

INSTRUCTIONAL DEVELOPMENT  
AND  
BEHAVIOR ANALYSIS PROGRAM

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BEHAVIOR PROSTHESIS DEPARTMENT

Walter E. Fernald State School

Belmont, Massachusetts

Beatrice H. Barrett, Ph.D., Director

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## APPENDIX

Preprint of Chapter on Behavior Analysis to be Published in  
Volume IX of Annual Review of Mental Retardation and Developmental  
Disabilities

The Behavior Prosthesis Department was established at the Fernald School in 1963 with support from the Massachusetts Department of Mental Health, the National Association for Retarded Citizens and the National Institute of Mental Health.

Improved habilitation of severely behaviorally handicapped persons in the community as well as the institution continues to be its mission. Its approach includes automatically programmed behavior-analytic and instructional environments; 1:1 tutorials; instruction in group settings; training of institution and community teachers, peer tutors, parents and direct care personnel; and consultation for university, community agency and institution personnel both locally and nationally.

Its contributions to residents and staff of the institution, as well as to the Commonwealth and to the field of mental retardation in general, include:

- ongoing exploratory and developmental research into a) variables that maximize effectiveness of habilitative instruction and b) behavioral characteristics of retarded learners that must be remediated or prosthethized for credible outcomes,

- automated environments offering residents repeated opportunities to obtain preferred reinforcers while their basic behavioral skills are being assessed and developed and their specific behavioral deficits are being remediated or prosthethized,

- a wide variety of preacademic, academic, social, prevocational and vocational instructional sequences developed in the first self-contained behaviorally oriented classroom for "custodial" children-- a classroom that served as a model for institution and community classrooms across the country,

- instruction of residents of all ages in various community-oriented quantitative skills, the communication skills of reading and printing, and the leisure-time activity of play,

- sequential operational description of the steps involved in both process and content task analysis in instructional design and in criterion-referenced, curriculum-based assessment,

- a series of forms for standardized recording of instructional data and for standardized description of sequential instructional procedures,

- continuing refinement and evaluation of newly developed instructional procedures and sequences with particular reference to their facilitative effects on both acquisition and mastery of increasingly "normal" skills,

- a service delivery system that can integrate volunteer community paraprofessionals and institution residents as tutors of the severely handicapped, as well as provide daily accountability for pupil progress,

- design and construction of prototype recording, signaling and behavior measurement devices for field application,

--design and construction of prototype remedial and prosthetic devices to meet specific needs of handicapped persons and their teachers.

In addition, the department offers:

--sponsorship of lecture and film presentations at Fernald by leading researchers in the field of applied behavior analysis,

--seminars and workshops for institution teachers and their supervisors, for ward personnel, for community teachers and for local ARC's,

--consultation to the major habilitative departments on the grounds and to community agencies serving retarded people,

--supervision of graduate and undergraduate student teachers of Fernald residents,

--formal graduate training and regular in-service training of teachers of severely handicapped residents,

--a resource library of reprints that is being continually updated with acquisitions relevant to analysis and modification of retarded behavior,

--yearly reports on new findings and new products and their application in both behavior management and instructional technology,

--publication of a) studies ranging from laboratory analysis of basic operant behavior characteristics and remedial and prosthetic variables to classroom tactics for generality training to cure of encopresis by parents in their own home, and b) reviews of new texts in applied behavior analysis,

--presentations of new developments and findings at professional meetings.

This report outlines major projects currently under way, resource functions and services of our department for both the institution and the broader community concerned with retarded people, direct assessment and instruction of residents during the past year, and our own staff's professional development.

#### STAFF

Carl Binder, B.A., Barbara Colby, B.A., and Judith Linn, M.S., continued in their regular full-time positions, and Gene Buchman, M.A., and Sue Scott, M.Ed., continued half-time.

Deborah Pease, M.Ed., a full-time staff member since 1973, switched to half-time in July. Ms. Pease continued to work with us half-time until November while pursuing doctoral studies at Boston University.

Frances George, B.S., who began working as a half-time teacher in our department in 1974, was loaned to CERC from September to the end of November, at which time she was assigned to a regular CERC position.

Ellen Rabin, a ~~master's~~ <sup>masters</sup> student at Boston University, joined us full-time from the end of March through the middle of May. David Keller, also a ~~master's~~ <sup>masters</sup> candidate at B.U., began as a volunteer teacher in April and when Ms. Rabin left, assumed her position for the remainder of the year.

#### WORK IN PROGRESS

Projects currently under way include:

--Several analyses of response differentiation and stimulus discrimination: (1) the relationship of reinforced and unreinforced rates to accuracy levels of unremediated, remediated and prosthethized response differentiation and stimulus discrimination, (2) intra-individual variability in rate patterns during the course of acquisition, (3) the relationship between rates of stereotyped behaviors and accuracy rate patterns during the course of acquisition, (4) acquisition sequence of response differentiation and stimulus discrimination and their relationship to "best" performance both before and after remediation or prosthesis, (5) comparative effectiveness of prosthetic and remedial variables in differentiation and discrimination learning. The methodology of these studies has been described in previous reports (available on request).

--A follow-up survey of all residents who have participated in Behavior Prosthesis Department programs.

--Assessment of reinforcer preferences of students who will be given a choice of auditory, visual and edible reinforcers in the laboratory as a consequence of their successful classroom performances. (The practical implications of a method which successfully identifies a range of reinforcer preferences are especially significant with the severely retarded, who are often not motivated by commonly reinforcing events.)

--"Programmed Precision Teaching," a frame-by-frame slide-tape introduction to the universally applicable standardized behavior measurement, monitoring and accountability system of precision teaching. Designed to accompany The Handbook of the Standard Behavior Chart by Pennypacker, Koenig and Lindsley.

--A form for simple, fast, nondistracting recording of individual performance within small group instruction.

--A management system for monitoring and feedback of daily individual behavior in a group setting.

--Evaluation and modification of sequences to teach printing and quantitative skills.

--Comparison of delay and distance-fading procedures in errorless discrimination training.

--Simplification and standardization of a distance-fading procedure for teaching word recognition.

--Further development of a reading program that will be published in the coming year as part of a living skills manual for moderately retarded children living at home.

#### ASSESSMENT AND INSTRUCTION OF RESIDENTS

Although our teaching functions were greatly curtailed because of the freeze on hiring and a temporary reallocation of a Behavior Prosthesis Department position, we were able to offer instruction this year to 22 residents, approximately half of whom are adults, and six pupils at CERC.

In addition, for Title XIX, Mr. Buchman did complete psychological assessments of 34 residents, psychological testing of another 34 residents, and complete educational/vocational assessments of 20 residents.

#### RESOURCE FUNCTIONS FOR INSTITUTION AND COMMUNITY AGENCIES

Almost daily we receive calls for consultation--from our Fernald colleagues, from staff of community schools, mental health centers and research centers, and occasionally from people seeking personal assistance. Queries concern a wide range of problems and topics. Some examples this year were: anorexia, effects of specific drugs on specific behavioral processes, selection of specialized treatment facilities, literature references, sources of instructional materials, graduate training programs, referral to behaviorally oriented therapists, and in-service training programs.

In addition to such routine consultations, our department has provided ongoing didactic consultation to 70 Fernald staff members as well as many community teachers. We have participated in workshops, sponsored presentations at Fernald, taught graduate courses for special education teachers, and shared copies of reports and instructional materials. These resource functions of our department are outlined in this section of this report.

#### Assistance to ADLU

At the request of Dr. Hugo Moser and Dr. Donald Anderson, Mr. Buchman served as Acting Director of the ADLU program in the Greene Blind Unit from March 12 to March 29. During this period of administrative difficulty, Mr. Buchman was given "front-line responsibility for staff scheduling

and program decisions in ADLU."

Since that time, we have taken on responsibilities for "psychology" input and in-service training for the teachers and other staff of ADLU. Working closely with the staff and in consultation with Mr. Keith Moore, GBU unit director, we hope to increase the effectiveness of this program as a unit for intensive training in self-help, preacademic, academic and social skills.

#### Consultation to Other Departments and Units

From September to November, Farrell Hall teacher Meg Diters spent approximately half her time in our department's classroom assessing her Farrell Hall students' performance on a quantitative skills sequence developed by Ms. Pease and described in our last annual report.

During part of the same period, we provided similar assistance to a 766 tutor of a GBU resident.

Beginning in October, Mr. Binder participated in weekly lunchtime seminars for teachers of the Adult Education Department. Originally planned with Dr. Barrett and Ms. Ellie McDonagh as a form of in-service training, the seminars evolved into a forum for discussion of problems in designing and implementing educational programs for Fernald residents. The group is now compiling written materials concerning guidelines for program implementation. In connection with these meetings, Mr. Binder has provided consultation to the staff of CEP and to other teachers in the Adult Education Department.

Mr. Binder has also provided ongoing consultation to Farrell Hall staff, particularly those in Apartments 5 and 6. During the year, he participated in in-service training sessions for those apartments at the invitation of the teacher assigned to the apartments, and spent an average of two hours a week in observation, assessment and consultation with respect to behavior management and curriculum design.

In addition to assisting the Speech and Hearing Department by pretraining a North Building resident for audiometric testing, Mr. Buchman provided the department with extensive consultation about equipment.

Dr. Barrett, Mr. Binder and Mr. Buchman met several times with Dr. J. Gardner and Wheatley Hall staff to discuss curriculum planning and the possibility of including some Wheatley Hall residents in our department's instructional programs. We are still anticipating the opportunity to assist Wheatley Hall in this manner and perhaps also to provide an in-service training resource for Wheatley personnel.

Mr. Binder served informally as building psychologist for Thom I during the fall, until the Psychology Department was able to assign one of its staff members to the unit. Participating in unit meetings and in daily planning sessions for in-service training, Mr. Binder consulted with staff about a number of specific and general problems. In February he conducted an in-service session on behavior management techniques and basic principles of behavior analysis for the Thom I day shift.

Teachers of the Basic Skills Training Unit consulted with Mr. Binder concerning curriculum revision.

Consultation to Community Schools

Mr. Binder served as a consultant to two junior high schools in the Reading school district. With a view toward program extension into public schools as increasing numbers of institution residents move into community settings, Mr. Binder provided Reading teachers and administrators with direct assessment of both students and teachers and consultation about:

- individual and group behavior management problems
- the Standard Behavior Chart as a means of evaluating effects of instruction on individual students
- basic skill performance rate data
- curriculum ladders based on objective, measurable skills as a means of improving assessment and remediation
- the difference between acquisition and mastery of skills
- self-control through self-monitoring
- more effective use of resource rooms for special needs students
- extension of remedial procedures into the home and other classes
- use of audiovisual aids
- in-service teacher training
- teacher self-assessment

Mr. Binder also provided consultation to teachers at the AMIC school in Watertown on the use of the Standard Behavior Chart.

He has also become involved recently with the International Learning Center in Belmont, a new community program to train moderately handicapped persons to be teacher aides in classes for the severely handicapped. Our department's experience in including older, more skilled Fernald residents as tutors and clerical assistants in our classroom for severely and profoundly retarded students should have direct application to the new vocational training program. The International Learning Center plans to provide trainees with hands-on experience in community day care centers.

Several programs in the Educational Collaborative for Greater Boston have asked Mr. Binder to provide consultation and in-service training. Many Fernald residents, as well as residents of other state schools, are being served by these EDCO programs.



### Workshops and Lectures for Institution and Community Teachers

Substituting for Dr. Barrett who was recovering from surgery, Mr. Binder participated in an in-service training workshop sponsored by the Education Department. Mr. Binder spoke on "Behavioral and Environmental Normalization with Implications for Assessment, Advocacy and Instructional Technology" to a group of more than twenty teachers.

Mr. Buchman conducted a workshop on "Discrimination Learning: Research Issues and Classroom Applications" for the Behavioral Intervention Project of the Lexington-Arlington-Burlington-Bedford Special Education Collaborative. The first of a series of workshops on behavior modification and analysis, this session focused on laboratory-developed methods for teaching retarded, autistic and neurologically impaired children.

Mr. Binder conducted a Behavioral Intervention Program workshop on "The Effects of Response-Rate Building on the Acquisition, Retention and Transfer of Skills."

Mr. Buchman spoke on "Teaching Sight-Reading and Related Skills" to special education teachers and other professionals at the Boston College Campus School.

Mr. Binder conducted an in-service seminar for teachers at the Horace Mann School in Newton.

### Presentation to Fernald Psychology Department

At the request of Dr. Eric Ward, acting chairman, Mr. Binder gave a presentation on the use of the Standard Behavior Chart to Psychology Department staff.

### Presentation to College Students

Dr. Barrett and Mr. Binder conducted an informal seminar on "The Many Dimensions of Behavior Analysis" for social work students at Emmanuel College.

### Supervision of High School Volunteer

From February to May, Derek Arnold, a student at the Belmont Hill School, spent two hours, three times a week, teaching visual attending, pre-reading and reading skills to a Farrell Hall resident. Working under Mr. Buchman's supervision, Mr. Arnold conducted tutorial sessions with both automated instructional apparatus and table-top classroom materials.

### Formal Instruction for Graduate Students

Dr. Barrett and Mr. Buchman continued to serve on the faculty of Lesley College's graduate program for teachers of the severely handicapped. They were joined this year by Mr. Binder, who taught a course on basic principles of behavior analysis. Dr. Barrett's course focused on advanced

projects in behavior analysis, and Mr. Buchman's course dealt with remedial procedures for language training. As in previous years, many students are DMH employees and nearly all are teaching in schools where Fernald residents are placed. Most classes were held in the evening in our department, where students could observe first-hand our facilities and activities and share our resources.

#### Presentations at Fernald Sponsored by Behavior Prosthesis Department

Dr. Matthew Israel, director of the Behavior Research Institute in Providence, presented a multimedia program on "Behavioral Treatment of Individuals with Severe Behavioral Disorders" to an audience of about 130 persons including ward personnel and teachers, DMH administrators and graduate students from local universities. Dr. Israel's presentation was co-sponsored by our department and the In-Service Training Department, with the assistance of the Media Center.

Our department also arranged for Dr. Betty Vincent of the Department of Behavioral Disabilities, University of Wisconsin, to speak to 30 Fernald teachers on "Early Intervention with the Retarded in a Community School Program."

#### Publications

An article entitled "Covert Processes in the Natural Environment" by Mr. Binder appeared in Behavior Therapy, 1975, 6, 568.

Dr. Barrett completed a critical review of behavior-analytic contributions to the habilitation of retarded behavior. With a bibliography of 442 items, this reference source presents an analysis of manipulated components in the areas of behavior management and instructional contingencies. Entitled "Behavior Analysis," this paper will be published in the 1977 Annual Review of Mental Retardation and Developmental Disabilities edited by Dr. Joseph Wortis. A prepublication copy is appended to this report.

Mr. Buchman is refining one of his reading programs for publication in a living-skills manual for moderately retarded children residing at home. He is also preparing a section on use of telephones for the manual and is co-authoring a section on money skills.

Dr. Barrett's article "Behavior Modification in the Home: Laboratory-Developed Tactics to Bowel-Train a 5½-Year-Old" (originally published in Psychotherapy: Theory, Research and Practice, 1969, 6, 172-176) has been reprinted in a new book for nurses and other health care students and professionals: Approaches to Modifying Patient Behavior by M. D. LeBow (New York: Appleton-Century-Crofts, 1976).

#### Distribution of Articles and Instructional Sequences

This year we distributed more than 180 copies of publications and other instructional materials prepared by staff members.

Prototype Cumulative Recorder for Classroom  
Designed by Mr. Binder and Dr. Barrett

To minimize the effort of recording important aspects of students' performances, we have modified a standard electromechanical behavior-recording device, the cumulative recorder, so that it can be operated remotely by a teacher in a classroom. The record it produces clearly shows the temporal distribution and rate at which a student gives "correct" responses, the trials (frames) on which errors occur, and the number of frames included in a "backup" procedure to "simpler" items in an instructional program. A permanent record of this nature makes it easier to locate sources of errors for many students and to test out program revisions designed to increase program effectiveness.

Devices Designed by Mr. Buchman

Mr. Buchman has designed and constructed a variety of devices for training, signaling, safety, and other purposes. These devices have been provided, when possible, at no charge or at cost to activities with which we have a working relationship, mostly at or through Fernald. Arrangements have been made to make the devices commercially available from Behavioral Devices, 76 Pine Street, Concord, MA 01742.

Signaling Devices

Wet Pants Alarm: Three units in use--Fernald, Delta House and Camp Freedom. Improved, high-reliability version of Foxx-Azrin device. Differentiates between urine and perspiration to avoid false positives. Ultra-low current drain; will not run down batteries if activated continuously (Foxx-Azrin devices can be activated for only 30 seconds--two minutes per set of batteries) to avoid false negatives. All solid-state, body-worn unit.

Preset Fixed-Interval Intervalometer: Two in use--Fernald Psychology Department. Solid-state, miniaturized body-worn unit. Generates covert timing signals for time-sample data recording. Can signal two observers simultaneously for reliability checking and training. Adjustable calibration of single preset interval for synchronization to external standard.

Adjustable Fixed-Interval Intervalometer: One in use--Fernald. More sophisticated and versatile version of preset intervalometer. Both interval and calibration adjustable. Requires set-up before use. Can generate any interval from 1 to 60 seconds.

Bug-in-the-Ear Remote Teacher-Training Device: One in use--Fernald and Camp Freedom. Body-worn, solid-state, wireless unit. Audible only to wearer. Allows supervising teacher to direct student teacher/class interactions at a distance or from behind one-way mirror. Quarter mile range. Can also be used for volunteer, parent or sibling training.

Variable-Interval Pseudo-Random Intervalometer (under development): Programmable, miniaturized, body-worn unit. For classroom and resource room use. Generates covert timing signals for variable-interval reinforcement to build stable, high-rate performance. Adjustable mean

interval and calibration.

### Stimulus Programming Device

Synchronous Binary-Coded-Decimal Slide Projector Output Device (under development): Inexpensive and reliable alternative to currently available systems of programming projectors for teaching machine applications.

### Prosthetic and Remedial Training Devices

Spina Bifida Walker: One in use--Fernald/community. Custom-designed, ultra-lightweight, folding rollator-type walker for spina bifida child. Incorporates platform crutch supports, vertical handgrips, wheels and stabilizers. Can be carried under the arm or on wheelchair when collapsed. Usable on smooth surfaces and pavement. Aluminum and steel.

Rough-Terrain Walker: One in use--Fernald/community/Camp Freedom. Heavy-duty, off-the-road modification of the spina bifida walker. Incorporates 6 x 150 ball-bearing wheels, sand skids, bearing shields. Usable on sand, uneven and broken terrain, paths and fields that may be impassable to a wheelchair. Allows normal outdoor camp experience for a crippled child. Aluminum and steel.

Potty/Toilet Reinforcement Device Activation: One in use--Delta House. Activates tape recorder with march music, applause, praise, etc., belt feeder, light displays and other remote devices for success on the pot. Differentiates between excreta and anything else the trainee might throw in to try to activate it. All solid state.

Audiometry Preconditioning Unit: One in use--Fernald. Portable, battery-operated, solid-state training unit for ward and classroom use. Trains tone on/tone off discrimination and response differentiation needed for formal audiometric evaluation without tying up highly trained technicians. Can be run by teachers, aides, attendants. Impact-resistant.

Tape Recorder to Worksheet Frame (or Slide) Synchronizer: One in use--Fernald. Portable, battery-operated, solid-state unit. Allows student to complete recognition (auditory-visual association) training sequences without continuous teacher supervision, interaction and pacing, and without elaborate and expensive teaching machines. For use with table-top worksheet programs.

Gated Remote Reinforcer Dispenser (under development): Inexpensive portable unit for classroom and related uses to help build independent on-task behavior and reduce dependence on continuous supervision and social reinforcement.

### Safety Devices

Permanently Installed Seatbelt Kid-Proofing: Five in use--Fernald. For safe automobile/taxi transport of agitated residents (students); allows attendance at school and training programs by those who would otherwise be unable to attend without 1:1 supervision during transit. Modifies seatbelt release so that it can be opened with a pen or pencil, but not a finger. Can be released instantly in emergencies; engraved with emergency directions.

Kid- Detachable Seatbelt/Proofer: Two in use--Fernald. Requires several seconds to install and remove, but usable in vehicles where a permanently installed device is not feasible (for example, cabs also used in public service).

Wheelchair Transporting Brace: One in use--Fernald/community. Allows upright, expanded transport of wheelchairs in vans, etc. Prevents chair from collapsing and falling over on turns; precludes damage and injury. Can be installed and removed in less than five seconds. All steel.

#### STAFF DEVELOPMENT

We try to take advantage of opportunities to consult with other professionals, visit outstanding habilitative and instructional programs, attend professional meetings and participate in professional associations.

This section outlines briefly our major activities in this area this year.

#### Consultation from Other Professionals

This year we had the opportunity to obtain consultation from several colleagues who are experts in areas related to our work:

- Eric Haughton, Ed.D., Belleville, Ontario, Public School System
- Jay Birnbrauer, Ph.D., University of Western Australia
- Lou Brown, Ph.D., University of Wisconsin
- Betty Vincent, Ph.D., University of Wisconsin
- William Bricker, Ph.D., University of Miami
- Matthew Israel, Ph.D., Behavior Research Institute, Providence, R. I.

#### Information-Seeking Visits to Other Facilities

Mr. Binder visited the Madison Public School System for three days in February, at the invitation of Dr. Lou Brown of the University of Wisconsin's Department of Studies in Behavioral Disabilities. He observed and consulted with the staff of Madison's pioneering program of education for the severely handicapped, based in the community schools and affiliated with a university teacher-training program.

Dr. Barrett, Mr. Binder and Mr. Buchman visited the Biomedical Engineering Center at the Rehabilitation Institute of the Tufts-New England Medical Center to learn about the Tufts Interactive Communicator for severely physically disabled students.

Attendance at Professional Meetings and Workshops

Staff members attended meetings of the Boston Behavior Therapy Interest Group, workshops sponsored by the Behavioral Intervention Project of the Lexington-Arlington-Burlington-Bedford Special Education Collaborative and the annual meeting of the American Association for the Advancement of Science.

Membership in New Association

Dr. Barrett was invited to join the American Association for Education of the Severely/Profoundly Handicapped.

Special Appointments

Dr. Barrett was reappointed a consulting editor for the American Journal of Mental Deficiency.

Mr. Binder headed the public relations committee of the Boston Behavior Therapy Interest Group, a chapter of the Association for Advancement of Behavior Therapy.