, I questioned her where RT 90 goes. Her right hand turned to the right at 90 degrees at the same time her head was kind of shaking like it was a yes. I again asked her where F-D goes. She moved her right hand upward. I then quizzed her where the nose is. Her right hand turned RT 90 and then forwarded. I asked her if it will have the line. She nodded negatively. I told her to go ahead. She did hit the return key and told me that she was right. I clapped. She typed PD LT 90 FD 40. As she moved her right hand up and started moving it out, she said, "Me know." I said, "Okay. Where does LT 90 go?" She moved her finger forward. I asked her where the nose was. She turned her hand up. She hit the return and said, "Me right." I asked her what she would like to do next. I told her to look through the book quickly, but that did not seem to be a good idea. So, I put the book away and got out a sheet of paper. I asked her to try on the pictures. She did not respond for a while. I pointed to #3 on the sheet and asked her to try it. She said, "Same recently?" I asked her what she would do on this screen. She typed in CS and pressed the return. I gave her the choice of doing #1, #3, or #4. She chose #4 (See Appendix I). She spelled F-D 20, typed it in, pressed the return, and said, "Me right." Next, she typed RT 20 and pressed the return three times. I said, "Wait, let's stop." I got the DLM.

FOURTH 5 MINUTES

I moved the DLM dial in 20's several times. Amanda tapped my shoulder, and she fingerspelled R-T 45. I responded by moving the DLM 45. She then indicated 90. She typed RT 90 and pressed the return. I demonstrated what she had done. As I put the DLM device away, I told her she could start again. She typed CS, and pressed return. I told her to wait, but she typed FD 20 and hit the return. I again commanded her to wait. She paused. She was thinking as she was fingerspelling R-T. I told her to put the pen down. I tapped her shoulder and asked her where it went. I moved my finger from the top of the drawn line to the top corner. Amanda said, "Must have a line." I said, "It says no line. So, what to do with this?" Amanda paused and then indicated what she wanted. I told her to follow it. She indicated that she was not sure how to follow it. She fingerspelled P-U. I told her to try. She said, "Me wrong. Wrong." I said, "It was alright to learn from the mistakes. You are learning better. If you are getting more mistakes, it does not matter. You can understand why and how as you fix them. Do not worry about mistakes. I am not criticizing.

No." Amanda typed PU FD 20 and pressed the return key. She next input FD 20. I asked her about the 20. She responded, "Same recently. FD 20. Hit return." I asked her if she knew why. There was a soft no and she twisted her hair. I got other paper and showed her PU FD 20. I drew FD 20 but made no visible line. She said, "Oh! I want ..." and typed PD FD 20. I said, "Beautiful! Now, what do you want to do?" Amanda started to speak and then looked at the screen. She turned her left hand LT 90 and said, "No? Yes? No?" I got the DLM device out and told her to use it if it helps. She worked with the device and typed LT 90. She pressed the return key and said, "Yeah! Yeah! Yeah! Yeah!" She smiled. She typed RT 90 and hit the return key. She tapped my arm and typed RT 90 again. She hit the return key and clapped excitedly when she looked at the screen. She tapped my arm and said, "Excuse me. F-D 20. Okay?" She typed it, hit return, and clapped. I asked her what she should do next. She tapped my shoulder and moved her head back and forth. I did the same.

FIFTH 5 MINUTES

She typed PU FD 20, hit the return, and clapped. I told her that I wanted the lines to be the same length. I asked her to remember how many steps. I told her to try another. She replied, "90? What did you said recently?" I told her to use CTRL-T and look at the commands. I reminded her that she added another 20. I asked her how many she had altogether. She said "40. So, you need 20 more." I typed ST and then wrote down on the paper. Amanda watched me record. Then, she typed FD 20, erased PU, hit return, and said, "Wrong me." I told her she was right. I pointed out the ones that were the same. She said oh and smiled. She patted my shoulder. I told her she had done fine. She tapped my hand and said, "I was wrong, but now I know. Tell me recently next to go." I told her to do it again. She asked, "A line?" I responded affirmatively and asked how she would do it. She slapped her face with both hands. Then, she typed, FD 20 and hit return. She knew it was wrong. I asked her why. She clapped and said, "Wrong me. I am sorry." She rapidly typed BK 20, hit the return, and said good. She asked, "RT? FD? RT?" I told her to look it up in CTRL -T. I said, See it. PU." She said yes and moved her hand for pen up. I asked if she understood that would not be a visible line. I told her that she needed to draw. I asked how she would do it. I typed ST. She paused. She fingerspelled P-U then P-D. Then, she typed PD FD 20 and pressed return. She typed PD again. I interrupted her to tell her it was not necessary to type PD again. She erased it. She watched me write. I told her to think how to do it. I asked her where the nose was. She said that she wanted to try again. Again, I asked her where the nose was. She pointed to the nose on the screen. I help her with the exact placement of her finger. She smiled and spelled R-T. I told her, "Yup." She typed RT 90 and signed, "I know it will be wrong. Wrong me." I asked

her if she thought it would be wrong. She was typing. I repeated the question. She signed, "Should use L-T 90." I said for her to try it and see what happens. She hit return and said oops, but she did not need to type LT 90. She turned her head right toward her neck. I smiled and recorded. Amanda typed PD FD. I interrupted her to remind her she still had the PD command there and it was not necessary to repeat it. She replied that she needed to draw a line. I told her that the PD command was still there. She erased it, tapped my shoulder, and spelled F-D 20. She asked if that was all. I said yes. She signed, "It will lost." I told her, "No. You try."

SIXTH 5 MINUTES

She typed FD 20 and pressed return. She appeared puzzled about the size. I encouraged her to look at it again. She grabbed my arm, put it to her chest, and signed sorry. I asked why. She signed, "See. We still have P-D. It's drawing a line. If we don't have P-D, we won't be able to draw a line. So if we use P-U. Not necessary P-D." I told her to finish P-D. She replied, "I am fed up. Please help me." I encouraged her to try and think. She spelled P-U. I moved my shoulder up. She typed PU FD 20, pressed return, and signed, "Me right!" I said for us to look at it. She asked, "More?" I answered affirmatively. Amanda started to type and then indicated she would not need P-U again. I tapped her shoulder to stop her. I reminded her that she did not need to repeat the P-U command. Amanda typed FD 20, hit return, and clapped. I said, "Good. What else?" I continued to record and Amanda tapped my shoulder and signed, "Again. Again. Should I use P-D?" I replied that it was fine to change the command when that was needed. She typed PD FD 20, returned, and clapped. I showed her the picture. She practiced movements with her hand and fingerspelled L-T 90. She typed and hit the return. She waved at me and signed sorry. She typed RT 90, returned, and typed RT 90. She fingerspelled P-U and P-D. I suggested that she use CTRL-T. I typed ST. She typed PU FD 20, and hit the return key. I asked her if she knew why. She moved her finger in a wavelike fashion. I told her that P-U would not draw a line. She typed BK 20 and pressed return. She put her hand to her mouth and said, "Hmm." I looked at my watch. Amanda said, "Help me. Hurry up, Amy." I said, "Nope. Look at the screen." She said, "Tell me if I am right P-D?" I pointed my finger toward keyboard. Amanda typed FD 20, hit return and signed, "I told you." She typed BK 20, fingerspelled F-D, and signed, "Never mind." I asked her what happened to the line. She paused, looked at the screen, tapped my hand, and fingerspelled P-D. I encouraged her to go ahead and try. I asked her if she were sure. She said she was not. She typed PD FD 20 and signed, "I know." She continued to type FD 20 and PU FD 20.

SEVENTH 5 MINUTES

I told Amanda it was fine if she needed to change the pen. She typed PU, and erased it. The, she typed FD 20, hit the return key, and said, "Yeah!" I looked at the time. She signed, "Hurry! Tell me! P-D? F-D 20?" Next, I told her to try H-T. She did it. She smiled and I signed beautiful. I said, "Now, we are finished. I want you to write in your journal (at home). Wednesday is our last day. She asked why not Friday. I told her that Friday is home going (meaning that she would go home that day). I instructed her to return to her cottage.

EIGHTH LOGO SESSION

March 7, 1990

FIRST 5 MINUTES

I started this session by asking Amanda for the journal. She made the entry for the session on March 2 independently after the session. She tore the entry from her notebook and gave it to me. Amanda watched as I read the journal. I reacted to the sentences in the journal. I encouraged her to continue LOGO learning. Amanda appeared eager to get started at the computer. She asked me, "What do you want me to make?" She entered ST into the computer. I told her there would be something new and interesting, REPEAT command. I showed her the brackets needed in the commands. Apparently, she recalled where to find them. She indicated that she wanted no help. I did remind her that the brackets were on the left side of the TDD and the right side of the computer. Also, I pointed at the bracket key and told her to use it and the shift at the same time. After the subject typed REPEAT 6 [PRINT "HELLO"], I asked her what she thought would happen. She said it will print HELLO. I told her it would print HELLO six times. Then, I told her to hit the return key. The computer screen was not showing a full screen for the printing of HELLO. So, I pressed CTRL-T to get a full screen. I counted the HELLO's--one, two, three, four, five, six. Amanda signed, "Oh! I understand. See it." I said, "Suppose the teacher told you to write, 'I will not be late to class again' 200 times. You type like this and you are cheating and give it to her." I was laughing. Amanda signed, "I will not be late for class again." I told her yes and to type it. She clapped after she typed it quickly and correctly. She said, "I will not be late for class again. Wow! Long!" I responded that it was. The subject looked puzzled when the wrap on the computer moved a letter to the next line. I told her to continue typing. It was fine.

SECOND 5 MINUTES

Amanda questioned the u in a word. I told her it was my handwriting and corrected it to o in for. She finished typing the sentence. The whole command was REPEAT 100 [PRINT [I WILL NOT BE LATE FOR CLASS AGAIN]]. I asked her how many times she thought it would print. She replied 100. I signed for her to press the return key. As it printed, Amanda said, "Ooooh!" I told her, "You can print them out and give them to your teacher. It works. Saves time. Kidding!" We exchanged facial expressions. I instructed Amanda to type from the paper. I reminded her to start at the beginning as I pointed to it, FD 40 RT 90. I told her that she could imagine what it would look like. She said, "FD steps, right?" I said yes. She responded with FD 40 and right and moved

her fingers in the air. Then she said 4. I said right, 4 times. I told her it saves time to use a 4x drawing. She responded, "Fast." I affirmed this and told her she did not have to type each line four times as we could repeat it. The command was REPEAT 4 [FD 40 RT 90]. I instructed her to type CS. She typed in the information and hit the return. Then, she typed another example, the staircase. I reminded her how long it took to type the commands for the staircase in a past session. Amanda indicated she remembered and I smiled. She said fast and I agreed. She completed the typing and depressed the return key. She said, "Me right." I said, "Fancy." She cleared the screen for the next example. I gave her a choice and suggested that she practice. She made her choice. I suggested that she go back to see how it works. She typed BK 20. I indicated that was correct and she hit the return key. She typed LT 90, discovered it was wrong and tried to erase it, but it was too late. She next typed RT90. LOGO responded. I asked her if she knew why. She did not. I told her that she had forgotten the spacing as I pointed between the RT and 90.

THIRD 5 MINUTES

Amanda typed RT 90 and hit the return key. She clapped and continued the same process as if she had a rhythm with RT 90, FD 20, LT 90, FD 20, RT 90, and FD 20. I told her one more. She typed RT 90. I showed her by pointing to the screen that the turtle needed to go down. She typed FD 20, hit the return, and clapped. At this point, I told her we had finished with one block and she needed to look up commands. CTRL-T was used for this. I told her we would use the repeat marks. I told her to start typing from the paper after you type CS. She did and typed BK 20. hit return key, and then CS again. She asked me what I wanted. I told her, "BK 20, please." She did this and typed REPEAT. I spaced for her. I told her that the number did not matter. She suggested 6 and I said alright. She then asked to see on the paper and counted 4. She typed 4 [and hit the return key. LOGO responded. I told her to wait, but she continued with CS and BK. I responded by putting my hands to my face and saying, "I told you to wait. She said sorry and typed CS. She then typed BK 20 REPEAT 4[and asked me if she needed a space. I was busy writing down her commands.

FOURTH 5 MINUTES

I showed her what she needed to type. Then, she typed RT 90 FD 20 and continued with LT 90 FD 20, RT 90 FD 20, and RT 90 FD 20. I checked her typing against the directions on the paper and then she pressed the return key. We watched the turtle move. It was great until the last one. That was my mistake! I asked Amanda if she wanted to try to fix the mistake. She replied that I could try and she would watch. I suggested that we try example # 3 (see Appendix

J). I got the DLM device and asked her if she remembered . I looked at her and asked, "Don't you feel good?" She replied, "I am okay, but I want to do #2. #1 and #3 little confuse me. #3 is hard." I said, "It is not hard. Let's try. You can use DLM." She picked up the DLM device. I called her attention to the slanted line. Amanda moved the device at a 45 degree angle. I said, "Yes, try on the computer." She fingerspelled R-T? R-T? R-T? I was busy recording. She typed RT 45, hit the return key, and fingerspelled F-D. I picked up my pen and looked. She indicated 5. Then, she typed FD 5 and asked if she were finished. I responded that 5 was too short. More steps were needed. It is better longer. She said, "Better back." She erased the 5 and typed 45. She typed BK 20, hit the return, and said, "It not what I want." I told her, "Better C-S." She did. Then, she quickly typed FD 45, hit the return, and voiced stupid. I lightly laughed. She then typed CS and said, "Think as I write." She typed RT 45, hit the return, and said okay. I told her to draw the forward steps little, because 45 was too long. She asked, "How many?" I replied 15. She typed FD 15 and hit the return key. I told her she did not need to do what was on the paper. She tapped my shoulder and fingerspelled F-D 15. I asked her why. She replied that it would go down and then looked puzzled. I asked her, "Where's nose?" I showed her where she needed to turn. She replied, "Yup. R-T 90" and typed. I reminded her she could use the DLM device. She said she knew, hit the return key, and clapped. I affirmed that she needed to go down. Amanda questioned by fingerspelling F-D 15.

FIFTH 5 MINUTES

Amanda typed FD 15 and hit the return key. I told her okay and continue like the first one. She asked how many. I told her whatever she wanted. She said 3. She put both hands together and moved them to the left. She typed LT 90 and hit the return key. As I recorded, she continued typing FD 15, RT 90, FD 15, LT 90, and FD 15. Then she said, "I forgot." I asked, "Where's nose?" She questioned, "R-T?" I replied, "Don't ask me." She used the DLM device, moved it RT, typed RT 90, hit the return, typed FD 15, and hit the return. I told her, "Now, we want to see what happens if we use the REPEAT 5x command. It will draw the same thing five times. Right?" I used CTRL-T and we looked at the screen. We wanted to start with RT 45 and type REPEAT. I was busy with the papers. Amanda said, "Spend the night. Call my Dad?" I replied that I would call her Dad. She replied, "Mom, because Dad works." I said, "I will call your Mom." I affirmed that I would call. Amanda fanned with the DLM device. I typed ST and returned. I communicated, "Let's use REPEAT command. C-S, please." I showed her to type RT 45. When she did, I said wonderful. Next, I told her to type REPEAT 5 [. Then, I pointed to the commands she needed to type. I put brackets on the commands used prior to this so she

could see how the REPEAT works. Amanda pressed the return key. As I smacked my lips, I said, "Wonderful. You got the idea. We have a few minutes left. It is your decision to draw another picture. Fast." Amanda replied, "I am curious to see the videotape. To see your camcorder. Get up?" I said, "Fine." I turned to the camcorder and said, "Hi Amanda, How are you?" She replied fine. I was surprised and said "You feel better?" She replied no. I said, "No? Little? Sort of? Let's stop. Come back please." Amanda sat down. I said, "Okay, we need to stop our work. Do you want to play with the computer for a while? She replied, "No, I want us to chat. I said, "Fine. Remember your book." Amanda nodded. I said, "Let's go over this. Then, I'll let you write in your journal. Alright?"

SIXTH 5 MINUTES

Amanda replied, "Better write in journal now." I said, "Well, I need to ask you these questions about the test. Okay, you go ahead and write in the journal. Then, we'll discuss the tests. Alright?" Amanda quickly grabbed her notebook. I asked her if she needed a pencil. She said she did. I looked for the pencil and found it under the computer. She said (referring to my pants), "You were short." I replied, "Yes, it's short." She said that her cottage counselor would not let her wear mid-calf length pants. I told her, "Don't worry about them. Don't let them tell you." Amanda tapped my arm and said, "I don't know what to write. It's same on that journal I have"(meaning on March 2). I told her to just write in the journal what happened on the computer and how she felt. She just looked at me. I said, "Today is the last day. It's finished. So, write down what you feel." She wrote, tapped my arm hard, and signed finish. I fingerspelled F-I-N-I-S-H. She saw my reflection on the computer screen and said, "Ha! My eye see you." I said, "I noticed." She fingerspelled E. I asked "What?" She turned my face away. (She fingerspelled some letters) I told her that I could not see. I was out of my range. I took my glasses off and held them to the side. We both laughed. I then spelled E and A after she did. She said that I had cheated by looking at the computer screen. I told her that I did not look at it. She covered the monitor with the notebook. I said, "Fine. Whatever." I could see from the videotape that she had fingerspelled C. I told her it was too far away. She moved it and I repeated it. Next she spelled R and I spelled K. She shook her head no. She spelled R again and I repeated it. She responded Y-E-S. Then, I repeated the letters she spelled: Y, S, and A. She spelled R, and I responded L, R. She tapped my shoulder. I turned to her. She said stay and pushed my head back. I could see from the videotape that she had signed, "My name is ____." I told her, "Too bad, Can't see. I am getting a headache. My eyes turn all around. They are hurting. You go ahead and write." She wrote for two minutes, tapped my shoulder, and told me she knew she was

finished. We went over her journal entries. I smiled at her first entry in which she said she wanted me to stay forever. Amanda interpreted the next one to mean she did not want to quit. I asked her if she meant she did not want to quit LOGO or the school. She said she meant she wanted to learn computer LOGO so I would continue to teach. I asked her if she wanted me to stay here all my life and she shook her head yes. I replied, "All my life! Wow!" She tapped my shoulder and said, "Computer work. LOGO." I inquired about the next entry concerning not feeling good at the computer because her body was sick. Amanda explained that she knew I wanted to go to Atlanta, but she wanted me to come back.

SEVENTH 5 MINUTES

I asked her why. She said, "Because Amy is a good teacher." I felt flattered and said, "I am impressed. Thank you." We began work from the inventory. I asked Amanda if she felt pressure in the math class and not here in LOGO. She responded that she felt awkward. I asked, "Do you like math now?" She shook her head no. I said, "No? Why don't you like?" She replied because. I removed the pencil from her hand and put it on the table so she could sign. Amanda signed, "Because to used to subtraction. Other kids need to learn. I get tired of help them. I want to move on in math." I asked if she felt math was fun. She responded, "Think little." I asked, "Do you feel happy in math class?" She shook her head no. She taped my right hand and said, "We use multiplication now, next year." I replied, "You wait to use multiplication until next year?" She said, "NO. Now." I said, "Oh, I thought you meant next year. I misunderstood you." I asked, "Was it fun to work with math problems?" She replied that it was with multiplication. I said, "It is important for you to take math every year until you finish school." She smiled and said yes. Next, I asked, "You think your friends do math better than you?" She nodded her head and said, "Yes. Fine. I meant--not multiplication--but addition and subtraction. We are learning multiplication. Not get expert. But will be skilled in math." I asked, "Feel math is tiresome and boring?" She nodded her head yes and said "We do about an hour." I asked, "What is your favorite subject?" She asked to see the test. I told her the question was not there and repeated the question fingerspelling S-U-B-J-E-C-T. She responded, "Work?" I replied, "S-U-B-J-E-C-T means social studies or math or reading or English or spelling." She replied ASL. I questioned her response. She said, "Know. Read. See. We sing and sign ASL." I replied, "Your favorite subject is A-S-L, right?" She said yes. I said, "That's great. I am proud. Do you want to say something about LOGO today--feel--study--learn?" She said, "Fine, but my throat is sore." I said, "Yes, I know it hurts. Well, okay, let's forget about your sickness. Do you feel good about LOGO? How has it influenced you? Not today, but other days." She replied, "Like work. Like to learn." I said, "Okay, like this computer room or

the other in middle school. Which do you prefer?" Amanda replied, "Here. I like here the best." I checked, "You like here better?" She responded, "Because other bother interrupted. That's why." I said, "That's why. Kids bother us at middle school. Suppose no one bothers us at middle school--so which do you like--here or there?" She replied here. I said, "Here? Doesn't matter. Listen, if we enter middle school computer room, nothing bothers us. Would you like there better than here? Right?" She shook her head yes and said, "I like there if kids don't bother us." I said, "Well, do you want to say something more?" She shook her head no. I asked, "Are we finished?" She shook her head yes.

APPENDIX D

SPECIFIC COMMANDS AND DESCRIPTIONS OF PROCESSES
IN EACH SESSION

This appendix contains a sequential listing of all data input for the computer during the eight sessions of this study. Notes are provided to show who input the data, the questions concerning the data, and the responses to the data by the LOGO program, the subject, and the researcher.

FIRST LOGO SESSION

February 7, 1990

<u>Data</u>	<u>Notes</u>
No Data	this session

DATA ENTRY #2

February 9, 1990

Data

Notes

- 1) PRINT [HELLO]

I told Amanda to type this statement directly from the book on page 16. It took her a while to type it because she was not familiar with the computer keyboard since it is not the same as the keyboard she was accustomed to on the TDD (Telecommunications Device for the Deaf). I had to help her find the "[", and then she typed HELLO. She signed, "Stupid, me," as she tried to find the "]". I said to her, "No, you are learning. It is alright," and then I typed the "]" for her. I explained the <RETURN>. I signed "RETURN" with two fingers crossed as a letter R and then my right hand with R twisted just like it was really for the typewriter carriage to be returned. I told her that when you saw <RETURN>, it meant to hit the return key. After Amanda hit the return key, LOGO responded:

HELLO

I said, "It says HELLO. She was about to type HELLO, but I stopped her from typing.
- 2) PRINT [GOOD MORNING]

I signed, "PRINT" as the sign for a hard copy, "[]," and "GOOD MORNING." Amanda keyed it into the computer. After she typed "GOOD," she had to look at the book on my lap for the spelling of MORNING. She spelled M-O-R-N as I put the book on the table. She typed it, and then signed, "Dumb, me." I said, "No, you are not. You are doing fine." I corrected the typing since there was no space between GOOD and MORNING. I let her hit the return key, and the LOGO responded:

GOOD MORNING

Amanda said, "Wow."
- 3) TYPE [GOOD MORNING]

I had her type this input as I showed her it on page 17. Amanda typed T, looked at the book, and fingerspelled Y before typing it. I helped her find P,E. She then typed the rest of the input except the last]. I volunteered to help

her type the "]" I told her to hit the return key. LOGO responded:

GOOD MORNING?

- 4) TYPE [GOOD MORNING?]

I told her to type straight from the book on page 17. After hitting the return key, LOGO responded:

GOOD MORNING??

I asked her if she understood why there were two question marks. Her answer was no. I explained that there was a question mark inside the bracket.

- 5) PRINT [HELLO

I told her to try this command. She did ask me if it was the same thing. My response to her was it was a different one. She typed the whole command and returned. LOGO responded:

HELLO

GOOD MORNING

She did notice that it printed on two separate lines. She told me that she understood.

- 6) TYPE [HELLO] TYPE [GOOD MORNING]

I asked her to look at the book and type this command. She did type as she looked at it. After she pressed the return, LOGO responded:

HELLOGOOD MORNING?

- 7) PRINT [PRINT]

I told her to do this one on page 19 and she typed it. As soon after she pressed the key, LOGO responded:

PRINT.

She did study the LOGO response and I discussed that it printed PRINT from inside the bracket.

- 8) PRINT "HELLO

She typed it straight from the book on page 19. I did help her find the ". She then pressed the return. LOGO responded:

HELLO

She opened her mouth and signed hello. I explained to her that this time we used the quotation mark, not the bracket and it can still be printed.

- 9) PRINT "HELLO"

Next she copied this command from the book by typing and returned. LOGO responded:

HELLO"

- 10) PRINT HELLO

I informed her to continue by typing this command, and she did. I also told her that it

was a little different from others. After she hit the return key, LOGO responded:

I DON'T KNOW HOW TO HELLO

She did sign this response and her facial expression demonstrated to me that she didn't understand why. I told her that we did not put either brackets or quotation marks. Therefore, LOGO does not know how to print HELLO.

11) PRINT 2

I informed her we could this example and it was different from other examples due to the math part in it. She typed it and then hit the return key. LOGO responded:

2

She noticed that it only printed 2. I informed her that it can print the math part without any brackets or quotation marks, but not in the language part. She was thrilled and wanted to try another one.

12) PRINT 2 + 2

I helped her find the +. I tried to stop her from hitting the return, but it was too late. I just wanted to ask her what the LOGO response would be. LOGO responded:

4

13) PRINT 34671 +
(834 - 657)
+ 562

She had some trouble shifting the +, and I helped her once. After she finished typing PRINT 34671 + (834 - 657) + 562 and pressed the key, she said, "Wow." LOGO responded:

35410

14) PRINT [2 + 2]

I showed her to type this from the book and informed her to wait before hitting the return key. I asked her to guess what it would look like. Her answer was [4]. After pressing the return, she questioned why it didn't compute 4 since LOGO responded:

2 + 2

I informed her that was because of the brackets.

15) PRINT [HELLO]

I typed this one since I wanted to review with Amanda. I returned. LOGO responded:

HELLO

16) PRINT "HELLO + 2

I told her to input this one. I asked her what she thought the response would look like even before she hit the return. She tried to look at the book, but my hands covered it. Later, her

response was HELLO 2. Then, she hit the return. LOGO responded:

+ DOESN'T LIKE HELLO AS INPUT

She signed, "Immature." I laughed and she laughed. I explained the reason to her.

17) PRINT [HELLO] + 2

I asked her to type it and asked her what she thought it would look like. She paused and answered HELLO + 2?. I told her to press the return. LOGO responded the same thing as the last one. I explained why LOGO doesn't print out all the input. I reminded her of the symbols.

18) PRINT 2 -

I allowed her to type it from the book. I almost helped her find the subtraction sign, but I decided not to since she needed to learn independently. She typed and then pressed the return and LOGO responded:

NOT ENOUGH INPUTS TO -

She looked puzzled and I explained that there was no other number after the subtraction sign.

19) 2 + 2

I asked her to please type 2 + 2. She said that she knew and commented it will get 2 plus 2 equal 4. I encouraged her to type it in. I quizzed her to see if she thought the answer would be the same, but this time she answered 4 +. After she pressed the return, LOGO responded:

I DON'T KNOW WHAT TO DO WITH 4.

I explained to her that was because of no command such as PRINT.

20) 3

I asked her to try 3. She asked me if that was only 3 to be typed. After typing it and returning, LOGO responded:

I DON'T KNOW WHAT TO DO WITH 3

21) PRINT 3

I made this up because I wanted her to see the result so she would understand better. She input it and hit the return. LOGO responded:

3

I asked her if she saw the difference between these two responses. She appeared to think she understood, and I did not question her more.

22) PRINT 5-4

While she was typing this input, she told me that she knew the result. I asked her to please

tell me the answer. Her answer was 2. I questioned her if that was a 2 and she nodded her head yes in response. I told her to press the return. She told me that she knew it was one and then hit the return. LOGO responded:

1

I clapped and cheered.

23) 6 - 3

I asked her to type this input. She answered a 3 before pressing the return. LOGO responded:

I DON'T KNOW WHAT TO DO WITH 3

She said that it needed a PRINT command.

24) SHOWTURTLE

I asked her to type this command. After she input it and pressed the return, we saw the turtle appear on the screen.

25) CLEARSCREEN

I asked her to type it and then to return. I told her that was wonderful after she pressed the return.

26) FORWARD 40 RIGHT 90

I was being careful to use the sign for the word, FORWARD. I showed her this command from the book on page 25. She spelled F-O-R-W-A-R-D while she was typing it. I gave her the number 40. She continued to type RIGHT 90. I discussed with her about the term FORWARD and RIGHT before she hit the return. She opened her mouth after seeing the turtle go forward 40 steps and then turn RIGHT 90. I quickly explained what happened to the turtle and how moved.

27) FORWARD 40

I fingerspelled F-O-R-W-A-R-D 40 for her to type. She asked me if that was all. I helped her hit the spacebar between D and 4. Then, I quizzed her about what she thought would happen. She gave her answer by moving her left hand back. After she hit the return, she smiled at me. I told her that it went forward (horizontally), not backward.

28) RIGHT 90

I asked her to type it. After she input it, I asked her what she thought would happen. Her response was that it went backward (still horizontally) as she moved her left finger. I allowed her to press the return key. I demonstrated to her how it works by pretending I was driving and turning to the right at 90 degrees.

- 29) FORWARD 40 I spelled F-O-R-W-A-R-D 40. She then typed it and I asked her what she thought would happen. Her answer was that it went forward horizontally as she moved her right finger. After she returned, her right finger moved as it went down vertically.
- 30) RIGHT 90 I told her that I wanted her to try RIGHT 90. She typed it and answered my question about how the turtle would move. She paused and answered that it turned to the right at 90 degrees. After she hit the return key, I clapped. I told her to look at the diagram on the screen and informed her it looked like a table.
- 31) FORWARD 40 I informed her that we would like to make a square and asked her how she would make the square. She spelled F-O-R-W-A-R-D 40. I told her to input it. She typed it and asked me if she could press the return. I told her that she could. I clapped after she hit the return and saw the turtle draw a line. She said that she was smart.
- 32) CS I discussed with her about an abbreviation for CLEARSCREEN which was CS. I told her to type it. After she input it, she asked me if she needed to press the return. I told her she may do so.
- 33) FORWARD 200 I spelled F-O-R-W-A-R-D. She was ready to type it. I tried to tell her the abbreviation of it. Then, I informed her to input 200. I then asked her what she thought would happen. Her response was that she did not know and she wanted to hit the return key and see what happened to the turtle. I told her to look at the turtle for a minute and then she said that she knew as her right finger backwarded vertically. I allowed her to hit the return. I informed her that the turtle went up and then wrapped because 200 was too many steps to be in a fullscreen.
- 34) CS I told her to type it and she did.
- 35) BACKWARD 20 I spelled B-A-C-K-W-A-R-D. She smiled and then typed it. I informed her to space and then to input 20. I helped her hit the spacebar. I questioned her about what she thought would happen. Her response was that the turtle went

up and then backed down (vertically). After hitting the return, LOGO responded:

I DON'T KNOW HOW TO BACKWARD

36) BK 20

I typed it and it worked.

37) BACKWARD 20

I typed it and returned. LOGO responded the same thing as in number 35. I said, "BOO!" I informed her that was maybe because of wrong spelling. Anyway, I said, "BACK is abbreviated with BK."

38) CS

I asked her to type it.

39) FD

I told her to type F-D and then to space. She typed it, but she hit the return instead. LOGO responded:

NOT ENOUGH INPUTS

40) FD 40

I typed this one as Amanda said that it went up and then went back down. We had a small discussion about the term of FORWARD.

41) BK 40

I told her to type it as I spelled B-K. She typed it and I then informed her to space. After she spaced, I said to her to input 40. She did and I asked her what she thought would happen. Her answer was the movement of her right finger up vertically. I sighed and questioned to her about what B-K meant. We had some discussion about both terms of FORWARD and BACK. I quizzed her with the same question and her reply was the movement of her right thumb backward. She then hit the return key. I informed her that it went back to the same place as before. We concluded this data entry so Amanda could have 10 minutes to write the journal.

DATA ENTRY #3

February 14, 1990

DATANOTES

- 1) ST
I told Amanda to type it and to return the key. I briefly discussed with her the abbreviation of SHOWTURTLE. The turtle appeared on the screen.
- 2) RT 45
I asked Amanda if she remembered what is R-T. She did not remember and I spelled R-I-G-H-T. I told her to type RT and to press the spacebar. After typing, I asked her to input 45 and to wait before she hit the return key. Before she input the 45, her right hand turned at LT 45. After she saw the turtle turn at RT 45, she put both hands together turning to the right at 45 degrees.
- 3) FD 40
I asked her to input F-D and we discussed the sign of FORWARD and the abbreviation of it. She typed 40 after I told her to do so. After I asked Amanda if she remembered how to FD 40, she smiled, turned her right hand to the right at 45 degrees, and moved it forward. I told her that was right and informed her about forward 40 steps up. She said to me that she was right after she pressed the return key.
- 4) RT 90
I gave this command to Amanda by signing. She asked me to help her spell as she tried to spell R-F. I spelled R-T. She told me that she knows where the screen turtle would go. Her left hand turned RT 45 and then it went forward. I briefly discussed RT 90 and asked her to demonstrate me where the turtle would go. Amanda put her right pointer finger on the screen while her left hand rotated at RT at 45 and then forwarded. After she hit the return key, she told me that she was wrong. I correctly showed her as my right finger turned to the right at 90 degrees.
- 5) CS
I typed it for Amanda.

- 6) RT 45 FD 40 RT 90
FD 40 RT 90 FD 40
RT 90 FD 40 RT 90
- I asked her to copy these three lines from what I wrote on the yellow sheet. She had some problems understanding not to press the return key each after each command. After she pressed the key, she appeared amazed to see the diagram the turtle drew. I asked her what kind of the shape she thought it was. She answered it was a triangle. After I questioned her if it was a triangle or not, she drew a diamond shape with her pointers. I turned my paper around and quizzed her again what it was called. She answered by signing, "baseball" and by spelling, "b-a-s-e." I informed her that was a good idea. I then told her that it was a s-q-u-a-r-e. I drew a square on a piece of paper and turned it around to the side.
- 7) CS
- I instructed Amanda to input it.
- 8) RT 90
- Amanda saw the command from the paper I prepared. I asked her what would happen as she hit the return key. She answered by positioning her right hand at RT 90 and forwarding it. She smiled at me after she pressed the return key.
- 9) CS
- I asked her to type C-S and to hit the return key.
- 10) LT 90
- I told her to type it and to wait for me. After questioning her, she responded by putting her left hand and turning to the left at 90 degrees. I then informed her that she may press the return key. She told me that she was right after seeing the turtle turned LT 90.
- 11) CS
- Amanda was told by me to type it and to press the return key.
- 12) BACK 50
- I spelled B-A-C-K 50 to her so she could type it. I quizzed her and she responded by moving her left hand vertically backward. Of course, she expressed to me that she was right after hitting the return key and seeing the turtle's position.
- 13) FD 45
- I told her to type this command. To answer my question, she put her left hand and shifted forward vertically. We discussed back and forth by quizzing and demonstrating to each other. Finally, Amanda's left pointer finger forwarded

horizontally. I told her that was correct and asked her how many spaces it would go. Her answer was 45. I signed a yes by using both hands.

- 14) CS
Amanda was informed to input it and then to press the enter key.
- 15) FD 45
I told her to type FD 45. I told her to press the return key without quizzing her.
- 16) BACK 45
I spelled B-A-C-K 45 to Amanda. She typed it although she asked me if I told her to type 45 or not. After quizzing her about the position, she moved her left pointer finger backward vertically. She pressed the return and saw the turtle go backward 45 steps. She said to me that she was right.
- 17) BK 30
I spelled B-K 30 for her to type and told her to wait for me. I questioned her about what would happen to the turtle. Her left finger moved vertically forward. I called her name as my facial expression showed her that she show know better. After asking her what B-K means, she paused and moved her left hand forward and downward. I told her that she did not tell me what B-K was, and I again asked her that meaning. She spelled B-A-C-K. I again asked her and this time her finger pointed down. I asked her how many would it go down and she replied 30 and then d-e-g-r-e-e. After she pressed the key, I quickly explained that was not 30 degrees, but units.
- 18) F-D 45
I told Amanda to type F-D. I explained to her about the steps and she interrupted by saying 45. She hit the return key after asking me for permission to do so. I talked with her about what happened in the last two commands as I showed them to her on the screen by pressing both control and T keys.
- 19) ST
I typed this one.
- 20) FD 75
Amanda thought of this command all by herself and hit the return key. She told me that she did not see why the screen turtle forwarded too long. I explained to her that it was because she added both FD commands which ended up 120.

- 21) ST I input this one by pressing both control and T keys to look at the screen to make sure I have written all the commands Amanda typed.
- 22) CS I also typed this one.
- 23) FD 45 I told Amanda that I was going to show her what we had completed by typing this.
- 24) BK 45 I explained to her that this made it go back to the same place as before.
- 25) BK 30 I input it and pressed the key without an explanation.
- 26) FD 45 I informed Amanda that this was what she typed earlier. After I hit the enter key, I told her that was her mistake for not adding. I discussed with her that one more was needed for the turtle to go up and she interrupted me by saying that was 30. I paused and said to her that she was right.
- 27) FD 30 Amanda typed this command by herself and hit the return after asked permission to do so.
- 28) HOME I typed HOME and was puzzled for a moment. I wanted the screen to be cleared. I informed Amanda that command was for the turtle to return the original position.
- 29) CS I again typed it and pressed the enter key after I informed her that we wanted the screen to be cleared.
- 30) T Amanda did not understand what I was trying to say. I told her that I wanted her to draw a shape like T.
- 31) BK 45 Amanda tried this one by herself.
- 32) F-D 45 She spelled it out before she typed it.
- 33) L-T 45 She did it immediately. I tried my best to explain to her the term of degree, but she wasn't really understanding that much. I could tell, because she kept saying different degrees.

- 34) LT 70
Amanda just typed it after a quick discussion. I tried to explain to her that she added both LT commands and it became 115 degrees.
- 35) CS
I typed it because I decided it was best for us to start all over.
- 36) FD 100
I input it so Amanda would start in a easy way making a T.
- 37) LT 90
After we looked at the protractor, she decided to type it.
- 38) RT 90
She entered it after trying to ask me if it was right. She did spell R-T 90. After questioning her, she moved her right hand horizontally forward.
- 39) LT 90
She decided to type it after we discussed the turns RT and LT.
- 40) BACK 100
We talked the changes of the commands. I mentioned that using LT and RT were only for the turtle to change. She then spelled B-A-C-K. I told her to try in on the keyboard. She asked me for the number, but I told her to use whatever she wanted.
- 41) LT 100
It appeared that Amanda wanted the turtle to step 100 steps. She spelled L-T 100 before she typed it. She questioned me to determine if she was right or not. I asked her why she thought LT 100. She told me that was because it went RT as she moved her right hand forward, not turning to the right. Also for the LT command, she mentioned that it went left as her left hand backwarded, again not turning to the left.
- 42) RT 10
I told her that I would show her how to do this. Unfortunately, I made a mistake by pressing another zero which made it 100 instead.
- 43) LT 110
I typed this one, but the turtle did not return to the place as I wanted. So, I had to think for a moment.
- 44) LT 10
I input it and thought what the next input needed to be.

- 45) LT 10 I finally got what I wanted after typing this command and pressing the return key.
- 46) FD 100 I decided to type it because I wanted Amanda to see that the turtle does draw the line.
- 47) LT 90 Again, I continued to type.
- 48) FD 50 I entered this input and Amanda appeared to wonder how it worked.
- 49) BK 50 I discussed about using the commands, FD and BK, but Amanda wasn't very attentive. Her facial expression looked like that she was disappointed after she hit the enter key.
- 50) BK 60 She decided to use 60. It should have been BK 50. After hitting the return key and seeing the turtle finish the T she told me that she was right.
- 51) FD 60 I typed it because I wanted to show her that both top sides of a T should be exactly the same.
- 52) BK 50 It helped Amanda to realize that she needed to use the same number for both sides of the T by seeing the turtle right near to the end of the line, but it wasn't at the end. I briefly explained that we would use 50-50, not 60-50 due to a longer line on one side.

DATA ENTRY #4

February 16, 1990

DATANOTES

- 1) ST
Amanda first spelled A-T. I signed SHOWTURTLE. She then spelled S-T.
- 2) FD 100
I asked Amanda to type it as I copied it from the book. I told her to watch the screen while I pressed the return key.
- 3) RT 90
I signed this command to her and she input it. I asked her to watch the screen again, but she interrupted me by showing me both of her hands put together turning to the right at 90 degrees. I asked her if the turtle will make a line or not. I asked her to watch the screen while I hit the return key.
- 4) FD 100
Amanda did the typing as she saw my pointer finger on the book to show her to one to type. She asked me if it was okay for her to press the return key. I allowed her to do so. After seeing the turtle forward 100 steps, she said, "Down." Actually, it went horizontally forward for 100 steps.
- 5) BF 100
Amanda typed this one, but she took longer than for the others. She opened her mouth after she pressed the return key. LOGO responded:
I DON'T KNOW WHAT TO DO WITH BF.
I informed her that LOGO doesn't know what BF means.
- 6) BACK 100
We discussed using the command either BACK or BK, not BACKWARD. Amanda had some difficulty making the decision of what to input. I questioned her about where the turtle would go. She responded that the turtle would go down as she moved her right pointer finger downward. I did asked her again and she changed her mind by saying that it would go left. She realized that she was wrong after hitting the return key and seeing the turtle move.

- 7) LT 100 After a short discussion, she decided to type LT 100 and to hit the return key. After this, she looked at me .
- 8) RT 100 She did asked if she could use R-T or not. I preferred not to answer her question. After she typed the command and pressed the return key, I explained that it went back to the same place as before.
- 9) FD 100 She spelled F-D while I was busy writing down the command she had made on the sheet. She wanted my response; however, I told her to try it herself and not to make me decide for her. She then input 100 after typing FD. As soon as she hit the return key, she saw what happened to the turtle and said that it went back to the same place as before she typed BACK 100.
- 10) BACK 100 She spelled B-A-C-K. I told her that she had done that recently and it was finished. Therefore, she erased it.
- 11) RT 90 We had to discuss about already using LT . She remembered that she had typed LT and explained to me why it didn't work. So, I told her that was right and also it needed to be the opposite. She said that the turtle needed to go that way indicating she meant for it to turn at RT 90, but she did not say RT 90. She asked me if she needed to input RIGHT and I answered for her to try. She questioned about that, but she typed RT 90 anyway. After she pressed the return key, I asked her if she saw why and saw the turtle turn to the right at 90 degrees. She expressed that she did, but I explained that it TURNED.
- 12) RT 90 She typed this command. After she saw the turtle turn RT 90, she opened her mouth indicating that she had made a mistake.
- 13) RT 90 I told her to try again, and she might have thought I told her to type another RT 90.
- 14) RT 90 She spelled R-T as she typed it. She first asked me if L-T needed to be input or not. I did not answer her at all, but really that was right she needed to input LT 90. She started to type RT 100 as that was what she told me, but

- instead she typed RT 90. She noticed that the turtle had already been there before.
- 15) RT 90 She indicated that she wanted to type this command since it had been right before.
- 16) BK 100 She spelled B-A-C after I told her that we wanted the turtle to draw a line. I told her to try after she fingerspelled. Before she entered the BK 100, she begged for my answer. I refused, as I informed her to answer by herself. I asked her if she saw the line.
- 17) FD 100 I commanded her to try FD 100. She input it and then hit the return key. I asked her if she still wanted to draw a square. She replied that she did.
- 18) FD 100 I questioned her as to what the turtle would do. She tried to figure out where would the turtle go as she moved her body position, but she said, "I don't know." I told her that she does know. I discussed with her if FD and BK do give a line. She answered BK. It appeared to me that she thought only one command would draw the line. After showing her that the turtle would move that way, she responded F-D. I praised her even before she hit the return key. She said that she was right after pressing the return key and seeing the turtle move forward 100 steps.
- 19) LT 100 She told me that she wanted L-T and typed LT 100. She pressed the return key right away. She said that she was wrong.
- 20) RT 100 I corrected it for her. I told her not to type 100 since it was incorrect. I told her that she needed to input a right angle which I used the word perfect angle for the right angle due to her lack of the concept of right.
- 21) L She entered L and said that she was wrong. She erased it.
- 22) RT 90 She retyped it after she erased the L. She saw the turtle change and said, "Oh, I see."
- 23) RT 90 She went on to type RT 90 without questioning me. I said to her, "Amanda, if you continue to type RT 90, then think where it will go." She

answered by turning her right hand to RT 90. I told her to try. She pressed the key.

24) RT 90

She input another one after all I explained about the term RT (does not draw the line, but only changes the position).

25) RT 90

I told Amanda to try again. She typed another RT 90 because she thought that I told her to type it again. I had said for her to try again. After she pressed the key, I told her not to use RT 90. She questioned me if she needed to input L-T and I said to her, "No. LT changes the turtle." She responded oh.

26) FD 100

I moved my right hand horizontally forward and toward Amanda and told her that we wanted it to draw a line. She moved her hand vertically toward to the computer and spelled F-D. I told her to try. She did FD 100 after asked me to do so. After pressing the key, she told me that it didn't match.

27) HT

I told her to wait and typed HT so she can see that it does match at the corners.

DATA ENTRY #5

February 21, 1990

DATANOTES

- 1) T
Amanda typed it on the keyboard, since we wanted the turtle to appear on screen. After she hit the return, she said, "I told you." She meant that she knew T was not right. LOGO responded: I DON'T KNOW HOW TO T, and she paused appearing to recall which command she needed to "call" the turtle to appear.
- 2) S-T
Amanda asked me, "S-T?" I told her try it on the computer. She typed it and hit the return. She clapped.
- 3) R-T 90
I told Amanda that I wanted her to type R-T 90 and to wait. She typed it. I said, "Remember the turtle face...", and she interrupted by signing, "I know." I told her to watch the screen while I hit the return. She watched and commented that LT 90 is on the other side.
- 4) RT 90
Amanda said, "I know where," and smiled. She typed it and waited. I asked her what it would look like. She pointed her finger to the turtle on the screen and moved it to right 90 degree. She hit the return and signed, "Me right."
- 5) CS
Amanda typed it directly from the sheet and hit the return. This command was for the screen to be cleared. The reason I wanted it to be cleared was because it would be easier for Amanda to see the movement of the turtle better after cleaning all the drill using RT and LT commands.
- 6) RT 180
Amanda typed RT 100, and she corrected it. I asked her where the turtle went. She put her hand on her nose and pretended that she was a turtle. Then, she moved her head to right. I replied, "Right to where?" She looked at the computer and her right hand moved 90 degrees right. I said, "Yes, one more." Her right hand moved another 90 degree right. It was awkward for her to do it. I hit the return key as Amanda watched the turtle turn 180 degrees to

the right. She signed, "Me, right" meaning "I am correct."

7) RT 90

After Amanda typed it, I asked her where RT 90 went. She held her hands together and paused. I got up and turned my body around so that my body position was the same as the turtle's. I put both of my hands together and asked her "Where is right?" I repeated it saying, "Right, then what to do?" She moved my hands to the left and said, "That is LT." I nodded affirmatively. She then moved my hands to the right 90 degrees as I turned my body 90 degrees right. I said good and sat down. She keyed the return and again said, "Me, right." I clapped. She made a face.

8) LT 90

After typing it and before keying the return, she replied, "I know where." I told her to tell me where and she asked me to stand up. I got up and positioned myself as the turtle was. She quickly turned my shoulder to the left 90 degrees, and I had to move my body quickly, too, so I wouldn't be hurt. I said, "Right." She hit the return and, of course, signed, "Me, right."

9) LT 90

After Amanda input LT 90, she immediately said, "I know where." I asked her to tell me where. She told me that she knows where, and won't tell me so I said please. She, then, stood up and I had to get up. Amanda moved my arm and asked if this was where the turtle is positioned on the screen. She noticed it was not, moved me to where the screen turtle was, and quickly turned me to the left 90 degrees. We both sat down and Amanda keyed the return. She signed to me, "Me, smart." I didn't say anything, but I just smiled and then laughed.

10) LT 90

I told Amanda wait and tell me where it was going after she typed the command. She got up and positioned herself as the screen turtle was. She turned 90 degree left without any pausing. I said, "Right." She hit the return key and sat down.

11) R-T 45

After she talked about a cheerleader jacket, I told her to focus on the computer, not cheerleader. She replied, "I think about it,"

and typed RT 45. I told her to wait and to think where it would go. She said, "See," and picked up the compass. She had to get up and to figure it out. I just got up and helped her fix the compass for a minute as we were trying to figure it out since we were not really experts. Amanda said, "Then it's," and turned her body right to 45 degree. I had to think before I responded to her. I moved my right hand, and said, "Yes!" I clapped and got excited because I did not expect her to answer correctly the first time since the idea of 45 degrees may be difficult for her. Of course, I was shocked and thought she must be better on the compass than I was. I wondered if this compass really did help her to understand or not. Anyway, we both sat down and clapped just as if we were celebrating.

12) R-T 45

I signed to Amanda, "R-T 45, again." Amanda told me where would the turtle would turn, typed it, and keyed the return. She smiled and signed, "Me right." I said as I moved my finger right twice at 45 degrees, "That is 45 and 45. Added them together is 90."

13) RT 45

I showed my list to Amanda before she put RT 45 into the computer. She was pausing just a second before getting up and quickly turned herself to the right at 45 degrees, and said that was easy, easy, easy. I clapped and said, "Yeah!"

14) R-T 45

This time I signed the command to her, and she showed me where the screen turtle would turn and typed it. She did not hit the return key, but she just got up, turned her position to the right of 45 degrees, and finally keyed the return. I clapped and said, "Now, one more command."

15) LT 180

Amanda typed LT 100 by mistake, but I corrected it. She said, "But on your paper it is written 100." I responded to her that would probably due to my lousy handwriting. She said okay. I asked her to show me where the turtle was. She yawned as she got up from her chair and looked as if she was confused probably due to what I signed. I again asked her the same question. She told me that the turtle was going down. I said to her, "Wait a minute," and had to get up

because I had get her positioned as the screen turtle should be. She replied, "I know L-T 180," and I said, "Yes?" She turned to the left 90 degrees and said, "Wait." She turned back RT 90 and her arm moved LT 180. She asked me if that was right and looked at me for a clue. I gave her no response. She turned her body left at 180 degrees and said, "Me right me." I shy-like smiled and she immediately signed, "Me right!" I said, "Yeah!" She got excited and then hit the return key. I clapped. We gave each other a high five and cheered. We sat down.

16) RT 90

We discussed what kind of picture Amanda wanted to draw. She wanted to draw a rectangle. She asked me to help her choose the number and I told her just go ahead and type. She wanted me to tell her some LOGO commands and I replied no and it doesn't matter. Then, she typed RT 90 and hit the return key.

17) RT 180

After discussing about which LOGO command to use next and practicing some walking, the subject input RT 180. After hitting the return key, she looked at me and signed wrong.

18) CS

Amanda started over because she thought it would be a lot easier if the turtle was at the origin.

19) RT 90

She quickly typed it and hit the return.

20) FD

She spelled F-O-R-W-A-R-D quickly. After she typed FD, she asked me if it was okay if she used FD 90. I told her to go ahead. She did hit the return key without input 90. LOGO responded:

NOT ENOUGH INPUTS TO FD

21) FD 45

She asked me if it was fine with me if she used FD 5. I just said, "Fine." Then, she decided to use FD 45 after questioning me if it was still fine with me. She input FD 45 and pressed the return.

22) FD 45

After Amanda looked at the drawing, she determined it needed more. I told her that was not necessary. But, she went on typing another FD 45 and keying the return.

- 23) LT 90 After some practicing with her body movement, she typed it and then keyed the return.
- 24) RT 90 After she saw the turtle turning LT 90, she immediately typed RT 90. She hit the return.
- 25) RT 90 She had to practice the walk by using the LT and RT commands to see what the problem was. She then spelled R-T and finally decided to use RT 90. She input it and keyed the return.
- 26) FD 45 Right after she returned the RT 90 command, she said it needed FD 45. She typed it and pressed the return.
- 27) RT 45 She moved her body as the screen turtle was and informed me it needed R-T 45. I only responded for her to try. She typed it and keyed the return.
- 28) RT 45 After she saw the turtle turn to the right at 45 degrees and said that she was right, I pointed to the turtle's nose on the screen. She realized she wasn't right. I informed her that she forgot to add. She said, "45, 45." She had to type another RT 45. After pressing the return, she told me she was right and I clapped.
- 29) FD 90 After she spelled F-D 90, she looked at my facial expression and did not get any response from me. Next she spelled R-t 45 and typed it, but I tapped her arm to tell her to wait and then let her try FD 90. She did not wait. I erased RT 45 and typed FD 90. I asked her to return. She said something to me, but I interrupted to say please. She respected me and hit the return key. I explained the reason to her.
- 30) RT 90 She sat down after having stood for five minutes, but she got up quickly. She practiced her body movement before deciding which next command she needed to input. She spelled R-T 90 and typed it. She informed me that she was right. I got excited.
- 31) FD 45 Amanda appeared confused for a while trying to figure out what next command that needed to be typed. She spelled R-T 45, but I blocked her from typing it. I had to get up to demonstrate

to her the turtle's position and asked her what she wanted to do. Her response was to forward to the corner. I told her to try and she kneeled down. I was behind her crossing my arms. She asked me if it was okay to use F-D, paused, and said 45. I was so thrilled and smiled even though she did not see me since I was still behind her. As soon as she returned and turned her head to me, I told her that was good. I clapped.

32) HT

I pointed to the screen turtle and signed, "Hide turtle." I realized I used two very similar signs. I, therefore, spelled H-T. I told her the meaning of it. She spelled H-T, typed it, and pressed the return key. She clapped afterward. It was a beautiful rectangle that she made.

DATA ENTRY #6

February 28, 1990

DATA

NOTES

- 1) ST
Amanda tried to spell T-S-T and later changed her mind and spelled S-T. She input it and keyed the return. The turtle appeared on the screen.
- 2) LT 90
After discussing that she wanted to draw a triangle, she decided to input L-T 90. After seeing the turtle positioned to the left at 90 degrees, she showed me with her facial expression that she did not want it.
- 3) RT 90
She said that she wanted R-T 90 because she thought it was an easy way. Her facial expression was like she was saying gosh. I reminded her that it changed back to the left. I showed her the DLM compass which had the triangular paper turned to the left at 90 degrees and then changed it to RT 90.
- 4) RT 90
She typed it and pressed the return key.
- 5) RT 45
She spelled R-T 45 twice and looked at the DLM compass. She asked me if it was right. I questioned her about where RT 45 went as I demonstrated the DLM compass. She pointed from the triangular paper forward toward the air with her left hand. I intended not to say anything since I wanted her to learn all by herself.
- 6) RT 90
She typed it and hit the return key after we discussed about the command Amanda already learned. She frowned after seeing the turtle positioned to the right at 90 degrees.
- 7) RT 90
She decided to do it again and return the key.
- 8) RT 90
She said that she needed RT 90 again. She asked me why. I explained the consequences by showing her the DLM compass and turning the triangular paper three times.

- 9) ST I typed it because I typed both control and T keys to show Amanda the commands she had input so we could discuss them.
- 10) LT 90 She input it after she responded that she wanted L-T 90 and I told her that she was right.
- 11) RT 90 I told her to do a little more, but she input R-T 90 after spelling R-T 90 to me. I told her to try it; therefore, she typed it. She said, "Yeah! R-T!" and closed her eyes before hitting the return key. She was disappointed to find that the turtle turned at the different place from what she expected and said that she better do a shortcut.
- 12) LT 45 I planned to demonstrate the DLM compass, but she said, "L-T 45." I was surprised and said that she was right. Then, she typed it and hit the return. She was so excited since she was right.
- 13) FD She forgot to input the number. She hit the return key. LOGO responded:
NOT ENOUGH INPUTS TO FORWARD
- 14) FORWARD She did not understand the response and thought it needed to be typed in a long word like FORWARD. Then LOGO responded the same thing.
- 15) FD 45 She asked me if F-D 45 was right. I told her that it doesn't matter. After she typed RT 45 and pressed the return key, she pushed her tongue out and clapped.
- 16) LT 20 After we looked at the DLM compass, Amanda spelled L-T 90. I told her that we needed to stop for a minute so I could demonstrate the DLM compass in a different way. I showed her each 10 degrees on the compass and put it down on the computer table. She picked it up and studied it. She asked me if L-T 20 was right. I told her that I am not deciding for her, but I encouraged her to do whatever she wanted to do so. She typed LT 20 and pressed the key.
- 17) LT 20 She asked if she needed more LT 20. She input it and hit the return key.

- 18) LT 40
She spelled L-T 40. She typed it and after she pressed the key, she clapped.
- 19) LT 40
After I explained to her about the last three commands that added up to 80 degrees, she decided to type LT 40. She said that she was wrong after she pressed the return key, but I stopped her and questioned her as to why she thought it was wrong. She pointed her finger at the nose and realized that she was right.
- 20) FD 45
She told me that she wanted to type FD 45 and I told her to go ahead. She typed it and said that she remembered .
- 21) RT 90
She spelled F-T 90 and then slapped her hand. She spelled R-T 90. I typed it and pressed the key. She signed, "Wrong, me."
- 22) LT 90
She immediately typed it and pressed the return key. She clapped. She asked me if that was right. I just encouraged to keep trying and she was puzzled.
- 23) LT 90
She said, "Nose," and also said that she was wrong again. She typed it and pressed the return key. I questioned her where her nose was. She interrupted by pointing to the turtle's nose on the screen even before I finished speaking. I said that she was right. I informed her that she was right before she typed another LT 90.
- 24) LT 90
She typed another LT 90 and hit the return key. I stopped her to show her the commands she typed by hitting both control and T keys because I thought she needed to look at these commands.
- 25) ST
I typed it.
- 26) LT 90
Amanda typed it and then, she pressed the return key.
- 27) RT 90
Amanda continued by typing it and moved her hand on the screen before returning.
- 28) RT 90
She input it and pressed the return key.
- 29) RT 90
She typed it and pressed the return.

- 30) RT 90 Again, she typed it and returned.
- 31) RT 90 After she typed it and pressed the key, she said, "Me. Innocent me."
- 32) RT 90 She typed it and hit the return.
- 33) LT 45 She asked me if she needed to type L-T 45. I questioned her if she wanted R-T 45 and she said, "No. L-T 45." I asked her where it would go, told her to do it, and not to ask me for more help. She typed LT 45, closed her eyes, and pressed the return key.
- 34) LT 45 She did it again and of course, she closed her eyes.
- 35) RT 90 She quickly typed it and hit the return key. She hid her face.
- 36) ST I spelled to her to type S-T and to hit the return key since we looked at the full commands by pressing both control and T keys and discussed the consequences.
- 37) FD 45 She had demonstrated FD 45 on the screen prior to typing ST. She typed it and pressed the return. She clapped. It completed an almost perfect triangle at last.
- 38) CS I asked her if she wanted to do another drawing. She spelled CS three times.
- 39) LT 90 She chose the drawing of staircase. She practiced her hand movement and decided to type LT 90.
- 40) LT 90 She rapidly typed it.
- 41) CS She begged me to give her the right answer. We discussed about learning the commands. I was interrupted by Amanda as she said, "Better back." I thought meant to type BK, but instead she typed CS.
- 42) LT10 Amanda typed this error due to not pressing the spacebar and LOGO responded: I DON'T KNOW HOW TO LT10.

- 43) LT 10 She corrected it and later said, " It was hard." I told her to use the paper to help her, and she showed me how she would start from the top of the staircase. I realized that was much harder to start right there and informed her to start on the bottom instead.
- 44) CS She started it over.
- 45) FD 20 I held the paper up so she could study the diagram. Then, she typed FD and again looked at the diagram. She continued to input 20. She pressed the return.
- 46) RT 20 She spelled R-T 20. I asked her where the turtle's nose was. She pointed to the turtle on the screen at the wrong place, but I corrected her.
- 47) CS I told her that she may start over. She hit both control and T keys to look at the commands. Later, she typed CS and pressed the return.
- 48) FD 20 I reminded Amanda to start on the bottom of the staircase while she was looking the diagram on the paper. She chose to type FD 20 and hit the return.
- 49) RT 90 She asked me if she could input R-T 20. I moved my body trying not tell her the answer. She decided to type RT 90 and pressed the return. Then, I said, "Yeah!"
- 50) FD 20 She immediately spelled F-D 20. I told her to do it while I hid my smile. After she typed it and hit the return, she clapped.
- 51) LT 90 She studied the paper while she moved her left arm to the left at 90 degrees. She typed LT 90, returned, clapped, and looked at me. I then clapped.
- 52) FD 20 She typed this one and clapped after returning and seeing the turtle turn.
- 53) RT 90 Amanda practiced with her hand to decide if it needed to turn to the left or to the right. She tried RT 90, LT 90, RT 90, LT 90, and finally RT 90. She typed RT 90

- 54) FD 20 She rapidly input it and went on to the next command.
- 55) LT90 She said, "Oops! Sorry!" LOGO responded:
I DON'T KNOW HOW TO LT90
I questioned her about the response and she said that she didn't know why. I began to say that was because she forgot to... and was interrupted by Amanda saying, "I know why." I then said, "Space," but she went on typing next command.
- 56) LT 90 She corrected it. She clapped after seeing the result on the screen.
- 57) FD 20 She typed it. She returned and then clapped.
- 58) RT 90 She typed it, hit the return, and again clapped.
- 59) FD 20 She asked me if she needed more F-D. I told her that was fine with me. She entered it, pressed the return key, and then clapped.
- 60) LT 90 She quickly typed the next four commands without seeing the turtle turning after hitting the return key each time. She seemed to know what command to type in the pattern.
- 61) FD 20 She just continued typing without stopping to ask me any questions.
- 62) RT 90 She continued.
- 63) FD 20 It was last command she input for a beautiful staircase drawing. Both of us clapped.

DATA ENTRY #7

March 2, 1990

DATANOTES

- 1) ST
I questioned Amanda to see if she remembered what to do. She paused and then, she spelled S-.....S-T. I told her to try and to go ahead. She typed ST, returned, and clapped.
- 2) LT 90 FD 20
I showed her these commands on the prepared paper. I stopped her before she pressed the return, because the space was not between FD and 20. I corrected it and pressed the return for her.
- 3) PU FD 50
She copied these commands straight from the paper. I asked her to wait before she hit the return. I quizzed her what would happen. She answered that P-U does not have a line. I applauded her for a correct answer. She also mentioned that it meant HIDE TURTLE. I asked her to watch the screen while I pressed the return. After she saw the drawn line and the absence of the turtle, she told me that was what she meant. I informed her to recall FD means forward steps; therefore, FD 50 means forward 50 steps.
- 4) SC
She mistakenly typed it. After hitting the return key, LOGO responded:
I DON'T KNOW HOW TO SC.
- 5) CS
She corrected it by typing CS.
- 6) FD 20
She typed it directly from the paper I had prepared. I questioned her about what would the turtle do. She answered that it would move 20 steps. I said, "Yes, but here?" She signed F with her hand moving forward. I told her that was good. After hitting the return, I asked her if she knew why there was no lines. Her answer was that she did not know. Then, I showed her PU in the instructions.
- 7) CS
I asked her to type it.
- 8) PD FD 20
I asked her to type PD by fingerspelling P-D. She asked me if that was all. I told her to go

ahead and type. I next told her to space, then to input F-D 20. She questioned about the number. I repeated it. She typed it. I quizzed her about what would happen. Her answer was down 20 steps. After I told her to wait, she interrupted me because she wanted to show me. I continued saying, "Oh, first you said down 20 steps." She said that it goes up. I informed her that was right and asked her if it would draw a line. She nodded affirmatively and questioned me if that was right. I applauded.

9) PD FD 40

I pointed to the commands one by one and she typed. I stopped her from hitting the return because I needed to ask her what she thought would happen. She told me that there will be no line. I said to her, "No line. Then, what do you mean F-D?" Her answer was the movement of her hand forward. I asked her how many moves. Her response was 40. I praised her.

10) PD FD 20

She typed PD FD, said that she knew, and continued typing 20. I questioned her about what would happen. She signed the back sign and then told me that she was sorry. She continued and signed, "FORWARD, move up 20 steps." I asked her if there would be a line. She responded that there would be one. She pressed the return. After looking at the screen, she responded that she was right.

12) PD FD 40

The commands were not abbreviated on page 29, but Amanda read them well and typed them in abbreviated form with no problem. After typing, I questioned where it would go. She replied, "P-D move the line up." I said, "P-D?" Then, her response was that it does have a line. I asked her how many. Her response was 40 steps. I informed her that was correct. After she pressed the return, she said to me, "I told you." I said, "Good! Great! You did fine. You think good."

13) PU RT 90 FD 20

I showed her the next line from page 29. She input it as she read them from the book. I quizzed her about what she expected to happen. She signed the word, "protest" as the turtle turned to the right at 90 degrees. I turned my finger RT 90 degrees. She exclaimed a yes. Her right hand moved forward on the right side. I

asked her if had a line. Her reply was that it did have a line. I quizzed her again about the line. She then answered, "Yes, it will draw a line, then no line. Let's see." As she hit the return, she was nervously smiling. As I pointed my finger to the screen where PU is, I explained the term P-U. I informed her that she did a good job.

14) PD LT 90 BK 40

She input them as she copied from the book on the same page. During her typing, she informed me that she knew what would happen. I asked her for the answer. Her answer was that it would turn to the left and have no line. I then questioned her where. Her response was that it would be at the right side and have the line. I informed her that it would have a line. Then, I quizzed her where the turtle would go and where the nose was. She had to figure out with her hands. I asked her where B-K 40 would go. She said that she was sorry and then moved her hand LT 90 and forward vertically. I then clapped. Next, she hit the return key and said that she was right after seeing the turtle position.

15) PU RT 90 FD 20

I told her to type these commands. After she did, she informed me that it would have a line. She tried to figure out with her hands as she thought about where the screen turtle would go. I pointed my finger to the screen where PU was. I then spelled P-U and asked her if it would have a line. Next, she spelled P-D and then said, "No." I questioned her where RT 90 would go. Her right hand turned RT 90 at the same time her head was shaking a yes. Next I asked her where F-D went. Her right hand moved forward vertically. I quizzed about where the nose was. She turned her right hand and then moved it forward. Next question was if it had a line. Her response was a no. She was allowed to press the return key. She told me that she was right as soon as she saw the turtle position as she expected.

17) CS

After I asked her to chose the picture from the sheet, we had a quick discussion. She typed CS and pressed the return key.

- 18) FD 20 After she chose the number four from the sheet I drew, she spelled F-D 20, typed it in, and hit the return key. She told me that she was right.
- 19) RT 20 She typed it without asking me for any help.
- 20) RT 20 She kept typing and pressing the return.
- 21) RT 20 Again, she must have decided it needed a little more, typed another one, and pressed the return.
- 22) RT 90 I told her to stop after all she quickly typed RT 90 three times. I showed her how RT 20 moved three times from the DLM dial. She tapped my shoulder to spell R-T 45. I demonstrated how RT 45 turned on the DLM compass. She decided to type RT 90 and pressed the return. I continued to show her how RT 90 turned on the DLM dial.
- 23) CS I told her to start over. She typed and pressed the return key.
- 24) FD 20 She did not listen to me to wait. She went on typing FD 20 and pressing the return.
- 25) PU FD 20 After some discussion about drawing the line by a different command other than RT, she spelled P-U and was informed to try. She said that she was wrong. I said to her, "It was alright to learn from the mistakes. You are learning better. If you are getting more mistakes, it does not matter. You can understand why and how to fix them. Do not worry about mistakes. I am not criticizing. No." She finally input PU FD 20 and hit the return key.
- 26) FD 20 I asked her about the 20. Her response was that it was the same as she had been using. She pressed the return.
- 27) PD FD 20 I drew FD 20 but made an invisible line. She said, "Oh! I want..." and typed PD FD 20. I told her that was beautiful after she pressed the return and saw the turtle draw a line 20 steps forward.
- 28) LT 90 I asked her what she wanted to do next. Her left hand turned to the left at 90 degrees. She asked me if it was right or not. I told her to use the DLM device if it helped her decide. She

used it and then typed LT 90. After she hit the return, she said yeah four times and then smiled.

- 29) RT 90 She continued typing RT 90 and returned.
- 30) RT 90 She tapped my shoulder to inform me that she was going to type RT 90 again. She was so excited and clapped after returning and seeing the turtle take a turn to the right at 90 degrees.
- 31) FD 20 She again tapped my shoulder to tell me that she wanted to type F-D 20 if it was okay with me. She typed, returned, and clapped.
- 32) PU FD 20 I asked her what she needed to do next. She continued to tap my shoulder and moved her head back and forth. I did the same. She then typed PU FD 20, returned, and clapped.
- 33) ST I typed this one since I informed Amanda that she needed to fix the line to be the same length as the other. I told her to use CRTL-T to review the commands on the screen.
- 34) FD 20 I informed her that she needed to add another 20. She typed PU, but she apparently thought it was not right. So, she retyped FD 20. After hitting the return key, she said that she was wrong but I informed her that she was right.
- 35) FD 20 She just typed it and returned. She informed me that was wrong and asked by me why. She did not answer my question, but she just said that she was wrong and sorry.
- 36) BK 20 She immediately typed it and hit the return key.
- 37) ST After Amanda studied the commands on the screen by hitting CRTL-T, she realized that P-U was still there. I typed ST for her.
- 38) PD FD 20 She paused for a moment and spelled P-U and then P-D. She typed PD FD 20 and pressed the return.
- 39) PD She typed it again, but I told her that she did not need it. She erased it.
- 40) RT 90 I asked her where the nose was. She pointed to the turtle's nose on the screen. She smiled and then spelled R-T. I said, "Yup." She then

typed RT 90 and informed me that she knew it was wrong. I questioned her why she thought it was wrong. Her response was L-T 90. I told her to go ahead and try. She did not change the input, but she hit the return.

41) FD 20

She typed PD FD, but I reminded that P-D was still there. She erased it. She asked me if that was all. My answer was yes. She informed me that it would be lost. I told her no and for her to try. She retyped FD 20 and hit the return. She appeared puzzled as she looked at the screen. I told her to look again. She next grabbed my arm, put it on her chest and signed sorry. I asked her why she was sorry and she told me she was fed up.

42) PU FD 20

After saying that she was fed up, she asked me to help her. I encouraged her to try and think. She spelled P-U and then typed PU FD 20. She pressed the return and told me that she was right.

43) FD 20

She asked me if she could do more. I encouraged her to do so. She typed FD 20, hit the return, and clapped.

44) PD FD 20

She asked me if she needed to use P-D. I told her that was fine if you need to change the command. She typed PD FD 20 and pressed the return. She clapped.

45) LT 90

She practiced with hand movement after I showed her the picture. She fingerspelled L-T 90 and typed it. After hitting the return, she waved at me and told me that she was sorry.

46) RT 90

She continued to type, and return.

47) RT 90

She immediately typed it and hit the return key.

48) ST

I suggested that Amanda hit CTRL-T to review the commands she input. I typed ST after she finished the review.

49) PU FD 20

She spelled P-U and P-D. She typed PD FD 20 and pressed the return. I asked her why this happened. She moved her finger in a wavelike fashion. I informed her that the a line cannot be drawn by the command, P-U.

- 50) BK 20
She input it and pressed the return.
- 51) FD 20
She asked me to help her. I refused and told her to look at the screen. She questioned me if P-D was the next command or not. I pointed my finger to the keyboard. She decided to type FD 20. She signed to me, "I told you."
- 52) BK 20
She input BK 20 to erase the last command she made.
- 53) PD FD 20
She started to spell F-D and then told me never mind. I asked her what happened to the line. She paused, and studied the commands on the screen. Then, she tapped my hand and spelled P-D. I encouraged her to try. I asked her if she was really sure. Her answer was that she wasn't.
- 54) PU FD 20
After returning the last command, she signed that she knew and went on typing the next command, PU FD 20.
- 55) FD 20
She typed PU, but she erased it. She retyped FD 20 and pressed the return. She exclaimed, "Yeah!"
- 56) PD FD 20
She rushed to finish the diagram and asked me to tell her the next command, but I didn't. She rapidly spelled P-D, F-D, and 20 to me. She questioned if she was correct. She then typed and returned.
- 57) HT
I told her to type H-T since would be able to the diagram clearly.

DATA ENTRY #8

March 7, 1990

DATANOTES

- 1) ST
Amanda entered ST without any difficulty.
- 2) REPEAT 6 [PRINT
"HELLO"]
After she typed this command, I quizzed her as to what she thought would happen. Her response was that it would print HELLO. I informed her that it would print HELLO six times. She pressed the return key. The printing of HELLO wasn't as expected. So, I pressed CTRL-T to get the full screen. I counted the HELLO's by saying 1, 2, 3, 4, 5, and 6. Amanda informed me that she understood.
- 3) REPEAT 100 [PRINT
[I WILL NOT BE
LATE FOR CLASS
AGAIN]]
I told her that if the teacher asked her to write 100 sentences stating, I will not be late to class again, she could cheat by using this command and print a hardcopy for the teacher. I was laughing. She signed the command and I told her to type it. She appeared to be amazed that it was a long sentence. After she hit the return, she said ooooh while she saw it print 100 times.
- 4) REPEAT 4 [FD 40
RT 90]
I asked her if she recalled the beginning of LOGO session when we used FD 40 RT 90 four times. She did. I told her that time could be saved by using the REPEAT command with a 4. she typed it and hit the return key. She commented that it was fast.
- 5) CS
She was told to type it and hit the return.
- 6) REPEAT 6 [FD 10
RT 90 FD 10
LT 90]
I asked her to type the command for another example of a staircase. I asked her if she remembered it took a long time for her to input these commands for the staircase. She typed and responded that it was fast even she before she pressed the return. She said that she was right after seeing the turtle zoom to make a neat staircase.
- 7) CS
She input it to clear the screen for the next example.

- 8) BK 20
After she chose which diagram she wanted to practice, she decided to type BK 20. I told her that was correct.
- 9) LT 90
She typed LT 90, but she said that she was wrong and tried to erase it.
- 10) RT90
She quickly typed and pressed the key. LOGO responded:
I DON'T KNOW HOW TO RT90.
I questioned to see if she knew why LOGO gave this response. She told me that she did not. I told her that she forgot to press the spacebar between RT and 90.
- 11) RT 90
She corrected it by retyping it. She pressed the return and clapped.
- 12) RT 90
She quickly typed it and pressed the key. She clapped.
- 13) FD 20
She knew what next input would be; therefore, she typed it and returned. Of course, she clapped.
- 14) LT 90
She had no problem inputting it, pressing the return key, and clapping.
- 15) FD 20
She continued to type, and hit the return. Again, she clapped.
- 16) RT 90
She knew the pattern, so she typed it and depressed the return. She continued to clap.
- 17) FD 20
She typed another FD 20 and hit the return. She clapped.
- 18) RT 90
I told her to type one more. She typed it, pressed the return, and clapped.
- 19) FD 20
I pointed my finger on the screen to show her that the turtle needed to go down. She typed FD 20, hit the return, and clapped.
- 20) CS
She was told to type CS.
- 21) BK 20
She was told to type it and press the return.
- 22) CS
She accidentally typed it and pressed the return key.

- 23) BK 20 REPEAT 4 [I asked her to please BK 20. Then, she knew she had to type REPEAT. I spaced for her. I informed her that the number didn't matter. She decided to use 6 and I said fine. She asked me to see the paper so she could count from the example. She counted 4. She typed 4 [and pressed the key. LOGO responded:
NOT ENOUGH INPUTS TO REPEAT
I told her to wait.
- 26) CS She didn't wait but typed. She pressed the return.
- 27) BK 20 REPEAT 4
[RT 90 FD 20
LT 90 FD 20
RT 90 FD 20
RT 90 FD 20
She typed BK. I covered my face with my hands and then said to her, "I told you to wait." After I instructed her how to input the commands, I checked her typing with the directions on the paper. I gave her permission to press the return key. We watched the turtle move. It was fun and wonderful until the last one. It was my error. I asked her if she wanted to fix the mistake. She wanted me to try so she could watch.
- 28) RT 45 After she chose example three, I told her that she could use the DLM device. She picked it up and moved the triangular paper on the device right at 45 degrees. I told her that was right and she could try it on the computer. She then spelled R-T? R-T? R-T?. I was busy recording. She typed RT 45 and pressed the return.
- 29) FD 45 Right after she pressed the return on the last command, she spelled F-D and then decided to use 5. She typed FD 5 and asked me if she was finished. I informed her that 5 was too short. So, she needed to input more steps. It was much better if it was longer. She said, "Better back." She backspaced the 5 and corrected it to 45. She pressed the return key.
- 30) BK 20 She continued typing without stopping or questioning me. After she hit the return, she responded that it was not what she wanted.
- 31) CS I told her to type CS and she did.
- 32) FD 45 She immediately typed FD 45 and pressed the return. She voiced stupid.

- 33) CS
She typed it and hit the return key without stopping or asking me
- 34) RT 45
She said, "Think as I write." As soon as she recalled which command she needed to input, she typed RT 45 and pressed the return. She said it was okay.
- 35) FD 15
I informed her that FD 45 was too long and for her to use less steps. She asked me how many. I answered 15. She then typed FD 15 and hit the return key.
- 36) RT 90
She tapped my shoulder and spelled F-D 15. I quizzed her why. She responded that it needed to go down and looked puzzled. I asked her where the turtle's nose was. I demonstrated to her where it needed to turn. She said, "Yup. R-T 90" and typed it. Before pressing the return, she was told that she could use the DLM device. She responded that she knew, hit the return, and clapped.
- 37) FD 15
I told her that it needed to be moved down. She asked me if F-D 15 was needed. She typed it and hit the return key.
- 38) LT 90
I told her okay and to continue it like the first one. She asked me how many. My answer was for her to use whatever she wanted. She said 3. She put both hands together and pointed to the left. She then typed LT 90 and pressed the return key.
- 39) FD 15
I was busy recording. She input it and returned.
- 40) RT 90
She input it without any trouble and pressed the return key.
- 41) FD 15
She just typed it and returned since she knew the pattern.
- 42) LT 90
She input it and hit the return.
- 43) FD 15
I was still busy recording. She again typed it and pressed the return.
- 44) RT 90
She told me that she forgot. I quizzed her as to where the turtle's nose was. She questioned

R-T. I responded to her not to ask me. She then used the DLM device, moved it RT, typed RT 90, and finally pressed the return.

45) FD 15

She typed it and pressed the return key.

46) ST

I typed ST and returned it since we had discussed the use of the REPEAT command. We looked at the full screen as I hit CTRL-T.

47) CS

I told her to please type CS and to return.

48) RT 45

I demonstrated to her. Then she typed RT 45. I told her that was wonderful.

49) REPEAT 5

[FD 15 RT 90
FD 15 LT 90]

I told her to type REPEAT 5 [and then pointed my finger to the commands on the paper for her to type. I helped her by typing the last bracket. After pressing the return and seeing the turtle move, I said it was beautiful as I smacked my lips. I continued by asking her if she wanted to draw another picture fast because we did have few minutes left before she had to write the journal. She decided not to.

APPENDIX E

ORIGINAL JOURNAL AND RESEARCHER'S TRANSLATION
OF JOURNAL INTO STANDARD ENGLISH

①

entry 1

Me and Amy have plome with
the disk. I feel so happy
in here. I would stay here
not quit. I love computer.
OK.

Notes: Feb 7, 1990

asked not to leave at 4:00 when session was
over. She wanted to stay & work longer.

⑤

February 9, 1990

I want to learn math.

I feel good in middle room
computer room. I love it.

I might get one.

I like to be in
 Copten but I am not skill
 in Copten I love ~~Copten~~

I will stay in Copten with
 my the first.

It's good to learn in
 Copten room. I love to
 see I feel good ^{in the} than
 my math.

I like logo better than math.

I love computer lab very much.

I am sure it is fun.

me plome in the logo

February 21, 1992

I feel kindly in the Loge.

I am proud of my trip the
Loge.

I feel good because not quite
the computer and in Loge.

I will stay for 5 weeks.

I am lucky to be in Loge.

Feb. 28

1. I fell good ^{part the Logo.} ~~at Copten~~
2. I understand now I will do my best
turf
3. I am itest in Logo in Copten.
4. I really love play in Copten.
5. I learn about stair case today.
6. I will not quite in army's Copten.
7. I will still learn more and lots in Logo.
8. about Copten any thing I want learn
in Logo.

I really learn about Logo.
I am sad I don't want to
quite this Friday this week.

I will get Coupton in
Christmas next year.

I will learn Logo more and
make OK.

I hope my Logo get better me
help OK.

It is my last day to go Coupton
I will be sad.

My family is good at Logo.

I think my is very good
teacher in how do the Logo.

Love you all!

March 7,
1990

Today I finish at
hospo computer.

I want to see you forever
at TSD

I don't feel good at
computer because my body get
sick

Journal Entries

JOURNAL ENTRY # 1

February 7, 1990

Subject wrote:

Me and Amy have plome with the Disk. I feel so happy in here. I would stay here not quit. I love computer. Ok.

Meaning of Message as Interpreted by Researcher:

Amy and I had some problems with the diskette. I feel so happy being here in this computer room. I would love to stay here longer and not quit. I love the computer. Ok.

JOURNAL ENTRY # 2

February 9, 1990

Subject wrote:

I want to learn math. I feel good in middle room
computer room. I love it. I might get one.

Meaning of Message as Interpreted by Researcher:

I want to learn math faster. I feel good in the
middle school computer room. I love LOGO. I might get a computer.

JOURNAL ENTRY #3

February 14, 1990

Subject wrote:

I like to be in corpter but I am not skill in coupter
I love coupter I will stay in coupteu with Amy til finsing. it's good
to learn in coupter room. I love is Loge I feel good in Loge than my
math.

Meaning of Message as Interpreted by Researcher:

I like to be in a computer room, but I am not skilled
using the computer. I love the computer. I will stay in LOGO sessions
with Amy until it's finished. It's good for me to learn in this
computer room. I love LOGO. I feel better about in LOGO sessions than
in my math.

JOURNAL ENTRY #4

Februrary 16, 1990

Subject wrote:

I like lagoon better than math.

I love computer lab very much.

I am sure it is fun.

No problem in the lagoon.

Meaning of Message as Interpreted by Researcher:

I like LOGO better than math. I love the computer lab very much. I am sure it is fun. I have no problems with the LOGO.

JOURNAL ENTRY #5

Februrary 21, 1990

Subject wrote:

I feel linally in the Loge.

I am pound of my try the logo.

I feel good I will not quite the coupter lab and
in loge.

I will stay fou 5 week.

I am lucy to be in loge.

Meaning of Message as Interpreted by Researcher:

I finally drew a square with LOGO commands. I am proud of my trying the LOGO. I feel good. I will not quit the computer lab or LOGO. I will stay in LOGO sessions for 5 more weeks. I am lucky to be participating in LOGO sessions.

JOURNAL ENTRY #6

February 28, 1990

Subject wrote:

I feel good part the LOGO.
 I understand now I will do my best try
 I am iterst in Logo in coupter.
 I really love play in coupter.
 I learn about stair case today.
 I will not quite in Amy's coupter.
 I will still learn more and lots in Logo.
 about coupter any thing I want learn in Logo.

Meaning of Message as Interpreted by Researcher:

I feel good to be participating in LOGO sessions. I understand LOGO now. I will try my best. I am interested in using LOGO on a computer. I really love to play with the computer. I learned how to draw a staircase today. I will not quit Amy's LOGO sessions. I will and still am learning more commands in LOGO. With using the computer, I want to learn anything in LOGO.

JOURNAL ENTRY #7

March 2, 1990

Subject wrote:

I really learn about Logo.

I am sad I dont want to quite this Friday this week.

I will get coupter in Christmas next year.

I will learn Logo more and more ok.

I hope my Logo get better no help ok.

It is my last day to go coupter I understand.

I and amy is good on Logo.

I think Amy is very good teacher me how do in Logo.

Yea! Yea! Yea! Yea!

Meaning of Message as Interpreted by Researcher:

I am really learning LOGO well. I am sad because I don't want to quit LOGO session this Friday. I will get a computer for Christmas next year. I will learn more LOGO. I hope my work in LOGO will get better with no help from Amy. It is my last day to go to the LOGO sessions, but I understand. Amy and I are doing well on LOGO.

I think Amy is a very good teacher because she teaches me how to use LOGO. Yeah! Yeah! Yeah! Yeah!

JOURNAL ENTRY #8

March 7, 1990

Subject wrote:

Today it is finish at Logo coupter.

I want Amy to stay forever at TSd

I dont feel good at coupter because my body get
sick

Meaning of Message as Interpreted by Researcher:

Today the LOGO sessions are finished. I want Amy to
stay at TSD forever. I don't feel good working on the computer because
I am sick.

APPENDIX F

EXAMPLE OF LOGO TURTLE

LOGO TURTLE ON THE SCREEN

As a turtle appears on the screen, you can see that the turtle's nose is on the top of the its triangle like this: $\triangle$. When you need to draw the picture by commanding LOGO, then it will tell the turtle where to move. The examples will be followed.

For example, suppose you want to draw a block or square. The LOGO commands would be:

- 1) FORWARD 50
- 2) RIGHT 90
- 3) FORWARD 50
- 4) RIGHT 90
- 5) FORWARD 50
- 6) RIGHT 90, and
- 7) FORWARD 50.

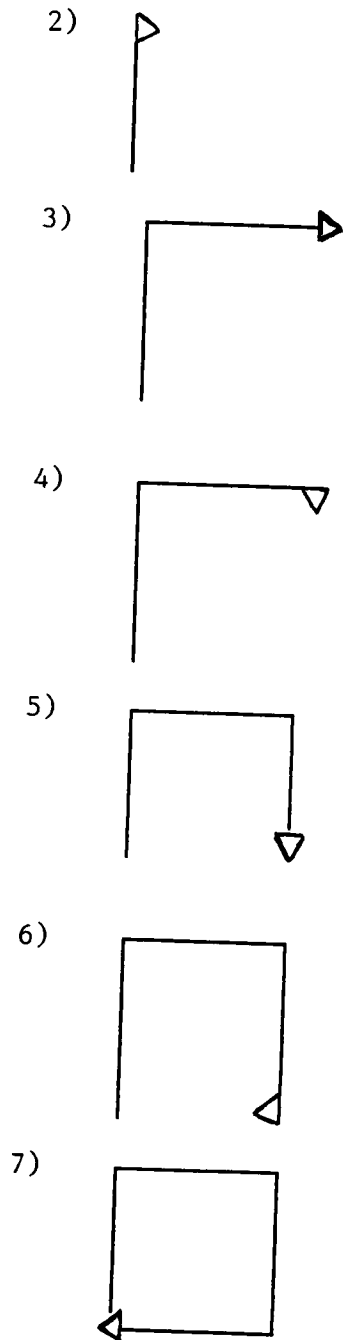
The diagram of a block or square would be look like this:

0)

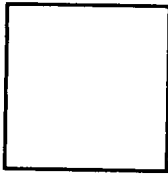


1)

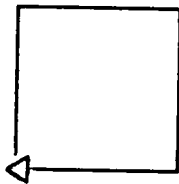




If you want the turtle to disappear, then you need to type the command, `HIDETURTLE` or `HT`. It will disappear so you can see the diagram, for example:



If you want to see where the turtle is, you can just type the LOGO command called SHOWTURTLE or ST. This command tells the turtle to appear on the screen. The diagram of the square will be shown below, and then you can compare these diagrams above (HT) and below (ST).



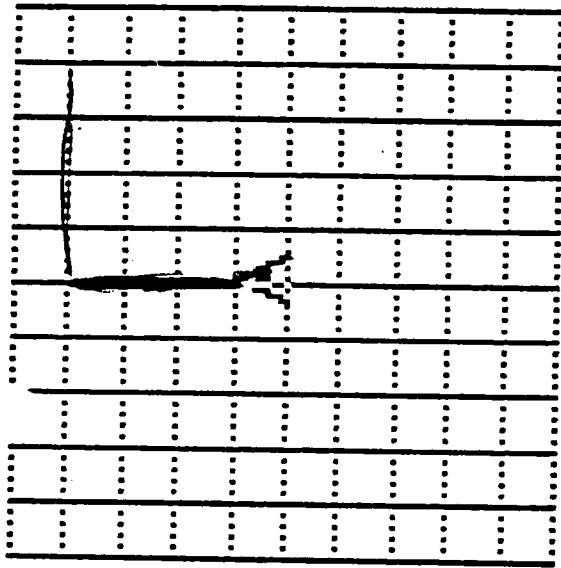
For more information - better example and diagram can be seen in Simon, S. (1985), How to talk to your computer. New York: Thomas Y. Crowell. pp. 26-29.

APPENDIX G

AMANDA'S PAPER TASKS

The first sheet (sheet A) Amanda completed was on February 16, 1990, which was the fourth LOGO session. The second sheet (sheet B) we did together to show Amanda how to complete it properly. The descriptions of these sheets are detailed in Appendix C--the FOURTH LOGO SESSION. On the third sheet (sheet C), Amanda drew a rectangle to show me what kind of shape she wanted to draw on the screen. On the fourth sheet (sheet D) Amanda wanted to draw a triangle. It was a reinforcement for Amanda to decide which commands to use. My notes on the left side of the page were an explanation of all the "LT" commands she input all of which totaled 80 degrees. More details are listed in Appendix C--SIXTH LOGO SESSION. The fifth sheet (sheet E) from the March 7th session, was used for Amanda to practice on while she was thinking about which LOGO commands she needed to input to draw a picture.

SHEET A

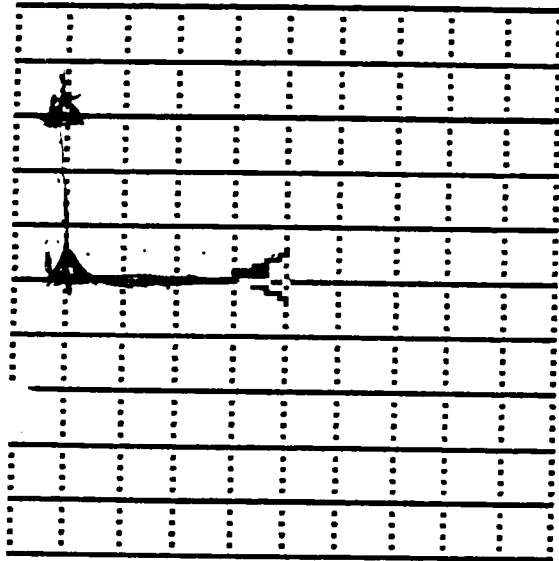


Forward

R-11

Figure 3-16

SHEET B



H
 A
 A

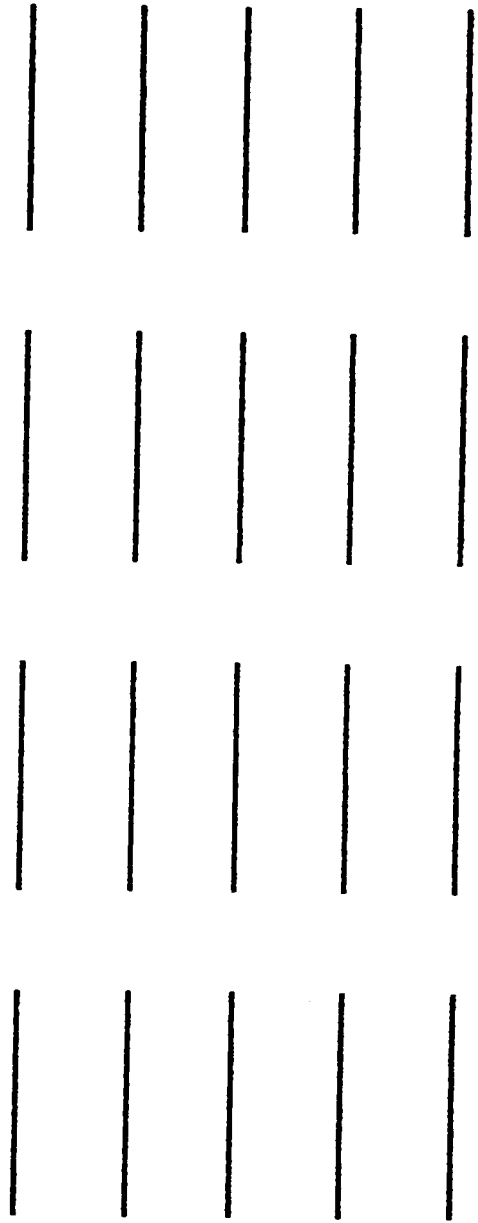
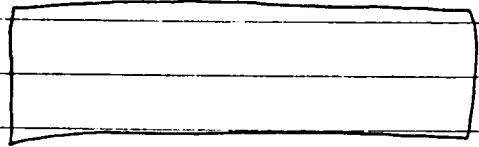


Figure 3-16

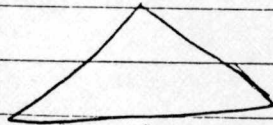
SHEET C

2/1/4



SHEET D

228



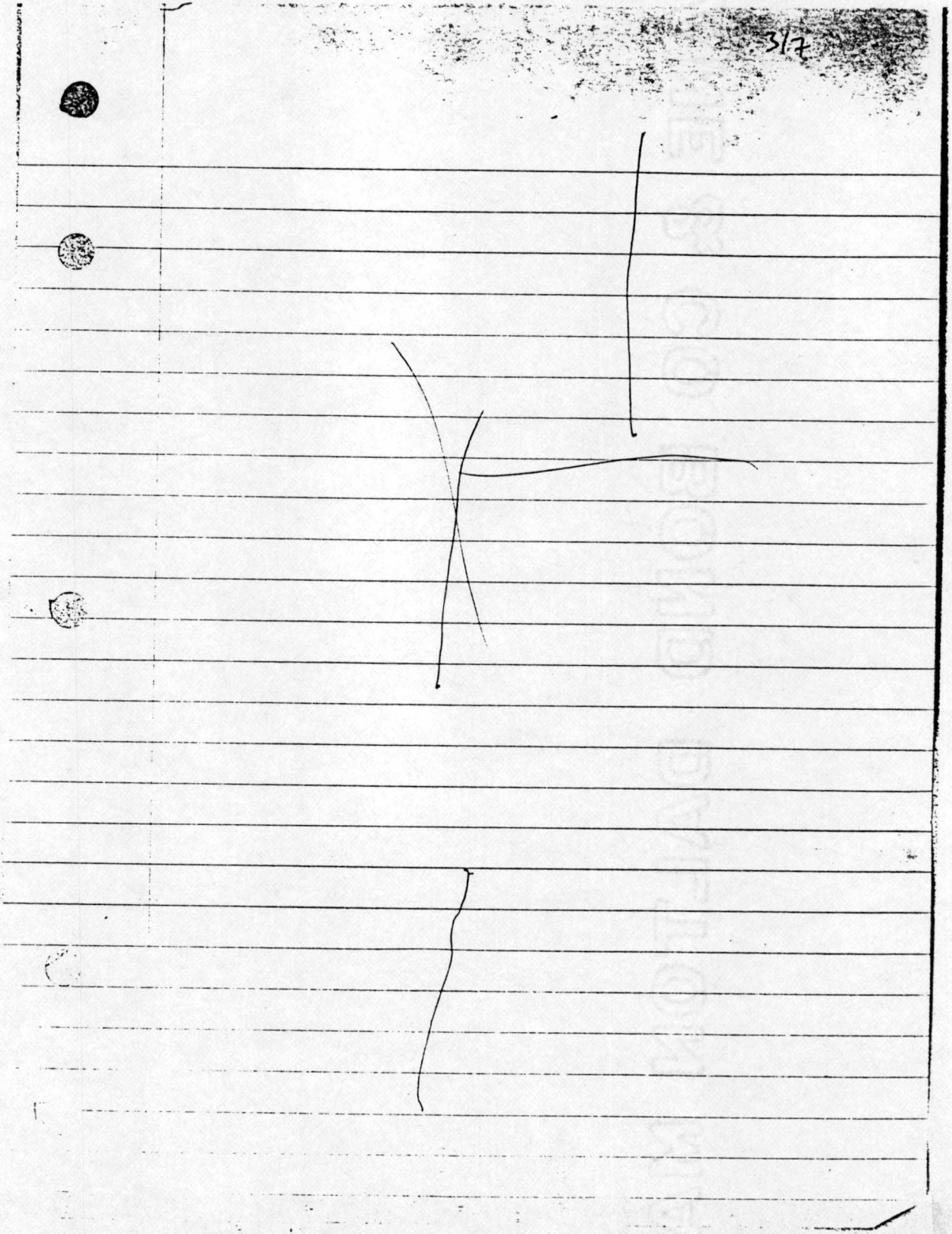
LT 20

LT 20

LT 40

80

SHEET E



APPENDIX H

DLM DEVICE

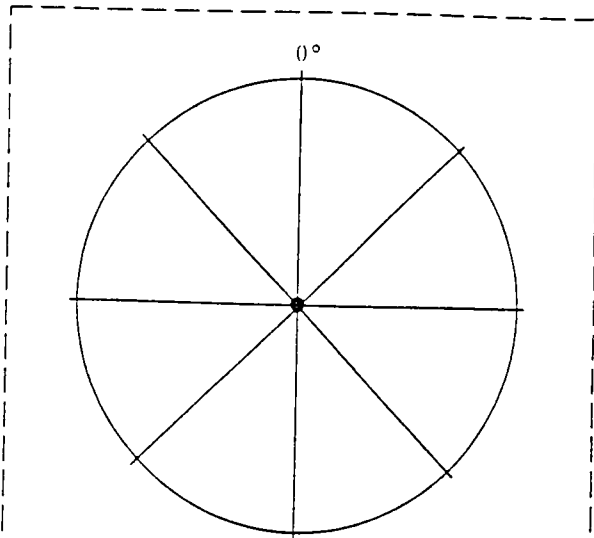
This DLM (Developmental Learning Materials) device was very helpful for Amanda since she was not familiar with the concepts of angle or degrees.

NAME _____

INSTRUCTIONS

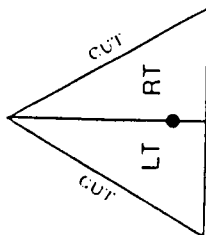
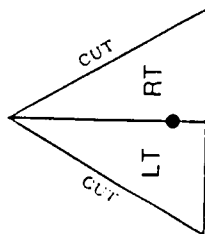
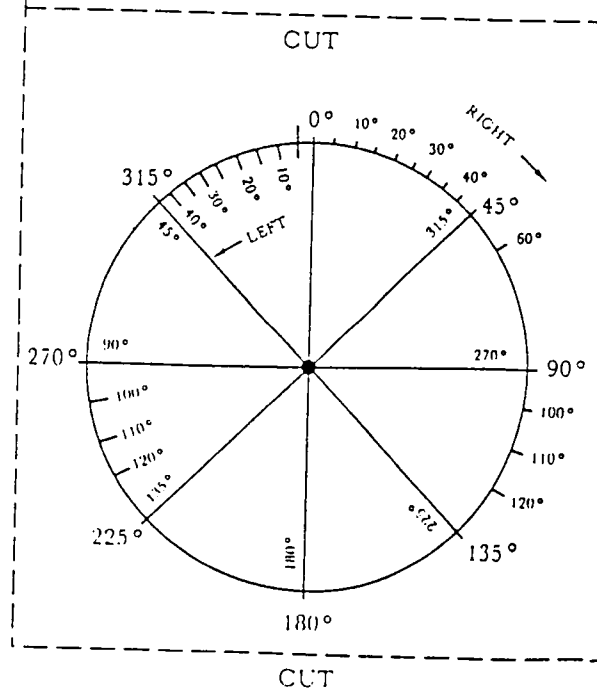
1. Cut out turtles.
2. Cut along dotted lines for two circle boards.
3. Put a hole in each turtle on the dot and in each circle on the dot.
4. Attach a turtle to each circle center with fastener.
5. Practice finding degrees on the circle by:
 - spinning turtle on black circle.
 - naming the degree where it stops.
 - checking answer by placing turtle at same place on circle with degrees marked.
 - practicing spinning turtle both LT and RT.

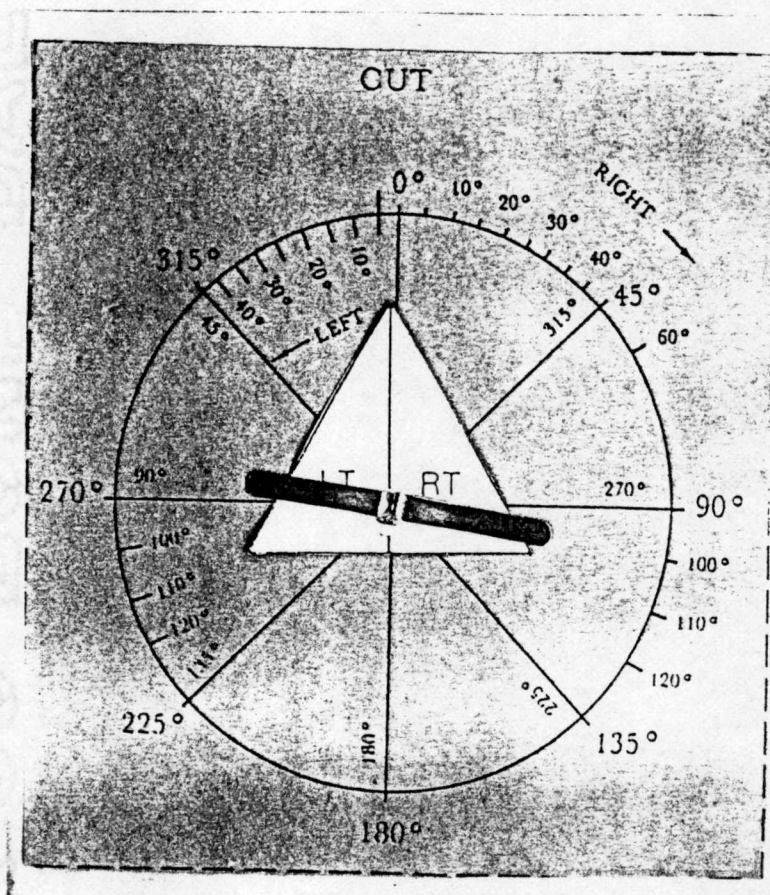
CUT

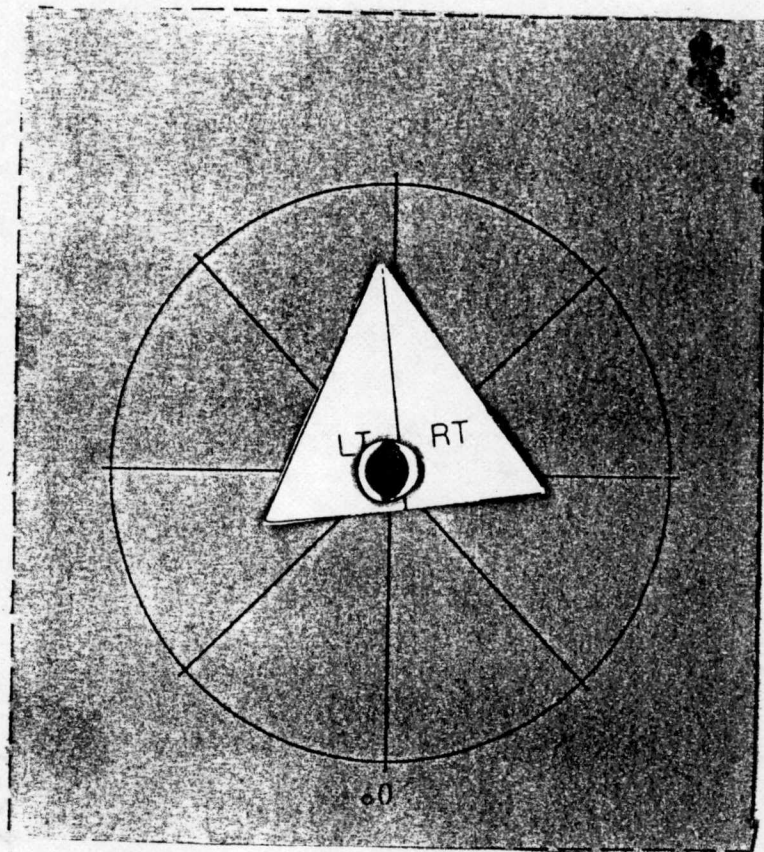


CUT

CUT







APPENDIX I

WORKSHEET

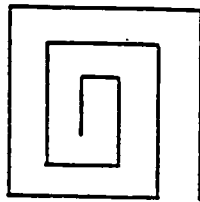
This worksheet was used in the SIXTH LOGO SESSION, February 28th, and in the SEVENTH LOGO SESSION, March 2nd, for Amanda to choose a shape to draw. In the SIXTH LOGO SESSION, she chose #2, the staircase and in the SEVENTH LOGO SESSION, she chose #4, the incompleted square. For more details, see the SIXTH LOGO SESSION and the SEVENTH LOGO SESSION in Appendix C.

Handout 3

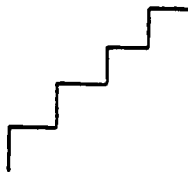
Name _____

Directions: In pairs, choose at least two of the following designs and write the instructions that will make the turtle produce the design. Use the computer to complete the instructions. These exercises will be collected and recorded.

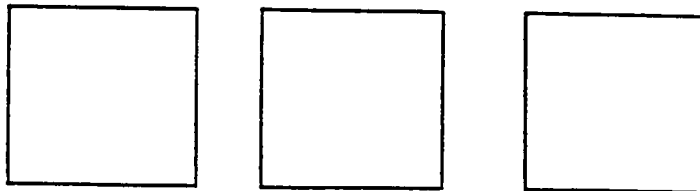
1.



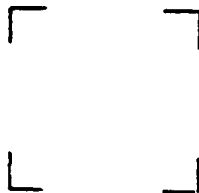
2.



3.



4.



APPENDIX J

MARCH 7 DRAWINGS

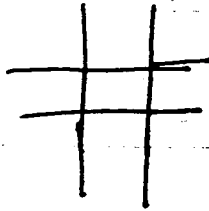
These next two pages were my drawings for Amanda to choose from. I did suggest to her that we try example #3. She told me that she wanted to do example #2 since she thought examples #1 and #3 were hard. I informed her that #3 was not hard and encouraged her to try it. For more information, see Appendix C in EIGHTH LOGO SESSION.

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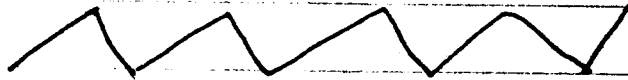
1)



2)



3)



4)



5)



VITA

Amy Rebecca McDaniel was born in Moncks Corner, South Carolina on October 7, 1964. She attended a speech school in Atlanta, Georgia, and elementary and middle schools in Marietta, Georgia. She graduated with honors from Joseph Wheeler High School in Marietta, Georgia in June, 1983. In September, 1983, she entered the University of Georgia in Athens, Georgia. In January, 1985, she transferred to Maryville College in Maryville, Tennessee. In the fall of 1986, she returned to the University of Georgia where she received a Bachelor of Science Degree in Mathematics Education in August, 1988. In August 1988, she began study toward a Master of Science degree in Special Education, with an emphasis in Deaf Education.

The author is a member of Pi Lambda Pheta and the Student Organization for Deaf Awareness.