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INTRODUCTION

A Retrospective View 1982-88

Logo St. Paul is a teachers' initiative. It is teacher-based and teacher generated, created and sustained by teacher leadership and energy. Teachers remain the center of the system that includes three interdependent variables: (1) Vision and leadership; (2) On-going professional development; (3) School adaptation, ownership and control.

This collection of Logo studies enlarges the documentation provided by teachers in 1983 and 1985. The latest set of papers captures a more mature energy and scholarship, and speaks to the rich and complex texture of growing Logo cultures in St. Paul schools.

Since 1982 -- the year Logo was introduced in St. Paul -- teachers have talked about Logo as a "language of learning" designed to accommodate the diversity of cognitive styles and the wide range of students from pre-kindergarten to grade 12. There are teachers who will credit Logo with building new cognitive structures!

The implications of Logo's learning power are significant. Logo-based learning represents a shift in instruction toward a balance between content and process... between words and images... between teacher centered instruction and student centered... between quantitative assessments and qualitative ones. The emphasis is on balance; Logo is not either/or.

Logo-based learning is focused on thinking and reasoning. This is a central and unifying force that continues to validate the promise of Logo as a reform technology:

° Logo is for all kids
° Logo provides new ways of thinking about thinking
° .... and new ways of thinking about schools and schooling
° Logo is a strong force in the professional growth and development of teachers

LOGO IS FOR ALL KIDS

The Logo experience in St. Paul is clear and persuasive: Logo is for all kids. This does not mean that all kids are the same or that the Logo experience is the same for all kids. Rather, it talks to the power of Logo as a language of learning, an instructional tool that is appropriate for the wide range of learning behaviors that teachers encounter in St. Paul classrooms. Students use Logo to deal with the concrete and the abstract in varying degrees and from different life perspectives. Logo encourages students to exercise their natural learning styles and to approach the Logo
task from different centers of focus. The Logo environment provides a context for intentional cognition in which students are empowered to take charge of their own thinking.

The following table documents Logo effects in a sample of 385 St. Paul students. The data serves to reinforce the contention of St. Paul teachers that Logo benefits accrue to the total student population as evidenced by academic success and enthusiasm for learning.

<table>
<thead>
<tr>
<th>Leading January Effects</th>
<th>Percent of the Maximum Weighted Effect Score (Relative Strength)</th>
</tr>
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<tbody>
<tr>
<td>Enthusiasm, excitement about learning</td>
<td>94</td>
</tr>
<tr>
<td>Sharing, teaching, consulting</td>
<td>91</td>
</tr>
<tr>
<td>Frequency of interaction with peers</td>
<td>90</td>
</tr>
<tr>
<td>Logic, structured thinking, planning</td>
<td>83</td>
</tr>
<tr>
<td>Likableness, sense of acceptance, belonging</td>
<td>80</td>
</tr>
<tr>
<td>Self-confidence</td>
<td>80</td>
</tr>
<tr>
<td>Cooperation, participation</td>
<td>79</td>
</tr>
<tr>
<td>Pleasure in work</td>
<td>75</td>
</tr>
<tr>
<td>Systematic problem solving</td>
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</table>

<table>
<thead>
<tr>
<th>Leading May Effects</th>
<th>Percent of the Maximum Weighted Effect Score (Relative Strength)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likableness, sense of acceptance, belonging</td>
<td>99</td>
</tr>
<tr>
<td>Sharing, teaching, consulting</td>
<td>99</td>
</tr>
<tr>
<td>Logic, structured thinking, planning</td>
<td>93</td>
</tr>
<tr>
<td>Pleasure in work</td>
<td>90</td>
</tr>
<tr>
<td>Frequency of interaction with peers</td>
<td>90</td>
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<tr>
<td>Self-confidence</td>
<td>89</td>
</tr>
<tr>
<td>Creativity, resourcefulness</td>
<td>84</td>
</tr>
<tr>
<td>Enthusiasm, excitement about learning</td>
<td>82</td>
</tr>
<tr>
<td>Spelling, writing</td>
<td>81</td>
</tr>
<tr>
<td>Concentration, memory</td>
<td>80</td>
</tr>
<tr>
<td>Motivation</td>
<td>77</td>
</tr>
<tr>
<td>Attention to detail</td>
<td>77</td>
</tr>
<tr>
<td>Use of quantitative relations, math</td>
<td>76</td>
</tr>
<tr>
<td>Cooperation, participation</td>
<td>76</td>
</tr>
<tr>
<td>Decrease in boredom in the classroom</td>
<td>76</td>
</tr>
<tr>
<td>Altruism, prosocial behavior</td>
<td>76</td>
</tr>
<tr>
<td>Level of achievement</td>
<td>75</td>
</tr>
<tr>
<td>Rate of learning</td>
<td>74</td>
</tr>
<tr>
<td>Decrease in isolation, shyness, passivity</td>
<td>73</td>
</tr>
<tr>
<td>Playfulness, curiosity</td>
<td>72</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Greatest Improvement from January to May</th>
<th>Percent of the Maximum Weighted Effect Score (Relative Strength)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spelling, writing</td>
<td>85 (increase in weighted score)</td>
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<tr>
<td>Rate of learning</td>
<td>64</td>
</tr>
<tr>
<td>Homework, class assignments</td>
<td>75</td>
</tr>
<tr>
<td>Level of achievement</td>
<td>73</td>
</tr>
<tr>
<td>Reading, reading comprehension</td>
<td>71</td>
</tr>
<tr>
<td>Descriptive power, coherence</td>
<td>66</td>
</tr>
<tr>
<td>Intuitive understanding, perspective taking</td>
<td>51</td>
</tr>
</tbody>
</table>

(Fire Dog 1985)

Peter Fire Dog, author of the St. Paul study, reports the following analysis of student subgroups:

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 intensive nonclassroom learning inhibitors compared to those with minimal outside obstructions.

... 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 student 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.

(Fire Dog 1985)

THINKING ABOUT THINKING

New technologies are concentrating on the study of human thought process. Research findings in studies of artificial intelligence may reveal new understanding of how thought emerges. They are now providing us with new ways of thinking about thinking.

Daniel Bell, the eminent Harvard sociologist, has defined the elements of critical thinking as follows:

- Conceptual - the ability to codify theoretical knowledge. This may be the most important aspect of post-industrial society.

- Computing - the ability to think in sequential, specific and highly formalized ways.

- Configurative - the capacity we have to construct models and simulations that allow us "... to play out the implications of what we want to do." The focus on the prefix "re" is important -- the ability of computer technology to redesign, reorder, rearrange and restructure.

(Bell 1984)
SCHOOLS AND SCHOOLING

The integration of new technologies into the consciousness and culture of schools is anticipated. It is merely a question of time. Teachers in St. Paul are examining Logo connections. In the process, their view of schools and schooling is changing.

In 1985 - the third year into the program - small groups of teachers began to investigate relationships between Logo and curriculum. Items:

° Young Logo
   Logo-like activities, with and without the computer, for young children in preschool, kindergarten, and first grade.

° LogoWriter
   The Logo experience integrating words and images encouraging what Papert calls "dynamic writing."

° Integrated Studies
   An interdisciplinary process using Logo as an integrative tool in language arts, social studies, science, music and art.

° Lego/Logo
   Interfacing computers and Lego constructions. Students explore elements of physics, engineering, mechanical design, and computer science.

° Logo Art
   An interdisciplinary project exploring the repeated patterns and symmetry of tesselations.

° Logo and Math
   Connections with algebra, geometry and calculus under investigation by junior and senior high math teachers.

° Logo and Special Populations
   Logo as an instrument for intellectual development and a medium for self expression in special populations. We are especially interested in students with "trapped intelligence", a term used by Sylvia Weir to describe the intellectual capacity of students who are not able to talk. (Weir 1987)
But what happens when Logo does not fit the prescribed program? We see changes in curriculum and instruction grounded in the strong expressions of students and teachers who are free to explore different modalities of learning. No wonder that Logo teachers have observed the appeal of Logo and Logo-like processes in both high and low achievers. Both groups search for new ways of connecting to the world of ideas not accessible to them in the traditional curriculum. In the process of working with Logo activities, students generate knowledge of their own. In many Logo classrooms, there are changes in the perspective of what schools and schooling are all about.

STAFF DEVELOPMENT

The very notion of staff development implies change: in teachers, in their teaching, and in the process of teaching teachers. Marc Tucker, makes the following comment about teacher education and computers:

Giving teachers short courses in computer programming and other elements of computer literacy is hardly worth the effort. What is needed goes deeper to a grasp of the nature of the computer as a tool to support intellectual endeavor across the whole curriculum of the school. (Tucker 1986)

The focus of St. Paul's staff development is on the personal and professional growth of teachers. Logo is one vehicle to facilitate this. The emphasis is as much on process and philosophy as on content. We want teachers to experience and reflect upon their own learning, and to grapple with the implications of a new technology, cognitive and developmental theories and cooperative learning structures. We hope Logo will empower teachers to take charge of their own learning with the development of new ideas, intellectual strategies and a sense of Logo scholarship.

Logo in St. Paul is a school-based program. It is a program of choice, chosen by the individual school with commitments from the school and the district office for continued development. Principals and teachers are encouraged to think about Logo as a total school effort as opposed to Logo for some students or some teachers.

Staff development is on-going. We continue to work with teachers who were trained in the first Logo workshop in November 1982. Staff development includes workshops, continuous in-service at the school site, peer coaching and observations. Issues of leadership and management are issues of staff development. All are designed to empower teachers to understand and apply the new technology.
Approaches to staff development are enlarged in several distinguished ways:

LOGO RESOURCE TEACHERS School ownership and leadership are encouraged by structuring school support systems. Release time is provided for resource teachers in each school for school-based in-service programs.

LEADERSHIP WORKSHOPS Resource teachers are supported by providing four leadership workshops each year conducted by Seymour Papert and LCS1 staff.


TEACHER INTERNSHIPS St. Paul teachers have participated in Logo training programs at MIT and at Boston's Hennigan School.

SCHOOL PAIRINGS New Logo schools are paired with old Logo schools. This serves to broaden the base of Logo leadership and is building a network of inter-school support systems.

LOGO SEMINAR A monthly seminar in Classroom Action Research was introduced in 1986 with faculty from Macalester College. Teachers served as both practitioners and researchers. They were encouraged to validate their experiences by reflecting and writing about them. The seminar stimulated a sense of Paulo Freire's "praxis": reflection and action upon the world in order to transform it. (Freire 1970)

LOGO NEWSLETTERS Newsletters provide a history and perspective of their own. They help us understand how Logo users report their work over a period of time. For this reason, I am including newsletters as part of the process of professional growth and development.

"Logo Link" is the newsletter of St. Paul teachers. The "3M Logo Tutors' Newsletter" is the voice of a volunteer group of 3M computer analysts, programmers and engineers who work with teachers and students in Logo classrooms.
A special note of thanks is extended to the Saint Paul Companies for their initial and continuing support. The opportunity for a school system to appropriate a technology of change and to remain at the edge of an ever-advancing technology would not have been possible without the vision and support of the larger St. Paul community represented by the Saint Paul Companies. The corporate presence in public education is a strong and validating force.

The Minnesota Academic Foundation for Excellence has cited the St. Paul Logo Program as one of Minnesota's exemplary programs. This award comes at a time when Logo's power is being recognized in new and different ways. We can report the following:

° New relationships between people and machines

° New understandings of cognition leading to new definitions of human intelligence

° New approaches to learning grounded in holistic thinking and socially interactive systems

The voice of the turtle is strong.

Geraldine Kozberg
January 1988

REFERENCES

Bell, Daniel. Address to the Minnesota Business/School Partnership, 1984


Tucker, Marc. Testimony to the National Governors' Association Task Force on Advanced Technology. February 10, 1986

This report documents the 1985-86 Lego/Logo Program at the Galtier Magnet School funded by the Superintendent's Mini-Grant Program. During this past year Galtier has set off in a new direction as a Math, Science, and Computer Magnet. With the staff already trained in the use of Logo as a tool to enhance learning, it was a natural to expect that Logo would be used to tie areas of the curriculum together. As the year developed, this did indeed begin to occur.

At the same time that Galtier Magnet was being planned (winter and spring '85), the developers of Logo at M.I.T. were beginning a new project to make Logo an even more concrete experience. The Lego/Logo program is based on hands on experience which became possible by developing a computer interface that would enable students to design, construct and program their own Lego machines. Even advanced commercial Lego sets now contain a wonderful assortment of parts including pulleys, several size standard gears, gear boxes, crown and beveled gears, worm-gears as well as electric motors. In addition to this, M.I.T. research personnel have developed touch sensors and light sensors to be used with the motorized Lego kits. These developments along with the building of an interface box have led to elementary age students entering the age of robots. St. Paul's commitment to Logo through staff development strengthened by our professional relationship with Seymour Papert and the M.I.T. Logo Group, made it possible for our district to become a pilot site for Lego/Logo.

In March 1986, upon completion of one week's internship at the Hennigan School in Boston, site of M.I.T.'s Lego/Logo research and development, Lego/Logo project was begun at Galtier Magnet. With the information gained from the Boston trip as well as a supply of the more sophisticated Lego pieces (interface box, touch and light sensors) it was possible to make the jump from Legos used to teach concepts in simple machines to programmable Lego machinery capable of receiving information (via the sensors) and acting according to the program wishes of the designer.

We began at first to give students a background in simple machines using the Lego construction sets to investigate the properties and value of different simple machines. As students became knowledgeable with these concepts, they began building devices which put the initial ideas to work in machines that were operated by Lego motors. The next step was to take the complex Lego machines that were being built by the students and interface them with Logo and the computer to make them programmable. Essentially, this opens up the world of robotics to elementary age students. Unlike other places which begin work with robots that are already built, students at Galtier began from the very bottom, learning first to design and construct their own machines and then to program what they had built.
It was obvious from the beginning of our work with Legos, that a certain enthusiasm existed that is not often seen within standard class settings. The main discipline problem became trying to get the students to quit and go on to another class when the time was up! Students stuck to what they were doing throughout the class. Even those few individuals who held back and did not become involved in the beginning simple machine stages of work were drawn in to full involvement when the focus switched to motorizing what was being built. At this point of the unit, there were literally no students holding back. All students were actively designing, building and testing their equipment. This in itself is an accomplishment worthy of note. In addition paired students were working together cooperatively toward a goal. Problems were encountered along the way in the design and programming of their devices, but as in their work in Logo, this was a natural experience and something to be overcome with redesign and retesting. As much time and energy was spent in problem finding as problem solving. Both skills are considered to be vital life-long skills going beyond any curriculum confines.

After the initial lessons spent relating Lego devices to simple machines, and Lego machines to compound machines in real life as well as time spent learning about gears, forces, and transfer of power - students were directed to an independent level of work. Each class chose a theme to develop using the Lego materials. One class chose to develop the "city of the future" while the other class chose to make an "amusement park." Both classes worked on their projects in small groups (two students) and finally as a whole group to assemble the individual group projects into a large class project centering around the chosen theme. Students wrote computer programs in Logo to power their Lego machines. Machines varied from ferris wheels and cable car rides in the amusement park to automatic rope jumping machines and actual robots in the city of the future. The two classes presented their finished projects to the school and community as part of the spring science fair at Galtier School on May 27th.

This year was only the beginning to what promises to be an exciting and expanding development for schools already involved with Logo and the Logo philosophy. Even though the material is not yet commercially available, teachers at Galtier have piloted the idea and have begun the task of curriculum development to use Lego/Logo in an integrated curriculum. This summer's writing project brings Science, Math, and Language Arts together into one interdisciplinary unit centering around Lego/Logo. Our intent is to teach concepts as they are related to each other rather than as isolated subject areas.

Throughout our work this past year it became obvious that children, even at the elementary age, are capable of working with complex ideas in surprisingly simple approaches. Several parents who visited our Spring Science Fair commented on how closely students' work and construction of motorized and programmed Legos paralleled their work as engineers. Concepts like mechanical transfer of power, gear ratio, and friction factors were only approached on the theoretical basis before college. Yet, given plenty
of hands on experiences designing, building, and testing, elementary students have shown they can gain a working understanding of these concepts.

All this is not to say that we are attempting to produce a class of elementary age engineers. The real power, I feel, lies in at least two other directions. First, students are involved with problem finding and problem solving both as they build and as they write computer programs to operate their machines. Secondly, communication and cooperation skills are improved as students work in pairs to build and program their Lego creations. Both of these are needed as life-long skills not only in today's society but even more likely in the society of tomorrow that our children will face.

July 1985
IDEAS FOR KINDERGARTEN PROJECTS USING OLDER STUDENTS AS MENTORS

Ardyce Ehrlich

One problem area in working with LOGO and kindergarten students is trying to find time to work with the students individually. Students are usually not skillful enough to give each other the needed help. Mann Elementary has been exploring the idea of pairing kindergarten students with fourth and fifth grade students in a mentoring approach in a reading and LOGO program. Students meet together at a specified time over a period of weeks. The meetings take place in the kindergarten classroom. The older students select books from the library to read to the younger students and also spend scheduled time working with the younger students on LOGO. This pairing has been done in both the regular and the special needs kindergarten classes. The program has been ongoing for three years.

GENERAL FOCUS

Using older students to work with the younger students has a two-fold benefit. Younger students get the individual attention they often need to reinforce learning. Older students reinforce their own learning by teaching concepts they already know. The socialization aspects of the program have been good for the self-esteem of both age groups.

Ideally projects that the mentors do with the younger students in LOGO should relate to other mentoring projects going on; for example, reading and writing.

BEFORE STARTING

Kindergarten teachers should spend some time with the mentoring students to explain the reasons for the projects and the kind of results they are aiming for. Mentors should also be made aware of the kind of climate the kindergarten teachers are trying to produce in their classrooms and how the mentors can help with that. Teachers should stress that the mentors should talk with the kindergarten students about what the turtle is doing, what they are trying to make, etc. Lesson plans for the mentors to use could be provided.
PROJECT IDEAS

1. Basic LOGO concepts

The first interaction could simply be a review of the basic turtle commands. If the younger student is comfortable using what he/she knows, new commands can be introduced. Mentors should talk to the younger students about what they are doing and use some positive reinforcement.

2. Single-Stroke LOGO and Mazes

These programs can be written and placed on disks either by the teacher or the mentors. Mentors can load the programs into the machine and show the younger students how they work. With LOGOWriter the drawings done with single-stroke LOGO programs can be easily printed out or saved. If Apple LOGO is used, a command that will dump the drawing directly to the printer can be written into the program.

Use of single-stroke LOGO can be combined with a social studies or art project where younger students are assigned a specific idea to express. The designs can be printed out with the help of the older student or the teacher.

3. Drawing Shapes

Trying to draw different shapes is a good project for mentors and younger students. Any of the geometric shapes used in kindergarten can be introduced, as well as any others the mentor knows. From this, students can go on to try to combine shapes to make different objects or drawings. This can be done using either regular LOGO or single-stroke LOGO. If you are using LOGOWriter, the stamp command can be introduced and students can use various stamps in their drawings. New commands such as REPEAT can be introduced by the mentors as needed.

4. Writing

Using print statements in Apple LOGO or the LOGOWriter word processor ties in very well with the reading that the mentors are doing with their younger students. Mentors could discuss a book with their student and then write something about the book together on the computer. Mentors begin as "typists" and let the younger students take over when they are ready. LOGO graphics to illustrate part of the story could be included. Both the writing and graphics can be printed out by the mentors or teachers.

December 1985
TESSELLATION
Ardyce Ehrlich

Tessellation is the repetition of identical interlocking shapes that can be repeated indefinitely. It is a fascinating subject to explore with LOGO. Because of the ease of making geometric shapes with LOGO, students will need a minimum of LOGO programming experience to try tessellation. Procedure writing and use of REPEAT statements are helpful to know, but neither is necessary.

Tessellation can be approached as a visual arts project, or combined with language arts, math and/or science to make an interdisciplinary study. It makes a good independent project for students to work on. The basic ideas can be introduced and the specific project put on a worksheet for students to refer to during their computer time.

CONCEPTS TO BE RELATED TO TESSELLATION:

As An Art Project:

1. Discussion of Maurice Escher and mosaic tiles.

Both Escher and artists who work with mosaics are interested in tessellation as a means of covering surfaces completely with interlocking designs. Tessellation is also used in geodesic domes and other architectural forms.

2. Discussion of symmetry - including the use of color to produce different effects. You might want to use a kaleidoscope to introduce this.

3. You might want to have your students try some tessellations with paper and pencil or crayons before they try it on the computer. There are only three kinds of polygons that tessellate perfectly - those with three, four, or six sides. You may either tell this to your students, or let them discover it using pattern blocks or paper cutouts.

4. As a follow-up to the LOGO exercise, you might want to have your students make something else using their tessellated design, e.g. a painting, a mosaic, a collage, a poster, etc.

As An Art/Language Arts Project:

1. Use of new vocabulary. Introduce concepts generally and have the students define them.
2. Written or oral discussion of what the students have produced. Students could also demonstrate their work for the class in an oral presentation.

3. Further research into artists who use tessellation or any of the concepts involved with tessellation.

As an Art/Science or Art/Math Project:

1. Tessellation is one kind of pattern repeated in nature - e.g. honeycombs. Other patterns found in nature that are also used by artists are spirals, meanders, and branching patterns. Tessellation could serve as an introduction to examining these patterns and discussing possible reasons for their appearance (such as space constraints and efficiency).

2. Geometric shapes and patterns have their foundation in natural observations. This could be a good discussion topic for younger students as well as older ones.

3. Examination of the mathematical ideas involved in LOGO turtle graphics and their expression in tessellation. Students could provide explanations of the math they used to make their tessellations. The mathematical basis of symmetry could also be introduced.

4. Perfect tessellations can only be done with certain polygons. You or the students might try some repeated designs with other kinds of polygons - both regular and irregular - and discuss the differences.

Attached is a project that was developed for use with 6th, 7th, and 8th grade students. Please feel free to use it as is, or adapt it to your particular needs. A sample tessellation with squares is also attached. You might want to show it to your students as an example.

January 1986
1. Pick a shape - a triangle, square, or hexagon.

2. Write a LOGO procedure that will draw your shape. Remember you will be repeating this shape so don't make it too big.

3. Write a LOGO procedure that will make one tessellated row of shapes.

   Things to think about:
   
   Which way is the turtle heading when you start?
   Which way is the turtle heading when you finish one shape?
   How far do you have to move the turtle to make another shape?

4. Write a LOGO procedure that repeats one tessellated row four times to make a large pattern or grid on the screen. Do not let the rows wrap around the screen.

   Things to think about:
   
   Which way is the turtle heading when it is finished with the row?
   How far do you have to move the turtle to make another row?
   Which way must the turtle be heading to make another perfect row?

5. Go back to your basic shape and write another LOGO procedure that changes the shape in some way. You can either stay inside the shape or go outside the lines. Make sure you return the turtle to the position and heading needed to start another shape in the right place.

6. Write some new procedures that use your new shape or put the altered shape into the original procedure that makes your grid or pattern and see how your tessellation has changed.

7. Save your tessellation pages on the class disk and print out three copies on the printer.

8. Using markers or crayons, color your designs using three different color schemes. Keep in mind the effects of color on symmetry and movement.

9. Write a paragraph describing the way color affects the design for each of your color schemes.
TO square
repeat 4 [fd 30 rt 90]
END

TO row
repeat 6 [square rt 90 fd 30 lt 90]
END

TO design
pu setpos [-100 70]
pd
row
repeat 4 [pu lt 90 fd 180 rt 90 bk 30 pd row]
END
TO square:
square
rt 25 fd 40
rt 135 fd 40
pu bk 40 lt 135 bk 40 lt 25 pd
END

TO row:
repeat 6 [square] rt 90 fd 30 lt 90
END

TO design:
pu setpos [-100 70]
pd
row:
repeat 4 [pu lt 90 fd 180 rt 90 bk 30 pd row]
Mann Elementary School has been actively involved with the LOGO program since its inception four years ago. Four teachers were trained in the initial workshop; three to four teachers have been trained in each additional training session. All of the regular classroom teachers and three of the special education teachers are now LOGO trained. Mann has self-contained classrooms, and the computers are in the individual classrooms. All classrooms have one computer, and several classrooms have two.

LOGO was initially introduced at Mann as part of the Community/School Collaborative, an attempt to involve the total school community more fully in the activities and decision-making processes at the school. During the 1983-84 school year, the first full year of the collaborative process, several activities to inform and involve parents with LOGO were developed. There were three introductory workshops, a six-week class for parents in LOGO, and several LOGO family nights when families could come to school at night to work with LOGO with their children. During the following two years, additional introductory workshops and LOGO family nights were held.

Initial inservice was provided by a resource teacher from outside the building and consisted mainly of demonstration lessons and informal meetings with teachers during prep times. At the beginning of the third year, inservice days were instituted when teachers were released for part of the class day to work on LOGO. These sessions were mainly for skill development.

By the middle of the third year, enthusiasm on the part of the staff and some of the students was beginning to wane. Mann was a school using LOGO, but no one was really sure how or why. In some classrooms computers were going all day; in others they were hardly utilized. There was general recognition that something interesting and often exciting was happening when the students were working with LOGO, but teachers were frustrated with the lack of time to teach new LOGO skills and ideas and to be able to see what the students were doing. LOGO, in most cases, was an "add-on" activity; something both the staff and students saw as unrelated to the rest of the school curriculum. The staff was still interested in using LOGO, but were unsure as to what they were working toward and how to proceed.

In the early spring of 1985, two new ideas were initiated through the combined efforts of staff members and the LOGO resource teachers. The first was the development of a mini-lab. All of the computers were pulled together for two days, and each teacher had a chance to bring his/her classes in for a whole class period. This was a great energizer, both for the staff and the students. For many of the teachers, it was a first chance to see what all of the students were doing with LOGO. Several teachers used
the lab as a time to teach new LOGO skills. Mini-lab time became a regular part of the school, occurring every six weeks or so.

The second major initiative was a mini-grant written by a teacher and a LOGO resource teacher. It was a first attempt to write a specific curriculum unit of which LOGO was an integral part. The emphasis would be on using LOGO as a tool to teach something else, rather than on teaching LOGO. The grant was approved and the unit was completed in May. The excitement of the teacher and the students spread to several other classrooms, and proved to be the springboard for the activities of the following year.

This year, (1985-86) through the combined efforts of staff members and a LOGO consultant, Mann began to refocus its use of LOGO in two main ways:

(1) looking at ways LOGO touched on curriculum to reinforce ideas and concepts currently being taught, and
(2) to use LOGO and new LOGO skills to introduce new concepts and ideas.

Emphasis was on using LOGO skills students and teachers already had rather than on increased skill development. New skills would be introduced only as needed for particular projects. Concentration was in the areas of social studies, language arts, and the visual arts. Math concepts were also included when appropriate.

This new approach began with an intensive inservice effort in the fall. Teachers were released in groups of three or four for a half day to work with the LOGO consultant to develop ideas and projects. Project ideas were for the most part teacher initiated, with the LOGO consultant providing assistance in making connections to LOGO and in implementation ideas. Many of the projects were interdisciplinary in scope, combining, for example, language arts, social studies, and LOGO. Teachers also had time to learn and practice new LOGO skills required for the various projects.

After the projects were developed, the LOGO consultant worked with the classroom teachers to introduce the projects to the class. In some cases, the mini-lab setting was used to do this. The consultant was also available to help facilitate the progress of the project when necessary.

Among the projects developed through the year were the following:

1. 4/5 social studies units on U.S. Geography. This was a team taught unit developed by two teachers. LOGO was used for the development of a data bank and individually designed state flags with symbols of the states.

2. 4/5 unit on early American History. The focus of the unit was the 13 colonies - Then and Now. This unit was done by two classes. One class, working on the 13 Colonies Then, wrote a Colonial Newspaper with all of the articles and illustrations done with LOGO. The other class concentrated on the 13 Colonies Now, and
wrote travel brochures for each of the states, with descriptions and state symbols done in LOGO.

3. First grade social studies unit on Early American History. LOGO was used to design a class quilt. Each student designed one square. The students created a pattern book for the quilt with all of their LOGO programs, printed out each individual square, and put them together to make the quilt.

4. Third grade language arts. LOGO was used to create a class story with each student writing part of the story.

5. Sixth grade visual arts. LOGO was used for an art project in tessellation. Students used LOGO to make tessellations and develop an understanding of the repetition and patterning involved in mosaic tiles and the work of M.C. Escher.

6. Fourth grade social studies. A project involving mapping, graphing, and scale. LOGO was used to reinforce the above ideas. Students were introduced to new LOGO commands that deal with grid coordinates and used the context of U.S. geography to work with them. A transparency of the United States was placed on the computer screen and students used LOGO to locate cities and determine distances between them by 'flying the turtle'.

7. Kindergarten - combined effort of two staff members
   a. Cooperative tutoring program where 4/5 students had LOGO partners in the kindergarten rooms and worked with those partners in reading and LOGO. Kindergarten teachers provided "lesson plans" for the older students with specific projects to work on during their tutoring sessions.
   b. Music programs using LOGO II to help children explore music in another form - including writing their own songs that the computer would play.
c. The beginnings of a thematic monthly curriculum that would integrate LOGO activities into other ideas being explored. Four months of activities that include art, music, numbers, and shapes are already planned.

8. 4, 5, 6th grade personal banners.

Three classrooms had students design personal banners with LOGO. Students created their own personal symbols and wrote explanations of their symbols with LOGO. This was combined with an art unit in which students made self-portraits in various art media.

The Resource Room (Special Education) teachers worked with the regular classroom teachers on these projects, and students who have resource room help spent extra time in working on LOGO skills. Additional activities in the areas of writing and language arts were also developed for use in the resource room.

At the end of its fourth year with LOGO, Mann has moved from a school using LOGO to a school with a LOGO culture. What began as a look at a new kind of computer technology, has become a general acceptance of the total philosophy inherent in LOGO and it has permeated the school. Evaluation surveys done by the LOGO consultant indicate a greater understanding of LOGO and its use and a growing awareness of LOGO both by individual teachers and on the building level as a whole. Teachers are already beginning to develop projects and ideas for the next year. The school has begun to look at the notion of "LOGO-like" thinking and its application in areas that do not directly involve using LOGO on the computers.

Student involvement with LOGO has increased in most classrooms, and for many students, using the computer and LOGO has become a comfortable normal part of the school day. Many students in the building have been working with LOGO for four years now, and there is a vast accumulation of LOGO "knowledge" among the student population. Each new project adds to that knowledge base, and the "knowledge" diffuses from student to student and from class to class. It is important to note that all of the LOGO projects were done with ALL of the students within a classroom. The concept of equity of access has continued to be a major part of the program. Most of the projects were done by pairs or groups of students. Several teachers have reported that many students are also helping each other and working together during class activities that do not involve LOGO.

There has been an extraordinary level of growth in terms of both leadership and cooperative efforts among the staff. Sharing LOGO ideas has been a catalyst for sharing other curriculum ideas and for developing new teaching strategies.
Cooperative efforts between regular classroom teachers and special education teachers and between upper and lower grade teachers have also increased. The use of LOGO changes the atmosphere in the classroom, and in many cases, those changes have resulted in a greater awareness of the differences in student learning styles and consequent changes in teaching style.

The use of LOGO is not uniform among classrooms. Two teachers in the building have chosen to not involve themselves in this new process, and are content to let LOGO be used by the students purely as an exploratory computer exercise. This situation probably will always exist. Because the building as a whole, however, is committed to LOGO and its accompanying philosophy, the underlying LOGO culture is still a part of those classrooms.

The development of the LOGO culture at Mann took several years and moved through several phases. Mann is a typical school in many ways, with a broad mix of students and staff. Two different administrators were at the school during the four year process, and there were several staff changes. The LOGO culture persisted and grew despite these changes for three main reasons:

1. Compatibility with general school philosophy

Mann has a long history as a school strong in non-traditional activities and approaches. This style has remained consistent through several staff and administrative changes. There has always been an active, involved parent body that has pushed for challenging activities and inclusion in new opportunities provided by the district. The school culture was an ideal place for a LOGO culture to 'grow'.

2. Total school commitment to LOGO

Early in the second year of the LOGO program, the school community, including the parents, made a strong commitment to the use of LOGO in the school and acceptance of the philosophy of equity that goes along with it. This has led to training of all staff members in the use of LOGO. If teachers are not interested in the expanded uses of LOGO, the commitment to allow all students access to LOGO and the computers still remains.

Strong administrative support by the building principal has been an integral part of the process, both in terms of being willing to spend school funds for needed equipment, and in supporting the leadership efforts among the staff.
3. Concentrated LOGO inservice help

Inservice efforts went beyond providing skill development to include discussion time with small groups of teachers, planning time for projects, and facilitation of the projects during their execution. LOGO is not easy to fit into a traditionally organized school. The role of the consultant was to help teachers develop and expand their ideas and to integrate LOGO ideas in as comfortable a manner as possible. Teachers were encouraged to ask questions, try out ideas before using them, to informally assess and evaluate the various projects. What worked? What didn't work? How would I change this if I tried it again? These are important questions and inservice time provided valuable opportunities to get beyond the surface issues and take an in-depth look at the reasons for using LOGO and what it would provide the students.

July 1986
One of my greater achievements in high school has to do with a turtle. Not a turtle that lives on land or in water, but one that lives on the computer screen. I am talking about a computer language called LOGO. One of the main features of this language is the ability to direct a "turtle" around the screen in order to draw graphics. The language was developed by Dr. Seymour Papert, a professor at the Massachusetts Institute of Technology. The idea behind the language is to help people develop problem solving skills.

I began learning LOGO at the end of my eighth grade year. The way I learned LOGO, however, was different than most students. In most computer classes, the students are told what they need to know and then given assignments to do on the computer. Fortunately, a friend and I were able to take an independent study in LOGO. In this case, we had to discover the language ourselves and create our own "assignments". This had many advantages over a typical class. Not only did we get a better knowledge of LOGO, but we learned to work together to teach ourselves.

Due to this special situation, the LOGO coordinator for the St. Paul Schools heard about us. She invited us to demonstrate some of our programs at a presentation she was giving about LOGO. Our demonstration must have impressed her because later during the summer she asked us to help teach a LOGO workshop. After the workshop, I felt a great sense of achievement knowing that I had learned enough about LOGO to be able to teach it to someone else.

My LOGO experiences continued through high school. I went on to teach at several more workshops and also began attending, along with junior and senior high school teachers, more advanced LOGO workshops. Between my sophomore and junior years I attended, upon the personal invitation of Dr. Papert, an international LOGO conference in Boston. As I continued my involvement in LOGO, I continued feeling a sense of achievement. Being able to make another person understand a given concept shows that you have a very good understanding of the concept yourself. It means that you have reached a level of achievement of which you should be proud. Because there are no bounds to LOGO, my achievements with the computer language will never end. I have, however, reached a high enough level to feel that LOGO is one of the greater achievements of my high school years.

March 1987
Teacher Feature
by Rebecca Poplin
Featuring: Penny Rendall
Tourist Attraction in St. Paul

Planning a summer trip? Recently, students in Penny Rendall's class created an ideal vacation spot for Logo lovers, the town of Logoville. In Logoville you could see a movie at Appleup Theater, get copies printed at Stamp Copying Company, and plan your remodeling at Setbackground Wallpaper Store. Later, you could take a break at the Spacebar Cocktail Lounge then go to your room in the Embassy Turtles Hotel. On the weekend, you might take the family to Turtleson Monument, gaze at Mount Rushturtle or visit the FD 100 Racetrack. Logoville was a monumental effort and just one of many exciting learning experiences in Penny's class.

Penny Rendall is a fifth grade teacher and Logo resource teacher at Groveland Park Elementary School in St. Paul, Minnesota. Under the direction of Gerri Kozberg, St. Paul schools have made a major commitment to Logo and LogoWriter. As one of the first teachers trained, Penny has participated actively in teacher training, has conducted seminars for parents, and has been a facilitator for the St. Paul Summer Logo Institute.

Timetables and Schedules

Penny feels that computer time should be deeply integrated with classroom work. She has two computers which students use throughout the day in 15 minute intervals. Although a schedule is kept, time and computer use are flexible. Students can choose whether they want to use the computer. Most often, there is a specific project or a real purpose for computer use. For example, students might be asked to create a book report using STAMP to illustrate the report. Each week, computer sharing time enables students to show what they have been working on or for Penny to introduce a skill or primitive.

Excursions

Recently, students have been using LogoWriter to help them travel back to the time of the early settlers. As part of a social studies project, each child or group organized a class presentation which included a computer program. For example, one group working on early medicine developed a true false test using the word processor function of LogoWriter.

One of Penny's students discovered that several countries have exactly the same flag with different colors, so he created a graphics program about the flags. Program users are to guess which country the flag represents.

A project directed by one of Penny's colleagues was called "Peace and Peacekeepers." Students did research on famous people who worked for peace. Using the computer, they wrote essays and created symbols to represent peace and the person they learned about.

Science World

Three weeks are set aside at Groveland Park to have all the computers together in a lab situation. Cathy Overby, the science teacher, introduces many new computer skills and interfaces measuring instruments with LogoWriter. One recent project involved using the paddle port hooked into a thermometer and having the data read onto a chart. Since Cathy is the science teacher for grades K-6, she found that she needed extra help during computer lab time, especially with the kindergarten children. Penny helped work out an interesting solution to this problem. She began a project called Turtle Tutors.

Tour Guides

Turtle tutors are third and fourth grade students who work with the kindergarten class. Becoming a tutor wasn't easy. An application process resulted in selection of 25-30 students. Tutors received special training and learned special Turtle Tutor Tips: Never press the key for the student; point or give clues instead. Always sit next to the student; be at their level. Penny adapted an idea from Instructor magazine for the tutors. It is the 3P method: Pause, Prompt, Praise. Penny is planning to do some role-playing with the tutors and will also go over lesson plans with them so they will have a purpose for going into the kindergarten class.

A Wider World

Penny Rendall feels that teacher training is vital to Logo's success. If teachers aren't trained and don't feel ownership, Logo could become another game or word processor rather than a philosophy. The effectiveness of teacher training depends on how it is presented. The watchword in St. Paul is "Logolike thinking."

As a part of a week-long seminar on LogoWriter, teachers toured businesses where Logolike thinking was going on. Some went to an artificial intelligence lab while others went to a publishing company or to 3M. Penny's group visited a neonatal center. Teachers studied the kinds of activities taking place in these businesses and analyzed skills they are now teaching for their relevance and effectiveness. Logolike thinking is a part of the planning for teacher training, too.

Penny believes that Logo has changed her in the past five years. Since learning Logo, she has become excited about discovery learning and has developed a deeper appreciation of how students learn from each other. In addition, her perspective about Logo's place has changed. She believes even more strongly that it is important to integrate computer use into the curriculum. Unless the computer is part of social studies or language or writing, it can become just another add-on. In nearly any job students take, they will be using a computer. It will be an integral part of their lives. Computers in education must be integrated with everything we do and be a natural part of the learning environment.

Rebecca Poplin uses Logo to teach computing and mathematics at a junior high school in Wichita Falls, TX.
Building Buildings

In November, we asked you to send us buildings you made with LogoWriter. Well, we received some awesome examples of your construction feats. Thanks for sending in your ideas.

Here are just a few samples.

The buildings used in this city were created by the following students.

From Groveland Park School in St. Paul, Minnesota:
Elease Jones, Katie Sharrk, Allison Dublin, Kurt Chasapuzo, Heather Hauermecke, Richard Williams

From Ramsey Junior High School in St. Paul, Minnesota:
Cheng Lo, Anna Lamin, Jason Wirka, Mike McNuin

From P.S. 152 in Brooklyn, New York:
Toan Thai

From Parma Senior High School in Parma, Ohio:
Bob Yogerst
The focus of this case study is cooperative learning and teaching within the context of integrated curriculum with LOGO as a facilitating agent and tool. The study took place over a two year period at Mann Elementary School; and teachers are currently planning for next year.

Mann School is a small neighborhood elementary school. Its students have a wide range of economic and cultural backgrounds including a large number of students mainstreamed for language and speech problems. In addition to the K-6 classes, Mann also has a pre-school speech and language program. The school has self-contained classrooms with one or two computers in each classroom.

LOGO was introduced to Mann School in November of 1982. Three teachers were involved in the initial training. Over the past four years, all of the regular classroom staff and several of the support staff have been trained in LOGO. The school has made a commitment to LOGO both as a computer language and as an educational philosophy and the majority of the computer usage (from pre-school to 6th grade) in the school involves LOGO.

Classes involved in this study were made up of 4th and 5th grade students with a wide ability range, both academically and in LOGO use. The first year one class of students was socially immature and 'me-oriented'. Both classes were non-cooperative and inexperienced in working together. The second year a number of new students entered the classes, both as incoming 4th graders as well as in the 5th grade class.

Some students had four to five years of LOGO experience and some had none. Students with LOGO experience had used both the graphics and text procedures of Apple LOGO. The second year LOGOWriter was introduced and students learned to incorporate LOGOWriter word processing and additional graphics with the commands they already knew. Most of their LOGO work prior to fourth grade was individual exploration with little specific direction from the teacher.

Both teachers involved have a high interest in cooperative teaching methods, the project approach, and in integrated curriculum. Judy is the "idea" person and Pat is the "organizer" and the "facilitator." Both teachers are also very interested in the affective areas of teaching and increasing positive socialization opportunities in their classrooms.
Both teachers have had introductory training in LOGO as well as several follow-up workshops and inservice training. Neither teacher considers herself "technically expert" in LOGO. They feel comfortable, however, in using the LOGO they know and in sharing their questions about LOGO with their students. Each student in the class realizes that he must be a resource to the other students (and sometimes to the teacher as well!)

Teachers have access to other teachers and resource people to answer specific technical questions about LOGO.

The projects began as a result of the feeling on the part of both teachers that it would be more fun and more interesting to work together on units. Both teachers were feeling isolated in their classrooms and were actively seeking some type of cooperative activity to revitalize their teaching. They had both worked with integrated curriculum units, but wanted to learn to use them better and in a wider variety of curriculum areas.

Teachers also wanted to begin to incorporate LOGO into the curriculum rather than leaving it as a separate entity. They wanted to take advantage of the problem-solving techniques and opportunities that LOGO provides and to extend these techniques into a specific subject area. An additional objective was to use LOGO as a facilitating agent for developing cooperative learning strategies among the students.

Several different methods were used for pairing and grouping students. In some cases students were allowed to choose their own partners; in others, students were assigned to groups. Sometimes students with little LOGO experience were paired with students with more LOGO experience. Occasionally the groupings were random.

PROJECTS-FIRST YEAR

DATA BANK

The first project attempted as a team effort was a Data Bank about the United States. The Data Bank was written in LOGOII as part of a mini-grant during the previous year. Students in the two classes researched information using the data bank, entered additional information, and then produced state symbols using LOGO.

THE 13 COLONIES - THEN AND NOW

This unit was planned and developed using staff development inservice time. Different activities were developed for each class within the framework of a coordinated unit on Early American History.
Pat's class (4th grade) worked with the 13 Colonies Now and Judy's class (4/5 split) worked with the 13 Colonies Then. Pat's class used outside resources and lecture for learning how the states developed from the past to the present. The class wrote letters to the Chamber of Commerce of each state to get information about their state. Pairs of students worked together on getting the information and each student then produced his/her own individual "travel brochure" about the state with text and graphics written in LOGO.

Judy's class was taught using slides of paintings done during the Colonial and Revolutionary Periods. The book was used as resource material. The teacher selected several events from the period. Students were assigned to either write text or produce graphic symbols about their event in LOGO. These were put together into a Colonial Newspaper.

In both classes the Language Arts specialist worked with the students on writing and editing techniques. Both the travel brochures and the newspaper were printed out and shared with both classes. During all phases of the project, there was a stress on group work and sharing among students in each class and between classes. It was common to walk into each room and find groups of students working in several different corners of the room, around the computer, and in the halls!

PROJECTS - SECOND YEAR

Initial planning for this year's activities began during the LOGO Summer Institute which focused on LOGO and the project approach. For all three teachers, it was also an introduction to LOGOWriter. They picked "Patterns" as a general theme for the year and developed several ideas to explore this theme.

TESSELLATIONS

This unit began with a discussion of geometric forms and the patterns found in nature. Both classes went on a nature walk together and looked for examples of various patterns. Tessellation was introduced and students were given a LOGO project that involved producing their own tessellated patterns. This was the introduction to LOGOWriter for most of the students. Students in each room were paired for this project. They worked together on the LOGO part of the project and then each student was given a print-out of their tessellation of color. The final activity of the project was to discuss in writing how their use of color changed their tessellation. Copies of each tessellation were laminated and put together in a book.

ANIMAL BEHAVIOR

The development of this particular unit was an attempt to take the process that was used in the social studies units and apply it to another curriculum area, one in which the teachers had not worked extensively before. This unit was the focus for several months beginning in late fall. It was based on an Omnibus unit for gifted and talented students. Activities were developed around the theme of "patterns" and included:
1. Direct observation of animals-
   Students observed animals individually a certain amount of
time each day and recorded animal behavior.

2. Direct observation of insects-
   Students described their spider's physical characteristics,
   identified the type of spider, and recorded behavior.
   Spiders and fruit flies were put together to observe their
   interaction.

3. Interactive quizzes-
   Students were introduced to concepts involved with
   interactive programming in LOGO. They were given group
   instruction in developing a short quiz. Each student
   picked an animal (other than a cat or dog), researched
   information about their animal, and wrote a five-question
   quiz about their animal in LOGO. Each student wrote
   his/her own quiz, but students were strongly encouraged
   to work together in the LOGO implementation of the
   quizzes.

4. Fables-
   Concurrently with the quizzes, students studied the
   form and content of fable writing with the Language
   Arts specialist. Students then wrote their own fables
   and presented them to the rest of the class using
   puppets as part of the presentation. Writing of the
   fables was done individually and video-taped.

5. Animal Quilt-
   Each student designed a symbol for his/her animal in LOGO.
   Students were asked to look at the idea of pattern in
   relation to their animal; what about their animal was
   repeated or patterned in some way. Students worked
   individually on their symbols with strong encouragement
   to use other students for resource help. Symbols were
   printed out and transferred to quilt squares. Parent
   volunteers assisted the students in outlining their
   symbols with embroidery stitching and squares were
   sewn together to make two large quilts, one in each
   class.

All of the concepts in this unit were introduced to both classes at
 once with Pat and Judy beginning to team-teach the units. The specific
 activities took place in the individual classrooms. Teachers were becoming
 increasingly comfortable with teaching as a team, rather than just writing
 the units together.
The next unit involved study of American government with the Constitution as a focus. The unit was planned using several outside resources. Students began with the historical background of the Constitution and moved to current governmental practices, both state and federal. This unit was team planned and taught, and students worked in mixed groups from both classes. Activities included:

1. Field trip to the State Capitol.

2. Local State Representative visited classes and answered student questions.

3. Students were given outlines of information presented in lecture as an aid to notetaking.

4. Each student was required to keep a log book of lecture notes and current events materials such as clippings from the newspaper. This log book was collected and reviewed by the teachers weekly.

5. Debate-
   A unit on debate was presented. Teachers picked a topic for debate. Students were randomly grouped into debate teams. Groups included students from three different classrooms. The groups were given time to meet and prepare for the debate. The debate was presented before the entire three classes and videotaped. Students voted on the outcome of the debate, and the final decision was made by an impartial observer, (the principal!)

6. Research paper-
   The language arts specialist presented a unit on research paper writing to both classes. Students were given topics on either a president or a comparison of our government with the government of another country. The research paper included note-taking, outlining, and bibliography. This was the first attempt at clustering (giving different topics to students at different academic levels). Gifted students were given the government comparison topic.

7. The Great Seal-
   This was the culminating activity of the unit. The main thrust of the whole Constitution Unit was the idea of compromise, and this activity gave the teachers the opportunity to let the students use their visual ability to look at the idea of compromise in a different way. Students were shown the Great Seal of the United States.
They were randomly grouped, mixing students from both classes. Each group was given time to discuss what they thought the Great Seal meant. Each group elected a spokesperson and that person came back and reported to the Committee of the Whole (both entire classrooms). After all of the reports came in, the teachers told the students exactly what the various symbols in the Great Seal meant.

Working in the same groups, students were given a project to create the Great Seal of Horace Mann School in LOGO. There was general discussion and brainstorming about some of the values that the students and teachers are trying to express at Mann. The groups met, planned, and implemented their seals. Each group also wrote a description of what their specific symbols meant. The seals were printed out, colored, and the entire student body voted on the seal they wanted to represent Mann. Plans for next year include making a mosaic of the winning design to be permanently displayed at the school and printing the seal on school T-shirts.

RESULTS AND OBSERVATIONS

FOR THE TEACHERS:

Comfort level in working together has grown tremendously. Teachers involved have very different working styles and had to do a considerable amount of compromising to work successfully together. Pat is much more organized and Judy had to learn to organize her ideas and express them well ahead of teaching time, rather than just "jumping in." Pat became more relaxed in working with both groups together and in dealing with a more informal structure. Pat is also more comfortable with taking risks in her teaching. Working with each other's students forced both teachers to be held more accountable for what they were responsible for teaching.

Over the span of the two years, both teachers learned the importance of good planning time in developing units of such a broad scope. Deadlines became very important and in some cases open houses or district-wide presentations became the impetus for getting the projects finished. The inclusion of LOGO into all of these units added the complication of making sure there were enough machines available for students to complete their work. The teachers became extremely good at sharing computer resources and procuring additional resources when necessary from the rest of the building.
In terms of LOGO, their objective of utilizing LOGO to the fullest extent as an integral part of the classroom has been met. Many new possibilities for using LOGO in the curriculum have been explored and there are many more that they would like to try. Teachers' technical knowledge of LOGO has increased because of the additional usage, and they have both become more comfortable with teaching students new LOGO skills instead of relying on outside LOGO resource help.

FOR THE STUDENTS:

Students became more willing to work with each other and to ask other students for help. They began doing this with the LOGO part of the projects and this process extended into other areas of the curriculum by the end of the first year. The majority of the students became more comfortable with LOGOWriter and the use of the computer and the printer as the year went on. Dealing with 'bugs' in the program and with the equipment, became a 'class' problem-solving activity. Students became more comfortable with risk-taking as well, both with their LOGO work and in dealing with each other.

Students began to put the interest of the group ahead of their own interests. This showed up particularly in their work on the debates and on the Great Seal. One group asked for extra time to rework their seal because they decided that their original effort was too much the work of only two people. In another group, one of the students was working at home on the computer and was asked by his older brother about the reasons for some of the things in the seal. The student responded that it couldn't be changed because it was the work of the group.

There seemed to be overall improvement in higher-level thinking skills. Asking students to think and discuss concepts such as patterns and symbols produced responses graphically, orally, and written, that were on a very high level. Ten and eleven year old students proved capable of dealing with very sophisticated concepts when introduced using this approach.

Students became very comfortable in speaking in front of groups; whether it was their own small group, their own class, or all three classes together. They became better at discussion and brain-storming, agreeing or disagreeing with each other, without fear of recrimination or ridicule.

Students in both classes are coming very close to Papert's "computer as pencil." Use of LOGO and the computer has become as much a part of their school day and school work as any of the other resources in the room.
This study began as an exploration of cooperative teaching and LOGO. It moved from teachers planning units together, to team teaching with individual projects in each classroom, and finally to team teaching with joint projects involving a mix of students from each classroom. This process was not planned at the beginning, but evolved naturally as the units progressed over a two year period. LOGO-like thinking throughout the curriculum has become a reality for the teachers involved as well as for their students.

JULY 1987
In 1980 a colleague of mine, Judy Klatt, and I submitted the following paper to The Science Materials and Textbook Adoption Committee:

Jerome Bruner, a noted authority on processes of education, has observed that in order for a child to learn science he must first be a scientist. Implications are that a child be involved with concrete experiences in manipulating objects and systems in the environment. This philosophy is supported by the findings of Piaget and others after extensive research of children's developmental stages. Briefly, two levels of development spanning the elementary school years are defined by Piaget:

1. Until the age of 7, children learn best through concrete personal experiences. (Pre-operational)

2. A child between the ages of 7-12 begins to grow in ability to apply concrete knowledge, but is still not ready for total abstract thought. (Concrete-operational)

During the elementary school years, children are naturally engaged in the process of abstracting with respect to the world about them. Our function then is to provide them with phenomena and experiences which are particularly useful. Since all understandings and explanations depend on previous concrete experience, one of the major roles of the early elementary years is to provide a wealth and variety of experience which students may draw upon at a later time.

We strongly feel that science education, based on how children best learn, necessitates an inquiry approach for quality learning. Such an approach not only represents the nature of scientific endeavor itself, but also provides the student with a model of learning how to learn.

The benefits from inquiry have impact on the overall child, both in intellectual development and the building of positive attitudes toward science and science-related careers. Inherent in inquiry is pupil-pupil interaction which places the child in the role of justifying a position or disagreeing with a peer, both of which enable a child to grow in ability to reconsider and re-evaluate decisions (Karplus 1967). Inquiry, then, gives the child a unique and useful way of understanding the world about him. It provides him with the means of gaining his own answers about the world and, most important, a chance to test his ideas and improve his process of inquiry. The teaching of science must preserve these qualities of science and not become lessons "about" science.

The latest National Assessment of Education Progress (1967-1977) shows rather appalling data in attitudes toward science and science-related careers. Generally there is little positive feeling expressed. Why has this happened? Indications point to little experiential learning having an influence. Children consistently wanted more concrete experiences than they had received. As an example of their lack of experience only 58% of 13-year-olds had ever used a microscope and only 39% had ever made their own microscopic slide (R. Johnson, 1980). If the inquiry approach was utilized, most definitely there would be an attitude shift to the positive. We have schools in St. Paul that utilize inquiry learning in science that can attest to the development of these positive attitudes.
Inquiry learning also facilitates cooperative goal structuring that adds to greater effective and cognitive outcomes. Children feel better about themselves and the subject matter when there is a pupil-pupil interaction in a cooperative structure. Also, cognitive development occurs on higher levels through the inquiry-cooperative approach than it does under the highly verbal and authoritarian statements of adults or written material (Johnson & Johnson, 1975).

Without inquiry and pupil-pupil interaction the science program becomes analogous to a poorly taught reading lesson. In all too many classrooms a science textbook confines science to such lessons while excluding experiential learning. Overwhelming evidence from Piaget, Bruner and others cannot be ignored. To do so is to admit it is teacher convenience and not children that matter in how science will be taught in St. Paul.

An area that needs crucial attention for successful implementation of the science program does not deal with materials, but with people. Teachers need to understand the importance of experiential learning, but first their needs of how to physically handle the program must be given attention. The expected outcomes of the lesson must also be made known to them. Teachers need long-term inservice training to gain familiarity and understanding of the program, but also to be kept abreast of new changes and ideas in the curriculum. Teachers cannot be introduced to a program and immediately cut loose, or set apart, from the very support resources they require to help them deal with problems arising from the programs' use.

An essential part of a viable program is at least one resource teacher capable of providing direct classroom help and the required long-term inservice training. Another essential element are aides to keep the materials teachable. It is people who will create quality instruction from available materials, so great attention must be given them in bodily support, encouragement, and leadership. St. Paul is its own example of how a program will fail when people are not supported.

The science curriculum should be electric and change needs to be a process of evolution, not traumatic revolution. Curriculum must be responsive to student, teacher, and community needs and issues. There is, therefore, a crying need to establish or reinforce existing structures in St. Paul that would guarantee evolution of the science curriculum. We already have the Science Advisory Committee and the Science Materials Selection Committee that should be used for this purpose. Science is basic to our interactions in daily life, and as such is too important to receive attention only in five-year cycles.

A quality science program is our goal in St. Paul. We need to emphasize experiential learning, evolution of curriculum, and support for classroom teachers. In doing so, will make a commitment to our students.

REFERENCES


National Assessment of Educational Progress 1967-1977

The philosophy expressed in the curriculum guide for Jefferson County Public Schools was felt to be so similar to the philosophy of the authors that portions of it are represented here.
In 1987, I am facing some of the same questions. At this time, I believe I have another piece to the answer and submit the following report of developments at Galtier Magnet Elementary School.

THE ROLE OF THE SPECIALIST: AN IDEAL

Two years ago (1985) Galtier Elementary School set out on the task of creating a Math, Science and Technology Magnet school. New programs, new ideas, along with new staff members all began to be put in place. Especially in the areas of science and technology, the Galtier staff was similar to other elementary staffs in respect to a certain fear and hesitancy to become involved too deeply. A certain feeling of inadequacy existed that could be both witnessed in actions (or lack of certain actions) as well as spoken comments. Although this is hardly fitting of the intent of the school, it certainly is a predictable behavior given the anxiety toward science and technology throughout the ranks of elementary teachers in the city, the state, and nationwide. Overcoming these anxieties was certainly to be a major focus. Although the task was hardly a new one, the attempted solution has truly been novel in reference to our own district. Specialists hired to teach a specialized field in the elementary curriculum is not a new idea, but hiring them to provide half time student instruction and half time project and staff development is certainly a new idea in St. Paul.

There are significant benefits that arise out of employing specialists in elementary schools using this model. The specialist is in a position to be a resource person who can not only assist in instruction of students directly but also aid teachers in their instruction of students. All subjects on the elementary level are best taught when they are integrated with each other rather than in isolation. This belief is held by many elementary educators. The classroom teacher is in the best position to be able to accomplish this. If all of the science or computer related technology related work were to be presented by the "specialist", students would acquire a perspective of these areas requiring talents or skills that can't be achieved by merely average ability in the field.

It has been my experience that the best science atmosphere, the best music atmosphere, the best social studies atmosphere, etc. exists in a regular elementary classroom and is presented by the classroom teachers. It is in that setting where connections and integrations are best and most easily made from one subject to another. None of this is to imply that specialists are not worthwhile or that all classroom teachers are better than all specialists or any other jump at conclusions. Rather, it is stated to emphasize the important vital potential that lies in being that classroom teacher. The potential for integration and providing connections exists with the teacher who spends the most time with the student.
So why employ specialists? Traditionally, the role of the specialist was rather like a band-aid to cover the deficiencies of the teachers in that building (a generality, of course, but nevertheless true in all too many cases) and at the same time provide prep time for the building staff. These specialists can be quite good and indeed fill a need that might not otherwise be met. However, the specialist is not in the ideal position to promote connections between curriculum areas. And, as stated previously, the misuse of a specialist can promote the notion that only a select few are talented enough to understand and appreciate music, art, physical education, science or technology.

A better solution is the one currently being implemented at Galtier. Yes, the specialist still exists as an instructor in a specific area. In addition to that, the specialist has time free from students to be a resource for teachers. The sole burden of science and computer instruction does not rest on the shoulders of the specialists, but is rather a shared responsibility. Teachers can be given the kind of in-building support (in-service on a day to day, topic to topic basis) that they need to develop the knowledge and technique to be increasingly self sufficient. The role of the classroom teacher is not diminished but rather raised up as a model close to students' everyday existence who can deal comfortably with all academic areas.

But then what happens as teachers become comfortable and proficient and beyond need of the specialists? If all progresses as we have seen happen at Galtier, the specialist has also grown in knowledge and technique, and because time has been built into the schedule free from teaching duties, new ideas and approaches can be tried, new technologies and units researched and implemented. From there the process of passing on new ideas to the teaching staff continues. Busy schedules and increasing responsibilities keep most teachers from trying new ideas. The specialist in this setting, however, can be both staff developer and curriculum developer and act as a resource available to students and staff on a continuing daily basis.

As one step in assessing the benefits of the specialists at Galtier, the following survey was presented to the classroom teachers at Galtier in May of 1987. The intent of the survey was to gain insight into the usefulness of the specialist system as it is currently being implemented at Galtier. While it is a small sampling, it represents about 70% of the regular classroom teachers at Galtier. Taken together, along with the comments when offered, they form a general attitude which is certainly positive and supportive in nature.
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<th>QUESTION</th>
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<td>1. How often did you teach computer lessons before the magnet began?</td>
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<td>3. Rate your comfort level of teaching your own computer lessons before the magnet began.</td>
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<td>COMFORTABLE</td>
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<td>Rate your comfort level of teaching your own science before the magnet began.</td>
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<td>4. To what extent has your teaching knowledge about computers increased since the magnet began?</td>
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<td>To what extent has your teaching knowledge in science increased since the magnet began?</td>
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<td>5. To what extent have the specialists increased your confidence in teaching your own computer and science lessons?</td>
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<td>VERY MUCH</td>
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Several things should be noted from the previous information that is significant in this study.

First, in both areas of science and computer education, teachers were on the average only moderately comfortable teaching these areas. (Average of science comfort was 3.2 and computer comfort 2.75 on a scale of 0 to 7). After two years of magnet existence and work with specialists, teachers indicated on the average a very significant increase in their teaching knowledge for both of these areas. (Average response in both areas exceeded 5.5 on a scale of 0 to 7, with 7 indicating very much increase in teaching knowledge).

Second, it should be noted that nearly everyone felt that the specialists increased their confidence in teaching these two subjects (Once again on a scale from 0-7 with 7 indicating the most aid to confidence, the average response was 6.2). Seven out of nine responses chose either a 6 or 7 to describe the extent of specialist aid to confidence.

Several teachers offered comments in addition to the survey itself. The tone of those comments was supportive of the use of specialists. One comment referred to the new labs and special equipment as a factor in increasing teachers' knowledge and comfort level.

One last item should be noted from the survey. A teacher who was already heavily involved in either science or computer instruction may in fact teach less of one or the other in a magnet setting than before. The specialist may take over instruction that was being provided by the teacher previously. This should not be a liability if the teacher and specialist work together toward providing instruction. It is important that the classroom teacher continue to be involved with his/her students in these areas.

CONCLUSION

In 1980, when I was originally involved with a plan to provide change in the way science instruction occurs in St. Paul, we knew that a teacher training and support model was essential to success. The computer area was virtually non-existent at that time but is similar in many ways to the field of elementary science. Teachers are hesitant and often ill equipped (knowledge wise) to provide good instruction in these two areas. By 1980 we had already discovered that increasing a teacher's knowledge base through workshops and classes was helpful but all too often did not lead to long term lasting change.

In 1980 we proposed a support group as well as a district position to oversee the training and support of teachers in science. In 1982, a staff development model was initiated that involved the training of teachers in
Logo, and then supporting their efforts on site in classrooms. The model vastly increased the chances that teachers would continue to implement ideas learned in the initial week long workshops.

In 1985, St. Paul established magnet schools and hired specialists to assist in the implementation of curriculum specific to magnet site. This model is capable of all that we hoped for in 1980. The ability to be on site in a building to provide support to teachers, as well as participate in the student instruction (but not take it over), has been a very valuable opportunity to bring change to the way teachers approach a subject area and the way they approach education in general.

Is this paper a call to promote a hands-on, inquiry approach to elementary education? It is that but much more. It is a call to look at education as a never ending on-going process. If that is to be true for our children, it must certainly be true for us the adult leaders of this process. Teachers need to be looked upon as learners and supported as learners by their colleagues and by the system in which they are employed. Growing and improving is an on-going process for all of us and we need to be supported in that process. The success of the specialist positions at Galtier should point the way toward teacher development and growth. It cannot take place in a week or be completed in a workshop. It takes place over time when the support is available on a continuing basis. It is expensive on the surface; but the benefits result from the improved program, improved instruction and increased self-esteem for students and staff alike, make it well worth the effort.

July 1987
GIRLS, IS THERE A COMFORT LEVEL?

Karen Thimmesch

While teaching in a secondary magnet program I became responsible for assembling most of the equipment required for the program. My area of specialty - Fibers, Fabric Design and Puppetry - was attended primarily by female students in grades ten through twelve. When I borrowed the necessary hand tools from the custodial staff, inquiry was made to find out exactly who was going to achieve the feat of putting bolt A into slot B and attaching arm C. The questioners were informed that my students and I would be completing the task ourselves since no other assistance was available. Looks of disbelief were soon replaced with snickers and slanted smiles as they wrongfully assumed that I was pulling their legs.

As word spread throughout the large high school of the impossible undertaking we had tackled, almost every male adult stopped in my room at sometime to see if we really could do it. Yes, we did it, why wouldn't we? We could follow the directions just as well as anyone else. Because we had not experience doing this particular job, it was assumed that we couldn't do it. We were handicapped because we had no experience, but we were definitely capable.

As my teaching assignments changed and I started to work with younger students, I was constantly made aware of this lack of experience in the education of my female students. Most of my observations were of very subtle occurrences until I began teaching at the Math, Science and Technology Magnet at Galtier School. I became involved in two projects which reinforced the idea that female students had the ability but lacked experience. The first was the introduction of Logo, later followed by LogoWriter. The second was the integrated curriculum designed around the Lego/Logo topic of machines.

Before the opening of the 1984-85 school year when Galtier was 'just' a neighborhood school, the teaching staff was introduced to the language of Logo. I was fascinated with the idea of computers. Their many possibilities for creating images and the miraculous eraser that left the slate with no tell-tale smudges seemed a doodler's dream come true. As I became more confident and ventured into trying my ideas just for the pleasure of seeing if they would work, I also began to detach myself from the machine to see what others had done or were trying.

There was a wide variety of learning styles among my peers that I would later see duplicated by my students. The one observation that has stayed with me from that week was that for many of the women there was a fear of THE MACHINE. It was a machine, but to them it seemed to take on a life of its own, a monster life that could throw fear into the hearts of the inexperienced.
I work with a very intelligent dedicated staff. The question of capabilities was never a consideration; there had to be another reason for the current limitations of those individuals. A replay of the equipment assemblage at the high school many years before began unwinding in my memory. They had had no chance, no opportunity to experience. Without experience, there is no comfort.

That year my nine and ten year old fourth graders all started at the same place. At least that was my assumption. I knew that none of them had used a computer or Logo before so they were all going to be on equal footing. Until winter break this seemed to hold true. Shortly after that, however, differences began to appear.

Since Logo is basically a graphics program with some text possibilities, a student's understanding of shapes and geometry soon determines the speed with which she can write procedures to draw the desired shapes. Those students who were skilled in mathematics quickly became adept at writing procedures. The various shapes were combined into recognizable objects. I began to see many of the familiar Logo houses. At this point it seemed that the determining factor for the student to become skilled in Logo graphics was math ability. There were more female than male students in the high fourth grade math group that year, and converse here were more male than female students in the low math group. (The middle group was very close to even.) Life was finally fair. The computer appeared to have no gender bias.

Then as more students achieved the Logo house, variations began to develop. Creative thinking began to overtake the recipe house. For the creativity to be manifested, problem solving skills became mandatory. Students began looking at each other's houses. Some shared ideas and information willingly; others hoarded their treasures and clothed them in secrecy. Comparisons of the products showed two groups of graphics. One consisted of very neat and clean but sparse screens; the other showed crude collections of many shapes representing a variety of objects in a scene. The members in each of the two groups did not fall into the categories of high and low math ability as they had previously. There were two other projects in my classroom that were progressing concurrently that neatly defined which students would belong to each group.

The class had been divided into groups with each group being responsible for one of the land areas on the earth's surface. After researching the area, they were now engaged in producing a three-dimensional model of the area using paper, cardboard and paint. The groups had decided which building task each member would do. In almost all cases, the students had volunteered for their tasks. Most of the detailed model building - intricate animals, dwellings, machings and vegetation - was being produced by the male students. The female students chose to paint the models and the backgrounds. The males readily told me that they 'did that kind of thing at home all the time'. They elaborated by explaining that they often constructed structures to use with their cars, trucks and toy people figures. The females indicated that they weren't interested in those kinds of toys.
The other project had two parts. It was on the second part that I noticed the division of students. Each student had written and illustrated a story which had pages designed like a book. Since students appreciate having a product to take home, I decided to have them bind their books. Bookbinding is a skilled craft which can be very creative. On our level however, it needed to be a step by step process which did not allow for variations. While ninety per cent of the students produced a story, only sixty per cent finished the bookbinding. Most of those were female students.

The sparse Logo scenes that I had observed were done by the recipe following bookbinders. The crude landscapes with numerous objects came from the model builders. While neither group was totally composed of one sex, the majority of the first group were female; the second male. This group of children, like the adult group of my peers, was approaching learning based on each member's individual comfort level. The comfort levels defined by the experiences of those individuals were apparently gender determined.

The following year Galtier became a magnet school for math, science and technology. The teaching staff had the option to remain or to transfer to a school with a more traditional setting. In the three senior high schools that I had taught in, the majority of the science and math teachers had been male as well as the majority of the students in the upper level courses. The courses did not seem very inviting for female students. The few times I had passed the computer lab I saw no female students. I chose to remain at Galtier for several reasons - one of which was a belief that math and science could be made comfortable for girls.

In some of the data that has been published concerning girls and math it has been noted that math and science are seen as 'male' subjects. The enrollment at Galtier for the 1985-86 year was approximately two thirds male. My class consisted of 21 boys and 9 girls.

Many of the activities that we did depended on group or partner learning. I tried various methods of grouping from random selection to calculated assigning. The most productive groups consisted of two girls and two boys at different skills levels. If one girl was in a group of four, she was often ignored by the males or expected to do all the secretarial type of work. If a girl and boy worked as partners, the male usually directed the activity unless the girl was very assertive. When girls worked together as partners, each participated according to her ability and they were able to concentrate on the topic.

During the second semester Galtier became involved in the Lego/Logo project. Machines are designed and controlled through the computer by the student. Teachers were invited to participate on a voluntary basis. I saw this as another opportunity to use the 'male' subject of machines to provide experience time for girls to become more comfortable with it. The sixth grade students chose their own partners, and as I had suspected they would, each chose a partner of the same sex.
Initially the students began exploring the Legos through the use of free play time. It became readily apparent that most of the boys were very familiar with the materials. They were able to design vehicles, machines and structures almost immediately. The girls worked diligently but needed much more time and a great deal of assistance. There was a vast difference between the block assemblage capabilities of the boys and girls. During those first weeks an observer could assume that at their present rate the girls would never reach the point where they would be able to use the computer to control their machines.

The Legos were used on and off for nine weeks. At the end of the period, Galtier presented it Science Fair. The class had designed a theme project based on a city of the future. Every pair of students had been responsible for designing and building a machine for the city. Every pair was able to control the machine using a computer procedure written by the students. Did someone do all the work for those girls who were so far behind? No, they caught up! And in some cases surpassed the level of ability that the boys had shown.

During the course of the project I had numerous opportunities to talk with the students. Most of the girls had never had Legos to work with. Many had no building blocks of any kind. They considered playing with cars, trucks and machines as male activities. The machines that they were experienced with - toasters, washing and sewing machines, stoves, and hairdryers - were not recognized by them as being mechanical. The boys, on the other hand, had almost all had experience with blocks; and even in sixth grade, frequently had Legos at home that they currently were actively using. They felt comfortable with the ideas of gears, motion and speed.

Comfort level and familiarity are the determining factors. As soon as the girls had had enough time to manipulate the Legos so that the blocks became familiar items, they were able to compensate and make up for lost ground. After the fourth week they exhibited the same capabilities displayed by the boys. The potential for their understanding of the concepts had been there; they had just needed the time and experience with the manipulatives to reach their comfort level before they could move into the next realm of understanding.

As the 1986-87 school year began I implemented some strategies in my classroom based on the things I had discovered about girls and their learning. Wanting to allow those girls all the opportunities they would need to remain knowledgable in the areas of math, science and technology, I became curious about the ideas that the girls had themselves. Later in the year, after they had gone through the Lego/Logo project and we were comfortable with one another, I decided to ask the girls some questions about: math, computers, Legos and learning situations. My hope was to be able to find ideas that I could use to develop influences so that young girls would remain comfortable with math, science and technology into junior and senior high school.
While each of the eighteen girls I had the opportunity to talk with had certain specific ideas and thoughts about math and technology, four themes wove common threads throughout my individual conversations with them. Three of the themes I had already seen in my classroom; the fourth was a definite strong suit that I had not availed myself of in the past. Twelve of the students had indicated that math became important to them only after a member of their family had convinced them of its value. In ten of those cases, the family member had been a woman. This came somewhat as a surprise to me because in my readings I had found research information that specified family influence mainly coming from men. This had, however, been at the secondary level. Since only three of the students were living in single parent households, I considered this a valuable piece of information when working with female students from all types of family backgrounds.

Most of the students were aspiring to professional careers and recognized the need for a solid mathematics background. If the influence in their families had come from women, that support should be reinforced in the classroom. Female role models are imperative, especially those that can encourage and instill the idea that there will be definite times of struggle, but that in the end, it is possible to attain the professional goals sought by the students. The other possibility that I see for including female family members in the teaching of mathematics to the students is to use mathematical problems in the areas of expertise usually attributed to women. In this way work done at home could become more comfortable since it would be on familiar topics: topics that women had experienced with and in which they were experts.

The theme that caused the greatest excitement in our conversations was the determination of learning partners when cooperative situations in the classroom were desired. The sixth grade students felt very strongly that there were no differences in the math and technology abilities of male and female students. Initially they also stated that it would make no difference if they had a male or female for a partner. However, when further questioned (in seventeen of the cases) the students indicated that they would choose another female for a learning partner.

Quite simply, the reasons revolved around either the fact that boys had negative attitudes toward the learning abilities of girls, or girls felt that their attention needed to be focused on impressing the boys. Many students said that boys thought that they were smarter than girls and often told girls that they were stupid. Others indicated that boys always tried to do everything and frequently hogged the materials or refused to compromise. Responses fitting into the other category were more difficult for the students to express. Since these students are going through puberty, awareness of the opposite sex is taking a priority position in their lives. To them, working with a boy meant that they could not focus on the topic. Time needed to be spent worrying about how their hair looked, what they would say, if their clothes looked right, if their makeup needed repair or if their best friend would be jealous. What was academic learning time had now become on-the-make time.
Another concern of the students was that they always seemed to be catching up with the computer abilities of the male students. They were confident that they would be able to reach the same goals if they had enough time to work on the computer. Male students were usually very willing to share the programs they had written with female students, but often became very impatient with the idea of teaching them how it was done. Research that has been used recently to address the reasons for girls' lower abilities in the technical areas is that when offered an elective or free use of computer time, girls do not usually take advantage of it. As I mentioned earlier, only boys were usually seen in the high school computer labs.

At Galtier there is an effort to provide each student with the necessary assistance to reach her potential. As in other schools, if a student has shown a learning handicap, extra time and teaching are provided to allow that student to catch up or hold on. To provide girls with the extra time and guidance they need to hold on to their rightful place in math, science and technology, Galtier has implemented Logo Lunch For Girls. It is an open lab held once a week for girls to use the computer for a topic of their choice. The girls divide their time between catching up on assignments and exploring their own ideas. Some girls come every chance they have; others more sporadically, but the lab has never been empty. Hopefully this use of free lab time will carry over into their secondary years so that they become less hesitant about operating in a technologically based world.

The last theme that ran through the student interviews was that their preferred method of learning was through the use of manipulatives. When they had things they could put their hands on, the learning transformed itself from a chore into fun. They felt that the times they used hands on materials went by very quickly, was enjoyable and allowed them to understand what they were doing. Their favorite was the Lego/Logo project. Being in control of their learning by building machines and directing them with computer procedures gave them a strong feeling of self confidence. Besides this, the students felt that when they worked with objects, if they made a mistake, it could be easily corrected without having to have an adult tell them they were wrong. Manipulatives offered them the ability to engage in self directed learning.

My classroom observations and conversations with students have given me several pieces of information that I think will make a difference in the education of girls. The discrepancy in the math and technology abilities of male and female students begins to manifest itself in the secondary years. This means that the causes of this discrepancy must start at the elementary level. The items that I have found to be crucial suggest that when a student feels uncomfortable with the learning situation her focus shifts from the learning to another area which will make the circumstances more inviting.
What this means for me is that classrooms at the elementary level should be focused on providing experiences that allow students to develop an insatiable appetite for exploration, that they are able to direct as much of their learning as possible, that they are able to seek out peers as learning partners and that the members of their families are considered valuable resources in their education. Most present day classrooms are being operated exactly like those of fifty years ago. What other area in our civilization has been so stagnant?

July 1987

NOTES


2. Fox, op. cit., p 315


REFERENCES


COMPUTER TECHNOLOGY AT PROSPERITY HEIGHTS

Joan Bodey

Prosperity Heights is a traditional school nestled on the east side of a large metropolitan city. The school has thirteen self-contained classrooms and is unique in that it is the only school in the St. Paul Public School System in which students are not bused. All students are neighborhood children.

Prosperity Heights has an average enrollment of 340 students. There is a 50% turnover in student population from year to year. Minorities make up approximately 37% of the student population. Most of the building space is utilized for traditional classrooms and there is limited space available for other programs. Both the professional and non-professional staff have remained unchanged during the 1985-86 and 1986-87 school years.

INTRODUCTION OF COMPUTER TECHNOLOGY

This traditional school and its educational programs are not only surviving, but flourishing amid the trend towards magnet schools and specialty programs. But how has the impact of technology, which is an integral part of the magnet and specialty programs, been incorporated into the traditional setting at Prosperity Heights?

A program to achieve this goal of incorporating computer technology into the curriculum was initiated at Prosperity Heights five years ago. Teachers were given training in a computer program called LOGO. Working in pairs, students spent 15-20 minutes per day at the computer. The LOGO program has been successful in developing the students' problem solving skills and much of this success can be attributed to the teachers' belief in the philosophy of LOGO and a commitment to the use of this program in their classrooms. On-going training for teachers has continued over the first three years for personal growth, as well as knowledge to be used in the classroom. In the program's second and third year, a teacher with advanced LOGO training came to our school once a month to teach teachers. This model was effective in giving teachers the confidence and skills to teach the new technology related to the program.

Two years ago, each St. Paul School in the LOGO collaborative identified one teacher in their respective buildings to act as a Computer Resource Teacher at his/her school site. Each building could then decide what its needs were and how to utilize the services of the resource teacher. This approach is better suited to fit the needs of individual teachers within a building and the differing needs of the various buildings throughout the district. Individual schools, such as Prosperity Heights, are free to make decisions on how they want to implement the LOGO program (especially with the support of the Staff Development Department, which provides substitute teachers for the Computer Resource Teacher and other classroom teachers).
At Prosperity Heights, classroom teachers collectively assessed students' needs by first identifying and analyzing the student population. The residential homes in the school's boundaries make up 50% of the school population. The continual monthly turnover in population is mainly from the surrounding apartment buildings. The use of a computer for these children was a positive experience because they were not only able to learn a new technology, they were able to learn appropriate and acceptable social skills through working with a partner at the computer.

The second decision of the classroom teachers was to define the role of the Computer Resource teacher at Prosperity Heights. The role of this resource teacher was defined as:

The Computer Resource Teacher supports the classroom teachers by providing continual training for those teachers, providing ideas and techniques to integrate LOGOWriter into the curriculum, and teaching model lessons in classrooms.

With the help of this resource teacher, other teachers would become more knowledgeable in LOGOWriter and more confident in their ability using computer technology.

Each teacher was given a half day of in-school training, twice per year, two weeks prior to the laboratory classes. During the training, two teachers and the Computer Resource teacher discussed what the students were currently working on in their classrooms with LOGOWriter and what units were presently or in the near future being taught in other subjects. Then, the decision on how to integrate LOGOWriter into the curriculum was made. Having made this decision, teachers were then given hands-on computer time to work on the new LOGOWriter applications.

A computer lab was temporarily established in the school by bringing all the computers from the various classrooms into one room. Computer lab sessions, involving a teacher and his/her class, were then conducted by the Computer Resource Teacher. In this "computer lab", the Computer Resource Teacher taught an introductory lesson to various classes of students, giving the classroom teacher an opportunity to observe the techniques and methods used in lab instruction. The teacher, like the students, became a learner. This "observation learning" is helpful in situations where the teacher will be conducting lab sessions with his/her classes without the aid of the resource teacher. The lab sessions not only allowed the classroom teacher to gain confidence in his/her ability to teach the lesson, but provided continuity when these lessons were continued in the classroom by the teacher. Due to the lack of available space, the lab sessions were only conducted during a three day period, twice per year. If the students needed any preliminary information prior to the lab session, the classroom teacher would cover this information during the two weeks prior to the lab class. This procedure was successful because students came to the lab sessions with some necessary information and then the resource teacher was able to instruct the students on the technical aspects of the computer and the LOGO program. Also, students were then given ample time to work on the program with the supervision of both the resource teacher and the classroom teacher.
Following the computer lab sessions, when the computers were returned to the classrooms, students worked at the computers on LOGO at the teacher's discretion.

**COMMUNICATION AND COMPUTER TECHNOLOGY**

The model described above, helped fill a void for the classroom teacher by creating a support system within the school; an invaluable resource during formal training sessions as well as on a daily basis. A goal for the 1986-87 school year was use LOGOWriter as a vehicle to improve communication in the following areas:

- Communication between staff members
- Communication between students
- Communication between students and staff members

The classroom teachers were surveyed to evaluate the impact LOGOWriter had at Prosperity Heights on intra-school communication. To successfully implement the LOGO program at Prosperity Heights, much cooperation and communication was necessary. As a result of this communication, most teachers felt the use of the LOGOWriter program enhanced their communication with other staff members at meetings, at lunch time and at other LOGOWriter workshops. LOGOWriter's versatility strengthened communication and was helpful in improving relationships among staff members.

Most of the teachers felt that their communication with other staff members increased because of the LOGOWriter program. More interaction and communication occurred between staff members as they discussed new ideas and concepts, methods of integrating LOGOWriter into the curriculum, students' problems and progress with LOGOWriter, and other technical information regarding the program and the computer.

In-school teacher training sessions were valuable to the classroom teachers and increased interaction and communication among them. It not only provided "individual" time but established a trust level with colleagues, and gave teachers an opportunity to share ideas and concerns regarding LOGOWriter. Teachers were able to increase their understanding of LOGOWriter and to further develop the integration of LOGOWriter into other curriculum areas.

LOGO curriculum coordination among the various elementary grade levels also necessitates more communication between staff members. During the teacher training sessions and the computer lab session, as well as in any follow-up discussions, there was much communication between the classroom teacher and the Computer Resource Teacher.
The teaching staff was surveyed and suggested several other LOGOWriter-related activities enhancing communication among the staff; setting aside some time during staff meetings for the entire staff to share ideas, concerns, and problems regarding the use of LOGOWriter in their individual classrooms and the school as a whole and the creation of a LOGO bulletin board where students' work could be displayed. All teachers surveyed agreed that they had observed a greater amount of communication among their students with the use of LOGOWriter in their classrooms. Students discussed their ideas and showed their projects to one another. Some teachers used their "show and tell" time to give students an opportunity to show and explain their LOGOWriter projects. By teachers also requiring specific projects, more on-task discussion occurred between partners, as well as between groups.

LOGOWriter increased student communication in the majority of the teachers' classes. When students were paired at the computers, working together on a project, there was obviously much interaction and conversation. Collectively working towards a project goal, they strengthened their ability to communicate ideas and help one another. Often, one member of the paired group assumed a "teacher role" and effectively helped his/her partner.

Most teachers felt that using LOGO also increased communication between students from different rooms. Computer work that was displayed in classrooms, as well as hallways, created an interest among students and generated discussions between them. Several teachers noted that students with brothers or sisters at Prosperity Heights learned commands and procedures from their siblings.

About half of the teachers stated that their students enjoyed discussing their LOGOWriter work with them. Whether a student needed help with a problem or was proudly explaining his/her project to the teacher, LOGOWriter resulted in more teacher-student interaction.

The majority of those surveyed felt that LOGOWriter was easier to integrate into regular classroom activities than LOGO. The word processing feature of LOGOWriter was most helpful and effective in the Language Arts, Social Studies, and Science areas. The LOGOWriter program's ability to combine word processing and graphics was also a plus. The ease with which the students could print out their work from the printer for a hard copy was beneficial. Learning specific features, such as stamping, shading, creating a contents page, and writing procedures on the flip-side was also advantageous for the students.

How has this integration of LOGO activities changed the atmosphere of the teachers' classrooms? It has created a better learning environment. LOGOWriter has made learning more interesting and enjoyable in the curriculum areas where it has been used. It provides students with an opportunity for purposeful communication. The students have not only become familiar with computer technology, but have become more comfortable and even confident using it. Teachers have observed more cooperation and sharing
between students. LOGOWriter promotes self-esteem, especially for those students who are weak in other academic areas and discover that this problem solving approach is one way that they can experience success. The use of the wordprocessor has been helpful to students who lack fine motor coordination in written work.

3M TUTORS

A new computer tutoring program involving 3M employees as tutors began in October of 1986. Each tutor was assigned to work with several pairs of students, helping them with LOGOWriter. The tutors met with their groups once a week, during two 1/2 hour periods. The tutoring program has had a positive effect on the students involved, learning new ways to arrive at an end product and in turn, sharing their newly acquired knowledge with their peers. Prosperity Heights is grateful that 3M provided this new educational opportunity and commitment to its students. Community involvement in education is an important asset to any classroom!

CONCLUSION

A school-based program using LOGOWriter, allowed teachers to develop curriculum to best serve the needs of their students. The ownership of this program (the flexibility by which the staff could use the Computer Resource Teacher within the building at Prosperity Heights) has proven to be a successful endeavor. It has created an atmosphere of cooperation where teachers feel they have input in the development and success of the program. From the responses of the teachers, it is apparent that LOGOWriter is an effective learning device at Prosperity Heights.

JULY 1987
The intent of this paper is to raise some questions related to student use of Logo / LogoWriter, and to discuss new roles that Logo makes possible for teachers. While others may concern themselves with WHAT students are doing with Logo, the focus here is on HOW students use Logo. Others have described the teacher's role as helping students choose appropriate projects, and perhaps guiding them toward a complete product. The emphasis here is on three new roles for teachers: skilled observer; cognitive coach; and connection maker. Finally, the role of staff development in establishing and supporting new teacher roles is discussed.

Computer technology, and Logo in particular, offer educators a variety of new opportunities to affect student learning. A major emphasis thus far has been on integrating Logo and the curriculum. This has led to many exciting learning opportunities for both students and teachers. Children are learning to use the computer to represent their ideas with text and/or graphics. LogoWriter makes it possible for students to "do their work" in any subject area, from math and science to English, art, and music. Teachers who are learning about Logo with their students have made significant changes in their classrooms. Logo is not only integrated in their curriculum, it interacts with the curriculum, changing it in ways that could not be anticipated. Social studies classes now not only conduct surveys and elections, they can use computer graphics to instantaneously represent results. Science projects not only describe phenomena in nature but can now simulate them with animated graphics. Poems and stories can not only be illustrated, even young children can actually turn words into pictures or add music to create songs. These are but a few of the powerful and positive changes that Logo has made possible.

TEACHER/OBSERVER

Logo offers another kind of learning opportunity which has been largely overlooked in most classrooms. Some teachers have recognized the value of students' computer work as something of value in and of itself, not only as a means to an end. Students' Logo work provides a unique opportunity to observe their thinking processes. Sylvia Weir (1987) speaks of Logo as an empirical window, through which an interested observer can view children's thinking and learning in action. It is no condemnation of teachers to point out that most do not take advantage of this unusual chance to learn about and from their students. Teachers are charged with many responsibilities. Many see their role as disseminators of information; they have to cover the material, get through the text book, and prepare students for the next course. They are held accountable for product, not process. Elementary teachers have classes of twenty-five to thirty students each day, while secondary teachers face the same number every hour. They hardly have the time to stop and observe each student work on the computer.
Given teachers' responsibilities, it seems unlikely that many will be able to spend the time necessary to observe and reflect on each student's Logo work. Nonetheless, how children interact with the computer provides valuable insight into their thinking and learning processes. A possible alternative is to develop partnerships with others who share an interest in how children think and learn. Such a partnership has been formed between the St. Paul Public Schools and Macalester College, a liberal arts college in St. Paul.

Working with Marita Hopmann, a developmental psychologist, and Walter Mink, a clinical psychologist interested in cognitive development, and their students at Macalester, a method for observing children's Logo work has been devised. The Logo work of several pairs of third and fourth grade students has been recorded as they worked on the one computer located in their classroom. We plan to record fifth and sixth grade students working both on the computer in their classroom and in computer labs. We are currently analyzing the data which has been collected (Hopmann, et.al 1987). We do not pretend to have the answers to the complex questions that surround cognitive development. What we have to offer is a method for collecting information and some insights on how this information may be put to use.

The method is quite simple. The teacher or observer disconnects the cable from the computer to the monitor; it is then connected to the "video in" port of a VCR. A second cable is connected from the "video out" on the VCR to the monitor. The video signal can thus be recorded on the VCR without interfering with the image the computer user sees. An audio signal can also be recorded directly on some VCRs through the "audio in" port. A teacher, or other interested observer, can thus record the Logo work of students for later examination. In addition adult observers can station themselves near the students and record anecdotal comments on their behavior.

What might one look for in children's Logo work? Access to a tape recording which shows every keystroke offers almost limitless data. What does one attend to? The answer depends on what one is interested in. It is up to each individual teacher or observer to decide which are the important questions, and what to do with the answers they find. Several kinds of questions are open for exploration.

A first level of questions might focus on just what the children do. What commands do they use most frequently? What numbers do they choose? Do they use single commands or string them together? Do they use repeat statements? Can they write procedures? Are variables used? Do they use recursion? What do they try to make? Are they successful?
A second series of questions may focus on errors. Do the children make mistakes in their use or choice of commands? Do they choose appropriate inputs for commands? Do they recognize errors before they generate error messages? Do they respond to error messages by trying to correct their errors? Can they make appropriate corrections? Are their mistakes related to the syntax of Logo? Are the mistakes in estimating angles or distance? Are there errors of logic? A third level of questions may relate to the structure of their work. Do they generate an endless stream of commands, one on a line, line after line, or do they create groups of commands? Do they use procedures? If so, do they use super procedures and sub procedures? Do they pass information from one procedure or page to another? Do they send to, or retrieve information from their disk? Still another level of questioning may relate to their decision making process. How do they decide what to do? Do they work individually, in pairs, small groups? Is there much discussion about what to make or how to proceed? Does it make a difference if they are in same sex or opposite sex pairs? Are some children dominant and others passive? Do members of pairs take turns typing? Do they work on assigned projects or do they do what they want to do? Who decides? An individual teacher may be interested in any of these questions or in any of several others. The point is that it is possible to answer some of these questions by observing video tapes of children's Logo work.

COGNITIVE COACH

Teachers and others interested in using Logo to learn about thinking can observe children using Logo, then reflect with them about how they are thinking. Talking with students about what they do, and especially how they do Logo, presents an opportunity for children to learn about their thinking. An adult familiar with a variety of styles can help children understand both their own style of thinking and learning, and that of others. It may well be more useful for students to learn more about how they DO think, than it would be to teach them how they SHOULD think. Teachers can become a "cognitive coach", helping children understand their own abilities, their strengths and weaknesses. A teacher or other adult who is prepared to act as a cognitive coach can observe students manipulating the elements of this symbolic environment, and, keeping in mind the developmental level of the students, guide the students, building on the strengths they present. Students begin to see themselves as competent thinkers; a sense of self efficacy emerges. As confidence builds, students take on new challenges and accept new intellectual risks. The term coach is a helpful one. A coach cannot instill talent in a player; a coach can only help each player achieve his or her maximum potential. A coach balances "strokes" and "pokes", encouraging, supporting, yet always challenging. A player does not become proficient because of the coach's efforts alone.
The player must do the work. In this case, the student must take charge of his or her own learning. The teacher monitors and responds to the student, providing ongoing feedback. When necessary the teacher may prescribe remedial activities. The cycle begins again: motivate, inform, coach, monitor. Teacher and student actively engage in the sustained, recursive process of learning. Bernice McCarthy (1980) speaks of this cycle not as a circle, but as a spiral. Each time the cycle is repeated one slowly ascends toward higher levels of cognitive development.

Teachers who want to teach so called "Higher Order Thinking Skills" to students can also find Logo useful. Teachers who choose to use a program such as Pogrow's H.O.T.S., Feuerstein's Instrumental Enrichment or any of several other programs available, may find Logo useful as an environment which children can manipulate with the skills they develop through such programs. The teacher can observe how children manipulate this flexible environment, and look for evidence of application or transfer of the skills taught. For instance, one of the early lessons in Instrumental Enrichment teaches orientation in space. Students learn that relative terms like left and right depend on the orientation of an individual. Are students exposed to this lesson able to translate what they learn to turtle movements?

Many thinking skills programs emphasize precision of language. They point out that precision is necessary for children to learn the vocabulary of thinking. Logo also requires precise use of language. The procedural nature of Logo and the language which is used to talk about Logo work gives teachers and children a new vocabulary to discuss thinking. In this context, a teacher has the opportunity to sit with a student, or a small group of students, and discuss thinking. They can talk about "strategies"; they can reflect on predictions and compare them with results; they can discuss sequences, ("What needs to be done first?, O.K., then what"). Students can talk to each other about their thinking processes using precise language that teachers introduce and model. It is not uncommon to hear children describe their work using this new vocabulary, "I used sub-procedures to make the wheels on this truck". On the other hand, it is unusual to hear children describe their thinking in Bloom's terms, "Well first I analyzed the situation, solved the component problems, then synthesized parts into the whole".

**CONNECTION MAKER**

Careful observation of children's Logo work provides innumerable opportunities for teachers to view children's intuitive understanding of important concepts. A skilled teacher, tuned into individual students and to the important concepts imbedded in the curriculum, can aid children in building bridges from their intuitive understanding to the more formal understanding represented in the curriculum. Uri Leron (1987) points out that the curriculum stresses remembering declarative information, while Logo emphasizes intuitive procedural information. Leron stresses the power of connections:
The real drama (and the real mathematics) lies in the interaction between intuition and formalism. Children know what a rectangle is before programming it in Logo - after all, they can easily image it or draw it on a piece of paper. By writing the RECTANGLE procedure, therefore, they do not learn the concept rectangle. Rather, the significance of their programming activity is that they start with an intuitive representation of a concept, and create a formal representation for it. What is truly important about the children's creation is not the formal representation per se, but the link they have formed between the intuitive and the formal representations. This link is important in both ways. Formalizing intuitions helps where rigor and communication are necessary. Making the formalism more intuitive, on the other hand, is necessary for any meaningful and creative involvement in mathematics, such as problem solving. (p. 14).

Lerone doesn't believe that Logo formalism should replace the standard curricular formalism, but that there should be "more and better bridges between the two types of formalism, to help the learner move more easily between them" (p. 15). Talking with students about how and why they do what they do with Logo, a skilled teacher could make a number of important curriculum connections. Helping students translate their personal intuitions ("I don't know why, it just works") to formal declarations ("The sum of the exterior angles of any regular polygon is equal to 360 degrees"), would be a powerful new role for teachers.

Sylvia Weir (1987) speaks of two kinds of bridges. The first is much like Lerone's, a link from intuitive knowledge a child already has to "what is to be learned"; the second, a link from programming to a variety of subject areas. She states:

A computational environment should be a place where the learner's intuitions, her current explanations of phenomena, are evoked during the activity. Thus when there is a conflict between her existing explanation and her new experiences, as she interacts with the materials, this challenge can form, over a period of time, the basis for learning. The aim is to forge a link between activities that prevail in the street and home and classroom activities .... (p. 44).

THE ROLE OF STAFF DEVELOPMENT

How does one change what teachers do in their classroom? How does one change the focus from product to process? How does one introduce procedural knowledge to an environment that values and tests for declarative knowledge? There is growing recognition that there are no more one brain problems in the real world. Both teachers and their students need to communicate their ideas to their peers. They need to develop respect for different points of view and different styles or approaches to problems.
In St. Paul, Logo has provided an opportunity for this kind of discussion to begin. A partnership, a "community of inquiry", which includes individuals and institutions that share a common interest in education has developed.

Largely through the efforts of Geraldine Kozberg, Director of Staff Development, the St. Paul Schools have developed relationships with several institutions of higher education including Macalester, Hamline, St. Thomas, and the University of Minnesota; with business and industry including the St. Paul Companies, 3M, Control Data, Honeywell and Cray; and perhaps most importantly with several school communities - teachers, administrators, parents, and students. Through these relationships, new roles are emerging, new ideas are taking root.

Staff developers have the same four roles that McCarthy suggests all educators share: motivator, informer, coach/facilitator, and monitor/remediator. Just as in the classroom, these roles follow a cycle, creating a spiral, which enable those who participate to move to higher levels of development - both cognitive and professional development. As in the classroom, a "cognitive coach" may be useful in helping teachers better understand how they are performing, and how they might achieve their full potential. The very same processes of human learning are in operation. Staff developers can model, and then support, new roles for teachers. Teachers can develop new collegial relationships with others who share an interest in children's thinking and learning.

Staff development is not a series of events - workshops, lectures, or videotapes. It is a sustained articulation, a fitting together of important pieces into a total school improvement program. School based staff development ensures that all the pieces, the events, connect with the larger school plan. The mission of an effective school is to enable all students to achieve their maximum potential as learners. Logo provides a vehicle for accomplishing that mission. Ongoing staff development provides the support. Teachers still have to make it happen.

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During the week of LEGO/LOGO training, I have given much thought about how I will proceed with LEGO/LOGO in teaching my first graders at Hancock Elementary School. First graders, by their very nature, are usually curious, uninhibited, imaginative and creative -- characteristics that I try to capitalize on in the learning process. However, first graders come to school at various levels of maturity. It is important to keep their levels of maturity and stages of development in mind. These include readiness skills, motor skills and intellectual development. Therefore, because of varied maturation levels and somewhat limited skills, I believe the process of introducing and teaching LEGO/LOGO must be slow and paced according to the children's rate of growth and development.

In this paper, I have written my plan of classroom management using Legos and LogoWriter for an entire school year. My challenge is to introduce and teach LogoWriter and Legos to my class with the understanding of both the characteristics and maturity levels of six-year-old children, so they will fully be able to comprehend, progress and enjoy the process of learning. Because these children have had little or no prior experience with LogoWriter and the computer, I plan to introduce LogoWriter and Legos separately, and later (in the Spring) I will show them the connection of Legos and LOGO.

It is my plan to begin in September by first introducing Legos with the large Duplo models. Fine motor skills are often limited at this time of the year. Therefore, until I can determine just what the children are ready for, I feel this would be a good way of introducing Legos. The children will be able to play, manipulate and experiment with these blocks. As fine-motor skills increase, I will bring the small blocks into the classroom. Again, the children will "play" and experiment with these Legos. I will provide a period of each day (free time) so every child will be able to play with them. This will be an on-going activity throughout the year.

September is also the time when I will introduce the computer and LogoWriter. This will be completely separate from the Legos activities. I will spend approximately a month's time on computer readiness -- before the children even turn the computer on. By the beginning of October, they will most likely be ready to begin. During the past two years, I have found that by spending this much time on readiness training the children are "ready and able" to begin and understand the new skills they will be learning.

In December or January, the first graders will have become proficient enough with LogoWriter so that we can begin integrating units: e.g., Social Studies, Art, Language Arts and LogoWriter. For instance, the unit on "The City" will be an integrated unit and will provide a background and
preparation for LEGO/LOGO. Included in this unit will be a tour of our neighborhood (to get a "feel" of the environment of our neighborhood in St. Paul); programming on the computer in which the children create buildings, streets, trees, cars, buses, etc.; newspaper articles about the city; stories written on the computer that go "with" the pictures they have created; rebus stories written on the computer.

At some point, the children will create a city environment using milk cartons, construction paper, fake grass, etc. This will later be used with cars and trucks that the children will build with Legos. Another project will involve each child creating a picture of his/her house on the computer, accompanied by a story he/she will write about his/her house and family -- including his/her address and telephone number. Each child's program will be printed on the computer printer, and we will put these together into a booklet.

I plan to introduce LEGO/LOGO to my class in the Spring (April or May). Exactly when in the Spring will depend on two things: 1.) the readiness of the children; 2.) when the materials will be available for my class to use. The teachers in my building have assured me that there will be a two week block of time for my class to use these materials. I feel that will be a long enough time for the children to learn and begin making Lego projects without becoming tired of the project.

During the first three or four days, the children will free-play and experiment with the blocks and materials. They will work and play in groups of two or three. Since I have a self-contained classroom, noise level will not be a problem to the rest of the school. I plan to have the children sit on the floor or at tables (wherever they are comfortable) in their groups and "play" for approximately thirty to forty-five minutes each day. The amount of time will depend on the children's attention spans, etc. I will walk around to each group, providing help -- if necessary. After three or four days, I will ask each group to build a car. I will need to teach the class about axles and wheels, since the children may not know that wheels revolve on an axle. When the children have completed construction of their cars, they will "run" them down a ramp and experiment with how far their cars can go. Concepts, such as friction and gravity, will be demonstrated and discussed.

At this point, some of the children may be ready to attach the motor to their cars. I feel that most first graders will not be ready for this without a great deal of help. After discussing the situation with one of the sixth grade teachers in my building, she and I agreed that she will bring her sixth graders to my room to help my first graders attach their projects to a motor and get them going. Later, the sixth graders will help the first graders to interface their projects with the computer. At this time of the year, I feel the first graders will have had enough experience with LogoWriter to basically comprehend some of the concepts of the programming the sixth graders will be doing. At any rate, they will be exposed to it. I feel this is an important step, because I want my students to see that there is a connection between Legos and LOGO.
At some time during the second week with LEGO/LOGO, the children will see and experiment with how their cars fit in with the city environment they created. Other projects the children will be involved in will include creative writing about their projects (language-experience, individual, and rebus stories on the computer). The use of visualization will be a key element in eliciting and generating ideas. The children will also be asked to write or draw in their journals about what they did each day. Individuals and groups will share their ideas and projects with the class.

I feel that the most important element in learning and exploring LEGO/LOGO in first grade is the process -- not just the product. The process includes problem solving, use of imagination and creativity. Legos and LOGO are wonderful vehicles for providing the opportunity for children to use their skills to learn, explore, grow and enjoy.

LEGO/LOGO Summer Institute
July 1987
LOGO-LIKE THINKING AND AMERICAN WOMEN:
What Do They Have In Common?

Leslie Doscher Snow

This paper is dedicated to my students who helped me discover the power of Logo-like thinking to influence my development as a teacher. It is also dedicated to Geraldine Kozberg and the network of teachers using Logo who have consistently supported my Logo education despite certain odds and setbacks.

Special thanks go to the staff persons at Macalester College who listened to and advised me on this particular project. Last, but not least, I thank Seymour Papert and his associates for creating something powerful enough to entice me to remain a teacher despite great odds and what oftentimes seems like little reward.

* * * * * *

Every junior high school teacher has experienced it. Each year as seventh graders arrive, we all eventually discover the students who have been passed on to us without having mastered key reading and writing skills. In my St. Paul, Minnesota classroom these students arrive in a somewhat homogeneous group having not yet finished the elementary basal reading series and expected to continue in this series as seventh (and sometimes eighth) graders. These are the children who typically resist reading anything all the way to the end, writing anything except notes to their friends in some slang-based form of shorthand, and public speaking in any form that is not related to the telephone. They are at risk: of losing credits, of eventually dropping out of high school, of remaining on the tightrope between literacy and illiteracy for many years ahead. The greatest challenge for me seems to be that of motivating these students to grasp the power of language study and information management. Since advancing technology requires students to move beyond the mastery of "content" learned in a daily 55-minute period to a level of competency as independent learners who can continue to develop language skill during the 12-14 waking hours that they are not in English class, these children are also at risk of remaining at the back of the societal "pack" with less access to power.

Originally I designed this research project around using Logo-like thinking in the areas of vocabulary development, research and writing. However, at the time of the project, I was about to embark on a study of famous American women with my students, so the content of the project reflects that topic.
The original project involved a series of sequential steps:

1. Listing all words currently known from a given category;
2. Expanding the list by consulting a variety of resources, including references, (dictionaries, thesauruses, newspapers, etc.), human resources, (other students, teachers, family members, other community members), etc. There were no limits placed on the sources of information;
3. Exploring the list for subcategories and making appropriate sublists;
4. Selecting a member from the list or a subcategory and asking at least three questions about it;
5. Researching the answers to the questions asked, and documenting the sources of information;
6. Organizing the new information learned into a cohesive paragraph or series of paragraphs, and writing ORIGINAL text for publication and/or oral presentation.

The challenge of this project seemed overwhelming in relation to the size of the class and the skill of the students, but by design, the project was individualized and would encourage students to seek out assistance from people other than myself, most likely from other students. I also adopted a Logo learning attitude of my own that would encourage me to try other approaches if the design of this project wasn't working. I had decided to attempt this project without the use of computers since the availability of a sufficient number of computers was not a possibility at that time. The real Logo "power" of this project was not dependent on hardware, but on its ability to motivate reluctant readers/writers to finish a reading and writing project in a cooperative learning atmosphere.

The listing activity got us off to a good start. Students were listing names of famous American women as fast as they could write. After I convinced them that there were no limits on the list other than the category itself, students felt more comfortable about plunging in. We had a lively discussion about whether or not Boy George could be listed. I observed students sharing with each other who did not normally talk to one another.

After having composed a well balanced list of names, I asked the students to inspect their lists to see if they could see any subcategories. Once a few subcategories had been suggested, some students objected to not being told the subcategories to begin with, which suggested to me that they were unaccustomed to moving from a list to discovery of categories.
After students were charged with the job of expanding their lists by at least ten names, students began sharing with each other immediately (as soon as they were assured that any resource was permissible, including friends, family, reference books, community groups, and any others they could discover). By the next morning students reported that they had consulted with friends, family, even television programs, in order to expand their lists. Few students had added less than 20 names to their lists, and several had identified new subcategories in which to "file" the new names.

Since most of the names listed were of people currently living, I decided to teach students how to use the Readers' Guide to Periodical Literature within the classroom environment. Students showed an enthusiasm for moving ahead, so I taught them how to use this resource by leading them through an oral "discovery" exercise in which students observed the alphabetical order of entries, discovered that the Guide is published monthly, found meanings for various abbreviations used in entries, and discovered that not all magazines are indexed in the abridged version. Then students were expected to locate and copy an entry for a woman on their list, later transposing information from the entry to an index card to be presented to the librarian for a search for the magazine.

During this exercise I was able to give a considerable amount of individual help to those students who required it. I was able to involve other students in answering their classmates' questions. I also observed that students who finished early were helping other students without prompting from me.

When the eagerly awaited day arrived on which we were scheduled to work in the library, students plunged in at the circulation desk, making their requests for magazines. Some students ran into their first obstacle of this project, i.e. magazines missing from the library files. We did some problem solving to try to find the resources by visiting other libraries. I also encouraged students to return to the Readers' Guide to find other articles about the same person.

Before reading the articles that were available, students were encouraged to suggest questions that could be asked about each woman to give them a purpose for collecting information and to prepare them for the charting process ahead. Students suggested researching birth information, current age and major accomplishments of at least five women.

At this point the group appeared to show polarities: those students who had been able to find resources were busy reading, sharing and showing others their work; those unable to find resources quickly had a hard time focusing on the task at hand and were unable to problem solve effectively without my intervention.
During the reading and charting process, most students were on task and working cooperatively to share magazines. Some students branched out into using collective biographies after they discovered the wealth of information contained inside each volume. I required them to research information on 5 women; most students were able to find information on 4-6 during a single class period and the more aggressive information seekers were able to chart information on 20 women! Students were also able to solve an important problem: some articles did not contain birth dates, but did contain the current age of the woman they were reading about. Students figured out that they could subtract the current age from the date of the magazine and discover the year of birth. As students collected these facts, they charted them under the headings "Name", "Date of Birth", "Major Accomplishments".

After students seemed comfortable with the charting process, I introduced them to the outlining process and its comparisons and contrasts to charting. After resuming their independent work on charting and outlining, some students became satisfied with their work and stopped collecting, eager to begin writing their papers. I observed that students generally needed little supervision from me; they were actively sharing information with each other, and they were still demonstrating an overall positive attitude after a week's work on this project. Many of them were reading more than was necessary to collect information for their charts. For the first time I observed them reading by choice rather than by assignment!

I encouraged students to begin writing their rough drafts as soon as they had a completed chart or outline. Students generally seemed to feel competent to sit down and write one paragraph for each woman on their chart. Some students were ready the next day to begin revision, so I gave the instructions for a mechanical revision.

Students were to proofread their rough drafts for errors in indentation of paragraphs, use of capital letters, spelling and punctuation. They were also instructed to read their draft out loud to another student to listen for awkward wording or missing words. Those students who stuck closely to their outlines while composing found that the writing seemed choppy; they decided to add more information to create more well balanced paragraphs. Even though I had previously experienced resistance to the revision process by these students, I also observed open sharing between students during the revision process for the first time.

During the wrap-up sessions, as students were finishing their final drafts, I gave an optional enrichment assignment to students who were already finished. I asked them to imagine a situation in which they could interview one of the women they had written about. They were instructed to describe the setting of this imaginary meeting and create a visual impression of the person they were interviewing. They were also to devise at least five questions to ask this woman. Each of the responses to this assignment was uniquely creative and it seemed to provide students with a good sense of closure.
As the final drafts were being prepared for my reading, I suddenly felt disappointed about the lack of computer availability for this project, for I was impressed with the power of Logowriter to contribute more than word processing capability to this project. I saw applications in the charting process and the designing of graphics to complement the written reports.

Looking back over this project I could hardly believe that the students I had previously described were the same students who had worked so diligently and cooperatively to produce the original manuscripts that I held in my hand. We then discussed how they could (with less help) duplicate this project on another topic using different categories. They had been able to successfully tap the power of language study and information management. The real "power" of Logo-like thinking had reached beyond the computer memory and keyboard to touch these students in a special way. Instead of hearing these students say "I can't" or "I don't want to", I heard a resounding "I CAN" and "I DID!"

August 1987
Welcome to the first issue of LOGO LINK, the Community/School Collaborative's own LOGO newsletter.

There are over 200 teachers in 18 schools working with LOGO now as part of the Collaborative. Students and teachers are doing some wonderful things with LOGO and we would like to try to help in sharing that information.

We will try to provide useful LOGO tools and programs as well as information about workshops, books, articles, etc. but the main purpose of the newsletter is communication. This newsletter is for you- the LOGO teachers- to share what you are doing in your classrooms and to learn about what others are doing.

The articles in this first newsletter were gathered by LOGO resource teachers. Please let us know what you are doing with your students, about interesting individual efforts, or about any problems you are having with any area of LOGO. Graphics print-outs or programs may also be submitted. We will publish this newsletter as often as we have enough material.

This is a special and unique effort we are all involved in. Your input is essential and valued. Please let us hear from you so we can spread the word about all of the terrific things we are doing with LOGO!

CLASS NEWS

Al Surdo's 6th grade class at Longfellow has put LOGO on the VCR. His students created original graphics procedures and then recorded them on videotape. They dubbed voice and music over the graphics to create quite an interesting show!

Penny Rendall's 5th grade class at Groveland Park is working on a class story. The class is divided into groups- each of which is working on one part of the story. They have written the script and are now working on the graphics. They are planning to produce a videotape of the finished product. We look forward to seeing it.

Several classes at Mann are using LOGO to develop writing skills as part of the school's literacy project. Students are writing original stories and articles with LOGO text-editing procedures which allow the user to write in the LOGO editor without using Print statements. Stories are printed out and students and teachers work together on developing better grammar skills and increased vocabulary. Students can then re-edit their stories, change or correct them, and print out the new version. LOGO text edit procedures are available from any of the LOGO resource teachers.
Mary Schroeder's 6th grade class at Longfellow has been working on combining LOGO and art. A recent project had the students write a program to draw their names on the graphics screen. The next step was to create a design by manipulating the name on the screen. Her students created fascinating patterns with their names. Some rotated their procedures so their names appeared in several different orientations; others set different positions with the turtle before drawing their names again. Mrs. Schroeder printed out these original designs (see example). Her next class project will be to create animals by putting together simple LOGO shape procedures.

BY TIFFANY HELD

I AM RED AND I CARE.
I MAKE YOU LOVE AND I LIVE INSIDE YOU. SO IF YOU CARE ABOUT ME,
I CARE ABOUT YOU.
I WON'T GIVE YOU ANY TROUBLE UNLESS YOU DON'T TAKE CARE OF ME.

Karen Timmesch's 4th grade class at Galtier has been writing short poems and stories and creating a graphic design to go with them. The students have been printing them out together.

Teaching a whole class a new LOGO concept with only one computer can be difficult. Mann has developed a mini-lab idea which they plan to use once a month. All of the computers are pulled into the gym for two days. Teachers bring their whole class into the mini-lab for a regular class period on each day. All of the students can work on computers at the same time and the teachers can get a really good look at how and what the children are doing. The mini-lab was combined with a LOGO family night at the school.

Several teachers are beginning to experiment with some list processing applications of LOGO, such as a sentence generator program. The procedure picks one item from the "subject" list and one item from the "predicate" list and puts them together in a sentence. Students can create their own lists in the LOGO editor. This activity is taken directly from a school language textbook and is an example of how one can integrate LOGO and the existing curriculum.
Lynn Blumthal and Marge Mountain at Monroe and several other teachers at different schools have been working with a LOGO spelling program. You can input any list of words, ask students to spell them, and test to see if spelling is correct. Students can create their own spelling lists in the editor. This is a flexible program that you or your students can modify or develop to fit your needs.

```
TO SPELL.WORD :LIST
DO.IT.WORD :LIST
FINISH
END

TO DO.IT.WORD :LIST
CLEARTEXT
IF :LIST = [] [FINISH :LIST STOP]
PRINT :LIST
WAIT 200
CLEARTEXT
PR [SPELL THIS WORD]
PR []
PR FIRST :LIST
WAIT 200 CLEARTEXT
TEST.IT.WORD RW :LIST
END

TO TEST.IT.WORD :WORD :LIST
TEST EQUALP :WORD FIRST :LIST
IFT [PR "GOOD! WAIT 100 DO.IT.WORD
DELETE :WORD :LIST]
IFF [PR "OOPS! TRY AGAIN" WAIT 200
DO.IT.WORD. :LIST]
MAKE "LIST DELETE :WORD :LIST
END

TO FINISH :LIST
CLEARTEXT
PR :LIST
PR []
PR [CONGRATULATIONS! YOU HAVE SPELLED]
PR [ALL THE WORDS CORRECTLY.]
END

TO DELETE :WORD :LIST
IF :LIST = [] [OP []]
IF (FIRST :LIST) = :WORD [OP BF :LIST]
OP SE (FIRST :LIST) (DELETE :WORD BF :LIST)
END

TO RW
OP FIRST READLIST
END
```

Many 1st grade teachers use the TEACH program. This program is on the LOGO Tool Kit which all LOGO buildings should have. The TEACH program allows you to write a procedure and see the commands executed as you enter them. This is a good aid for those children who cannot write a procedure in the LOGO editor because they cannot conceptualize movement of a turtle they cannot see. TEACH can be a useful step toward the use of the regular LOGO editor. If you are not familiar with the TEACH program and would like to know more, check the Tool Kit documentation or ask your LOGO resource teacher.

LOGO RESOURCE TEACHERS

Bruce Anderson, Groveland, Phalen Lake
Lynn Blumthal, Monroe (on leave)
Ardyce Ehrlich, Jefferson
Roy Erickson, Prosperity Heights
Mike Hopkins, Magnet Elementary Schools
Paul Krocheski, Ramsey, Murray
Bobbi Levitan, Magnet Elementary Schools
Terry Moore, Monroe, Hayden Heights
Marty Reed, Mann
Mike Rosen, Homecroft
Nancy Watson, Randolph Heights
Barb Winthrop, Highland Elementary

PROBLEM CORNER

We have many LOGO teachers who are working with young children - under the age of seven. Some of these children have difficulty with the regular LOGO commands for various reasons. There are a number of programs available such as DRIVE programs, ZOOM, INSTANT, etc. which allow children to produce LOGO graphics using single character commands. Have you used any of these programs? Do you think they are effective? How difficult is the transition to regular LOGO? We would like to hear from teachers who have had this problem and how they are dealing with it.
LOGO BIBLIOGRAPHY

Practical guides:

APPLE LOGO by Harold Abelson
This is a good general text on our version of LOGO (LCSI). It has some good ideas and applications beyond turtle graphics.

LEARNING WITH APPLE LOGO by Dan Watt
This book has good teaching materials for young users and beginners.

THE TURTLE SOURCE BOOK by Donna Bearden, Kathleen Martin and Jim Mueller
Reston Publishers, Virginia, 1983
A good resource for using LOGO in the classroom. It has lots of ideas for projects and activities.

DISCOVERING APPLE LOGO by David Thornburg
Addison-Wesley, Menlo Park, Calif. 1983
An interesting look at LOGO graphics and how they relate especially to mathematical concepts in nature. May be more meaningful to advanced LOGO users.

APPLE LOGO PRIMER by Gary Bitter
Reston Publishers, Reston, Virginia
A useful introduction to basic LOGO concepts

TURTLE GEOMETRY by Harold Abelson and Andy di Sessa
MIT Press, Cambridge, Ma
The computer as a medium for exploring mathematics and physics

Philosophy and Theory:

MINDSTORMS: COMPUTERS, CHILDREN AND POWERFUL IDEAS BY Seymour Papert
Basic Books, New York
Describes the philosophy of learning around which LOGO is built. It is thought provoking and profound.

THE SECOND SELF by Sherry Turkle
An interesting and provocative look at the way computers can change the way we look at ourselves and our culture.

NEW ARTICLES ON LOGO

Effects of Computer Programming on Young Children's Cognition
Douglas H. Clements and Dominic F. Gullo
Kent State University
Journal of Ed. Psych, 1984
(contact Gerry Kozberg for info)

FOR YOUR INFORMATION

Open-Lab Workshop
Highland Senior High
Call Marty Reed at Mann (690-2497) for information

LOGO '85
July 22-25
Cambridge, Mass
Contact Gerry Kozberg for information

SCHOOLS USING LOGO
Mann Elementary
Highland Elementary
Randolph Heights Elementary
Groveland Park Elementary
Monroe Community School
Hayden Heights Elementary
Prosperity Elementary
Phalen Lake Elementary
Galtier Elementary
Maxfield Elementary
Hill Elementary
Longfellow Elementary
Homecroft Elementary
Jefferson Alternatives High School
Murray Junior High
Ramsey Junior High
Highland Secondary Complex

Please send articles to:
LOGO LINK
2143 Pinehurst Ave.
St. Paul, Mn. 55116
Welcome to the second issue of LOGO LINK!

This LOGO LINK comes in two parts - a newsletter and a diskette. The newsletter has lots of information about things going on in the schools and elsewhere. The diskette contains sample programs collected from many different St. Paul schools. Most of the programs were done by students.

We hope you will share this disk with your students. We would like LOGO users to see what other people are doing and to share their ideas. Documentation is provided to show you what kinds of programs are available.

We hope you enjoy using this diskette. Please let us know what you think. If there is interest, we will try to put together another one in the fall.

Some teachers and students will be going to LOGO 85 in Cambridge this summer. We will share the information gathered, as well as other news about LOGO in our first issue of the new school year. Have a good summer!

LOGO LUNCH AT HIGHLAND PARK ELEMENTARY

During lunch students at Highland Park Elementary may stay in their classrooms with their hot or cold lunch to have extra help with LOGO. This program was instituted by Barbara Winthrop, speech clinician at Highland and has become known as "LOGO Lunch." A schedule was developed so each class has a specific day and all children are offered the opportunity to have the additional time with the computer and a LOGO teacher.

In addition, an after school lab is open to students who wish to have more time with LOGO. Up to 15 students at a time have remained after school until 5:00 p.m. for this experience.

It has been great fun for students and teacher alike - lots of conversation and sharing - truly a "LOGO" experience.

"THE "BEST OF BOTH WORLDS" AT PHALEN LAKE ELEMENTARY

The computer lab at Phalen Lake is designed to supplement the regular curriculum. Children whose teachers have had LOGO training use the LOGO computer in their classrooms and also have the opportunity for instruction in a new concept or exploration of a project in a group setting. They also get to see each other's work at the end of the class period. The school feels that this combination gives the students the "best of both worlds."

AFTER SCHOOL LOGO OPEN LABS

Marty Reed and Lynn Blumthal have been setting up open lab LOGO time for LOGO teachers throughout the school year. These labs have been held at the Highland Secondary Complex and have been very useful to many teachers.

We would like to continue these labs again next year, if teachers are interested. Please let Marty Reed at Mann know if you would be interested in coming to an open lab, and also if you would be willing to be a "helping teacher" once in a while during the lab time.
Northwest Area Foundation sponsored a grant program in 1984-85 for collaborative projects between St. Paul school teachers and Macalester College professors. Two of the grants involved different aspects of LOGO. On Tuesday May 7, there was a public colloquium at Macalester College where the findings of the projects were displayed and discussed.

One collaborative project was done by Lynn Blumthal, 2nd grade teacher at Monroe and Nancy Johansen, teacher in the Department of Education at Macalester. It was an attempt to develop a creative writing program using Sprite LOGO, incorporating grammar and Sprite LOGO animation effects to stimulate writing. Macalester students worked with Lynn’s students on programs that she created. The programs used graphics to create a story. The children responded in several places with nouns or verbs. They then named the stories they helped write, corrected them in the LOGO editor and printed them out.

Another collaborative project was done by Marita Hopmann, asst. professor in psychology at Macalester and Mike Hopkins, LOGO coordinator for the magnet schools. They have developed, with the help of five Macalester students, two recording forms. One form enables observers to record the interaction between two children working at the computer. The second form enables them to record the commands typed into the computer. They hope to use these two instruments to accurately record what pairs of children do at the computer. They have been piloting their work at Monroe Community School, in both regular and special education classes. Results of their pilot study should be available early this summer.

LOGO IDEAS FOR THE PRIMARY GRADES

We would like to share LOGO curriculum ideas to use with early education kindergarten, and first grade students. If you would like to share what you have used or have ideas for ways to use LOGO in the classroom, let us hear from you. Call one of us at Mann School or send your ideas along. Look for more information in your fall issue of LOGO LINK.

Linda Mohn, kindergarten
Marty Reed, early ed.
Donna Dieltz, Sp.needs kindergarten
Rick Osborne, early ed.

LOGO NEEDS ASSESSMENT 1985-86

In order to more effectively plan for next year, Gerry Kozberg has requested that each school assess its LOGO needs for next year. Teacher and community response to the following will be helpful:

- LOGO goal for 1985-86
- Staff development
  - New teachers
  - Building-based inservice
  - District-wide workshops
- Community Needs

Please share your ideas with your principal and Collaborative council.
A five-week LOGO seminar was held at Highland Park Elementary School this spring in conjunction with Dr. Walter Mink, cognitive psychologist from Macalester College. Seven students from his class at Macalester had a field experience at Highland Park Elementary and joined with parents and teachers from Highland for this seminar. Each week a different presentation was offered giving participants a chance to explore different aspects of LOGO:

WHY LOGO presented by Dr. Walter Mink
LOGO and MATH presented by Bruce Anderson, science and LOGO teacher at the Highland Secondary Complex
LOGO and LANGUAGE ARTS presented by Lynn Blumthal, 2nd grade teacher at Monroe
LOGO and the ROLE of the TEACHER presented by Paul Krocheski, 5th grade teacher at Mann.
EVALUATION AND SUMMARY OF LOGO PHILOSOPHY presented by Geraldine Kozberg

The following is taken from the presentation given by Bruce Anderson.

Logo is "...math and heart and the science of discovering inner relationships." The world of mathematics is not a by-product of Logo; it is integral to the process itself. In Logo environments the two-dimensional world of textbook arithmetic gives way to the power of mathematics. Arithmetic "problems" allow students to manipulate numbers in order to arrive at correct answers. The mathematics of Logo involves the structuring and restructuring of spatial environments.

How do children act upon Logo environments in a mathematical sense? What is it that teachers should be looking for? Consider the following:

* EXPLORING relationships
  Turtle play involves important mathematical relationships, e.g., greater than, lesser than, equal, true, false.

* DISCOVERING mathematical ideas
  When making a square, the turtle begins and ends in the same position. The Total Turtle Trip Theorem is the powerful idea of 360 degrees.

* MAKING patterns
  Repetitive patterns express the important qualities of symmetry and asymmetry.

* DEBUGGING problems
  This is more profound than finding and correcting mistakes. Debugging is entering "into" a procedure and making changes.

* EXPERIENCING mathematical concepts
  Logo allows users to become involved in difficult concepts, e.g., variables, that will be encountered at another time in the formal study of mathematics.

* DOING geometry
  Turtle graphics make the abstract real.
Three intermediate LOGO workshops were held during this school year. The first two dealt with the use of advanced LOGO primitives, DELETE and random procedures.

The third workshop was held April 29 and 30. The focus of the workshop was on curriculum connections, specifically in math. Use of math functions in LOGO was reviewed and graphing examples were demonstrated. Menu use was also demonstrated and workspace management was reviewed.

A class disk was produced which contained the demonstrations used by the teachers (Bruce Anderson and Mike Hopkins) and several procedures that participants developed at the workshop. These procedures were not intended as "finished" products, but rather as taking off points. This disk is available, with a brief documentation. Contact Gerry Kozberg if you are interested.

Other workshops on specific topics, including Sprite LOGO and LOGOII are being planned for next year. LOGO teachers will receive information as soon as it is available.

NEW LOGO TEACHERS

Three introductory workshops were held during the school year, in October, December, and March. Almost 100 teachers from all 14 Collaborative schools were trained in LOGO. The teaching staff for the workshops was drawn from parents and teachers working in the Collaborative schools—making the LOGO effort in St. Paul very unique.

We welcome all new LOGO teachers and urge teachers who have been working with LOGO to give them your support and encouragement.

Please send articles to:
LOGO LINK
2143 Pinehurst Ave.
St. Paul, Mn. 55116
Welcome to 1986 and our fourth year with LOGO! There are now some 250 teachers working with LOGO in St. Paul, and we look forward to the development of more exciting and creative ways to use LOGO with our students.

Several LOGO people from St. Paul attended the LOGO 85 Conference at M.I.T. this summer: Bruce Anderson, Mike Rosen, Mary Joyce, Mike Hopkins, Ardyce Ehrlich, Gerry Kozberg, and students Jeff Wangensteen and Alan Latts. Many of the ideas we gathered have been shared with the LOGO resource people. Others will be discussed at the topic workshops described in this issue.

LOGO TOPIC WORKSHOPS

In response to the questionnaire that was circulated in the fall, we are forming LOGO interest groups. Several areas have been identified. We are going to begin with the six listed below.

An initial meeting for each group has been scheduled. Resource people have volunteered to coordinate the groups. They will contact people who indicated interest in specific areas on the survey. If you would like to meet with other teachers for the purpose of developing LOGO activities related to specific curriculum or interest areas, plan to attend a meeting. For more information contact the resource people or Mike Hopkins at 646-4854 or 293-7809. All meetings will be held from 3:45 to 5:00 at Galtier School in conjunction with the Open Lab.

January 16  LOGO and Art  Ardyce Ehrlich
January 23  LOGO and Special Education  Terry Moore
February 6  LOGO and Science  Bruce Anderson  Paul Krocheski
February 13  LOGO and Math  Mike Hopkins  Bobbi Levitan
February 20  LOGO and Social Studies  Ardyce Ehrlich  Judy Ronnei
February 27  LOGO and Young Children (Pre-school - 1st Grade)  Marty Reed

OPEN LAB AT GALTIER

Beginning January 16, Paul Krocheski, the computer specialist at Galtier, will be offering an open LOGO lab Thursday afternoons at Galtier School. People interested in working on LOGO in a supportive atmosphere may want to consider this opportunity. The lab will be open from 3:45 to 5:45 for six consecutive Thursdays (excluding Jan. 30) Contact Paul (646-4854) if you plan to attend.

LOGO LUNCH FOR GIRLS

Karen Timmesch, 6th grade teacher at Galtier, has a LOGO lunch for girls one day a week. Three groups of 15 4th-6th grade girls spend their free time after lunch working with LOGO in the computer lab.
WELCOME TO THE NEW LOGO SCHOOLS

Seven new schools have joined the LOGO program, bringing the total of St. Paul Schools working with LOGO to 23. Harding, Johnson, and Como Senior High Schools, Cleveland and Washington Junior High Schools, and Como and Hancock Elementary all sent teachers to a LOGO introductory workshop the week of November 18-22. The workshop was marked by the enthusiastic response of several participants. For the first time, this introductory group generated a class disk to share the interesting ideas that they were developing. The group decided to meet again on January 16th at Como Elementary. Bobbi Levitan is acting as a resource person to these schools, visiting the teachers regularly, providing information and insight. A second introductory workshop for these seven new schools will be held March 17-21.

EXPLORING TESSELLATIONS

The entire 7th-8th grade CHASE class at Highland Junior High has spent the last several weeks exploring the repeated patterns and symmetry of tessellation. The class began the unit with a discussion of Maurice Escher and his graphic designs, and went on to create graphic designs of their own with LOGO. The next step will be to print out the designs and color them to see how the use of different color schemes changes the visual effect.

WORKSHOPS CONTINUE FOR LOGO SCHOOLS

During the week of December 2-6, twenty-five teachers and one principal from sixteen LOGO schools took part in another introductory workshop. The teachers were all somewhat familiar with the way LOGO was working in their schools, and so were concerned not just with learning the language, but also with how to integrate LOGO and the curriculum they teach. The group scheduled another meeting to share information on January 30 at Galtier School.

These sixteen schools each have a resource person, a staff member who has volunteered to act as a liaison between the Staff Development Department, the LOGO teachers, and the principal. Additional support services are available through the Staff Development Department.

The principals' requests for space in this workshop totaled more than sixty people! To accommodate those teachers who could not attend this week, another workshop is being scheduled for the week of April 7-11.
USING THE TRANSTAR 315 COLOR PRINTER WITH LOGO

For those teachers that have access to the Transtar 315 Color printer and want to use it with LOGO, these are the steps you will need to follow:

1. Always turn the printer on first before you turn the computer on. The printer will not work if you turn it on after you turn the computer on.

2. Display the graphic picture you want to print on the screen.

3. Use either of the following DUMP procedures:

   TO DUMP
   .PRINTER 1
   (.TYPE CHAR 9 "11H"
   .PRINTER 0
   END

   TO DUMP1
   .PRINTER 1
   (.TYPE CHAR 9 "203H"
   .PRINTER 0
   END

These directions are compliments of Tuan Le, Joe Lancrain, and Cheryl Carlson of Como Park Senior High School.

LOGO RESOURCE PEOPLE

Bruce Anderson  Highland Secondary
Joan Bodey  Prosperity Hts.
Ardyce Ehrlich  Mann
Mary Joyce  Phalen Lake
Paul Krocheski  Galtier
Bobbi Levitan  Randolph Hts.
Bev Long  Randolph Hts.
Sandy Fox  Maxfield
Paulette Lenz  Monroe
Terry Moore  Murray Jr. High
Tom Noud  Hayden Hts.
Art Peterson  at Wheelock
Martin Reed  Groveland Park
Penny Rendall  Mann
Judy Ronnei  Highland Secondary
Mike Rosen  Jefferson Altern.
Ruth Schlegel  Homecroft
Dick Spaulding  Ramsey Jr. High
Jim Steiner  Highland Secondary
Nancy Watson  Highland Secondary
Barb Winthrop

NEW BOOKS ABOUT LOGO

COMPUTER SCIENCE LOGO STYLE, Intermediate Programming
by Brian Harvey
M.I.T. Press, 1985

NUDGES: Apple LOGO Projects
by Glen Bull
Holt, Rinehart, and Winston 1985

EXPLORING LOGO WITHOUT A COMPUTER
by David Thornburg
Addison Wesley, 1984

TEACHING WITH LOGO
by Dan and Molly Watt
Addison Wesley, 1985

CULTIVATING MINDS: A LOGO CASEBOOK
by Sylvia Weir
Harper and Row, 1985

ATTENTION: CALLING NEW IDEAS

Do you and your students enjoy seeing what other students and teachers are doing with LOGO? In order to share out ideas and creativity, we would like to put together another district-wide sample LOGO disk. We need your help in gathering a variety of work.

We welcome programs done by students and teachers (pre-school to senior high). When submitting programs, please include: 1) student's name, grade and school 2) name of calling procedure and 3) a one sentence description of the program. Please submit programs (a printout or disk) to Gerry Kozberg, Mike Hopkins, or Bobbi Levitan, c/o Staff Development Office, 360 Colborne (293-7809).
These procedures are useful in creating maps. The Minnesota example is just one way of using these "mapping tools". There are three basic pieces, more could be easily created based on these. These procedures were created from kids tracing maps on graph paper. They were encouraged to use the whole sheet of graph paper (quarter inch squares work well). We then had to select a scale that would create an appropriate representation on the screen. Essentially we had to find some number of turtle steps per quarter inch square on the graph paper. In this example we used a scale of 4 turtle steps/square. You may find a different scale would better fit your needs. Of course the scale could have been a variable in these procedures, something you may want to use in your adaptation.

The basic tools are:

- **LINE**
  - simply draws a line. It needs one input, the number of squares (on the graph paper) this version uses a fixed scale of 4 turtle steps/square.
  - The turtle starts drawing in the direction he is aimed when the procedure LINE is invoked.

- **OVER**
  - moves the turtle over 5 spaces on the X axis.

- **OTHER**
  - requires three inputs and uses them to draw a line of some length (:sqs) then puts the pen up and moves forward some number of blank squares (:blnk) then puts the pen down to finish the line (:fin)

- **BEGIN**
  - sets the position and heading to begin drawing our map.

- **MINNESOTA**
  - invokes the above procedures to actually draw the map.

- **Note:** we used the screen dump procedure to print the finished map.
Congratulations! As June arrives, so does the realization that another year is coming to an end. This has been a most productive year for the St. Paul Logo program. We offered four introductory Logo workshops; formed curriculum interest groups; ran after-school open labs; held a Logo Seminar for principals and resource people; and are planning a national Logowriter Summer Institute for this July.

To date, nearly three hundred teachers from over twenty St. Paul schools have been trained in Logo. Teachers are using Logo with the full range of students that St. Paul serves, from preschool special education students through secondary gifted students.

Teachers have made the difference. Logo is a flexible tool. Teachers are taking the tool and enabling their students to use it in many ways. While some teachers are essentially letting their students explore Logo on their own, more and more are using Logo to help students develop understanding of content related concepts. Building bridges to curriculum content is clearly the future direction of the Logo program. Next year we will not be expanding to more schools and more teachers, but focusing on giving depth to Logo; on enabling people to use Logo to do what they want to do.

LOGOWRITER

The newest Logo is here! It's called

LOGOWRITER

It combines the Logo we all know and love with a word processing component. Text and graphics can be combined on the same screen (called the PAGE). Both text and graphics are totally programmable. This page, in fact, this whole issue is being produced with LOGOWRITER.
Curriculum Connections

This year we have developed a variety of connections between Logo and the curriculum. You may recall that we set up meeting times earlier this semester for folks interested in integrating Logo in curriculum areas including: Art, Special Education, Science, Math, Social Studies, and Young Logo. Many teachers participated in these after-school meetings. Some specific activities are being developed in each area. We hope to make packets of materials available next Fall for those who are interested. Please contact the Staff Development Dept. if you are interested in joining or forming an interest group.

Marty Reed and the "Young Logo" group have developed several Logo activities, both on and off computer, for young (preschool, kindergarten, first grade) children.

Paul Krocheski and the sixth grade teachers at Galtier Magnet are using Logo with Lego s to create science projects. Classes have chosen themes including "City of the Future" and an amusement park. Small groups of students are collaborating on designing Lego creations which use gears, pulleys, and motors. The motors can be controlled by Sprite Logo programs, which Paul and the kids are developing. A video of the final products will be made during their Science Fair.

The Math group has been focusing on the needs of the Junior and Senior High Math teachers who have been involved in the group. Vaughn Ekbon and the folks at Central have developed procedures that plot conic sections. Connections between geometry and algebra are being developed.

Judy Ronnei and some of the Mann staff are doing a project which integrates Language Arts, Social Studies and Art. The focus is a newspaper related to the original 13 colonies and how they have changed. They are using Logo for both the text and graphics of this project.

Logo Videos

Ardyce Ehrlich, working with Mary Salek, Sally Saulk and the Chase class at Highland Junior High School, has created a video of their tesselations project. The students studied the work of Maurice Escher, then went on to create graphic designs using Logo. The designs were printed out then colored in different ways by the students. The colored designs were then photographed and a videotape was produced. Music and commentary are now being added. An edited version may be available in the Fall.

Dave Barrett and his fifth grade class at Galtier Magnet School are producing a Logo video based on Shel Silverstein's "The Giving Tree". The students created graphics and text procedures based on the story. Dave is putting the pieces in order and recording them on videotape.

Making your own Logo video is a challenging, but exciting project. If you have an idea you want to pursue call us for help.
The St. Paul Schools, in collaboration with Logo Computer Systems Inc. and Macalester College, is offering a national summer institute on Logo and "Thinking". The institute will feature Michael Tempel from L.C.S.I., who will teach Logowriter; Walter Mink from Macalester, who will focus on cognitive science; and members of the St. Paul Staff and community who will describe applications of Logo and "Logo-like thinking". The institute will attempt to explore the link between Logo and "Thinking". A brochure which describes the institute has been sent to all Logo teachers. If you want more information, contact Geraldine Kozberg at 293-7783. Financial assistance for St. Paul teachers is available.

Keeping an Eye on Things

Nolan Tveter at Monroe has devised a unique system for monitoring his students while they are working at Logo. He has attached long cables to the computer, which allow him to display the screen on the computer monitor, on a large screen that faces the class, and on a small monitor on his desk. The teacher can stay at his desk and see how kids are doing at the computer. Nice idea!! Nolan has the technical specifications if you are interested.

Another St. Paul Disk?

Response to the call for procedures for a second St. Paul sharing disk was less than spectacular. If people want to participate in creating another disk, we would be happy to put the pieces together. We need the pieces, however. As you look back on this year, if you think about a particular idea that worked well for you, or a particular student project that was successful, consider sharing it with others by sending a copy of the program to the Staff Development Dept. In the Fall we will try to make a disk with the ideas submitted, and will share it with anyone interested.

Logo Award

The St. Paul Logo program has been named one of the "101 Excellent Educational Programs" by the Minnesota State Department of Education. Your hard work has been recognized as an attempt to improve education in Minnesota.

State Fair Contest

This year the Minnesota State Fair Education Department will be including a "Computer-Generated Graphics" category in their art / crafts contest. Joan Thames at Groveland Park Elementary is in charge of the contest. Rules are available from Joan or call 642-2217 between June 1 and Aug. 11. She will accept entries at Groveland or send your entries to:

Education Department
Minnesota State Fair
St. Paul, Mn. 55108

This is a new category this year, so your entries have a chance of winning cash prizes!

Questions, Comments and Concerns

It has been a very busy and productive year. Plans are being drawn up for next year. Your input is important. What has gone well for you this year? What would you like to see improved? Please drop us a line, or call Gerry or Mike at 293-7809.

Have a GREAT summer!!
SUMMER INSTITUTE FOR LOGO TEACHERS

Our first national LOGO institute was held this summer in conjunction with LCSI and Macalester College. There were 54 participants: twenty nine from the St. Paul schools and twenty five from other school districts in Minnesota and other parts of the country including New York, Michigan, California, Washington, Wisconsin, Ohio, and Georgia.

A group of eight St. Paul teachers with consultants from Macalester, Control Data and Sperry participated in an eight week seminar to explore and plan for the ideas and topics presented at the workshop.

The focus was on three main areas:

- LOGOwriter and the project approach
  Direct instruction was provided, as well as open lab time and small group discussions based on curriculum areas. Teachers were encouraged to work together in pairs or groups to create projects that use LOGOwriter.

- LOGO and Cognition
  Each day featured a presentation on cognitive science by Dr. Walter Mink from Macalester College

- LOGO and "Real World" Thinking
  Presentations were made by Dr. Charles Green from Macalester on coalitions and change efforts, Steve Harrington from Control Data on learning styles and imaginal learning tools, and Peter Cantrell from the University of Minn. on research efforts on LOGO.
  Site visits were also arranged for groups of teachers to places such as 3M, Sperry, Honeywell, and Webb Publishing.

The institute was enthusiastically received by both participants and instructors. All of us enjoyed the opportunity to learn and share together. Plans are being discussed now for another institute next summer.

LOGO FLOOR TURTLE AT MANN

Students at Mann Elementary have a new turtle— a Valiant floor turtle robot that speaks LOGO! The floor turtle was purchased through the initiation of kindergarten teachers Linda Mohn and Donna Dieltz. The floor turtle works with infra-red and does not have to be attached to the computer. Students in kindergarten and first grade are exploring shapes and distances with the floor turtle now and eventually students in the upper grades will have a chance to experiment as well. When the teachers have developed some curriculum ideas and have the system well organized, the floor turtle may be available for other schools to borrow. Contact Linda Mohn at Mann if you would like to come and see the floor turtle in action!
LOGOWRITER COMES TO PHALEN LAKE

Phalen Lake is involved in a COMPAS program in creative writing called DIALOGUE. We have a writer-in-residence who team teaches creative writing lessons with classroom teachers. We will then be using LOGOWriter to print and illustrate an original story.

The intermediate students each have a reading partner in the primary grades. Each Wednesday they meet to read together. By this spring we hope to have small short stories written to share with our reading partners.

LOGO IDEAS FOR KINDERGARTEN/FIRST GRADE

Donna Dieltz, Marty Reed, and Linda Mohn have been working on curriculum ideas for using LOGO in kindergarten and first grade. The ideas are arranged in a month-by-month thematic plan and include off-computer activities and other computer ideas as well as LOGO activities. They will be glad to share these ideas. Please contact Linda or Donna at Mann or Marty at Wheelock if you are interested.

LOGOWRITER AT RANDOLPH HEIGHTS

After their first inservice in LOGOWriter, teachers decided to have a computer lab for the whole school. Sandy Fox, the resource teacher for the building, organized the lab which gave each class two sessions. The classrooms were matched primary to intermediate to help with initial introduction. These older students will then become the "Turtle Tutors" to the primary children for the remainder of the year.

During the next month, staff who have not been trained in LOGO will be given an introduction to LOGOWriter through inservice at school. Randolph Heights is also considering the LOGO Penpal Network for students in grades 3-6.

BRANCHING STORIES WITH LOGOWRITER

Ellery Carr's 6th grade students at Galtier used LOGOwriter to produce branching stories. Each student developed his/her own story with special points at which the reader would need to make a decision for the characters in their story. With the use of the "event" keys the options chosen by the reader would be acted upon by the computer and the next branching segment displayed.

LA TORTUE FRANCAIS

AVANCE 50 DROITE 90 CACHETORTUE

In Annette Truda's French II class at Ramsey, the LOGO turtle speaks French! Students spent three weeks on a group project combining their French and LOGO skills. Each group picked a French-speaking country and designed a symbol of their country in French LOGO. They then wrote a LOGO program that printed ten sentences in French about their country. Each symbol and description was presented to the rest of the class in an oral demonstration in French. Some students also provided costumes and food from their particular countries as part of their demonstrations. Countries chosen included Zaire, Switzerland, and Tahiti. There are plans to set up a Spanish and German set of LOGOwriter tools so this project can be tried in other languages as well.
CONSPELATIONS: AN INTEGRATED APPROACH

AT

GALTIER ELEMENTARY SCHOOL

Each year science classes at the 4th grade level are taught an astronomy unit on constellations. To enhance that unit and to draw students into active participation in the unit, a project was developed to include the use of the computer with Logo Writer. Each student was to use the computer to display a graphic representation of a constellation and a short report on the computer screen. In order to accomplish this, a number of steps needed to be taught that involved work in several curriculum areas.

To begin with students needed to understand coordinate graphing, so one or two math lessons were spent using their math book, graph paper, and the Logo Writer screen to illustrate paired number points. Once students had a grasp of plotting points on graph paper, we practiced plotting the stars of the Big Dipper on graph paper. The points (stars) plotted on graph paper can be directly transcribed to Logo screen positions. Doing this, however, will likely result in a very small representation on the screen. The students were shown how to scale their graph paper so it would more closely imitate the Logo screen. (Each graph paper segment can represent 4 or 5 on the monitor.) Since at this point we were dealing with one quadrant, we needed to make sure students drew their constellation on graph paper so that the "x" value didn't exceed 125 and the "y" value 80.

Students were taught how to use the setpos command in order to represent their star pattern on the screen. A blank shape could be used with the single dot in the center to represent a star or an actual star shape could be made with one of the shapes and stamped at the correct coordinate position.

Having practiced one constellation together and tried it out on a computer in our lab, we then had each student choose one constellation to complete for themselves. Along with the graphics each student was to use library resources and reference books to answer several questions about their constellation and include a report along with their graphics on the screen. When all were finished, we darkened the lights in the computer lab and used a video projector so that with everyone sharing we could present our own planetarium show.

We began with a science unit, developed and practiced a math skill, included reference and resource skills, and finally finished off with Language skills in the writing of the completed report with the Logo Writer word processor. Along the way students encountered and solved problems on a variety of levels. As a staff, we had provided problem solving experiences through an integration of curriculum.

BIG DIPPER

The Big Dipper consists of seven stars. The two stars in front of the cup points to the North Star. These pointers are the star Dubhe and the star Merak. The Big Dipper forms a part of a larger constellation, Ursa Major or the Great Bear.
Paul Krocheski has offered two six week LOGOWriter sessions for students.

Terry Moore at Monroe has offered LOGOWriter sessions after school for students and an open lab for teachers one night a week.

Phyllis Marsili at Hancock offered a workshop for parents and their students through Community Ed.

Judy Ronnei at Mann has offered an LOGOWriter sessions for teachers in an open lab format.

ELEMENTARY GRADES LOGO CURRICULUM

A team of teachers from Groveland Park Elementary have written a LOGO curriculum for elementary grades. It contains a suggested plan for teaching specific LOGO commands and activities and projects for each grade. Ideas for using students as "tutors" are also provided. Please contact Penny Rendall at Groveland for information.

AFTERSCHOOL LOGOWRITER WORKSHOP

There will be an afterschool introductory workshop in LOGOWriter Thursday afternoons January 8 through February 5. The workshops will be held in the computer lab at Humboldt Jr. High. There will be two sessions on each date: from 2:00 to 4:00 and from 4:00 to 6:00. Contact Mike Hopkins at 293-6710 or 293-7784 for more information. Registration forms will be sent to each school and inservice credit will be available.

INTRODUCTORY LOGOWRITER WORKSHOP

24 teachers representing 18 schools took part in our first introductory LOGOWriter workshop December 1-5 at 360 Colborne. In addition to learning about LOGOWriter participants also had the opportunity to hear presentations from Dr. Walter Mink and Dr. Charles Green on connections between LOGO and cognition and LOGO as a reform technology.
CELEBRATION OF THE ST. PAUL LOGO PROGRAM

The LOGO Seminar held on March 4 at the St. Paul College Club was a day for sharing and taking pride in the various activities and projects developed by teachers in the St. Paul LOGO program. The morning featured a series of large and small group presentations designed to explain and share a wide variety of ideas.

- LOGO and Whole Mind Learning: Anne Rae Sanderson Hancock
- LOGO and Foreign Languages: Annette Truda, Anita Ratwick Ramsey Jr. High
- LOGO and Younger Students: Linda Mohn, Donna Dieitz Mann
- Using Turtle Tutors: Marty Reed, Wheelock
- LOGO and Integrated Curriculum: Penny Rendall, Kathy Overby Groveland Park
- LOGO Newsletters and Sp.Educ.: Judy Ronnei, Pat Meuwissen Liz Aase, Lorna Keller Mann
- LEGO/LOGO: Kay Halligan, Joanne Walz Humboldt Jr. High
- LEGO/LOGO: Paul Krocheski, Karen Timmesch Galtier

The afternoon session featured a presentation by Steve Ocko from LEGO Systems. Video tapes of students working with LEGO/LOGO at the Hennigan School in Boston were shown, and there was an in-depth discussion of the philosophical and education framework around which LEGO/LOGO was developed.

COLLABORATIVE WORKSHOPS WITH LCSI

A series of four workshops focusing on LOGOwriter and curriculum were held during the year in collaboration with LCSI. Featured curriculum areas were social studies, language arts, and science and math. Each workshop was designed to help participants better understand the process of developing projects and ideas that use LOGOwriter to enhance the teaching of specific areas, as well as to provide LOGO activities and skills.

These workshops were open to teachers from other school districts as well as the St. Paul LOGO schools, and provided us with an opportunity to share the ideas we have developed in St. Paul, as well as to learn what teachers in other places are doing. Workshops were taught by St. Paul teachers and staff from LCSI, with special participation in both the December and January workshops by Dr. Papert.
NEW LOGO SCHOOLS

Six new schools have become involved with the St. Paul LOGO program this year. They are: Ames Elementary, Highwood Hills Elementary, Jackson Elementary, Sheridan Elementary, Benjamin Mays, and Humboldt Secondary Complex.

Five of the schools have been paired with schools already involved with LOGO. Each of the "old schools" has provided staff to instruct teachers from the "new schools" in using LOGOWriter. The instruction includes a series of afterschool workshops and inservice during the school day. This is a new kind of LOGO staff development model designed to increase networking between schools and staff members. Staff members from "old" LOGO schools involved in this process are:

- Marty Reed (Wheelock) working with Sheridan
- Terry Moore and Dan Gorman (Monroe) working with Benjami n Mays
- Linda Thain and Kathy Ames (Hancock) working with Jackson
- Joan Bodey and Deanna Dick (Prosperity) working with Highwood Hills
- Mary Joyce (Phalen Lake) working with Ames
- Kay Halligan (Humboldt) working with Humboldt Staff

Paired schools will continue to work together next year to continue instruction and inservice in LOGOWriter.

LOGO Talk, a special late afternoon event was held on May 6 to provide these new schools with more information about LOGOWriter and how to use it. Teachers currently involved with the LOGO program presented project and curriculum ideas on the primary, intermediate, and secondary level. There was a panel discussion on various structural options in using LOGO (using a lab as well as computers in individual classrooms) and the role of the LOGO resource teacher in each building. The concluding part of the event was a chance for schools to meet with their paired "old" schools to discuss plans for the coming school year.

LOGOWRITER AT HUMBOLDT

Several staff members at the Humboldt Secondary Complex attended an afterschool LOGOWriter workshop taught by Kay Halligan and Mike Hopkins. Many of those trained have started using LOGOWriter with their students. Others look forward to beginning work with LOGOWriter next year.

One of the most remarkable achievements has been with the physically impaired students. Pat Harty, Speech Clinician with the P.I. Program, working with Frank Kinkowski, Occupational Therapist and technology wizard, have enabled these students to use LOGOWriter. Students interact with the computer through adaptive devices built and designed by Frank. They use a three letter code to enter a Bliss Symbol code. The LOGOWriter program reads the three digit code and follows the directions. Pat says that for the first time these students are able to draw! Next year they plan to pair P.I. students with students in the regular education program who know LOGOWriter and can individualize their computer work to fit each student's needs and abilities.
LOGOWRITER AND JOURNALISM

The Journalism Class at Ramsey Junior High under the guidance of teacher Virginia Broich has been using LOGOWriter for all of its activities this semester. The class has been using the computer lab so all of the students have had lots of time to experiment with LOGO. Three issues of the Ramsey Review have been written with LOGOWriter, using a combination of LOGO-drawn graphics and hand-drawn illustrations. Each member of the class was asked to design an ad for the newspaper as an introductory activity for learning LOGOWriter. These ads were put together on one disk and shown on a large monitor during the lunch periods when the paper was being sold.

Other LOGOWriter activities were surveys on various topics, including one to see which kinds of candy students preferred to buy for fund-raising efforts, and political cartoons.

POLITICAL CARTOONS
Made with LogoWriter

"TECHNICALLY, HE IS OUT OF PRISON"

THE MADNESS HAS JUST BEGUN.

BRANDON PATTON
ANDY SHELE
Ramsey Junior High School

LOGOWRITER AND FOREIGN LANGUAGE

Students at Ramsey and Murray Junior High are bi-lingual in LOGO. Anita Ratwick's German classes at Ramsey have all been using German LOGOWriter. One class is designing personal symbols in LOGO and another class did a project on German architecture. Each group of students researched a particular style, made a representation of that style in LOGOWriter, and then wrote some text in German to explain their drawing.

French I students in Annette Truda's class at Ramsey and Marti Niemala's class at Murray have been designing French towns in French LOGOWriter. Each student picked a building found in a typical French town, drew a representation of the building including two objects you would find in the building, and then wrote some accompanying text in French.

Procedures for the French and German LOGOWriter were written on special pages which the students load into the computer using the GETTOOLS command.
SUMMER INSTITUTE TO FEATURE LEGO-LOGO

This year, our summer institute will allow teachers to learn about the LEGO/LOGO connection and explore activities that use this exciting new system. The institute will be staffed by St. Paul teachers from Galtier Magnet School where a pilot project using LEGO/LOGO has been in operation during this current school year. Technical and design consultants from LEGO Systems and MIT will be in residence to provide additional instruction and information.

The institute will have three main components:

- **LEGO/LAB**: Participants will design, build and program LEGO machines.
- **DESIGN LAB**: Participants will investigate related ideas from art, design, and architecture. They will build models of real and imaginary environments.
- **SITE VISITS**: Participants will have site visits to high-tech cultures in business, industry, and government agencies to explore real-world applications of LEGO/LOGO approaches.

Involvement in LEGO/LOGO is a school-based activity. Schools will make a building-wide commitment to experiment and explore this rich new interdisciplinary culture. Teachers interested in the summer institute should consult their building principals or contact Gerry Kozberg (228-3631) for more information.
The 3M Computer Tutors Newsletter is produced monthly for 3M Employees participating in the 3M Tutorial Program in the area of computer technology. Articles are submitted by members of the group and assembled for distribution.

Editor - Bob Singer

LOGO/WRITER

Currently the primary focus of our Computer Tutor group is a product called LOGO. A computer language which is appropriate for children from elementary through high school designed to enhance human learning. It can help them develop skills in thinking, planning, and logic.

LOGO/Writer is the latest version of LOGO from LOGO Computer Systems Inc. This new version was just made available this summer. The State of Minnesota has showed its support for this product by purchasing the product kit for every elementary school in the state. Besides many of the improvements in the product the big new feature was the introduction of a Word Processor. This now gives the students the capability of creating documents with graphics and text.

WORKSHOP

On October 20 and 21 I had the opportunity, along with Jack Tibbetts and Edward Yu, to attend a Logo Workshop with teachers from South Dakota, Wisconsin and Minnesota. More than learning the syntax of Logo commands and program development, this workshop gave me the opportunity to listen to those teachers that were seated around me and understand how they would use Logo Writer in their classrooms.

Experience in using Logo ranged from several years to never. It was interesting to see the reactions of those that never used Logo and didn't know where to begin. With help from instructors and experienced users they began to see the unfolding of a new tool to be used in the educational process. There were those, however, who felt computers were here to stay and children will need to learn how to use them, but learning to use a computer themselves was out of the question. Not to unusual, most of them drive automobiles but never learned how to repair them and not the least bit interested in learning. However, I felt everybody present saw the value of Logo Writer as the ideal environment in which to educate students in the use of computers and at the same time enhance the educational curriculum.
The statement was made at the workshop, I can’t remember who said it, “A true LOGO problem demands inquiry and discovery”. To me this is bottom line of any computer programming language. Especially Logo Writer where it has appeal (the turtle concept) delivers a challenge (get turtle to do such and such) and at the same time help in developing creative problem solving skills.

Another workshop is scheduled before the end of this year. See you there.

Bob Albright

WE LOGO

If the 3M Logo tutoring experience is to be a success, it seems best that we share program responsibility. Each person within our pilot group is invited to participate to whatever degree he, or she, wishes to. As of this time, the following persons have agreed to support the Logo organizational efforts:

- Jim Cheeseman New Member Training Coordinator.
- Bob Albright Galtier News Reporter, Logo Video Contact Person, 3M Logo Programming Expert (If you have a problem with Logo contact Bob.)
- Bob Singer Newsletter Editor and Highwood Hills News Reporter.
- Rick Burr IBM Logo Disk Contact Person.
- Art Edhlund Prosperity Heights News Reporter.
- Jack Tibbetts Liaison Contact.

As we grow within the Logo experience we may recognize the need for additional support positions. If you are aware of any position that you would like to assist in, please contact Jack Tibbetts.

All responsibilities listed above are temporary, pending group approval.

NEW MEMBERS

Nancy Guerino recently joined the 3M Logo pilot tutoring group. Nancy is currently assigned to Galtier Magnet School to complete initial Logo training. Once trained, building assignment will be determined via St Paul school officials. We sincerely welcome Nancy to our group and we wish her the best.

Officials of St Paul Public Schools have stated that they sincerely hope our Logo tutoring group will grow in size. Please begin to think of ways we may recruit new members for the second session (beginning in February 1986).

Remember we seek individuals who are:

- Computer literate.
- Enjoy working with children.
- Willing to become a part of the 3M tutorial program.

As a group we hope to encourage a membership that is sensitive and representative of the demographics of the St. Paul public school community.

GALTIER NEWS

The first session at Galtier was held in the computer lab. How impressive it was with its 24 Apple IIe computers with all color monitors, except one and several printers.

Paul Krocheski greeted each of us to his school. We had a short introduction before any students arrived. He explained how the lab is used within the school. Each class teacher brings his class into the lab and the students begin to work on their projects. The teacher of the class leads the session with Paul assisting.
A 5th grade class and their teacher arrived and went right to work. Paul got their attention and introduced the 3M tutors to the students and explained why we were there. Then back to work they went and we began to mingle around helping those that raised their hands.

I was impressed by the way the students went right to work without any mischief. The activity between students was just helping each other solve problems.

When is was time, the class picked up their material and moved on to their next activity and then a new class came in to use the lab. It was the same thing as the first, the students went right to work. It was exciting to work with the students and it was difficult to leave when our hour was up.

Bob Singer

PROSPERITY NEWS

The Prosperity tutors were greeted with a big banner printed on the computer saying "Welcome 3M LOGO Tutors". They even had a cake with special icing that welcomed them.

After the special greeting the tutors were introduced to some of the students and teachers. The interaction with the students was in the class room with two students working on the computer at a time.

HIGHWOOD HILLS OUTREACH

Bob Singer and Tom Cahill are involved in introducing Logo to Highwood Hills Elementary School. It is possible that the parents of Highwood may be invited to participate in an evening program designed to introduce them to Logo. If you would be willing to possibly assist in this outreach effort, please contact Tom Cahill.

HIGHWOOD HILLS NEWS

The 3M Tutor program has been providing computer enrichment classes for students in grades 1 to 6 for over three years. The basic goal was to provide computer awareness to the students. But because of limited resources only a small part of the student body had the opportunity to participate. Tom Cahill and myself would like to improve this situation and ideally have every student introduced to the technology of the computer.

The LOGO program which we have recently been exposed to could help us improve our offering to Highwood Hills. The most effective way to reach more students is through the teachers that are with them all day. Initially our tutoring time could be best spent by helping the teachers understand LOGO and how to incorporate its use in the class room.

I have talked to the principal, Mr. Al Peiper, and he has expressed an interest in this approach. He has also discussed this approach to his lead teachers and has received a real positive interest. I will be attending their staff meeting to discuss it in more detail.

Computer resources is currently a problem at Highwood Hills with only 5 Apple IIe computers available to be put into the 12 classrooms. The PTA could be a potential source for support and I will be pursuing this avenue with them.

Bob Singer

MEETING

Please reserve Monday, December 8, 1986 for a Logo luncheon and group meeting. Members of 3M and St Paul Public Schools will be invited to participate in this event. We will meeting in dining room D on the 15th floor of building 220 at 11:30. You have to take the elevator to the 14th floor where you will be directed how to get to the 15th floor elevator.

3M LOGO Tutors Newsletter
When we get together, we will review current progress of the Logo tutorial program and plan for future growth.

**NAME TAGS**

As a result of a recent poll, name tags have been ordered for most of the people within the 3M Logo tutorial group. We believe the use of name tags will assist people in getting to know us.

Most of you should have received your name tags and we thank Jack Tibbitts for coordinating this activity. For future reference the name tags were purchased from Artcraft Engraving Service, Mpls at a cost of $2.65 each.

**TITLES**

As a result of a recent survey, we would request that all 3M Logo tutors strongly encourage the students they interact with to address them by either 'Mr,' 'Mrs,' 'Ms,' or 'Miss.' Nine of the eleven tutors polled felt that the use of a formal title encourages appropriate respect for adult/child interaction and is consistent with professional objectives.

All persons within our Logo group expressed the belief that they felt it would be healthy for adult to adult interaction to be on a first name basis, whenever appropriate.

**PICNIC**

Historically, at the end of the school year, each 3M tutor and the student(s) he/she interacts with are invited to be part of a 3M picnic. We have already recognized that since each of us are likely to interact with several students, this may present a concern. This issue will be discussed at our December 8, meeting.

**XMAS**

Within the regular 3M tutorial program there is a wide variation as to how tutors choose to celebrate Xmas with their students. At some schools, the interaction is modest and at others it has become very elaborate.

As a group, it may be wise for us to come up with an agreement on how 'WE' will address this issue. Hopefully, we will choose a procedure that will represent us well and leave each person free from intimidation.

This issue will be discussed at our December 8, meeting.

**VIDEO**

Most of us have recently reviewed a video (produced by the British Broadcasting System) that addresses the issue of Logo in schools. Please keep in mind that the video may be an excellent tool to help recruit new persons into the Logo tutorial program. Also, if your manager, or any other official associated with 3M, would like to understand more about the program you are pioneering, please feel free to loan a copy of the video to them. If you need a copy of the video, please contact Bob Albright.

**NEWS LETTER**

Currently, we hope to produce a newsletter once per month throughout this pilot year. Please feel free to contribute articles for the newsletter. If you feel it would be desirable to mail people outside our group a copy of our newsletter, please contact Bob Singer.

**SIG**

Bob Albright suggested that it may be wise for us to consider developing a Logo Special Interest
Group (SIG) within the 3M Personal Computing Club. This issue will be addressed at one of our future meetings.

**LUNCH TICKETS**

Each member of the 3m Logo Tutorial group is authorized to have a lunch ticket. The lunch ticket may be used at any 3M cafeteria on each tutoring day and has a value of $2.25. If you do not yet have your lunch ticket, please contact Jack Tibbetts as soon as possible.

**MILEAGE**

Round trip mileage from 3M to Prosperity Heights Elementary School is 10 miles and from Galtier it is 20 miles.

Remember that Dave Ginkel has authorized one car pool to each school, each week, to be reimbursed for mileage.

**REGISTRATION**

Each person who wishes to participate in the 3M Logo tutorial program MUST complete a 3M registration form. If you need a form, please contact Jack Tibbetts.

**OUTREACH**

Dave Ginkel, Manager of Special Community and Corporate Projects, has expressed a keen interest in the progress of our group. He has encouraged each of us to be creative and offer suggestions on how to make the Logo program grow.

Currently, Dave Ginkel has been made aware that there is some interest in developing a video that would be designed to show students and personnel of St Paul Public Schools how we use computers in our world of work. Dave has stated that he is currently unaware of any funding that would support this effort, but he has said he is willing to see what support may be available.

**EVALUATE**

Please keep an informal diary of your experiences with the 3M Logo tutorial experience. If we are to help make the 3M Logo tutorial program a success, we need each member of our group to carefully evaluate each part of the program we are a part of developing. Remember that St Paul Public School Officials already have designed their curriculum. We hope to interact with them in a manner that is cost effective and highly productive for all involved.

**COMPUTER SHARING**

One idea recently offered by some members of our group was that some of us may wish to invite officials of St Paul Public Schools to visit our world of business and see how we use computers. It was felt that the following topics may be of interest:

- Word Processing (on PC's and Main Frame)
- Electronic Mail (All-In-1 and PROFS)
- Data Base Management
- Main Frame Terminal Interaction
- Productive Languages (COBOL, MARK IV, NOMAD2)
- PC Hardware
- PC Application Software
- Lab Processing
- Cardmaster
- VMX Phone Messaging

If we hope to put together an interesting program for our guest, we need more ideas from you. Please contact Bob Singer with your suggestions.

Once a list of ideas has been developed, we will ask St Paul School Officials to prioritize the list according to their interest. Then we will schedule an evening (or perhaps several evenings)
of computer sharing with them.

If you would like to be a part of this program, please let Bob Singer know of your interest.

RECHARGE

Within IS&DP PC70 recharge is 10111000 task 0100 (Civic Affairs Incl Jury). Other divisions use an equivalent recharge.

NSVP

The 3M tutors were invited to the National School Volunteer Program (NSVP) salute to school volunteers. There will be refreshments, 3M Chorus, and big screen previewing of the national television salute to school volunteers and the creative school systems where volunteers enrich the education of students!

- When: Wed. Nov. 12, 1986, from 7PM to 9PM.
- Where: Cafeteria, 3M Center

This event will be taped for future rebroadcast. The national show will be broadcast on CST (The Learning Channel) at 8:00 P.M., November 12, 1986.

REMINDER

The LOGO/Writer package is a product licensed by each school and has the normal Copywrite restrictions. The copies of the software in our possession are authorized under the take-home plan. It is important that you do not copy the software for distribution to anyone outside the LOGO tutoring group. To do so would violate the contractual agreement and could jeopardize the schools license.

If anyone is interested there is a LOGO package that is considered a Shareware product and could be copied for distribution. This product is an Apple LOGO like product that runs on the IBM PC. Its name is LADYBUG and is available through Jim Cheesman. If you would like a copy of this product send Jim a blank diskette and he will return it with LADYBUG on it.
DECEMBER LUNCHEON

Dave Ginkle hosted a lunch for the Computer Tutors and staff involved with the LOGO program from the St. Paul Public Schools. It was a very enjoyable lunch and time of sharing as a group. Thank you Dave for the lunch and the opportunity to get together as a group.

An informal meeting followed lunch to discuss how the new program was working in the two pilot schools. We had reports from Paul Krocheski from Galtier and Joan Bodey from Prosperity Heights on how the tutors were accepted in their schools. It was noted that teachers are willing to use the help, but need to prepare for the new way of sharing teaching with a tutor, like material preparation.

The question of why the Computer Tutor program was growing so fast, was answered by each of the tutors. Some of the ideas shared were:

- A type of evangelism - sharing our knowledge
- Desire to improve education
- Make learning "FUN" and enjoy discoveries
- LOGO is an order of magnitude above other computer languages
- LOGO could reform the way we educate our children
- Not tutors but rather MENTORS

LOGO - ST PAUL PUBLIC SCHOOL PROPECTIVE, THE FIRST FIVE YEARS.

by: Geraldine Kozberg
Director, St Paul Logo Program

From my vantage point at 360 Colborne Street (Central Administration of the St Paul Schools) this is what I see:

COLLABORATION

With Massachusetts' Institute of Technology (MIT), the continued presence and leadership of Seymour Papert (developer of Logo) and members of the MIT Logo Group. Papert-like learning and thinking are providing directions for educational futures.

With Macalester, the search for Logo connections in cognitive psy-
Pedagogical change from a system that is primarily product oriented to one that is focused on process; from a model of didactic top down sequence of learning to a discovery inquiry based format. I see stronger learners, stronger in the sense of learners using their intuition, who claim ownership of their learning and are thus free to risk and to learn more. I see students using learning modalities that are not tapped by traditional methods.

Cultural change. A new culture is evolving. We call it a computer culture, but we are too close to it to fully understand it. We are just beginning to tease out the subtleties and nuances of learning environments that involve incredibly complex relationships between children and machines.

The implications of Logo's learning power are profound. The State Department of Education has purchased a Logo Writer license for every elementary, middle and junior high school in Minnesota, some 1,100 schools! St Paul is in a leadership position of program and staff development. In January, a delegation of Japanese educators, sponsored by the Ministry of Education, will visit St Paul to study the model we have developed. Dr Papert will personally conduct a workshop in St Paul for a selected group of Minnesota science teachers. The opportunity to explore educational futures in here.

We are indeed a community of learners. Thank you, 3M, for helping us remain at the cutting edge of a ever-advancing technology.

The voice of the turtle is strong.

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HIGHWOOD HILLS

The teachers at Highwood had the opportunity of learning what the Logo program is all about. The afternoon session of their In-Service day, Jan 16, was used by Joan Bodey, of Prosperity Heights, in a hand-on introduction of LogoWriter. Bette Svendsen, director of the volunteer program, was on-hand to greet the teachers and also supplied the snack for the afternoon break. Thank you Bette.

The session began with a short video from Bits and Bytes on Computer Languages just before lunch. After lunch all the teachers returned to a computer lab set up in the 6th grade classroom. After the intro of LogoWriter, Joan showed them the four basic commands (FD, BK, RT, LT). Then all the teachers, that could fit around the seven computers, began to test their new skills on the keyboard. Tom Cahill and Bob Singer from the 3M
Computer Tutors were on-hand to assist the new LogoWriter students in getting the turtle perform.

One of the objectives of this introduction session was to find out how many teachers would be willing to begin LogoWriter training. At the end of the session there were 13 teachers that wanted the further training. This presented a problem because the school has only 7 computers. Each teacher that learns LogoWriter will have to have a computer in their classroom.

We'll have to wait until the next month to see how this problem was solved. Anyway, four weeks of Tuesday afternoon classes were scheduled beginning Jan 27. Joan and an associate from Prosperity Heights will conduct the classes. 

The computer is a major tool that has the capability of enhancing the objectives of business and education. If a person hopes to achieve the maximum benefit of their computer, it is vital that they understand the science of 'ergonomics.'

According to a publication entitled ‘Video Display Terminals and the Work Environment,’ "proper application of ergonomics - human factors engineering - can help to relieve the visual and musculoskeletal complaints and create a more satisfying and productive work environment."

Shortly after 3M Tutors began to interact with computers within the St Paul Public School system, it was recognized that many of the computer work stations had not been set up with an understanding of ergonomic principals. Michael W Hinz, Certified Health Physicist of the Health Physics Service Medical Department of 3M, was instrumental in providing St Paul Public School Officials with a 3M publication that addressed the issue of ergonomics. One of the 3M Tutors also offered an American Optometric Association publication, 'Vision and the VDT Operator,' to St Paul Public School Officials.

The St Paul Public School computer instructional staff reviewed the publications, and decided to encourage their educational personnel to implement ergonomic principals within their buildings.

3M Tutors at Prosperity Heights Elementary School offered to assist both the students and adults of Prosperity with the implementation of ergonomics at all computer work stations.

On 2 January 1987, the following letter was mailed to the 3M Computer Tutor news editor, Bob Singer: "Dear Bob,

(I) Just want to inform you how pleased I am with the 3M Tutors that come to Prosperity Heights. Not only are they working with the students, but (they) are concerned about the total computer system in the school.

The computer in the office was incorrectly installed for maximum efficiency. The printer was in the wrong location, which caused several misfeed problems. Also, there were several adjustments that needed correction. Your 3M Tutors took the time to totally tear-down the lay-out and revise it. The result is phenomenal. It has made my job much easier and has eliminated my frustration level with several things on the computer.

A big thank you to all of you for caring enough about the staff in addition to the students. I really appreciate it.

Sincerely,
Mrs Linda Christensen,
Secretary
Prosperity Heights Elementary School"

In addition to Prosperity Heights Elementary School, 3M Tutors have also helped Battle Creek Elementary School and Highwood Hills Elementary School in re-working their computer work stations to be ergonomically correct.
During the month of December, Dave Ginkel, 3M Tutors, and members of St Paul Public School Staff had a benchmark luncheon meeting. Because extensive sharing of program information occurred at that meeting, it was decided not to publish a newsletter in December.

PHONE CHANGES

Recently St Paul Public School officials chose to install a centrex phone system. As a result of the new phone system, most St Paul Public School phone numbers have been changed.

TEAMWORK

The 3M Computer Tutor program grows because of the combined teamwork of its members. During the month of January Nancy Guerino, offered to keep the 3M Computer Tutor / St Paul School Staff phone listing up to date. If you need an current phone listing, or if you wish to have the phone listing altered, please contact Nancy.

COORDINATORS

Art Edhlund, Nancy Guerino, and Bob Singer have offered to be school building coordinators for the 3M Computer Tutor program. It is the responsibility of each building coordinator to distribute information to program support personnel within their building and to take information polls as needed. We sincerely appreciate the volunteer spirit of each school building coordinator.

3M TOUR

St Paul Public School staff members, who are directly involved in working with the 3M Computer Tutor program, have expressed an interest in gaining a better understanding of how 3M employees use computers in the world of business and research. Tom Cahill has offered to work with Dave Ginkel, 3M Manager Of Special Community and Corporate Projects, to seek an clearer understanding of the scope of St Paul Public School staff interest. Once Tom has an understanding of the areas of interest, and appropriate security clearance to proceed, he will seek the support of 3M Computer Tutors to host an after work tour. Several 3M Computer Tutors have already expressed their interest in being a part of this project. We appreciate Tom accepting this challenging responsibility and we wish him the best of good fortune.

WORKSHOP

St. Paul Public Schools and Logo Computer Systems Incorporated will be conducting a workshop on using Logo Writer in support of a school's math and science curriculum. The one and one-half day workshop will begin on Monday afternoon, 23 March 1987, and be completed with a full day on Tuesday, 24 March 1987. St Paul Public School officials have offered three 3M Computer Tutors an opportunity to attend the workshop as their guest. Normal cost for the workshop is $90 per person. If you are interested in attending this workshop, please contact Jack Tibbetts by February 27.
The Board of Directors of the 3M Personal Computer Club (PCC) have offered to allow select members of the St Paul Public School computer staff to have limited access to the PCC Bulletin Board. Jeff Neilsen, a welcome new 3M Computer Tutor, has offered to volunteer his service to help set up this program. We sincerely appreciate the contribution the 3M Personal Computer Club is offering to St Paul Public Schools via the 3M Computer Tutor program and Jeff's volunteer spirit.

It can be truly stated that the personnel of 3M and the staff of St Paul Public Schools are professional people of different disciplines who are working together for the enrichment of our community.

MEMORIZING VS THINKING

The 12 January 1987 issue of Newsweek contains an interesting article on education entitled "Memorizing VS Thinking" (see page 60).

The 19 January 1987 issue of US News and World Report also contains an interesting education article beginning on page 58 entitled 'The Brain Battle.'

The Computer Newsletter
Editor:
Bob Singer

Contributors:
Joan Bodey
Geraldine Kozberg
Paul Krocheski
Bob Singer
Jack Tibbetts
TUTOR TRAINING

A LOGO training session for eleven new 3M Logo Tutors was held on the 3rd and 4th of February at Humbolt Senior High School.

Joan Bodey, Ellery Carr, Paul Krocheski, Kathy Thimmesch, and Bob Albright introduced the new tutors to Logo. Many of the persons who attended the training session expressed appreciation for the knowledge shared and were most eager to become involved with St Paul Public School students.

At the completion of the training session, the new 3M Logo Tutors were assigned to the following schools:

Galtier:

George Allen
Joe Gasper
Steve Merrick
Jeff Neilsen
Pam Solstad

Prosperity Heights:

Alton Bennett
Colleen Cleary
Mark Dandurand
Jim Echols
Neil Franey
Ed Martell

On February 10th each new tutor had an opportunity to visit the school where they were assigned, view children actually using the language, and meet the students they were eventually to work with.

With the completion of the February 1987 training session the Logo tutorial group had grown to include twenty active (Logo) tutors, two support persons, and three resource persons.

Next fall we hope to add several new members to our group. Hopefully, each member of the current 3M Logo Tutors will help to recruit an additional member by September.

PROSPERITY NEWS

by:

Art Edhlund

REINFORCEMENTS

Six new tutors have joined the four pioneers at Prosperity School. They are:

Alton Bennett, an advanced computer analyst from IS&DP (Information Systems and Data Processing) Division. Alton specializes in Finance and accounting systems.
Colleen Cleary, a computer programmer from IS&DP. Her specialty is in Marketing and Sales Systems.

Mark Dandurand, an advanced computer analyst from IS&DP. His interest is in Resource Systems.

Jim Echols, a Research and Development Supervisor from the Specialty Chemicals Division Laboratories. Jim will tutor on Wednesdays, because of a Tuesday conflict.

Neil Franey, an advanced computer Specialist from IS&DP. Neil serves as RD liaison for the division.

Ed Martell, a Lead Computer Analyst from IS&DP. Ed is in IS&DP Systems Administration.

TRANSPORTATION

Car Pools have been organized from 3M center to Prosperity School. Dale Peipho and Alton Bennett are the primary drivers. The group ride, provides good opportunity to exchange LogoWriter problems and solutions.

SPECIAL PROJECTS

Joan Bodey has issued some real challenges to some tutors and their kids. Dale Piepho, working with Libby Pederson and David Crowe from Frank Kastelic's sixth grade, are writing procedures to display text as a page in a graphic book. But, get this, the pages will turn from right to left, revealing new text on the following page! A real test for Dale, Libby, David, and LogoWriter.

Jack Tibbetts and his team of Dan Christensen and Dara Savandy from Roger Hickman's forth grade class, have been asked to write an interactive program that will graphically illustrate the basic magnetic principles of attraction.

Both programs are well underway at this writing. . .

QUADLINK

by: Bob Singer

For you IBM PC users out there that want to run some Apple II software but you would rather not buy another computer, Quadram Corp. has a solution for you. It is a product called Quadlink for around a $400 mail order price, that will put the function of an Apple II Plus in to the IBM PC. This product was first introduced in 1983 at a price of $600.

The product consists of a long board and two diskettes. The first diskette is in PC DOS format with the Quadlink software. The other is an Apple II DOS 3.3 formatted diskette with a general file utility (The Filer) software package. One of the five options on the menu is the QUADCOPY used to copy Apple II files to IBM formatted disks or IBM to Apple II.

The Quadlink board consists of the Apple II CPU, video circuitry, and its own 64K of memory. Once installed the Quadlink shares all the peripherals of the IBM PC, like the keyboard, monitor, disk drives (A B only), printer port, and the COM port.

Both the IBM and the Apple II operate at the same time and you can hotkey back and forth with Ctrl/Alt "A" for Apple and Ctrl/Alt "I" for IBM.

I use the Apple II environment (Quadlink) for several applications that are written in AppleSoft BASIC. I also have been able to run the LogoWriter software even though the environment is basically an Apple II Plus. LogoWriter normally will not run on an Apple II Plus. The buttons on my Koala pad work in place of the OPEN/CLOSE apple keys or if you have a set of paddles the paddle buttons work too. The Quadlink has a connector just like the Apple II Plus for plugging in game peripherals.

Along with the color in both the graphics mode and the text mode, it has 80 column display that is compatible with the Videoterm by Videx. It is activated by typing PR#3 and pressing RETURN.
I have had the Quadlink board installed in my IBM PC for three years and found the Quadlink system to be very useful and reliable system for my applications.

LIBRARY

We are in the process of establishing a LOGO library which will contain reference items, books, etc. pertaining to LOGO. The Library will initially be in Jim Cheeseman's office. If you have any ideas or suggestions as to items that should be included, please contact Jim Cheeseman.

LOGO DISK

St Paul Public School officials have authorized Jim Cheeseman to provide a copy of LogoWriter to each member of the 3M Logo Tutor group. Please remember that LogoWriter is a copyrighted language and the (LogoWriter) disks that are used by members of the 3M Logo Tutorial group are not to be copied.

In addition to LogoWriter, Jim Cheeseman also has a copy of a shareware Logo look-a-like program called LadyBug available for anyone who would wish a copy. Rick Burr has provided Jim with several copies of the LadyBug manual.

Any person interested in obtaining a copy of LogoWriter or LadyBug should contact Jim (733-2804) as soon as possible. Please be aware that you must provide one blank disk to Jim for each copy you desire.

DATA BASE

Nancy Guerino has invested a considerable amount of time to develop a 3M Logo Tutor data base. If you need a up-to-date Logo tutors phone list, mailing labels, and/or information for car-pooling, please contact Nancy at 736-1471.

LOGO SIG

On February 5, 1987 the 3M Personal Computing Club (PCC) Board of Directors voted to recognize the formation of a Logo Special Interest Group (SIG).

Each person who attends a Logo SIG meeting should have a rich opportunity to increase their knowledge of Logo. Each meeting is likely to include a formal Logo presentation and an opportunity for members to share Logo skills with one another. Logo SIG members will be encouraged to invite guest to meetings.

The 3M Logo SIG program should be of great value to any person who may have a general interest in Logo, and a special value to 3M computer literate volunteers who are members to 3M's Logo Tutor program. Hopefully, many of the guest who visit the Logo SIG will choose to become a future member of 3M's Logo Tutorial program.
Meetings will be held in Building 236, room B-147 from 11:30 to 12:30. The day of the week has not yet been identified. The first meeting should occur during the month of March 1987.

Any 3M employee who is a member of the 3M Personal Computing Club is welcome to become a member of the 3M Logo SIG.

If you would like more information about the new 3M Logo SIG, please contact Bob Albright.

CURRICULUM

We sincerely hope that each 3M Logo Tutor will eventually develop an in-depth understanding of the LogoWriter language. As we each grow in our understanding of Logo, we will have a better opportunity to be of service to our community.

However, while we hope each of you will become excited about many of LogoWriter's program features, please always be sensitive to the curriculum planned by the students teacher. Try to coordinate any new features you will be introducing to your LogoWriter students with his or her teacher.

We have asked St Paul Public School staff members who have children involved with the 3M Logo Tutorial program, to please advise their 3M Logo tutor, in advance, of the skills they would like support on.

* * *

EYE WEAR

By:
Mike Hinz
3M Health Physics Serv.

People who wear bifocals or trifocals and use video display terminals frequently find it necessary to tilt their head back in order to clearly focus on the information on the screen. This can result in complaints of upper back and neck discomfort or stiffness. A solution to this problem is corrective lenses with the focal distance set so there is a minimum or no tilting of the head, thereby eliminating most discomfort.

Have a co-worker measure the distance from your eyes to the center of the screen. Then ask your eye doctor or optician to write out a prescription for this distance. People who wear BIFOCALS normally order single vision lenses with the focal distance set at the distance their eyes are from the screen. TRIFOCAL wearers normally order lenses with the computer distance correction at the top and their bifocal (reading distance) correction at the bottom. Your eye doctor or optician should be able to tell you what will work out best for your particular situation.

Because computer glasses do not incorporate a distance correction, they can't be used for driving and people wearing them may have difficulty in focusing if they look across the room. But they will relieve the discomfort of tilting the head back at the terminal.

* * *

3M Logo Tutors Newsletter
Editor:
Bob Singer

Contributors:
Bob Albright
Jim Cheeseman
Art Edhlund
Mike Hinz
Bob Singer
Jack Tibbetts
The 3M Logo Tutors Newsletter is produced monthly for 3M Employees participating in the 3M Tutorial Program in the area of computer technology. Articles are submitted by members of the group and assembled for distribution.

LOGO REFERENCE LIBRARY

In the autumn of 1984 the 3M Logo tutoring program began. Participants in the program had to be computer literate and had to complete a Logo training program that was taught by members of the St. Paul Public School System.

However, as excellent as the training program proved to be, it soon became apparent that the technical demands of the program would make it necessary for each Logo tutor to continue his, or her pursuit of additional Logo skills.

It also became apparent that if each Logo tutor was required to develop his, or her own library of Logo materials, then the expense could have become an unreasonable burden for St. Paul Public School, 3M, or each 3M Logo Tutor.

In early December 1986, Dave Ginkle of 3M Community Affairs, reviewed the concept of developing a 3M Logo Tutors' reference library and a development plan was initiated shortly thereafter.

During the past few months, a considerable amount of work has been completed and we are now pleased to announce that the 3M Logo Tutors' reference library is finally available to each and every member of the 3M Logo Tutor program.

Currently, the Library contains four books. We have two copies of "Mindstorm" by Seymour Papert; one copy of "Apple Logo For Teachers" by Earl Babbie; and one copy of "Apple Logo" by Harold Abelson.

The 3M Logo Tutor's library also contains many interesting, brief articles that were provided to us via the staff of the St. Paul Public School system. These articles are mounted within several three ring binders.

Binder "A" contains:
1. From the Desk Of Dr. Papert
3. Logo Today: Vision and Reality
4. Microworlds: Transforming Education
5. New Theories For New Learning

Binder "B" contains:
1. The Mystery of Mastery
2. Computer Criticism vs Technocentric Thinking
3. Education And Thinking
(The Role Of Knowledge)

Binder "C" contains:
1. Introduction
2. The Information Processing Approach
3. Cognition (Exploring The Interior Universe)
4. The Program Within The Program

Binder "D" contains:
1. Logo / Learning In A Computer Culture (Paper by St. Paul Public Schools)
2. Computer As Mudpie
3. Cognition Development
4. Middle Childhood And Adolescence
5. Intelligence (New Ways To Measure The Wisdom Of Man)

Binder "E" contains:
1. Decisions
2. A Model For Improving Problem Solving
3. Mindworks

Binder "F" contains:
1. Logo And The Nature Of Learning
2. Problem Spaces In A Project-Orientated Logo Environment
3. Problem-Solving Activities In A Computer Environment: A Different Angle Of Vision
4. Testimony To The National Governor's Association Task Force On Advanced Technology.

Dave Ginkel, manager for 3M Community Affairs, has already contacted officials of St. Paul Public Schools to try to acquire additional reference books for the library.

Alton Bennett, IS&DP Finance and Accounting, and Jim Cheeseman, IS&DP Technical Services, have both agreed to help administer the growing library in the future.

At the present time, all 3M Logo Tutor Library Reference materials will be stored in Jim Cheeseman's office (224-4S-02). If you wish to sign out book, or article, please contact either Alton Bennett (733-4338) or Jim Cheeseman (733-2804).

Mark A Dandurand recently read the book "Apple Logo For Teachers." His excellent book review is included within this issue of the 3M Logo Tutors Newsletter.

We plan to include one book, or article review in each future issue of this publication.

During the next several months we look forward to expanding the library to include additional Logo related books and articles. If you are aware of any publication you believe would be a valuable addition to the 3M Logo tutors' Reference Library, please make your interest known to the library's administrative staff.

We sincerely hope the 3M Logo Tutors' Reference Library will become a valuable resource and service to each person interested in the 3M Logo Tutor program.

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BOOK REPORT
"Apple Logo for Teachers" by Earl Babbie - 1984

Report by: Mark A. Dandurand Logo Tutor
Being a new person in the 3M Logo Tutoring program I can use all the help I can get. One of the best forms of help I have received is from the book "Apple Logo for Teachers". It starts out in Chapter 1 "Getting Started" with basic student concerns like "I may destroy the computer?" and "I might erase or damage Logo", and other very basic and simple concepts for the beginner. Chapter 19 is "Advanced Text Processing" and Chapter 20 is "Teaching Logo in the Classroom". The book is very well written for someone doing tutoring. Each chapter follows a basic format of:

1. A Powerful Idea (the new information)
2. How to do it
3. Illustrations
4. A list of common bugs
5. Exploring further (sample problem)
6. Teaching Objectives
7. Student Exercises or a Logo Challenge

There's a lot of sample coding and examples. It is a help in trying to deliver the information in "Mind-size Bites". And in the back of the book is all the answers to "Exploring Further", "Student Exercises, & Logo Challenges".

I personally suggest this book as a must for all Logo Tutors and there is a copy available in the new 3M Logo Tutoring Reference Library.

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**LOGO SEMINAR**

by: George Allen

Perhaps too few of us at 3M have heard of LogoWriter. It's a wonderful language. On March 4th, the St. Paul Public Schools hosted a seminar for Logo teachers and volunteer tutors. The facilitators were all excellent and generated great enthusiasm among seminar participants.

LogoWriter, a later version of Logo, is unique. Its skill in building applications may range from students in grade K1 through graduate and postgraduate levels and beyond. LogoWriter provides unlimited potential for conceptual applications in mathematics, music, art, the physical sciences, language arts, and robotics (Lego-Logo).

At the seminar, teachers demonstrated some of the uses to which LogoWriter is being applied. For example, at Hancock School, Ann Sanderson's students perform blindfolded journeys through a maze. Commands of right turn 90 degrees, 5 steps forward, left turn 90 degrees, 5 steps forward, left turn 90 degrees, 5 steps forward, left turn 90 degrees, 5 steps forward, enables the student to complete a square. The commands are issued by other students guiding his/her movements. In this exercise the blindfolded student is the turtle. This becomes fun, and at the same time helps the students to learn angles and geometric forms. Concepts of angles and geometric forms must be understood when using the turtle to draw designs on the screen.

Paul Krocheski and Karen Timmesch at Galtier School are developing applications in Lego-Logo (robotics). This endeavor will give both teachers and kids opportunities to exhaust the farthest reaches of their talents in exploring concepts in electro-mechanical applications.

Celeste Carty and others at Maxfield School are providing direction and support to their kids in the math and science disciplines. The application of Logo into these areas becomes especially important when considering how these particular disciplines apply to our innermost and outermost existence.

Anita Ratwik and Annette Truda of Ramsey Jr. High showed tapes of their students translating French and German languages into Logo commands and applications.

The seminar was both enjoyable and exciting. Getting out and seeing the enthusiasm and participation of the teachers...
and tutors was indeed a wonderful experience.

We can be quite proud of ourselves at 3M for the bonding partnership which continues in volunteerism, community, and educational support.

A last note, for a moment, to say thanks to all.

**LOGO SIG**

On March 30, 1987, the 3M Personal Computing Club (PCC) Logo Special Interest Group (SIG) had its first meeting in building 236.

Bob Albright, 3M Lab Building Manager, was meeting facilitator. He quickly advised the group that the content of the meeting would be flexible in accordance with the group’s interest and needs.

Possible topics of interest for future meetings might include the following:

1. Teaching Methods
2. Available Resources
3. Types of Assignments
4. Show and tell
5. Problem discussions (and)
6. Programming tips and techniques

Bob demonstrated two Logo programs he recently completed.

The first Program demonstrated was called "Typing Tutor." In this program a random letter is produced at the top of the screen and shortly thereafter, begins to fall towards the mouth of a shark at the bottom of the screen. Hopefully, the student will find the correct key before the shark 'eats' the letter. Bob has set the program up so that the speed may be altered according to the skill level of the student.

The next program that was demonstrated was called "Merlin." This program is a game of skill complete with clever graphics and music.

Bob was very willing to provide a copy of his coding and/or a copy of his disk to anyone who asked for one.

The 3M Logo SIG is off to a good beginning, and we look forward to keeping you informed on the group’s progress in the months ahead.

Many thanks to Bob Albright for his ongoing creative inspiration and support of the Logo program.

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**ELECTRONIC MAIL BETWEEN LOGO TUTORS**

The 3M Personal Computing Club (PCC) has opened a new conference area on the Bulletin Board System (BBS), dedicated to discussions on educational software and teaching computer skills to children. This is especially appropriate for those of us involved in the 3M Logo Tutor program, as it can serve as a means for exchanging information, asking questions and expanding our networking capabilities between ourselves as well as the 3M computing community.

Some of the features of this system are:

Electronic Mail - Messages can be private, addressed only to another caller, or public where anyone can read and reply to them. Any replies to a message are "linked" to the message, so that a continuing discussion can take place, and callers can read from reply to reply and enter responses whenever they wish.

Educational Programs - There is a large base of public domain programs on the bulletin board. These programs can be downloaded to your computer and used at home. At the present time the number of programs designated as educational is limited, but hopefully this will grow as the interest in educational software expands.
Since the BBS is a private system for PCC members, the club does require that any 3M employee wanting to access the system join the club. Dues are $8 per year, which includes a subscription to the monthly magazine, discounts on computer supplies, etc.

The phone number for the bulletin board is 736-7275. It is accessible 24 hours per day, seven days per week, and can accommodate 300 or 1200 baud modems. You should set your computer for 8-bit, no parity, 1-stop-bit.

If you encounter busy signals when you call in, remember that the bulletin board has proven extremely popular among the PCC members, so try again in a few minutes. If you have any questions or problems, please give me (Jeff Nielsen) a call at 736-0251.

REMINDER

Please remember that the LogoWriter programs should NOT be shared with anyone outside the 3M Logo Tutor Group.

A BIGGER LOGO/WRITER

Bob Albright advised the staff of the 3M Logo Tutors Newsletter that a new copy of LogoWriter has been developed for the 128K Apples and should be available in the autumn of 1987.

LOGO TUTOR DIRECTORY

If you have any need for a copy of a 3M Logo Tutors membership listing, complete with current addresses and phone numbers, please contact 3M Logo Tutors' data base administrator Nancy Guerino, at 736-1471. Nancy is also most willing to produce mail labels upon request.

LOGO/LEGO VIDEO

We have been advised that a new video has been produced regarding the Logo-Lego project. Jim Cheeseman is currently trying to get more information about the availability of that video.

From all we have heard, we believe the video would be of considerable interest to all persons involved in support of the 3M Logo Tutor program.

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