

Exciting Effects of Logo in an Urban Public School System

Educators in St. Paul have found that classroom computer use benefits *all* their student populations, as evidenced not only by academic success but by students' increased enthusiasm for learning.

In the 1982-83 school year, the St. Paul public schools introduced the Logo computer language and educational philosophy into 26 classrooms. By June 1985, the project had grown to include 250 K-12 teachers who work in the full spectrum of urban public school settings, including special and remedial education, mainstream classrooms, and schools whose economic base ranges from very poor to predominantly middle class.

Implementing Logo

Every teacher in the project has undergone 40 hours of initial training in the

language and its classroom implications. Advanced training and support from inservice teachers who helped pioneer the project are available, and Logo's objectives mesh with a broader districtwide program called the Alliance for Effective Schools. The Alliance seeks to engage school administrators, teachers, parents, students, and concerned leaders from the public and private sectors in a dialogue about the substance and direction of public school education.

From the beginning, the Logo project has included a research component as one way of looking at how

teachers and students respond to Logo in their classrooms. While the research was being conducted, the system was growing. Many remarkable anecdotes were accumulated and, along with the formal dialogue in the Alliance and the formal research agenda, an enthusiastic informal dialogue took shape, enriching and challenging the other two perspectives.

Of all the questions raised about computers in the classroom, it is significant to note that the Alliance and Logo projects have consistently returned to two: (1) how can computers be used to engage all types of students



Richard Kovich

**Figure 1. Weighted Logo Effect Scores from 1983-84
Data on St. Paul Student Users (N = 385)**

Leading January Effects	Percent of the Maximum Weighted Effect Score (Relative Strength)
Enthusiasm, excitement about learning	94
Sharing, teaching, consulting	91
Frequency of interaction with peers	90
Logic, structured thinking, planning	83
Likableness, sense of acceptance, belonging	80
Self-confidence	80
Cooperation, participation	79
Pleasure in work	75
Systematic problem solving	75
Leading May Effects	
Likableness, sense of acceptance, belonging	99
Sharing, teaching, consulting	99
Logic, structured thinking, planning	93
Pleasure in work	90
Frequency of interaction with peers	90
Self-confidence	89
Creativity, resourcefulness	84
Enthusiasm, excitement about learning	82
Spelling, writing	81
Concentration, memory	80
Motivation	77
Attention to detail	77
Use of quantitative relations, math	76
Cooperation, participation	76
Decrease in boredom in the classroom	76
Altruism, prosocial behavior	76
Level of achievement	75
Rate of learning	74
Decrease in isolation, shyness, passivity	73
Playfulness, curiosity	72
Greatest Improvement from January to May	
Spelling, writing	85 (increase in
Rate of learning	84 weighted score)
Homework, class assignments	75
Level of achievement	73
Reading, reading comprehension	71
Descriptive power, coherence	66
Intuitive understanding, perspective taking	51

emphasizes the salience of the "teachable moment" type of intervention, when teachers are called on to articulate a student's discovery; confirm an intuitive, student-centered hypothesis; or debug an intellectual procedure.

Research Findings

In our 1983 and 1984 research, about half of all students were thought by their teachers to have improved in some aspect of their academic performance as a result of working with Logo. Ten percent of all student users showed dramatic improvement. Teachers were asked to indicate the degree of each student's improvement using 30 specific effect variables. Figure 1 displays, in order, the leading effects noted in January and May 1984, based on a weighting of the proportion of students improved in each area multiplied by the proportion for whom each effect was reported as significant. Also included in Figure 1 are those effects with the largest proportional increases (50 percent or greater) in weighted scores from January to May. The table suggests two things: (1) different kinds of effects from Logo usage may develop over time, with social effects preceding and developing in parallel with individual-cognitive effects; and (2) as might realistically be expected, the classroom environmental contingencies to student learning are complex and multidimensional. This second point is particularly relevant to schools approaching computer innovation as a simple phenomenon with an outcome that can be directly anticipated.

The list of Logo effects in Figure 1 is also an exciting testament to the opportunities that minimal computer exposure can create for public school students. On the average, these students spent only 40 hours of the entire school year using Logo, and the effects include cognitive and content skills and social-behavioral skills prerequisite to effective classroom participation and learning.

in learning? and (2) who is responsible for the quality and effects of the computer's impact on the classroom environment?

Most teachers in the St. Paul project establish a Logo "microenvironment" in one part of their classrooms. Typically, students take 20- or 30-minute turns at one or two microcomputers, often working in pairs at each terminal while regular classroom instruction continues. Using Logo, students define what are frequently complex graphics problems and solve them by programming the movements of a turtle on the monitor. Logo is often a powerful emotional experience for students and is extremely flexible for a variety of cognitive styles. It turns making mistakes and taking risks into advantages rather than disadvantages and, in a modified discovery-learning format,



“ . . . students in the lowest two achievement quintiles demonstrated improvement at about the same rate as students in the highest two quintiles.”

Another exciting finding emerged from further analysis of the subgroups of students for whom these effects were reported. There was literally no way to subclassify students that showed significant differences across levels of reported improvement. For example, students in the lowest two achievement quintiles demonstrated improvement at about the same rate as students in the highest two quintiles. Likewise, there was little or no difference (less than 10 percent) between males and females in level of improvement. The pattern also held for students from working-class backgrounds compared with students from middle-class environments, students with strong peer relations compared with social isolates, and students with extensive nonclassroom learning inhibitors compared to those with minimal outside obstructions.

Another analysis revealed that none of the student characteristics usually

considered to be traditional predictors of academic success or failure (disruptiveness in the classroom, initiative, independence, cognitive style, and emotional development, for example) were predictive of improvement through Logo. From a research perspective, the tentative conclusion is fairly straightforward: Logo effects seem to be both wide ranging and substantial, and appear to be available to students from almost any type of learning, social, or motivational background. Logo clearly represents an innovative way to create opportunities for academic success and enrichment for most students.

Logo's Educational Philosophy

Although Logo is, in its most elementary definition, only a programming language, it also comes with an implicit and loosely defined educational philosophy. The philosophy is not nearly as powerful as the programming language, partly because it has not been sufficiently articulated by educators and partly because its core assumptions are explicitly Piagetian or developmental. This second aspect sets up a pro/con conflict between developmentalist and non-developmental groups of teachers with equally high levels of commitment to classroom excellence and success for their students.

In St. Paul, the articulation of a Logo philosophy is just beginning to take shape after almost three years. One of the critical aspects of our large-scale experiment with Logo and learning will clearly be the extent to which our philosophy is not a position but a dialogue. Further, it is arguable that the positive results of our data analysis are not simply the consequences of students working at microcomputer terminals and using the Logo language. In large measure, these results are also the effects of an educational community systematically articulating its values, aims, and practical classroom objectives for teaching and learning.

Taking the Risk

To get Logo computers into the classroom and make them available to students, many people took extensive personal risks. The superintendent took a risk on a relatively unknown language and on the judgment of staff members with no computer background who researched the project and brought it into being. The Alliance coordinator took a risk in defining the Logo project as teacher-centered: with training required, teacher development strongly encouraged, and decision making for the course of the project decentralized to the schools whenever possible. Perhaps most important, teachers took a risk with Logo: they chose to accept into their classrooms an innovation that asked them to forego many of the control and authority aspects of teaching, as well as the role of being the person who defines correct answers and proper solutions. In doing so, they were confronted with a gaping unknown central to both teaching and innovation: what if it works? Could they handle a class with everyone learning in different directions and working on a large range of student-defined problems with a fairly high level of excitement?

It is important to recognize how tentative we are (and must be) about our own knowledge and how aware of our own limitations we can become in the face of youthful, talented promise in the act of fulfilling itself or showing unexpected promise. The Logo teachers in St. Paul faced this difficult first hurdle of innovation, and in asking these questions they and the administrators behind them communicated to students something at least as intrinsically powerful as the Logo language itself: the commitment of an adult community, with diverse individual interests, to the concept of success for all students. □

Pete Fire Dog is a doctoral candidate, Department of Sociology, University of Minnesota, Twin Cities, 1114 Social Sciences, 267 19th Avenue, South, Minneapolis, Minnesota 55455.

Copyright © 1985 by the Association for Supervision and Curriculum Development. All rights reserved.