

Some Effects of Logo With Emotionally Disturbed Children*

by J.O. Michayluk and D.H. Saklofske

Summary

In this exploratory research study, four children who were classified as emotionally disturbed were introduced to the LOGO computer program as part of the schools' ongoing structured-success program. Students worked on the computer at their own rate and individually for the one half hour per week, 9 week study period. Teacher's and researcher's observations, interviews with the children and program output suggested that LOGO had a salutary effect on the therapeutic and academic process. The results are further discussed in terms of LOGO as a motivator, socializing agent, and educational tool.

Introduction

The work described here is based on the LOGO program developed by Seymour Papert and the MIT LOGO Group (Papert, 1972a, 1972b, 1972c, 1980; Papert and Solomon, 1972). Originally created by Papert for children, LOGO incorporated an easy to learn, but rich and expandable vocabulary to reflect such key computer science ideas as local and global variables, naming, recursion, procedurization, editing, etc.

Ease of use and a solid Piagetian base ensured interest in LOGO as a research tool. Since its development, LOGO has been used with the physically handicapped, the learning disabled, the emotionally disturbed, the gifted, and the delinquent (Watt, 1982). In school settings, the research has ranged across all age groups and most subject areas. Although it is clear from the literature that LOGO has been widely accepted as a research-teaching tool, this same literature also points out that the exact role that LOGO and its related activities have to play have not yet been fully delineated.

* In order to protect the anonymity of participants, all names used in this paper are fictitious.

The authors are with the Department of Educational Psychology University of Saskatchewan Saskatoon, Saskatchewan

Review of the Literature

As indicated in the literature, the use of LOGO in the schools has increased dramatically during the past few years. Some of these studies have emphasized the observational or subjective components (e.g. Watt, 1979, 1982; Solomon and Papert, 1976; Lawler, 1980); other studies have attempted to include an objective measurement component (e.g. Milner, 1973; Statz, 1973; Howe, O'Shea, and Plane, 1974; Michayluk and Yackulic, 1983); yet other studies have focussed on a variety of special populations. For example, LOGO has been used with handicapped and learning disabled students (Weir, 1979; Watt and Weir, 1981; Papert and Weir, 1978) with some success.

Of special interest to the researchers was the suggestion made by Larivée that LOGO could be used as a therapeutic tool with juvenile delinquents. Noting that the delinquents were often concrete operational thinkers and incapable of either seeing or resolving contradictions, Larivée and his collaborators (Larivée and Michaud, 1980; Larivée and Gendreu,

1980; Larivée, 1979, 1980, 1981) have suggested that the LOGO program could be used in conjunction with traditional therapy to hasten the therapeutic process with juvenile delinquents. Similarly, other studies (Muller, 1982; Weir and Emanuel, 1976; Weir, 1981; Furst, 1983) have suggested that computer programs such as LOGO might prove to be effective with severely emotionally disturbed and autistic children. Emotionally disturbed children, it seemed, responded favorably to the immediacy of results and the non-human environment (no personal rejection nor threatening judgment) provided by LOGO. Interest by the researchers in this aspect of the literature led to this study with emotionally disturbed children.

The Study

An elementary school with a structured success program for severely emotionally disturbed children was chosen for this study. As many as ten children who are designated as emotionally disturbed (high cost funding) are taught by a teacher and a teacher-aide using a point-based, structured-success approach. In general, children earn points for appropriate behavior; the earned points can then be "cashed-in" for a variety of goods and experiences. In addition, children in the program are mainstreamed as soon as possible right in the school. This step is achieved with little difficulty, since some form of structured-success is found in virtually every classroom.

Table I
Available Psychometric Data

Subject	Sex	Birth Date	WISC-R	Reading Level
John	M	74/07/19	Verbal — 111 Performance — 114 Full Scale — 113	Verbal Reading ruled good. Comprehension rated low. **
Sam	M	71/12/24	Verbal — 85 Performance — 95 Full Scale — 89	Estimated at grade one level. **
Tina	F	73/11/20	Verbal — 100 Performance — 98 Full Scale — 99	Schonell Word Recognition Test — 2.4 grade equivalent.
Lon	M	73/06/03	Verbal — 92 Performance — 104 Full Scale — 97	CTBS Vocabulary—3.9 grade equivalent. CTBS Comprehension—3.8 grade equivalent.

** Teacher estimate.

The Subjects

Four children who were designated as emotionally disturbed were selected by the teachers and the researchers for the study. The three male and one female subjects had all been initially diagnosed as hyperactive, and all had been prescribed the drug, Ritalin. The available psychometric data on the subjects is summarized in Table 1.

One male subject was re-evaluated by his doctor, using placebos, during the last half of the study and found to be just below the criteria established for designating hyperactivity. His last two computer sessions were accomplished without any sort of medication.

The Method

The four subjects were put in pairs, and each pair was initially allowed two half-hour sessions per week on the Apple computer. For reasons which will be discussed later, it was eventually decided to have each subject work on the computer individually, that is, for one half-hour per week. Each session was closely supervised by one of the researchers.

The teacher and the teacher-aide were asked to observe and closely monitor the behavior and the achievement of the subjects during the research period (nine weeks). Typically, each computer session with the subjects was immediately followed by a meeting between the researcher and the teacher and/or teacher-aide, at which time information was exchanged and strategy for the next session was planned.

The computer sessions consisted of an introduction to the graphics capabilities of Apple LOGO. In the graphics mode of LOGO, a small triangle called a turtle draws a line when given commands of forward or back, and changes its heading when told to turn right or left. Initially, the subjects experimented in a trial-and-error sort of fashion, coming up with interesting but unproportioned designs (See Figure 1). With tutoring, the subjects eventually learned to write simple procedures and to put these procedures together into more complicated procedures. The researchers also introduced the subjects to recursion, for motivational purposes (all subjects liked the patterns which shifted and changed), although it must be pointed out that none of the subjects really grasped the meaning of recursion.

The reader might be interested in the fact that, although the LOGO study was never envisaged as being part and parcel

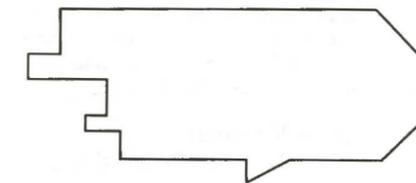


FIGURE 1. A random design.

of the regular structured-success program, the subjects immediately assumed that it was. Consequently, being able to work on LOGO twice a week quickly took on the dimension of reward for appropriate behavior.

The Results

The subjects came from a variety of backgrounds. One subject had two hyperactive siblings and a mentally ill parent; another subject had overcontrolling parents; another was put into a foster home because he was unmanageable at home; and in yet another case, having been an abused child, the subject showed virtually no attachment to any member of the family, the one exception being the family pet. It is not surprising, therefore to find that each subject reacted rather differently to the LOGO experience. These reactions are discussed below under general headings drawn from the literature.

LOGO as a Motivator

One of the strengths of LOGO is that children using it are dynamically active. This usually translates into interest and concentration, even with hyperactive children (Muller, 1983). The four children in this study were no exception. Except for a few minor outbursts of frustration (caused by an inability to spell), the children showed few signs of hyperactivity or a lack of concentration.

As an incentive, LOGO proved particularly effective with one male subject, *(Lon) whose behavior at school was characterized as passive-aggressive. The incidence of appropriate behavior, as judged by the number of earned points, increased dramatically prior to each LOGO session. Although the point count was inconclusive for the three remaining children, the teachers felt that their behavior was positively influenced, nevertheless.

At 12 years of age, Sam was the

oldest subject in the study. He was very small for his age, perhaps because of an HGH deficiency. Sam's problems were judged by the teachers to be the most severe, both emotionally and academically. When he first entered the LOGO study, he had just been given up by his parents and placed in a foster home. This experience, coupled with a grade one reading level, was having deleterious effects on his self-concept and his behavior.

His interest in LOGO was immediate, to the point where the teachers said it would have been disastrous for him to lose a session. Although it was difficult to establish that LOGO led to more appropriate behavior, on one occasion, when Sam was having a particularly bad morning, he removed himself to the time-out room as a precaution against losing his LOGO time.

LOGO as a Socializing Agent

The literature generally indicates that children learn to work together, using LOGO, with those "catching-on" first often acting as tutors to the others (Watt, 1982; Michayluk and Yackulic, 1983; Furst, 1983). With this in mind, the subjects were paired, in the hope that when one was working at the keyboard, the other would aid him. The researchers soon realized that the concentration these hyperactive subjects displayed while working directly with LOGO did not transfer to the situation where they were expected to watch and help someone else:

While Tina worked on the computer, John was unable to settle down. Despite several suggestions by the researcher to sit down and make helpful suggestions to Tina, John refused, preferring instead to pace nervously back and forth. When it was Tina's turn to help John, she did not show the slightest interest in his work, preferring to draw cartoon-like characters in her notebook.

After four weeks, it was decided to have individual sessions with the subjects. At this point the teachers reported increased interactions among the four in the classroom and on the playground. They tended to discuss their computer experiences constantly and, according to the teachers, "to the point of distraction." This interaction was particularly significant, since the teachers reported that the

four subjects had little to do with each other prior to LOGO.

In another instance, LOGO seemed to be a prime factor in reducing passive-aggressive behavior:

Lon came from an environment which was characterized as over-controlled. Lon's reaction to it was to exhibit apathy and disinterest. The teachers described his behavior as passive-aggressive; the school counsellor said that she found him completely baffling. It was with some surprise, then, that on the first session the researcher was met by a smiling, bright-eyed youngster, bubbling with enthusiasm! This enthusiasm continued throughout the entire study. Lon's performance and behavior during the LOGO sessions were normal. The teachers noted, too, that Lon would emerge from his unemotional and unmotivated state each time a LOGO session was imminent.

LOGO as an Educational Tool

The hyperactivity of the subjects was severe enough to preclude any pre-and post-study testing. Nevertheless, several important academic changes were observed.

None of the children understood such simple geometric concepts as *right angle* and *circle*. With the aid of LOGO turtle geometry, all subjects learned that a right angle had 90° and that four right angles equalled 360°, and, a circle equalled 360°. As well, two of the subjects were unable to spell such simple words as *circle*, *repeat*, and *square* at the beginning of the program. It was observed by the researchers that it was second nature to them to type these words into a program by the end of the study.

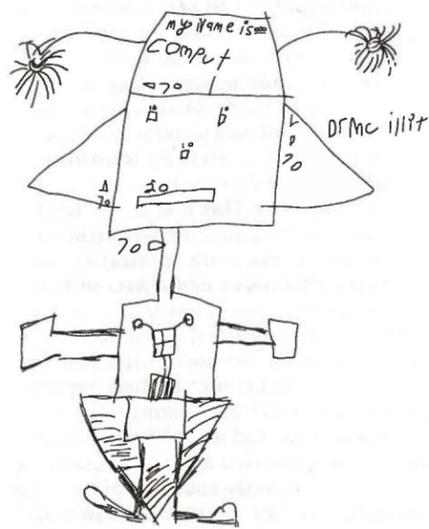


FIGURE 2. A proposed graphics project.

Another observed result of exposure to LOGO came near the end of the nine weeks, when the teachers acquired several CAI programs. It was reported that the four subjects involved in this study were more competent and relaxed when working on the computer; they learned more rapidly, solved more problems, and were more independent than the others. In other words, they had probably become "computer literate."

LOGO and Self-Esteem

Miriam Furst (1983) found that the computer had a useful role to play in enhancing the self-concepts of her mainstreamed K-8 children.

It's exciting to see what happens when children share their accomplishments with others. Children who were thought of as "losers" begin to be seen in a different light. They have acquired a skill valued by others and that changes the way they view themselves. (Furst, 1983, p. 15)

The researchers' observations agreed with those of Furst. In addition, there were also several serendipitous occurrences which illustrated how the computer can prove to be a concept builder:

Sam had been telling the teachers that he was the "dumbest kid in the school." At the computer session he became frustrated and pounded his fingers hard on the keyboard. The screen lit up with error messages. Sam was aghast at what he had done. The researcher simply said, "I don't know what you've done, but you must be pretty smart. I've been working on the computer for years, and I've never had error messages like that." Sam preened with pleasure and settled down to work.

In another session with Sam, the computer would not load the LOGO program. After several unsuccessful attempts by the researcher, and by Sam, it was suggested that the session be terminated. Sam persisted and the computer loaded the program.

"I fixed it," said Sam. Then he turned with a smile to the researcher and said, "Hey guy, if you have anymore problems with this computer, just call on me!"

Some General Observations and Conclusions

1. LOGO seems to be particularly effective with hyperactive children because (a) it provides immediate feedback, and (b) it is perceived by the children as being non-threatening and non-judgmental. Of particular interest to the subjects in this study were the turtle graphics; the sub-

jects showed absolutely no interest in the text mode of LOGO.

2. It was noted that the subjects responded best when they were allowed to develop their own designs and projects (with help). Occasionally, a subject's proposed project would be too elaborate and would have to be modified (Figure 2). From time to time, a chance design would fascinate the subjects, as was the case when Sam used a recursive program with very large number inputs. The resulting *Star Wars* type of design had his eyes riveted to the screen.

3. The subjects, once having programmed and saved some procedures, exhibited a certain amount of creativity in linking them together into a more elaborate program. Tina put two boxes and two circles together to make a car; Lon designed an apartment by stacking boxes one on top of the other; and, John's

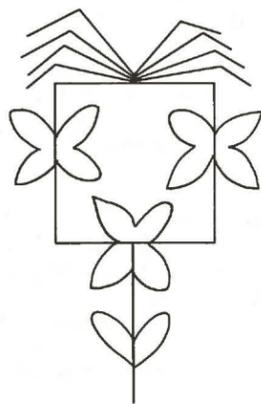


FIGURE 3. John's spider in a flower-box design.

graphic design used a square, a flower, and a spider (Figure 3). Also of interest was John's house (Figure 4), not so much for its complexity or creativity as for the fact that the entire design was programmed "mentally" without a single error (Figure 4).

4. The researchers were concerned about the effects of Ritalin on the performance of the subjects. For example, Tina took her Ritalin shortly before her LOGO session. Consequently, she often appeared lethargic. John, on the other hand, was put on Ritalin one week and placebos the next. Even though only the doctor knew which week was which, the researchers correctly identified the placebo week in each case; John made many more typing errors when he was being given the placebos.

It should be pointed out that the teachers, having seen the children prior to Ritalin, had no concerns in this regard. To them the medication aided rather than hindered performances.

5. The researchers were also concerned about the role they played in the study; that is, did the fact that the researcher

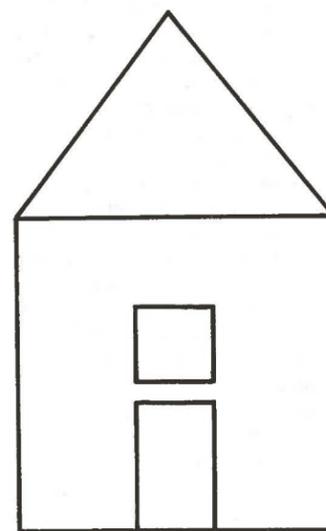
was male and a professor affect the results of the study?

Sam was just informed that the researcher was planning to take a ski trip. Sam threw his arms around the researcher's waist and cried, "Take me with you, take me with you!" Both the teacher and teacher-aide expressed surprise at this response, saying that was completely uncharacteristic.

In Sam's case one wonders whether the motivation and interest exhibited was entirely LOGO related, or a function of some researcher related variable.

6. And finally, based on the literature, and this study, the researchers feel that LOGO is a useful and versatile tool for use with emotionally handicapped children. LOGO (or at least the computer) gives a child prestige and respect from his peers; and by sharing this prestigious experience with others (peers, teachers, parents) the child's conception of self is probably enhanced. As expressed by Furst:

Eventually they (the children) come to see themselves in a more positive way. The "loser" begins to feel like a winner. He begins to glimpse the possibility that things can change for him and that he is capable of doing things that are of value to himself and others. (Furst, 1983, p. 15)



TO HOUSE

BOX 50	RT 90
FD 50	FD 20
RT 30	LT 90
TRI	FD 20
LT 30	LT 90
BK 50	FD 20
RT 90	LT 90
FD 20	PU
LT 90	FD 30
FD 20	PT 90
RT 90	FD 3
FD 10	PD
	BOX 10
	HT
	END

FIGURE 4. John's house.

REFERENCES

Furst, M. "Building self-esteem." *Academic Therapy*, 19 (1), September 1983, 11-15.

Howe, J.A.M., O'Shea, T., & Plane, F. *Teaching mathematics through Logo: an evaluation study*. DAI Research Paper, No. 115, September, 1979.

Larivée, S. "S. Analyze fonctionnelle de l'intelligence des enfants delinquants" — *Apprentissage et sociétisation*, 1979, 3(2), 163-192.

Larivée, S. *Quelques retambies clinique du paradigme Piagetian*. *Cahiers Pedopsychiatrique*, Automne 1980, 14, 41-77.

Larivée, S. "Le schème de la combinatoire: Un schème adaptatif." *Bulletin AMQ*, Mars 1981, 3-11.

Larivée, S., & Gendreau, G. "Piaget et la rééducation." *Apprentissage et sociétisation*, 1980, 4 (3), 201-214.

Larivée, S., & Michaud, N. "L'ordinateur au secours de l'inadaptation." *Revue des sciences de l'éducation*, Automne 1980, 3(VI), 451-472.

Michayluk, J., & Yackulic, R.A. "LOGO: A review of the literature and its ap-

plication." Paper presented at the CSSE Annual Conference, Vancouver, June 1983.

Milner, S. "The effects of computer programming on performance in mathematics." Paper represented at the Annual Meeting of the American Educational Research Association, New Orleans, February 1973.

Muller, J.H. "Young people's LOGO Association." *Byte*, August 1982, 8(7), 333-34.

Papert, S. "A computer laboratory for elementary schools." *Computers and Automation*, 1972a, 21(6).

Papert, S. "Teaching children thinking." *Programmed Learning and Educational Technology*, 1972b, 9(5), 245-255.

Papert, S. "Teaching children to be mathematicians versus teaching about mathematics." *International Journal of Mathematics Education and Science Technology*, 1972c, 3, 249-262.

Papert, S. *Mindstorms: children, computers, and powerful ideas*. New York: Basic Books, Inc., 1980.

Papert, S., & Solomon, C. "Twenty things to do with a computer." *Educational Technology*, April 1972, pp. 9-18.

Papert, S., & Weir, S. *Information prosthetics for the handicapped*. Logo Memo 51, MIT Logo Group, 1978.

Solomon, C.J., & Papert, S. *A case study of a young child doing turtle graphics in LOGO*. LOGO Working Paper 44, 1975. Revised 1976.

Statz, J.A. "The development of computer programming concepts and problem solving abilities among ten-year-olds learning Logo." (Doctoral dissertation, Syracuse University, 1973). *Dissertation Abstracts International*, 1973, 34(11), p.5418.

Watt, D. *Final report of the Brookline Logo project: profiles of individual student work*. Logo Memo 54, MIT Logo Group, 1979.

Watt, S. "Logo in the schools." *Byte*, August 1982, 8(7), 116-134.

Watt, D., & Weir, S. "Logo: a computer environment for learning disabled students." *The Computing Teacher*, 5(8) May 1981.

Weir, S. *The evaluation and cultivation of spatial and linguistic abilities in individuals with cerebral palsy* (Memo No. 570). MIT AI Laboratory, Cambridge, October 1979.

Weir, S. "LOGO as an Information Prosthetic for Communication and Control." Seventh Int. Joint Conf. on Artificial Intelligence. 1981, 970-974.

Weir, S. & Emanuel, R. "Using LOGO to Catalyze Communication in an Autistic Child." D.A.I. Research Report 15. Dept. A.I., Univ. Edinburgh, 1976.