LOGO 85 PRE-PROCEEDINGS

Massachusetts Institute of Technology
Cambridge, Massachusetts
July 22 - 25, 1985

Sponsored by the
Laboratory for Computer Science
Massachusetts Institute of Technology

EDITING AND COMPILATION OF THE
LOGO 85 PRE-PROCEEDINGS
BY MARK PALMGREN
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

TABLE OF CONTENTS

PREFACE

Logo 85 will be held from July 22 through July 25, 1985 at the Massachusetts Institute of Technology, under the sponsorship of the MIT Laboratory for Computer Science. This is the second in a series of annual conferences intended to foster communication within the Logo community. The presentations are aimed toward people who are familiar with Logo and actively involved with it. Logo 85 will include five plenary sessions featuring internationally famous Logo researchers and educational theorists. But the real heart of the conference is the more than 100 presentations by Logo teachers and researchers throughout the world. Abstracts of the presentations are included in these pre-proceedings. In addition to the program listed here, there will also be commercial presentations and exhibits running throughout the duration of the conference. Detailed schedules will be provided at the conference registration.

On behalf of the Organizing Committee, I would like to thank all the people who responded to our call for papers. We were surprised (overwhelmed, in fact) at the magnitude and the quality of the response. Unfortunately, this meant that we had to decline many excellent proposals for presentations.

We would also like to thank all speakers, exhibitors, volunteer helpers, and companies who have contributed to the success of the conference. Also, as chair of the committee, I would like to especially thank: Mark Palmgren for assembling and editing these preproceedings; Joyce Tobias, for coordinating contacts with corporate sponsors; and Tom Lough, for compiling the bibliography of Logo publications that is included here.

Hal Abelson
Co-Chair, Logo 85

GENERAL INFORMATION

Registration

The registration fee for the conference is $135 if paid before June 1, 1985, and $165 if paid after that date. This fee includes admission to all sessions; one copy of the Pre-Proceedings; the Welcoming Reception on Monday, July 22; lunch on Tuesday and Wednesday, July 23 and 24; the Exhibitors Reception on Tuesday, July 23; and the Banquet on Wednesday, July 24.

Registration at the conference will be held in the MIT Athletics Center Lobby on Monday, July 22, from 12:00 noon until 6:00 p.m. A registration/information desk will be located in the Athletics Center Lobby during the conference and will be available to conference participants, their families and friends for information and assistance. The conference telephone number is (617) 253-0823, and participants may have messages taken for them at this number.

On-Campus Housing

Single and double dormitory rooms on the MIT campus will be available to conference participants from Sunday, July 21 through Saturday July 27, 1985. Dormitories are located along the Charles River, within walking distance to all conference facilities. All rooms are furnished with twin-size beds, bed linens, blankets, towels and soap; rooms are serviced each day. There are no private baths or air-conditioned rooms on campus. Dormitories are equipped with elevators, ice machines, and coin-operated laundry facilities. There are telephones located in each room allowing campus and local calls. Public telephones are situated in the lobby of each building. The dormitory desks are staffed from 8:00 a.m. to 1:00 a.m. daily.

Cots are available for children between the ages of 6 and 14, with a maximum of two cots per double room. Youths over the age of 14 must be accommodated in a separate room.

The dormitory rates are $30 per night for a single room, and $34 per night for a double room. Cots are charged at $6 per child, per night.

Prepayment for the anticipated number of nights is required. A full refund will be granted if cancellation is received two weeks prior to the start of the conference (July 9). No refunds will be made after the arrival for nights the rooms are not occupied, except for early departure if 24-hours notice is given.

Dormitory rooms can be reserved by sending payment by check or money order, in U.S. currency (no credit cards please), to MIT Special Events Office, Room 7-111, Cambridge, MA 02139.

Off-Campus Housing

A block of rooms has been reserved for those participants who do not wish on-campus accommodations. Attendees should contact the hotel directly. Please state that you will be attending this conference when making your reservations. Availability and rate are not guaranteed after June 24, 1985. Room rates do not include a 5.7% tax.

Royal Sonesta
5 Cambridge Parkway
Cambridge, MA 02142
(617) 491-3600
Single $75. Double $85.

The Sonesta is located on the Charles River, approximately 3/4 of a mile from MIT. This hotel has a complimentary shuttle service to the campus. Parking is also available.

On-Campus Dining

Lunch on Tuesday and Wednesday, July 23 and 24, will be provided in the Athletics Center.

Families and guests may use the Lobdell Cafeteria in the MIT Student Center for breakfast and dinner at their own expense. A dining guide to the many eateries in the Cambridge/Boston area will be available at the conference information desk in the Athletics Center Lobby.

Transportation

Logan International Airport is approximately six miles from MIT. Taxi fare to the campus is about $12 regardless of the number of passengers. There is public transportation between the airport and MIT, however this involves a bus ride and three subway transfers.

If you are arriving by train at Boston's South Station, take the MBTA Red Line to the Kendall Square subway stop. Subway fare is 60 cents each way.

Sightseeing

Cambridge and Boston offer a wide variety of daytime and evening activities boasting a unique combination of old and new. Faneuil Hall and Quincy Market afford many fascinating shops and restaurants. There is an abundance of eating establishments in the area offering dozens of different cuisines, including Boston's famous seafood.

Attractions of particular interest include the Freedom Trail, the Museum of Fine Arts, the John F. Kennedy Library, the Museum of Science, the John Hancock Tower, Copley Place, the Isabella Stewart Gardner Museum, and Boston's historic waterfront. In addition to the many musical events taking place in Boston, there are a number of fine theatres.

Information on these and other tourist attractions will be available at the information desk in the Athletics Center lobby.

Climate and Dress

New England's weather is notoriously unpredictable, but during July the weather in Boston is generally warm and pleasant. The average temperature during the day is 75 degrees Fahrenheit, but this can sometimes be accompanied by high humidity. A light jacket may be needed in the evening; rainwear is usually not necessary, however it would be advisable to come prepared.

Special Events

A Welcoming Reception will be held on Monday, July 22, from 6:00 to 8:00 p.m. in the MIT Athletics Center. This reception is open to all conference participants and their guests.

On Tuesday, July 23, the Contributors and Exhibitors will host a Reception in the Sala de Puerto Rico (MIT Student Center), where all exhibits will be located.

The Conference Banquet will be held on Wednesday, July 24, in the MIT Athletics Center. Musical entertainment will be provided. Tickets for guests may be purchased at $25 per person (please see the enclosed registration form). The cost to participants is included in the registration fee.

CONFERENCE ARRANGEMENTS/QUESTIONS

Questions concerning any of the conference arrangements should be directed to the MIT Special Events Office, Room 7-111, Cambridge, Massachusetts 02139, Telephone (617) 253-1703.

LOGO 85 - SCHEDULE OF EVENTS

Monday, July 22

12:00-6:00 P.M.	REGISTRATION Athletics Center Lobby
4:00-5:30 P.M.	PLENARY SESSION A Kresge Auditorium
6:00-8:00 P.M.	WELCOMING RECEPTION Athletics Center

Tuesday, July 23

8:30-10:00 A.M.	SESSION I Various Sites
10:00-10:30 A.M.	COFFEE/BREAK Sala de Puerto Rico, MIT Student Center
10:30-12:00 P.M.	SESSION II Various Sites
12:00-2:00 P.M.	LUNCH Athletics Center
2:00-3:30 P.M.	PLENARY SESSION B Kresge Auditorium
3:30-4:00 P.M.	COFFEE/BREAK Sala de Puerto Rico, MIT Student Center
4:00-5:30 P.M.	SESSION III Various Sites

6:00-8:00 P.M.	EXHIBITOR'S RECEPTION Sala de Puerto Rico, MIT Student Center
8:00-9:30 P.M.	PLENARY SESSION C Kresge Auditorium

Wednesday, July 24

8:30-10:00 A.M.	SESSION IV Various Sites
10:00-10:30 A.M.	COFFEE/BREAK Sala de Puerto Rico, MIT Student Center
10:30-12:00 P.M.	SESSION V Various Sites
12:00-2:00 P.M.	LUNCH Athletics Center
2:00-3:30 P.M.	PLENARY SESSION D Kresge Auditorium
3:30-4:00 P.M.	COFFEE/BREAK Sala de Puerto Rico, MIT Student Center
4:00-5:30 P.M.	SESSION VI Various Sites
7:30 P.M.	BANQUET Athletics Center

Thursday, July 25

8:30-10:00 A.M.	SESSION VII Various Sites

10:00-10:30 A.M.	COFFEE/BREAK Sala de Puerto Rico, MIT Student Center
10:30-12:00 P.M.	PLENARY SESSION E Kresge Auditorium

LOGO 85 - CONFERENCE PROGRAM

1. MONDAY, JULY 22

Registration	12:00-6:00 P.M. Athletics Center Lobby
PLENARY SESSION A	4:00-5:30 P.M. Kresge Auditorium
Seymour Papert	
WELCOMING RECEPTION	6:00-8:00 P.M. Athletics Center

2. TUESDAY, JULY 23

SESSION I

8:30-10:00 A.M.
Parallel Sessions

PAGE NUMBERS REFER TO ABSTRACTS CONTAINED IN THESE PROCEEDINGS.

1) *Building 4, Room 4-370*

* Sharon Burrowes, "Logo in the High School: Successes, Failures, and Future Concerns" page 59
write for paper
* E. Paul Goldenberg, "On Being Creative" page 109

2) *Building 4, Room 4-270*

* Jeanne Bamberger, "Logo Music" page 36

* Ilse H. Schenk, "Visual Thinking with Logo: Powerful Catalyst for an Integrated Curriculum" page 197

3) *Building 4, Room 4-163*

* Alison Birch, Laurie Geannelis, and Marlene Kliman, "Logo Programming Style and Techniques" page 130

* Beverly Cunningham, "Elementary School Users' Groups" page 77

4) *Kresge, Rehearsal Room A*

* Jacqueline M. Dewar, "Incorporating Computer Literacy into a Math Course for Pre-Service Elementary Teachers" page 89

* C. Dianne Martin, "Analyzing Teacher Training in Logo Using a Stages-of-Concern Taxonomy" page 149
write for paper

5) *Kresge, Rehearsal Room B*

* David J. Cartmell, "Logo with Digitized Speech for Special Education" page 63

* Duane McGriff, "The 3 L's: Language, Literacy and Logo" page 156

6) *Building 4, Room 4-231*

* Mark J. Guzdial, "Object-Oriented Programming in Logo" page 113

* Jeremy A. Jones, "An Object-Oriented Extension to Logo" page 126

7) *Student Center West Lounge*

* Antonia Stone, "Logo in Corrections Education" page 220

* M. Sz. Turcsanyi, "Logo in a University Education: Experiments and Plans" page 242

8) *Student Center Room 491*

* Douglas H. Clements, Empirical Evaluation of Logo in Elementary Education: Research Review and Implications" page 73
write for paper

* Ann D. Thompson, "Logo: Is It Possible for All Upper Elementary Students and Teachers?" page 231
write for paper

9) *Student Center Room 407*

* Lynn Lieberman, "Logo: An Integratable Tool" page 141

* Marian B. Rosen, "Less Is More...For Now" page 191

10) *Building 4, Room 4-149*

* Meryle H. Kohn, "Developing Problem Solving Skills in a Logo-Based Pre-Engineering Mini-Course" page 132

* Tim Matthews, "Logo and Patterns in Middle School Science" page 150

11) *Building 4, Room 4-153*

* Loren Abdulezer, *et. al.*, "Logo in the Business and Professional Environment" page 32

12) *Kresge Auditorium*

* Informal discussion with Seymour Papert

Coffee/Break — **10:00-10:30 A.M. Sala de Puerto Rico, MIT Student Center**

SESSION II — **10:30 A.M.-12:00 P.M. Parallel Sessions**

1) *Building 4, Room 4-370*

* Brian Silverman, "Using Macintosh Logo to Create Microworlds" page 206

* Eric Brown, "A Lecture/Demonstration of LCSI Logo for the Macintosh" page 51

2) *Building 4, Room 4-270*

* Sandra Wills, "Doodle, Design, Debug: Process vs. Content in Teaching Logo" page 258

* Monica Shapiro, "The Teacher in the Logo Environment" page 201

3) *Building 4, Room 4-163*

* Carol Dworman, "The New York Computer School" page 93

4) *Kresge, Rehearsal Room A*

* Tamar Globerson and David Mioduser, "Learning Logo Mindfully: A Model Course" page 161

* Bob Lawler, "Methodology in Learning Studies: The Case Approach" page 137

5) *Kresge, Rehearsal Room B*

* Steve Tipps, "Sampling with Logo: A Microworld for Educational Research" page 236

* Andrew David, "Artful Futures: A Children's Design House and Other Experiments" page 81

6) *Building 4, Room 4-231*

* Donna Bearden, "The Projects Approach to Logo; An Example: Tessellations" page 43

* Michael Friendly, "Sprouting Trees in Logo" page 104
write for paper

7) *Student Center West Lounge*

* Geraldine Kozberg, "Making Logo Happen: Role of the School Administrator" page 134
met her last year

* Sheila Cory and Margie Walker, "From Plan to Implementation: A Focus on Process" page 75
Write for paper if necessary

8) *Student Center Room 491*

* Mariela Tovar and Jesus Vazquez-Abad, "Some Aspects of Children's Social Interaction in Small Group Problem-Solving with Logo" page 240

* Valerie A. Clarke, "When Attitudes Count" 71
equity

9) *Student Center Room 407*

* Elayne E. Schulman, "Logo for Secondary School Science Projects" page 199

* Ted J. Brucker, "Logo for High School Students" page 53

10) *Building 4, Room 4-149*

* Steve Shuller, "Logo in Schools: Issues and Experiences" page 204

* Richard Binswanger, "Logo and Mathematics at the Agnes Irwin School" page 47

11) *Building 4, Room 4-153*

* Ricardo Nemirovsky, "Latin America's Problems and Perspectives" page 168

* Eduardo O. Chaves, B. Bitelman, A. F. Gagliardo, A. Ripper, and H. Silva, "The Brazilian Version of Logo" page 67

Lunch — **12:00-2:00 P.M. Athletics Center**

PLENARY SESSION B — **2:00-3:30 P.M. Kresge Auditorium**

Andrea diSessa, Celia Hoyles

Coffee/Break — **3:30-4:00 P.M. Sala de Puerto Rico, MIT Student Center**

SESSION III — **4:00-5:30 P.M. Parallel Sessions**

1) *Building 4, Room 4-370*

* Susan Jo Russell and Virginia Chalmers, "Logo in Special Education: Barriers to Implementation" page 193

* Glen Bull and Paula Cochran, "Extending Logo: Creating Tools for Teachers and Clinicians" page 57

2) *Building 4, Room 4-270*

* Liddy Nevile, "Some Suggested Issues for Consideration if Logo Is To Be Integrated into Formal Curricula" page 171

* Aaron Falbel, "Computer Cultures vs. Computer Classrooms" page 99

3) *Building 4, Room 4-163*

✓ Daniel H. Watt, "Teacher-Made Microworlds: or Training Teachers to *Use* Logo Vs. Training Them to *Teach* It" page 249

* A. J. (Sandy) Dawson and David Bell, "Pathways to Knowing: Teachers Meeting Turtles" page 85
Write for paper

4) *Kresge, Rehearsal Room A*

* Informal discussion with Celia Hoyles

5) *Kresge, Rehearsal Room B*

* Dr. Chris Templar, "Extending the Concept of the Animated Video Movie Using Super Logo" page 230

* Robert Bickford and Louisa Birch, "Voice Synthesis and Sprite Logo: Exploratory Environments for Integrating Language Arts" page 45

6) *Building 4, Room 4-231*

* Allan Martin, "Black Box Programs with Lids that Open" page 147

* Tim Barclay, "Interacting, Using Logo, In Logo: or Writing Programs Where the Student Interacts as a Logo Programmer, Not Just as a Menu Selector" page 38

7) *Student Center West Lounge*

* Michael Tempel, "What's So Hard About Recursion?" page 227

✓ Anne McDougall, "Teaching and Learning About Recursion" page 154

8) *Student Center Room 491*

* Lloyd P. Rieber, "The Effect of Logo on Young Children: A Research Study" page 190

* Charles Jackson, Ed Davis, Elizabeth Henderson, and Sandy Norman, "Variables, Geometry and Structured Programming in a Logo Environment" 123

9) *Student Center Room 407*

* Wallace Feurzeig, "Algebra as Logo" page 102

* Lawrence H. Buck and Meryle H. Kohn, "The Logo Road from Algebra to Calculus and Beyond" page 55

10) *Building 4, Room 4-149*

* Pamela Sharp, "Logo and the Arts" page 202

* Dede Bartels, "Problem Solving/Problems Solved" page 41

11) *Building 4, Room 4-153*

* Tony Jones, "The Use of Logo in Teacher Training" page 124

* Marilyn Schaffer and Ian Spence, "The Roles of Computers in Freeing Children to Learn: A Teacher Training Model" page 195

EXHIBITOR'S RECEPTION — **6:00-8:00 P.M.**
Sala de Puerto Rico,
MIT Student Center

PLENARY SESSION C — **8:00-9:30 P.M.**
Kresge Auditorium

David Hawkins, Philip Morrison, Jerome Wiesner

3. WEDNESDAY, JULY 24

SESSION IV — 8:30-10:00 A.M. Parallel Sessions

1) *Building 4, Room 4-370*

* Louisa Birch, Ricky Carter, Kathy Cordes, Sheila Cory, Paul Goldenberg, Phil Lewis, and Jock McClees, "Problems and Solutions to Implementing Logo in the Classroom" page 152

2) *Building 4, Room 4-270*

* Tony Stavely, "The Properties of a Logo Adventure" page 218

* Jonathan Lawrence, "Using Logo to Write Adventure Games" page 139

3) *Building 4, Room 4-163*

* Michael Tempel, "Broken Logo" page 229

* Brian Silverman and Michael Tempel, "Crippled Logo: Breaking Logo to Study Statistics" page 208

4) *Kresge, Rehearsal Room A*

* Karl L. Zinn and Gordon Leacock, "Advice and Support for Teachers" page 265

* Joyce Tobias, "Logo and Teacher Training: What Should It Be?" page 238

5) *Kresge, Rehearsal Room B*

* Informal discussion with Andy diSessa

6) *Building 4, Room 4-231*

* Jose A. Valente and Ann B. Valente, "Forming a Computer-Based Learning Environment for Exceptional Children" page 245

* Bonnie Pearson Hirdes, "Use of Logo by Severely Physically Disabled Persons: A Preliminary Report" page 121

7) *Student Center Room 491*

* Richard Noss, "Constructing Mathematical Meaning via Logo" page 175

* Alain Bois and Jean-Pierre Muraire, "Linking a Dynamic Geometry of the Body with Logic Geometry" 165

8) *Student Center Room 407*

* Linda Morecroft, "A Relative Motion Microworld" page 163

* Michael Eisenberg, "Superimposed Turtle Walks and Kinematic Curves" page 96

9) *Building 4, Room 4-149*

* Susan Wolff, "Learning through Logo: Integrating Logo with the Elementary School Curriculum" page 260
Send for paper

* Leslie F. Thyberg, "The Origins of "Ask Three Before Me" or Using Individualism, Interaction and Integration to Create a Genuine Logo Learning Environment" page 234

10) *Building 4, Room 4-153*

* Scott R. Garrigan and Francis A. Harvey, "Extending Logo's Power and Utility Using Machine Language" page 105

* John Wood, "CLARE: Control Logo and the Real Environment" page 261

Coffee/Break — 10:00-10:30 A.M.
Sala de Puerto Rico,
MIT Student Center

SESSION V — 10:30 A.M.-12:00 P.M.
Parallel Sessions

1) *Building 4, Room 4-370*

* Cynthia Solomon, "A Discussion of Computer Environments for Children" page 212

* David Thornburg, "Logo, Artificial Intelligence, and the Left Hand" page 232

2) *Building 4, Room 4-163*

* Helene Landry, "Tortunaute: Une approche pour l'introduction de l'ordinateur dans la salle de classe a l'aide du langage Logo" page 136

* Nicole Michaud, "Pedagogical Notes on Learning Logo" page 158

3) *Kresge, Rehearsal Room A*

* Tony Adams, "Logo: Where to Next?" page 34

* R. Quentin Miller, "Multilogo" page 160

4) *Kresge, Rehearsal Room B*

* Hilda Carmichael, "Computers, Children and Classrooms: A Report on the Queen's *Creative Uses* Project" page 61

* Linda Spear and Julian Pixton, "Walsall Logo Project" page 214

5) *Building 4, Room 4-231*

* Denise Bisaillon, "MIT High Density School Projects" page 49

6) *Student Center West Lounge*

* June Ramondetta, "Developing a Logo Curriculum" page 188

* Peter Rawitsch, "A Logo Curriculum: The Key is <CONTROL>" page 189

7) *Student Center Room 491*

* Tamar Globerson, "Stylistic Differences in Learning Logo" page 107

* Steve Louie, "Locus of Control Among Computer-Using School Children" page 145

8) *Student Center Room 407*

* Tom Lough, "Logo and Physics PVCC Style: Instructional Methods and Techniques Used with Logo in a Calculus Based Physics Course at Piedmont Virginia Community College" page 144

* Paul Lorentzen and Arun Keshap, "Logo in Physics: The Students' Perspective" page 143

9) *Building 4, Room 4-149*

* Jean A. M. In het Panhuis, "Logo and the Development of Metacognitive Skills in Children with Learning Disabilities" page 181

* Jun-ichi Yamanishi, "Logo for Remedial Education of Autistic Children" page 263

10) *Building 4, Room 4-153*

* Daniel C. Orey, "Logo in a Multicultural Environment: A Cross-Cultural Analysis of Logo Programming in Relation to Cognition and Creativity" page 179

* Fatimata Seye Sylla, "Computers and Illiterate Women" page 101

Lunch — 12:00-2:00 P.M. Athletics Center

PLENARY SESSION D — 2:00-3:30 P.M. Kresge Auditorium

John Allen, Uri Leron, Horacio Reggini

Coffee/Break — 3:30-4:00 P.M. Sala de Puerto Rico, MIT Student Center

SESSION VI — 4:00-5:30 P.M. Parallel Sessions

1) *Building 4, Room 4-370*

* Molly Watt, "Putting the Fun Back into Recursion: Recursion Plays for Teacher Training" page 251

* Laurence J. Davidson and Alison B. Birch, "Using Logo To Explore Inductive and Deductive Thinking" page 83

2) *Building 4, Room 4-163*

* Philip Lewis, "Computers in the Mathematics Classroom: An Ongoing Experiment" page 140

* Forrest E. Smith, "Microworlds and the Classroom" page 211

3) *Kresge, Rehearsal Room A*

* Informal discussion with John Allen

4) *Kresge, Rehearsal Room B*

* Linda J. Barnhart, "Developing Critical Thinking Skills through Logo" page 40

* Evelyn J. Dale, "Problem Solving with Logo" page 79

5) *Building 4, Room 4-231*

* Totuka Takito, "Logo in Primary School as a Bridge to Discover Orders in Nature" page 226

* Hillel Weintraub, "Using Logo in a Japanese High School: A Description and Evaluation" page 256

6) *Student Center West Lounge*

* Informal discussion with Horacio Reggini

7) *Student Center Room 491*

* Sheila Rao Vaidya, "Integrating Logo into the Kindergarten Curriculum" page 244

* E. Jean Porter, "Texas Loves the Turtle: A Survey of Logo Activities in Texarkana" page 184

8) *Student Center Room 407*

* John R. Stremikis, "The Logo Weather Machine" page 222

* Amos Newcombe and Karen Stewart, "Exploring in a Physics Microworld the Laws of Gravity and Motion" page 173

9) *Building 4, Room 4-149*

* H. Pinxteren and R. Wegman, "pLogo as an Integrated Tool for Learning" page 182

* Stewart A. Denenberg, "A Service Project from Computer Science to Psychology: Emulating SOLO in Logo" page 87

10) *Building 4, Room 4-153*

* John Olive and Susan Paalz Scally, "The Atlanta-Emory Logo Project: Teaching and Understanding Geometric Relationships through Logo" page 177

* Reinhold D. Wappler, "Transfer and Integration of Logo-Based Mathematical Knowledge: Connecting the Logo of Grades 2-6 to the Mathematics of Higher Grades" page 247

Conference Banquet **7:30 P.M.**
Athletics Center

4. THURSDAY, JULY 25

SESSION VII — **8:30-10:00 A.M.**
Parallel Sessions

1) *Building 4, Room 4-370*

* Brian Harvey, "The Young Computer Scientist: A Curriculum Plan" page 118

* Brian Silverman, "Life Game and Beyond" page 207

2) *Building 4, Room 4-270*

* Gerri Sinclair and Malcolm Colton, "IdeaMap: An Idea Composing Microworld" page 209

* Gerard Weidenfeld, "Microworlds for Computer Literacy" page 253

3) *Building 4, Room 4-163*

* Bob Lawler, "Computer Based Microworlds and Reading: An Analysis for Their Systematic Application" page 138

* Fred D'Ignazio, "Build a Computer in Your Mind" page 91

4) *Kresge, Rehearsal Room A*

* Ihor Charischak, "Exploring Math Worlds with Logo" page 65

* Margot H. Maddock, "A Logo Sourcebook for *Mathematics, A Human Endeavor*" page 146

5) *Kresge, Rehearsal Room B*

* Informal discussion with Uri Leron

6) *Building 4, Room 4-231*

* Francis A. Harvey, "Integrating Logo into the Curriculum: A Potpourri of Applications" page 115

* David Squires and Royston Sellman, "Designing Computer Based Microworlds" page 216

7) *Student Center West Lounge*

* Belinda Pruitt, "Videotaped Logo and Programming Lessons" page 186

* Liddy Nevile and Tony Adams, "Using Video as a Medium for Giving Teachers an Intimate View of Logo Programming" page 169

8) *Student Center Room 491*

* Stanley H. Erlwanger and Marion Barfurth, "Teaching Mathematics to Grade Four Children in a Procedure-Based Logo Environment" page 97

* Joel Hillel, "The Notion of Variable in Turtle Geometry: A Conceptual-Analysis and an Observational Study of Nine-Year Olds" page 120

9) *Student Center Room 407*

* Judith W. Weinberg, "Implementation and Evaluation of the Logo Pilot Program in the Pittsburgh Public School District: Kindergarten - Grade 5" page 254

* Charles A. Kephart, "Logo Comes to Long Island" page 128

10) *Building 4, Room 4-149*

* Charles Hadlock, Toby Mintz, and Lisa Starobin, "Logo Projects by Students at the Lincoln-Sudbury Regional High School" page 225

11) *Building 4, Room 4-153*

* Begona Gros, "The Problem of the Evaluation and

Integration of Logo Language in the School Curriculum" page 111

* Lu Chuan-xing, "Logo in the People's Republic of China" page 69

Coffee/Break — 10:00-10:30 A.M.
Sala de Puerto Rico,
MIT Student Center

PLENARY SESSION E — 10:30 A.M.-12:00 P.M.
Kresge Auditorium

Panel discussion on current issues
Chaired by William Higginson

ABSTRACTS

Abstracts are arranged alphabetically by last name of presenter. Times and locations of presentations are listed in the program section of these preproceedings.

LOGO IN THE BUSINESS AND PROFESSIONAL ENVIRONMENT

Loren Abdulezer et al.

KEYWORDS: Logo: Business/Professional Use; Logo: Criticism; Logo: Future Developments; Logo: Advanced Topics; Computer Science/AI

It is clear from the Logo 84 conference that many different themes were emerging. One of those is Logo in the business and professional environment. This panel session outlines the experiences that people have had in using Logo for business-oriented applications. Some of the questions to be addressed include:

- Why was Logo selected as the choice language and programming environment for computing?
- The success of using Logo.
- Its shortcomings and features that need to be modified.
- How Logo fits into the reality of the business world.

The panelists chosen for this session include people from diverse backgrounds. They represent views from the financial services sector, public accounting, medical research, and commercial business.

During the past decade, a few highly talented people led by Seymour Papert had the vision and insight to demonstrate that computing is accessible and is useful as a tool for everyone. Logo has been successfully demonstrated in the academic community. There is no doubt that it is an excellent tool for teaching children how to think using the computer. However, forward-looking educators have faced a common criticism about Logo, viz., "It's fun to teach our students Logo, but can it help them to graduate to Basic and Pascal?"

The reason for this attitude is that there is a limit to what can be done on an eight-bit microcomputer. There has never really been a widely available version of a powerful Logo running on powerful machines. As students in our schools graduate, it is time for Logo to graduate and step out into the business and professional environment. Today Logo is being used to create:

- Expert systems for planning audit engagements.
- CAD/CAM software.
- Identify opportunities for arbitrage trading.
- Intelligent front ends to minicomputers and mainframes.

There are many more. Logo is indeed a serious language. It is also evolving into a serious computing environment. Throughout the range of experience of using Logo for professional applications, it has consistently repeated the same lessons taught to us in the schools: to use computers and "program" with computers, you don't have to know anything special about computers or computer science. All you have to know is how to think. The computer is a tool to help you do that.

Most people probably make the assumption that: "So long as you are going to do high-powered programming, you will need a sophisticated programming language and operating system environment." There is a fallacy in this reasoning. A system too complete and mechanical is too difficult to operate. Too much skill has to be developed before the creative process flourishes! That is why Logo was successful in the schools, and that's why Logo is becoming successful in the business and professional environment.

Logo is a language for thinking. It uses the computer as a playground for the imagination. Said in a slightly different way, when you program in Logo, you are really computing with concepts and ideas -- not lines of code. This difference is critical.

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LOGO: WHERE TO NEXT?

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KEYWORDS: Microworlds; Computer Science/AI; International Logo: Australia; Logo: Criticism; Logo: Future Developments; Logo: Advanced Topics

Two factors will have a significant influence on the future shape of Logo. Commercial implementors will make their own decisions, many independent of educational considerations and Logo tradition, and the move to more powerful personal computers will provide new opportunities, not all of which will be beneficial. In this paper, I discuss some language issues that are important as we move into this next phase of the Logo life cycle.

We stand at a critical time in the development of Logo. To stand still will be to see the most significant gain of a decade and a half of computing education swept aside; to be uncritical of present implementations will lead to an unrecognizable mishmash of ideas masquerading as a computer language.

Continued evolution of features will be a prerequisite for Logo's survival in the latter half of the 1980s. If these new features are to successfully project Logo forward and to become part of Logo's "essential glue", then they will have to either rectify past inadequacies or provide powerful computational tools that give access to new "powerful ideas." It is worth recognizing that powerful ideas within computing education have been very few and far between.

The criticisms of Logo both from within the Logo community and from other sources must be faced. Ideas that arose and were accepted in the context of teletypes, floor turtles, and 8 bit computers may not be quite so compelling for the next generation of microcomputers.

Logo has proved to be a suitable environment in which to create new "kits of parts" in which to develop microworld environments. As we move towards 16 and 32 bit computers, the opportunities and pressures become greater. Before considering new microworlds to exploit, language designers should be addressing the overall environment in which Logo operates. The new generation of microcomputers provides nothing more than the opportunity to solve these problems; they will not be solved automatically.

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MAKING MUSIC COUNT: FINDING THE MESSAGE IN THE MEDIUM

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KEYWORDS: Music; Implementation: Classroom/Individual; Mathematics; Science; Teacher Training Materials; Thinking Skills

A music version of Logo has been designed with the following multiple purposes in mind:

1) To provide a new medium in which to experiment with "procedural thinking," generally, and to experiment with its importance in making musical coherence, in particular.

2) To create opportunities for moving across media -- graphics, music, numbers, words -- so the sense of a procedure common to them all along with the power of Logo, itself, can emerge as working realities.

3) To demonstrate that computers can solve a critical problem in schooling: Children who work successfully with objects in real-time/space -- constructing, fixing, handling complex relations, drumming complex rhythm figures -- are often unable to translate this powerful action-knowledge into the entities and relations implicit in symbolic representations -- e.g., numbers, graphs, music notation. Equally problematic, but not so obvious, are the children who can "plug in the numbers" but with little relation to the direct, sensory experience of materials in real-time/space. Computers can be used as a means for effectively mediating between these two worlds -- "sensory knowledge" and "symbolic knowledge" -- such that each informs and enriches the other.

I will argue that we need to develop environments where the computer has the same status as more familiar materials such as Lego, tinkertoys, cuisinaire rods, drums, keyboards, guitars, batteries and bulbs, gears or a bicycle, such that children can move back and forth between them. On one hand they are designing/making coherent structures using their everyday sensory-action-knowledge to shape real-world materials; and, on the other, they are using the symbolic knowledge necessary for shaping coherent computer-made objects. By turning back to reflect on these processes, interconnections can emerge between ways of knowing and of thinking that

have traditionally remained in separate worlds -- disparate and opaque to one another.

It is in no way presumed that simple juxtaposition of activities and media can, by itself, result in the development of such conceptual intersections. Rather, work must go into devising curricula that will embody powerful coherence-making ideas that are shared across various media, sensory modalities, subjects-matters, modes of thinking and description.

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INTERACTING, USING LOGO, IN LOGO: OR WRITING PROGRAMS WHERE THE STUDENT INTERACTS AS A LOGO PROGRAMMER, NOT JUST AS A MENU SELECTOR

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KEYWORDS: Implementation: Classroom/Individual; Curriculum; Interactive Programming; Middle School/Junior High; High School; Teacher Training Materials; Logo: Advanced Topics

What do we do as teachers when the students coming into our classes are already Logo programmers? How do we build on that knowledge? As we look for ways to integrate Logo in the curriculum, how do we honor the Logo skills our students already have?

Interactive programs are one of the ways in which computers are used in the classroom. The usual kind of interactive program in menu-driven, and in the best cases, the menu opens up a realm of concepts, ideas, and relationships for students to explore. The student is not asked, however, to think about the programming; in fact, he or she need not even know which language the program is written in. This is all part of user friendliness.

The philosophy of Logo asks that we give students powerful tools that allow them to be in control of their own learning. As teachers, we also know what a good learning experience it can be to teach something to someone else. Logo offers this same learning-by-teaching experience to students, as does any programming language, but in many ways Logo does it better.

Student interaction with a program can occur inside or outside the program. Outside means exiting the program and going to the editor to modify existing procedures or enter new procedures. In many ways, this is the simplest solution, but it also has greater risks. Since there are no controls on what the student may do, there is a real potential for introducing bugs which are then extremely hard to find. At some level of program complexity, this can place an unreasonable burden of responsibility upon the student.

Inside the program means entering new statements and procedures interactively while the program in running. This means that tasks such as accepting the new input, integrating it with the existing program, and saving all this on disk must be handled by the original program. This demands more of the program and, therefore, more of the original programmer. Examples of programs using both outside and inside interaction will be shown.

In designing interactive programs for use in the classroom, the user's input can be of varying complexity:

1) Entering values for variables;

2) Entering program lines or statements to be subsequently executed; and

3) Entering new procedures to be integrated in with the existing main program.

For interactions inside the program, MAKE, RUN, and DEFINE are the Logo primitives needed respectively, along with an assortment of other Logo commands such as REQUEST, LIST, LPUT, etc.

In this presentation, how to use MAKE, RUN, and DEFINE will be explained. Then examples will be shown of programs which could be used in a variety of different subjects and grade levels. The hope is teachers will use these ideas in their own classrooms, both the examples shared and new interactive programs they write in the same spirit.

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DEVELOPING CRITICAL THINKING SKILLS THROUGH LOGO

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KEYWORDS: Implementation: School/District; Implementation: Classroom/Individual; Elementary/Pre-School; Teacher Training: Pre-Service; Teacher Training: In-Service; Teacher Training Materials; Evaluation; Student Projects

In the McGuffey School District, a pilot program directed towards increasing critical thinking skills was initiated during the 1983-1984 school year in East-West Finley Elementary. In this pilot, funded by the Pennsylvania Department of Education Chapter 2 Technology/Innovative Projects Grant, fourth and fifth grade students received instruction in Logo and microcomputer use. Appropriate teaching strategies were developed to establish a model which focused on improving critical thinking skills through questioning and guided practice with Logo. Based upon the results of the pilot, the district decided to expand this program into the four remaining elementary buildings.

Principals and teachers who would initiate Logo into the classrooms needed an understanding of the Logo philosophy, the language, and the desire instructional strategy. With these concepts in mind, an in-service course was developed and then approved by the Pennsylvania Department of Education.

Discussion during this conference session will include an overview of the in-service course, "Developing Critical Thinking Skills through Logo"; methods used to develop staff competencies in programming, philosophy, and instructional strategy; the transition from course participant to classroom instructor; practical classroom implementation and student development; and evaluation and modification of the program.

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PROBLEM SOLVING/PROBLEMS SOLVED

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KEYWORDS: Implementation: Classroom/Individual; Art; Middle School/Junior High; Evaluation; Problem Solving; Thinking Skills; Sprites

We've heard that Logo teaches problem solving, but not enough about specific problems that Logo solves. Clearly, it can be an effective tool used in a middle school art room. Simple Logo procedures and sprites enable children to create sophisticated animations for student video productions.

In the process of using Sprite Logo to solve the animation problem, the student learns many things. Most importantly, the student must learn a high level programming language to solve complex problems. He or she also learns about the art elements of line, shape and color, as well as about the manipulation of images.

The sprites that are a part of many versions of Logo are independently programmable shapes that can be stored within the computer's memory and are formed like any other computer graphic by defining pixels on a grid. The number of sprites that can appear simultaneously on the screen varies with the particular version of Sprite Logo used. Like a Logo procedure, each shape created in the shape editor is given a file name. When called by name, the sprite appears on the screen and can be stored and recalled at any time. It is immediately available and can move about the screen in any direction and at various speeds. The sprite can be an entire figure or just a part of a more complex figure.

A simple object can be created with a single sprite. More complex objects can be created by combining sprites. Because undefined pixels are transparent, sprites can be stacked one on top of another and the sprite located on a lower plane will show through the transparent pixels that lie on a closer plane. Sprites can be positioned on a plane so that when the screen is viewed as a whole they align to form a composite picture.

In the world of sprites, a lower number dominates. If an x-shaped sprite is on plane one, it will cover an o-shaped sprite on plane two. The edges of the o-shape will show, however. Sprites will also detect collisions, and this can be an important device in an animation sequence. When the collision occurs, the sprite can be asked to disappear or to transform into another shape (another sprite). Images can be manipulated with flexibility and creativity.

In my classroom, children work with Logo and sprites to create animated sequences to be used as title screens and special effects in student video productions. Off-line activities are used in the classroom to support on-line activities. For example, we learn about X and Y coordinates with a rope grid that is erected on a classroom wall. These off-line activities are often the subjects of the student tapes.

By integrating Logo into the curriculum of the art room, the students clearly understand the usefulness of the computer and Logo. They understand and accept the advantages and limitations of both. In the process of making simple animated stories to enhance student video productions, the students develop an image bank that can be used individually and by the group. Solutions occur as a result of careful planning and experimentation. Patterns are generated and aesthetic order emerges. Animations are presented, evaluated and reprogrammed. The students develop visual, cognitive and critical skills.

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THE PROJECTS APPROACH TO LOGO; AN EXAMPLE: TESSELLATIONS

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KEYWORDS: Implementation: Classroom/Individual; Mathematics; Art Elementary/Pre-School; Middle School/Junior High; Teacher Training In-Service; Teacher Training Materials; Thinking Skills

By taking the emphasis off of teaching Logo and putting it on using Logo to explore concepts, we can create a Logo environment for students with varying levels of expertise and ability. The following is an example of a project that may be introduced in fourth and fifth grade. As it develops, it can expand to challenge even high school students. A core activity leads to many possible detours for students with different interests. Tools include not only Logo, but also paper and pencil, shape blocks, wallpaper, beehives, math books, and art books. To begin, students need only be familiar with FORWARD, BACK, RIGHT and LEFT, and know how to define simple procedures. They should have prior experience exploring regular polygons and the Total Turtle Trip Theorem or the Rule of 360.

A tessellation is a repeating pattern of shapes, with no shapes overlapping and no gaps between the shapes. Regular tessellations are made by repeating a single regular polygon to cover a plane. From there, the possibilities are endless. At some levels, the line between mathematics and art becomes quite fuzzy. Students, whether they are in fourth grade or eighth grade, can begin their study by simply becoming aware of tessellations all around them.

In many schools, manipulatives have been relegated to kindergarten. Confiscate the shape blocks. Working with concrete objects can help bring clarity to ideas. After students have explored with the shape blocks, have them teach the turtle to tessellate. Bring in a wasp's nest or honeycomb. If bees and wasps can do it, surely turtles can! Start with regular tessellations using one shape. Some students might like to attempt tessellations made with more than one regular polygon, or even tessellations made with irregular shapes. Allow time for exploring and comparing. The process is much more important than the result.

Kaleidoscopes made from three small mirrors, taped in a triangle with their reflecting surfaces facing in, can be used to create quite elaborate tessellations off the computer. Using what happens in this experiment leads to the next exploration on the computer. Students begin to pick out

the smallest repeating pattern within a design. Next explore with irregular polygons and see what kind of patterns and rules you discover. Get a book on Escher's work. You're sure to get several "Wow!"s and a couple "I wonder how he did that?"s. This can lead to a computer exploration of altering regular polygons using point symmetry.

Once you've started working with tessellations, they continue to crop up in various places. A string art design can be rotated within a hexagon and the hexagon repeated to cover a plane and form a beautiful pattern. For the strong-hearted, you can even begin to explore tessellations created with recursion. How about a fractal-tessellation?

A bibliography and handouts will be provided.

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VOICE SYNTHESIS AND SPRITE LOGO: EXPLORATORY ENVIRONMENTS FOR INTEGRATING LANGUAGE ARTS

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KEYWORDS: Elementary/Pre-School; Language Arts

A friend of mine has a three and a half year old daughter, Claire. The two big things in Claire's life this past summer were going to the beach and Play Doh. And why not? For a three year-old what could be better than a huge sandbox with a swimming pool and a totally malleable and even edible chunk of stuff that can be shaped into anything? If you get tired of playing with a Play Doh dog, make a sandcastle. If you tire of sandcastles, fill a pail with sand and cover mommy's feet or go splash in the water.

This is how children play, and this free spirit, curiosity and energy is what we love about children. While this play is going on, something else is happening as well. Children are learning about the world and about themselves.

We will be showing some videotapes of children, as well as presenting at least two Sprite based Logo environments that use voice synthesis. These environments help children explore language not in workbook style, but with the same freedom and enjoyment that Claire is afforded at the beach.

Several kindergarten children are clustered around a computer. On the monitor is a colorful farm scene. Two kids are moving a rooster and a farmer around on the screen, animating a scene for their Sprite "actors" to act out. The kids are also typing in words for the characters to say to each other. A voice synthesizer repeats the dialogue as the animated characters they created move around on the screen.

At the computer, the kids are using the "Animated Coloring Book." Elsewhere around the room are drawings of farm scenes and animals the kids have made. There is a cardboard box farm the kids designed where a floor turtle explores as kids learn Logo commands. There is a large play table with magnets and wooden letter blocks. There is lots of activity. As it should be, the computer is just one of several integral tools in the classroom.

Language arts which include reading writing, spelling and speech is fundamental to the elementary classroom. Here in Louisa Birch's classroom the use of computers and Logo are an integral part of the curriculum. The computer is being used to teach part of what has long been considered the foundation of an elementary curriculum.

These kids are learning to read and write not because they have been given a workbook and asked to memorize a list of words, but because they are exploring and enjoying a language environment provided by new technologies. As a result of this exploration, they are discovering how to communicate, how to read and write.

Tools like the "Animated Coloring Book" challenge more traditional teaching styles and show more respect for the child as learner. Just as turtle graphics provide a Mathworld for kids to explore, these environments provide a fun and responsive Languageworld. They encourage the exploration, curiosity and freedom we admire so much in children.

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LOGO AND MATHEMATICS AT THE AGNES IRWIN SCHOOL

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KEYWORDS: Implementation: School/District; Implementation: Classroom/Individual; Mathematics; Middle School/Junior High; High School; Teacher Training: Pre-Service; Teacher Training: In-Service

Why do we teach mathematics? The answer is clearly abstruse and complex. We believe, however, that mathematics is more a way of thinking than it is finding solutions, and that too often students concentrate on simply getting an answer. Students hand in work that many times is devoid of any serious analysis, and yet this is not totally their fault. Mathematicians deal in abstractions, while ordinarily high school students are not developmentally ready to handle pure ideas on their own. Logo serves as a bridge to these concepts through the concreteness of the turtle. With it, we offer our students a chance to "play mathematician", exploring, experimenting, and discovering mathematics.

We are the Agnes Irwin school, a small private girls school (K-12), located in the suburbs of Philadelphia. Over the last few years, we have been using Logo as part of our elementary school curriculum, as well as the introductory language of our computer science courses. But over the last year and a half, we have made an attempt to integrate it into our entire mathematics curriculum, viewing Logo not so much as a programming language, but as a mathematics tool. The environment of Logo allows for experimentation with ideas of varying degrees of difficulty. We have used it to graph linear, rational, and trigonometric functions, as well as to draw their derivatives and integrals. We have used it to demonstrate such concepts as area and perimeter, ratio and proportion, place value, and basic multiplication and division. Our students have explored and extended the standard theorems and definitions; for example, in geometry, our work with parallelograms led us to the study of a new shape, the "hexallelogram." We are trying this approach throughout the school and have been surprised to see that procedures developed by one grade level can be used or modified by another grade level for its own needs, thus reinforcing the continuity of math.

It is my hope to impart some of the excitement we feel through specific demonstrations and anecdotes, and just as importantly, to give a feeling of the frustrations and difficulties that have been very much a part of our learning process. We have learned much about scheduling as well as the problems of teacher training. Program implementation is the key to

success; done properly, ideas and concepts flourish. I will share both our successes and failures in implementing our program as well as our proposed changes for the future.

We have made great strides over the last year and a half, and I intend to distribute copies of our most successful procedures. We are very enthusiastic, but realize we have a long way to go. I hope to stimulate a discussion that might help us improve our program.

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MIT HIGH DENSITY SCHOOL PROJECTS

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KEYWORDS: Implementation: School/District; Implementation: Classroom/Individual; Curriculum; Elementary/Pre-School; Teacher Training: Pre-Service; Teacher Training: In-Service; Teacher Training Materials; Logo Philosophy

This session will focus on two research projects being conducted by the Learning Group at MIT's Media Technology Laboratory. The session will be divided into the following three parts:

I. The Boston High Density Computer Project

A panel discussion by teachers and research observers. This project was conceived and implemented as a two-year, hypothesis-generating Logo study. A high density of computers (Coleco Adam) were placed in classrooms to be used as integrated tools for all aspects of the students education. A computer for every child (a ratio of one-to-one) or, at least, for every three children offered maximum access on the computers. Two Boston elementary schools, the Quincy and the Ohrenberger, were selected as the research sites. The fundamental goals of the project were multi-fold: 1) to study the children's preferred learning styles and the extent to which the computer enhanced these learning styles; 2) to investigate the affect of the Logo environment on areas pertaining to the socio-moral domain; 3) to explore the ways in which the computer can be fully integrated into learning activities and can serve as an interdisciplinary bridge; 4) to uncover differences in Logo learning styles, especially in terms of race, ethnicity and gender.

Themes for discussion will include the project's organization, and the teacher's preparation and ongoing support in the forms of designed Logo experiences and reading seminars. The methods of data collection will be discussed. A report on some of the salient findings of the study will be given.

II. The Influence of the Logo Environment on the Socio-Moral Atmosphere of the Classroom

The second part of this session will highlight one specific area of research within the Boston High Density Computer Project. This presentation will focus on the investigation of the impact of the Logo environment on the development of the socio-moral atmosphere of the classroom. The

atmosphere of the Logo environment was studied from the perspective of Lawrence Kohlberg's theory of moral education and development. A brief explanation of Kohlberg's paradigm and relevant definitions will be given. Features which are critical to the Logo environment as cited in previous studies will be reviewed and their socio-moral implications will be discussed. A description of the measurement instruments and a preliminary report of the findings will be presented.

III. Project Headlight

The final part of this session will concentrate on the design and development of a new project. This project will seek to create a school of the future by establishing a large-scale (approximately 200 students,) high density (over 100 computers) Logo environment within a Boston public school. Housed at the Hennigan Elementary School, this school-within-a-school will utilize a progressive, open educational approach. Topics for this discussion will include the overall research goals, the project design, and the teacher preparation and support activities.

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A LECTURE/DEMONSTRATION OF LCSI LOGO FOR THE MACINTOSH

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KEYWORDS: Logo: Advanced Topics; Logo: Future Developments; Language Design

The talk will feature a general discussion and demonstration of Logo on the Macintosh, covering:

- The "Macintosh human interface" and the traditional "Logo human interface": how they work together to create a new MacLogo programming environment.

- Logo as a user-configurable language based on the idea of naming things: Macintosh Logo extends the user-configurability to the type and number of primitives. Naming things now extends to naming devices, whether they be windows, files or input/output ports.

- Using the Editor window; using more than one editor at a time to contain various versions of a procedure, while only one exists in the workspace.

- Using the Debug commands and the Debug window.

- Arrays as a new Logo object similar in use to property lists, using PArray and GArray, and a simple operation named ListArray which converts any list into an array and any array into a list -- meaning that a stored array can be transformed with complex list processing operations, then stored back into Array Space for high-speed processing.

- Turtle Graphics and Quick Graphics, including pen width and pattern -- using the proper tool for the job.

- The Preferences Program: creating your own Logo.

- The Primitive Set Mover
- Configuring the serial ports for any modem or network

Special focus will be on language design as applied to Logo, and how it contributes to Logo's easy transition to the university and adult world.

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LOGO FOR HIGH SCHOOL STUDENTS

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KEYWORDS: Implementation: School/District; Implementation Classroom/Individual; Mathematics; Computer Science/AI; High School Teacher Training: Pre-Service; Problem Solving; Thinking Skills; Logo Philosophy

Logo has been unjustly relegated to the pre-school and elementary classroom. It is time to show Logo for what it really is - a highly sophisticated computer language that can have a strong impact on the entire educational process.

This presentation describes some ways in which Logo is now being used at George Washington High School in Denver. Most of the students are sophisticated high school programmers already familiar with Basic, Pascal, Fortran, and Forth.

Part I. The Environment

The unique networking environment of the Shared Resource Computer Laboratory at GWHS is a perfect atmosphere for the transmitting of Logo (philosophy and language).

Part II. Ideas Stressed in Logo Classes

1) Philosophy of Logo -- Logo embodies a complete philosophy of learning. Logo, the computer language, is a vehicle for this philosophy. The students learn an epistemology as well as language.

2) Unique Features of Logo

- Turtle Geometry -- Shapes are created and geometric properties are studied in the new light of Turtle Geometry. Turtle geometry is compared and contrasted with the Cartesian and Polar systems. Such a comparison not only aids in computer understanding, but gives a greater appreciation for the richness and power of the geometric display of data.

- List Processing -- Logo's ability to manipulate characters, numbers, words, and whole lists using simple commands and recursion opens up whole new computing vistas.

- Recursion -- Logo is an excellent language for examining the promises and pitfalls inherent in recursive processes.

3) Implementation -- The Fibonacci series, palindromes, reversals, base conversion, and "pig latin" are all good introductory programs - simple, non-graphic, and tail recursive. Poly, Spi, and Inspi - convert the idea of tail recursion into graphics. Multiple recursive procedures are built and studied. Starting with a "Koch Snowflake" separate procedures are gradually formed into a single, elegant, multiple recursive procedure that constructs the snowflake to any desired depth.

4) Advanced work

- Some take what they have already learned and begin to apply it to previously studied computer languages.

- Some build programs showing mathematical properties through geometric constructions.

- Many are fascinated by fractals and build programs to generate fractals either of their own design or based on the work of others, such as Hilbert, Sierpinski, or Mandelbrot.

- Some are employed as computer consultants and tutors in elementary schools. In this way they provide the expert Logo instruction so badly needed throughout our school district.

Part III. Examples

The bulk of the presentation consists of taped interviews with some GWHS students who have been working with Logo. They describe some of their most recent projects, their attitude towards Logo, and how Logo fits into their high school curricula.

Part IV. The Future -- The presentation concludes with a few words about future projects.

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THE LOGO ROAD FROM ALGEBRA TO CALCULUS AND BEYOND

Lawrence H. Buck and Meryle H. Kohn
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KEYWORDS: Implementation: School/District; Implementation: Classroom/Individual; Microworlds; Mathematics; College; Logo: Advanced Topics

Computer based learning normally follows one of two quite different approaches. In one, students create their own programs. Their main concern is generally computing, with the subject of the program secondary to questions of syntax. In the other approach, students use pre-written programs. Their concentration is focused on the subject covered by the software without regard to what makes the program work.

In designing a Computer Enhanced Learning format for college mathematics courses at New York Institute of Technology, we sought an approach that lay between these two extremes. We wanted students to sharpen their own problem solving skills by teaching the computer to solve problems one step at a time. This necessitated some form of programming instruction. The main focus of the courses, however, had to remain on the mathematics being taught. Programming skills would have to be developed gradually without extensive investments of time and attention. The Logo programming language provided an excellent tool for developing just such an approach.

Our talk will explore in detail how Logo provides a stimulating additional component to courses that also include traditional classroom instruction and the use of pre-written (commercial and NYIT generated) software. We will discuss key aspects of the development and implementation process (including software development, hardware considerations, integration of computer and traditional teaching techniques, and faculty training) for the computer enhanced algebra and trigonometry course that has been taught at NYIT for the past two years, and for the calculus course now being planned.

In particular, we will focus on one strand, exploration of the local and global properties of graphs, that runs through the algebra and calculus courses. We will illustrate how the student is introduced to microworlds of function plotting procedures that make it possible to review and re-examine topics already learned and then proceed to explore more sophisticated concepts.

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EXTENDING LOGO: CREATING TOOLS FOR TEACHERS AND CLINICIANS

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KEYWORDS: Teacher Training Materials

We have been using a Logo environment to create a series of tools for teachers. The concept of teaching tools is not dependent on Logo. However, the characteristics of Logo make it a conducive environment for development of tools. A software tool for teaching or clinical applications should meet the same criteria that apply to business productivity tools:

1) It should reduce programming overhead.

2) It should be modifiable by the user.

3) It should be designed for integrated use with other tools.

The teaching tools we have developed are user-driven in the sense that they are the result of requests and observed needs of local teachers and clinicians. Generally, each tool or family of tools was developed to meet a particular clinical or instructional need. Later these tools were passed on to other teachers, who adapted them to their own needs with our help.

Logo tool kits we have developed include:

- UVA Voice Tools (for speech synthesis applications)
- UVA Instant Logo (for facilitation of language learning)
- UVA Touch Tools (used with external switches and sensors)
- Stimulus Generators (used to produce practice items)

Many of these tools were first developed for use with language-disabled children. We are finding, however, that tools which are effective with language impaired populations in the clinic are also effective in the classroom.

Our experience to date suggests that at least three elements are required for successful transmission of Logo tools:

1) Illustrations of content applications.

2) Documentation for each tool kit.

3) A disk containing the Logo tool procedures.

Barriers to implementation and dissemination of Logo tools include:

1) There are insufficient models for using Logo teaching tools in the context of specific subject areas.

2) There is no effective distribution system for dissemination of disks of Logo tools, accompanying documentation, and models for their use.

3) Teachers, clinicians, and faculty in schools of education are often not aware of the significance of an open system of software tools.

4) At present there is more academic and economic incentive to produce articles and texts than to develop the kinds of instructional Logo tools discussed above.

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LOGO IN THE HIGH SCHOOL: SUCCESSES, FAILURES, AND FUTURE CONCERNS

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KEYWORDS: Implementation: Classroom/Individual; Computer Science/AI; High School; Evaluation; Problem Solving; Thinking Skills; Logo: Criticism

As in many high schools, the availability of inexpensive computers has created a sharp increase in demand for computer courses. In response, we developed a semester-long introductory course including the traditional "computer literacy" topics, some exposure to computer applications, and an introduction to programming using Logo.

During the 1984-85 school year, the first third of the course was spent learning about computers and using commercial programs to reinforce classroom material and familiarize students with the proper use of a computer system. Once students became comfortable with the equipment and the use of the computer lab, Logo was introduced through assignments to encourage experimentation and exploration. During the next third of the course, students learned new Logo primitives, wrote simple Logo programs, explored the use of computers in society, and learned about a variety of computer applications. For the last part of the course, increasing emphasis was placed on Logo. Gradually, more advanced concepts were introduced. Student programming assignments evolved towards more traditional programming class projects.

The most successful part of this course has always been the initial introduction of Logo. Almost without exception, students are thrilled by their initial success with the turtle. There is no feeling that this is "kids' stuff" as might be expected. From the near "dropout" to the most gifted college preparatory student, each individual delights in his/her first project.

Although we have never regretted our decision to teach Logo in this course, its use has not been without problems. For different categories of students, these difficulties occur at different points and for apparently different reasons. A few students simply do not seem to be able to cope with procedure writing, others find program design a roadblock, while still others seem unable to manage procedure inputs.

In spite of the problems, there are always exciting moments both in the classroom and in the computer lab. These include discoveries made by students during a classroom session or the spread of new ideas through the

Logo community that develops in the lab. Of particular interest are students who enter the course as devoted Basic programmers and who leave excited and challenged by Logo.

Through our experience over the past couple of years, we feel that there are a number of questions that we need to address. A few of them are listed here:

1) How can we move high school students who are game addicts towards independent programming in the context of the high school classroom? More significantly, should we try to move them in that direction?

2) What factors account for the students who do not seem to be able to cope with the problem solving skills necessary to write programs needing more than two or three procedures? Are these students weak in problem solving in general? Do they have a poor self-image or feel defeated by the educational establishment?

3) What is the best way to help students who have trouble with more sophisticated programming concepts to experience success without having them think that they are ready for an advanced programming course? Can they "feel good" about their work with the computer without thinking that a career in programming is in their future?

4) What skills learned in Logo programming will carry over to programming in other languages? In what ways will Logo be a help? In what ways a hindrance?

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COMPUTERS, CHILDREN AND CLASSROOMS: A REPORT ON THE QUEEN'S "CREATIVE USES" PROJECT

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KEYWORDS: Implementation: School/District; Implementation: Classroom/Individual; Curriculum; Elementary/Pre-School; Teacher Training: In-Service; Evaluation; Special-Needs Students; Problem Solving; Thinking Skills

This study examines the creative uses of computers in elementary schools and their impact on students' confidence and self-esteem, student-student interaction, student-teacher interaction, on male and female students, on classroom management, on the role of the teacher, on special education, on teacher training, on other members in the school, and on curricular areas such as computer literacy, learning Logo as a programming language, problem-solving and problem-creation, mathematics, oral communication, reading and writing, the arts, and values of the individual in society. Findings are based on intensive study of real classrooms over a two-year period. 433 students in eighteen classrooms that involved thirteen different teachers were studied over the two-year period; of these, five teachers and forty students were involved in the study for two years. Classrooms had one to five computers over an entire school year or students had access to a computer laboratory. Logo and word processing were studied extensively; the use of a graphics tablet and Musicland were explored for short periods. The report discusses in detail the various software that was used and offers extensive illustrations of what children from kindergarten to grade eight were able to accomplish with them.

The most significant finding is that the creative use of microcomputers in education is NOT automated education -- it is the very opposite. When the focus is on the development of independent and original thinking, the teacher and the "art" of teaching become critical elements in shaping the learning environment. Also, the role of the teacher in such an environment is different since the teacher is expected to deal with the unknown and unexpected as problems and questions arise. It was found that Logo is a highly adaptable language which made it possible to explore certain mathematical concepts in a different sequence and much earlier than is currently believed. Problem solving is an integral part of programming and of creative expression. The use of a word processor greatly aided language development, and the use of graphics tablets aided artistic expression, especially in the younger grades where the mechanics of using a pencil or brush are still a painful process for many students.

It was found that an environment that encourages exploration leads to extensive social interaction among students and that students become more willing to express their ideas, to refine or to revise them. A significantly greater proportion of students experienced an increase in their confidence and self-esteem if their teacher was able to give them greater autonomy over their learning and fostered social interaction. The impact on students' attention span and cognitive development in the special education classes was also significant. Differences in computer usage between boys and girls were observed in one of the classes.

It was found that teachers need strong technical, educational, emotional and social support in coping with changes demanded by the creative uses of computers. The principal plays a critical role in giving or fostering such support structures. Additional support is needed from knowledgeable people outside the individual schools. The events chronicled in this report suggest that reviews of the curriculum guidelines need to be made continually as new developments and uses of this technology emerge and as the exposure to computers in the early grades find extensions or repercussions in subsequent years.

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LOGO WITH DIGITIZED SPEECH FOR SPECIAL EDUCATION

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KEYWORDS: Special-Needs Students; Implementation: Classroom/ Individual; Elementary/Pre-School

Background

The setting is a special education situation involving a school being run by the Association for Retarded Children. We had been trying to incorporate computers in the education process to see if their unique capabilities could help out with some children who had some very special needs. In this case, we had some severely multiply handicapped children who had a great deal of difficulty using the traditional keyboard on the computer. The children also had communication difficulties and so we needed something which especially attracted their attention and also held their attention.

Solution Summary

So what was our solution? The computers we are using at the school are IBM PC's. We decided to use an alternative device to substitute for the keyboard. The device we are using is called the MOD Keyboard (the MOD Keyboard is a registered trademark of the National Research Council, Canada). Such a device permits the use of peripheral display customized for the user as well as single or multiple switch input for the system. For the programming job on the computer, we chose Logo because it could be used to exploit the graphics capabilities of the machine while at the same time it could be easily adapted to the needs of the particular children involved.

The program which we developed needed to be extremely easy to use and yet have a definite learning point. We decided on some programs which would draw some simple stick figures representing a boy, a girl, a mom and a dad. The children could all relate to these. But our solution wanted the children, even with their disabilities, to be able to draw the stick figures. We decided on two modes of operation for the children. The first mode gave the children the capability to just select a figure and it would be drawn for them in living color. The second mode gave the children the ability to select different parts of the body as well as the color and the position on the screen and they could gradually create their own figure.

We made this just a little bit more attractive and attention holding by adding the use of high quality digitized speech in conjunction with the stick figures.

So what did we have! We have a system which allows a person with physical impairments to operate a computer using as simple a device as a single switch. Through this interface, the person can draw pictures of familiar objects. As they are drawing such pictures, they hear high quality audio describing or naming what it is they are drawing.

A Little More Detail

In the course of this presentation, we will describe the hardware configuration and input capabilities of the system; we will describe the use of digitized speech directly with Logo; we will demonstrate the system; and we will describe our experiences and the results of this approach for the school children.

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EXPLORING MATH WORLDS WITH LOGO

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KEYWORDS: Implementation: School/District; Implementation: Classroom/Individual; Mathematics; Middle School/Junior High; High School; Teacher Training: Pre-Service; Teacher Training: In-Service

Overview

One of the goals of mathematics instruction is to get children to see the usefulness and power of mathematical ideas, and to get them to apply these ideas to a variety of problem solving situations. Unfortunately, not very many students are successful at doing this. One of the reasons is that there are not enough concrete models to help them understand these concepts. With the computer and in particular with Logo, we can create such models or environments in which powerful mathematical ideas are more accessible. These environments can be called "mathworlds."

Mathworlds

A mathworld is a structured environment that is designed to increase the probability of students bumping into powerful mathematical ideas. It is a place where people are engaged in mathematical activities in any topic area. The learning mode is exploration. The role of the teacher is to motivate the explorations and keep them productive without taking control away from the students. The focal point is a Logo-speaking computer which has, as a part of its library, a collection of microworlds (electronic environments for learning) which are specifically designed to support the learning of a particular topic.

The mathworld will include "neat" phenomena that students will find interesting to observe and interact with. The teacher will be responsible for supporting the students in discovering and getting to know powerful concepts through this interaction with neat phenomena.

Heuristics for Mathworld Design

The challenge to the educational community is to design mathworlds that are rich in mathematics as well as interesting to explore. Some of the key questions to think about in creating mathworlds are the following:

1) What are the sources of neat phenomena that children would find interesting to explore?

2) What specific knowledge or understanding should children acquire as a result of their interaction with the mathworld?

3) What are the powerful ideas and how should children be introduced to them?

4) What non-computer resources can be used to enhance this mathworld?

5) What questions can be asked that will stimulate exploration?

Examples of Mathworlds

Examples of mathworld explorations will be drawn from the arenas of measurement, probability, geometry and trigonometry.

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THE BRAZILIAN VERSION OF LOGO

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KEYWORDS: Translating Logo; International Logo: Brazil; Logo: Future Developments; Elementary/Pre-School

For a Logo learning environment to be as natural as possible for a child, it is necessary that the commands and syntax of the programming language be as close as possible to the child's mother tongue. This fact has motivated the many efforts to translate Logo commands into other natural languages, and to adapt Logo's syntax to that of the natural language in which the commands appear.

In Brazil, we have been using Logo with children since 1976. At first, only error messages were translated in an implementation of Logo which ran on a DEC-10 system. With the appearance of Brazilian-made microcomputer systems, an effort was made by the Nucleus of Informatics Applied to Education (NIED) of the State University of Campinas (UNICAMP) to implement a full translation on a CP/M-based microcomputer system, the Itautec I-7000, made by a Brazilian manufacturer, Itau Tecnologia S/A, of Sao Paulo, Brazil.

This was done with the conviction that the job of translating Logo into Portuguese was not by any means exhausted by converting English words into their Portuguese equivalent; one would also have to take into account the syntactical structure of the Portuguese language. Many examples of such adaptations are provided in the paper, e.g., use of the infinitive. Also, the Portuguese language uses accents and other signs which are not a part of the standard ASCII code. The translation work was facilitated by six years' experience of using Logo with children at UNICAMP. The children's reactions to many suggested translations (originally implemented as procedures within the English version) were recorded and, on the basis of this material, research was done to implement the full translation.

The work done was also one of the reasons for NIED being selected by the federal Brazilian government as one of five centers of excellency in the study of the use of computers in education. A federally sponsored three-year project is underway to introduce Logo to teachers and students of Brazilian public schools.

In conclusion, we now have a CP/M implementation of Logo in

Portuguese which fully takes into account the syntactical structure of the Brazilian language.

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LOGO IN THE PEOPLE'S REPUBLIC OF CHINA

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KEYWORDS: Implementation: School/District; Curriculum; Elementary/Pre-School; Middle School/Junior High; High School; College; International Logo: People's Republic of China; Teacher Training: In-Service; Evaluation; Translating Logo; Logo: Future Developments

It has been two years since Logo was introduced to our country. Logo is liked by everyone who has studied it. It has been most favorably received by those involved in education.

1) At the "Middle School Computer Education Conference 84", sponsored by the Ministry of Education, Logo was chosen as the programming language for middle schools.

2) Various Logo classes for primary and middle school teachers are to be held.

3) Lectures on Logo for children are held at Children's Palaces.

4) The laboratory for Computer Science at Beijing University has translated Logo into Chinese to facilitate Logo learning by children of pre-school age and students at primary school.

5) Preparations for a programming competition on Logo are being held.

Articles on Logo and its applications have been published and books about Logo are going to be published. The Department of Computer Science of East China Normal University and Microcomputer World has published "Series on Teaching and Studying of Logo." The set has ten books in all and was highly praised.

Some CAI and business processing software using Logo is being developed.

The Association of Logo Developers, where those interested in Logo can study and communicate with each other, is going to be set up. This will accelerate the spread and popularization of Logo in China.

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