

A PRECISION TEACHING DATABASE

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"A database is a shared collection of interrelated data designed to meet the needs of multiple types of end users."
"Database technology is unlikely to succeed unless the end users it serves are intimately involved in certain aspects of its design."

These are quotes from an authority on database technology (Martin, 1981), which introduce themes for this article about a database for precision teachers and trainers. The article describes the database and illustrates some current uses. We want to share our work at this stage in its development to encourage participation and feedback by a wider audience.

Who Needs a Database? Why?

Precision Teachers have helped develop an effective technology for accurately describing changes in human performance and learning. A standard dimension of behavior, frequency, a sensitive and convenient unit, movements per minute, and a universal display device, the Standard Celeration Chart, have advanced us far beyond traditional educational measurement procedures. For the individual child and pinpoint, PT procedures make it easy to observe behavioral variability, so we can apply our strategies and tactics to improve teaching and learning.

So far, so good. We can detect **within** child variability with relative ease. At the level of the Chart, our technology is effective. However, we don't have a technology of similar power for analysis **across** charts. Active Precision Teachers produce a large number of charts. As yet, no system has evolved for "managing" them. It's difficult to use PT data to get an accurate look at the across pinpoint, learner, or teacher picture. A PT database can help us **see** across chart, learner, and teacher variability as clearly as we can already **see** changes in learning and performance on individual charts.

The answer to the question we posed in the heading above is, "Everyone who wants to take a macro look at Precision Teaching data needs a database." For instance, we as teacher trainers, are primarily interested in discovering and controlling sources of variability among our practicum teachers. Gilbert (1978) reasons that if one human being in a setting is capable of high productivity and efficiency, then we need to

ask ourselves why everyone in the setting isn't making similar accomplishments. We apply this model to try to bring our least productive and efficient teachers up to the performance of our most effective teacher. This will be possible only if we can see the variability in productivity and efficiency among our student teachers. Curriculum developers may be more interested in using the database to look at variability across instances of performance on the same pinpoint or curricular material.

Many of us need a database, even baseball managers. Recently, an article described how Joe Torre, manager of the Atlanta Braves was using a database composed of player statistics to make managerial decisions during a game. For instance, if an opposing hitter has a high batting average against the pitcher on the mound, Torre will get these data in time to make a decision to replace the pitcher with one showing a better record against that hitter. The punch line of the article was this quote from Torre, "Managing a baseball team by hunch is fun, but a little data couldn't hurt."

The Behavior Bank

Precision Teachers actually recognized the need for a database early. Ogden Lindsley and Carl Koenig designed and managed a database, called the **Behavior Bank**, almost 15 years ago (Koenig, 1971; Pennypacker, 1973). It was an ingenious and ambitious project, years ahead of its time. Psychologists and educators who made contact with the **Behavior Bank** witnessed an important pioneering effort. It is unlikely that there is any behavior database today that comes close to the creativity and scope of its design.

We don't know the reasons for closing the **Behavior Bank**. However, a little first hand experience with it brought out some problems, chiefly those associated with centralized mainframe computer operations. By today's standards the **Behavior Bank** was distant, expensive, slow and clumsy--it wasn't "user friendly."

Microprocessors to the Rescue

Microprocessor technology and the advent of decentralized personal computing make it possible for Precision Teachers to create their own local database. These local systems are "user friendly," avoiding the problems of mainframe systems, and yet may be designed to do a variety of different and sophisticated jobs.

The primary requirements for such a local database are a microcomputer with disk drives, a Visi-Calc type spreadsheet program, and, of course, data. Our particular database uses the

IBM PC microcomputer and either the Multiplan or Lotus 123 spreadsheet. Other microcomputers and software programs, such as the TRS-80, Models III or 4, the Franklin Ace 1000 or 1200 models with Visi-Calc or Super-Calc, or the Apple IIe, with an 80 column board, will also work. The main differences between these systems will be convenience and speed.

A Trainer's Database

At the University of Florida, our primary responsibility is to prepare quality special education teachers--a teacher training function. It follows that some of the features of the database described meet the unique needs of teacher trainers and supervising teachers more than others.

The first step in creating the database was to develop an easy way for teachers to record their data. We developed a sheet called the Decision and Outcome Form. One copy is used for each pinpoint taught and is attached to the Standard Celeration Chart. Information on the form is organized by phase. A phase being that period of teaching during which planned conditions of instruction remain constant. Teaching conditions, outcomes, and change decisions are recorded for each phase. The data recorded are: learning channel; component aim (stage--accuracy or fluency building); set size (e.g., number of spelling words in the teaching set); materials used; supporting pinpoints taught simultaneously; performance standard; learning picture; first and last frequency for corrects and errors (these are not actual data points, but are obtained by drawing the learning line and then recording the frequency where the learning line crosses the first and last calendar days in the phase; decision rule used (decision rules are printed on the bottom of the form); and a brief description of the change made at the end of the phase.

These data from the Decision and Outcome Form are the primary input to the database. Using the IBM PC, we enter the data into a Multiplan spreadsheet. A spreadsheet is a matrix of columns and rows. Our sheet uses 23 columns. The first 13 columns accept data from the Decision & Outcome Form. The last 10 columns show the learning outcomes--different measures of effectiveness and efficiency. Each row in the matrix stores the data for a phase. Student teachers who produce lots of phases have a matrix with many rows.

Figure 1 is the Teaching and Learning Database: Teacher Report for one student teacher's practicum work for Spring semester 1983 (15 weeks). This report is too large to reproduce in full. A number of phases (rows) have been deleted from the middle. However, the summary

at the bottom of the report includes the omitted data. The top section of the report gives identifying data, report titles and the data. The next section displays information on the practicum teacher, teaching setting, and course taken. Below that is a section that describes the learners. The next section, TEACHING AND LEARNING OUTCOMES, is the main body of the report--presenting the phase-by-phase data for all the learners and pinpoints taught during the semester. Immediately following is the SUMMARY OF OUTCOME MEASURES. This section summarizes data across all phases and provides totals, medians, and other values. Following this is a two row section that lists other kinds of experiences the teacher may have had during the semester. Examples of other experiences include: participation in staffing conferences, consulting with other school or nonschool specialists, etc. The last section of the report is titled BULLETIN BOARD. We use this section to commend our students, to make suggestions for change, and to post notices. The student is encouraged to respond in writing where it says "Comments."

The main section of the report, TEACHING AND LEARNING OUTCOMES, has many headings. Some are easy to interpret, while others will need clarification. Table 1 provides a brief explanation for each heading.

The PT Database in Action

Our first full use of the database was with eight students enrolled in practicum courses in the Department of Special Education, Spring semester 1983. The student teachers came to this course with widely different kinds and amounts of experience and expertise. Some were new to education, having just transferred from another college. Others were completing their last practicum before graduation. Practicum placement also varied. Five students were placed in elementary resource rooms for children with varying exceptionalities (learning disabilities, behavior disturbances, intellectual impairments). One teacher was placed in an alternative school for middle-school emotionally handicapped youth, and two were placed in self-contained rooms for the physically impaired and multiply handicapped.

Both authors and another doctoral student were supervisors. We held a weekly meeting, about an hour long, to teach and maintain the database system and to share charts. Our early sessions were devoted to teaching the Decision and Outcome Form, a generally easy job. A few problems developed with students who had not had prior PT training. The most persistent was recording actual first and last frequencies instead of those determined by the celeration line.

Figure 1

Teaching and Learning Database: Teacher Report

**** TEACHING AND LEARNING DATABASE ****

DEPARTMENT OF SPECIAL EDUCATION

UNIVERSITY OF FLORIDA

REPORT DATE: April 19, 1983 -- Final Report

 TEACHER-- Carol M. TEACHING AT-- _____ Elem with Betty N. COURSE-- grad practicum in LD- teaching and inservice

Learner's Name	Age	Sex	Program	Grade	Comments
Kenny	10	M	LD	Third	IEP Focus: Ginn reading and preparing to move to new school
Wanda	6	F	EMH	First	IEP Focus: Pre-academic letter and number skills
John	10	M	EH	Fourth	IEP Focus: Ginn reading and Heath math
Keith	11	M	EH	Fourth	IEP Focus: Positive classroom social behavior & Sullivan reading skills
Cleveland	11	M	LD	Fifth	IEP Focus: Reading and behavior problems

TOTAL STUDENTS TAUGHT: 5

TEACHING AND LEARNING OUTCOMES

Learner	Skill--Pinpoint	Phase	Set	Focus	Tmgs	CalDays	Tmgs/Day	CFF	CLF	EFF	ELF	PfStdA	CelCor	CelErr	Cordys	Erdys	Ogs	Lops	Ogs/Day	Lops/Day
Kenny	S/S Math rndg	1	75	A	21	16	1.31	8	27	4	1	0	1.70	1.83	27	29	1425	225	89	14
	at aim	2	75	F	6	2	3.00	24	28	1	1	0	1.72	1.00	3	2	300	0	150	0
	S/W learn chnl	3	36	F	9	3	3.00	47	48	1	1	0	1.05	1.00	3	3	36	0	12	0
.....more data here.....																				
Wanda	S/S Color names	1	8	A	6	2	3.00	5	12	6	4	0	21.42	4.13	43	8	56	16	28	8
	slice back	2	4	A	21	15	1.40	28	42	4	1	0	1.21	1.91	18	29	56	12	4	1
	add colors	3	8	A	30	17	1.76	15	24	5	1	0	1.21	1.94	21	33	72	32	4	2
.....more data here.....																				

SUMMARY OF OUTCOME MEASURES

x's /'s

TOTAL PHASE COUNT= 114																				
SUM=			1654								12				1685	3938	46675	3591		
MAXIMUM=	75			31	50.00	124	230	20	5			21.42	279.5	73	559	5950	225	512		53
AVERAGE=	18			8	2.65	34	54	3	1			1.59	1.21	15	35	413	32	50		5
MINIMUM=	0			1	0.94	4	6	0	1			1.00	1.00	1	0	-473	-39	-237		-5

OTHER(not accuracy/fluency) OBJECTIVES= Maintenance() Endurance() Generalztn: MatrIs() Setngs() Compliance() Sptn Use()
 OTHER FIELD EXPERIENCES= Parents Confs(2) Staffing Confs(1) Reg Program() Write IEPs(2) PT, OT, Spch, Phys Contacts()

BULLETIN BOARD

** What can I say, Carol! This effort is tremendous. You have demonstrated high proficiency in many teaching skills. You have also produced more behavior change than we have yet documented by one student. Congratulations on a job exceptionally well done. I need to find out from you how you recorded data when you did three timings on one and only one day. No growth ever shows, but I'm sure some took place.
 Thanks for all you have helped us learn about teaching and learning. We all wish you the best and hope you have an exciting and rewarding career in education. Please keep in touch and share your skills and data with others.

COMMENTS--

By the last third of the semester, teachers were looking forward to discussing their reports. During the last meeting, the faculty distributed the latest version of their teaching reports and then left the room. When we returned, they were actively discussing technical aspects of their teaching. They seemed to be well under the control of the information database and were busy sharing and learning from each other. The database report was beginning to serve as a technical language for discussing teaching and learning in constructive ways. We ended the semester by commending our teachers for their fine work. The database covers so many aspects of teaching and learning, that almost every teacher was "best" at something. Some were highly skilled from the start. Others made improvements in productivity, efficiency, or both during each third of the semester.

An important consequence of this system is that using the database detects major differences within and across teachers that are not detected by supervisors who rely on direct observation of classroom teaching. Ratings of form and process tend to miss or mask large quantitative and qualitative differences in productivity and efficiency within and across teachers. Also, the person who enters the data into the computer seems to have a more intimate knowledge of the specifics of teaching and learning dynamics.

Summary Reports

Figures 2 and 3 display the Teaching and Learning Database: Summary Report. This report uses most of the data in the database to print a report using 19 different measures to describe teaching activities and learning outcomes. It is designed to achieve two objectives: first, to permit easy comparisons across teachers; and second, to provide a convenient summary of the total productivity and efficiency of all our practicum teachers. The summary report has many uses. Staff may use the data to analyze the effects of various training, supervisory, and placement procedures. Our special interest is to develop procedures for bringing the celerations and total productivity of teachers on the low end, up to the levels of teachers in the top quartile. The data may also be used as an empirical basis for reinforcing outstanding teaching, and for reporting teacher effectiveness to local school districts.

The first part of the Summary Report contains identifying and is displayed in Figure 2. Figure 3 displays the second part of the Summary Report and contains two sections: Teacher Input Options and Teaching and Learning Outcomes. The variability of outcomes is of particular interest. The range of variability is often $> X5$

and in some cases $> X25$. Even differences this large, on important dimensions of teaching, are nearly impossible to recognize by supervisors using direct classroom observations of teacher form and process--a serious shortcoming of traditional practice.

New Measures

We have used a few new measurement units: Cordys, Erdys, ogs and lops. One objective of the database is to provide solid measures of teaching **productivity**, as well as measures of efficiency. As we see it, celeration is a good measure of efficiency--the rate of learning during a phase. Across many phases the median celeration and the proportion of celerations $> X2$ and $< X1.25$ describe teaching efficiency. However, we do not have a measure of productivity. For example, two teachers may both produce $X1.8$ celerations teaching new vocabulary words. They are identical in the rate (efficiency) of learning produced. However, one teacher may only sustain this rate of improvement for 5 days, while the other sustains it for 10 days. Their efficiency is the same, but the latter is twice as productive.

Cordy is a measure of productivity and is defined in Table 1. Cordy is short for "celeration correct days." Erdy is the analogous measure for error movements. It is short for "celeration error days." We believe these two measures give PT technology a useful measure of combined teacher-learner productivity. It takes some experience with cordys and erdys before they have intuitive meaning.

Another new unit is the Og. Carl Binder (1982) described the Og as a unit of knowledge or force, and attributed its origins to Eric Haughton. Ogs are found by multiplying the amount of curricular material by the performance frequency. For example, writing 20 spelling words at 22 words per minute, produces a force of 440 Ogs (20×22). Since the basic unit of our database is the phase, we have defined an Og as the product of the set size (amount of curricular material) multiplied by the frequency change in a phase. If, while learning 20 spelling words, a student progressed from a starting frequency of 8 words per minute to an ending frequency of 22 words per minute, 280 Ogs would be produced (20×14). Lops, short for "learning opportunities," are analogous units applied to the change in error frequencies during a phase. Ogs and lops are handy units for analysis of amount of curricular material on learning, as well as for describing total knowledge produced.

Figure 2

Teaching and Learning Database: Summary Report-- Identifying Panel

**** TEACHING AND LEARNING DATABASE ****

DEPARTMENT OF SPECIAL EDUCATION

UNIVERSITY OF FLORIDA

**** SUMMARY REPORT SPRING SEMESTER 1983 ****

IDENTIFYING INFORMATION

Teacher Name	University Supervisor	School	Host Teacher	Course	Prev. Experience
Becky B.	Gerent	_____ Elem.	Karen P.	EPH 6942-3cr	No paid experience. Last masters practicum. Graduating in June.
Alecia F.	Gerent	_____ Elem.	Pat S.	EMR 6801-3cr	Transfer from Arts and Sciences College. No ed. courses or experience.
Jean H.	Wolking	_____ Class	Susan P.	EED 6943-4cr	Four yrs. paid spec. Ed. exper. Last practicum.
Nadia H.	Branscum	_____ Elem.	Eleanor H.	ELD 6944-3cr	One yr. pd. experience with severe emot. probs. Last practicum.
Jill L.	Gerent	_____ Elem.	Barbara H.	EPH 6942-6cr	Four yrs. + exper. at Sunland with adult retarded. 1st. practicum.
Susan L.	Branscum	_____ Elem.	Eleanor H.	ELD 6944-3cr	No pd. exper. Undergrad. degree in spec. ed. 1st. practicum.
Carol M.	Wolking	_____ Elem.	Betty N.	ELD 6944-3cr	No pd. exper. Undergrad. degree in spec. ed. Last practicum.
Lynn N.	Wolking	_____ Sch.	Susan C.	EED 6943-3cr	No pd. exper. Last practicum. Graduating in August.

Figure 3

Teaching and Learning Database: Summary Report for Eight Teachers

**** SUMMARY REPORT SPRING SEMESTER 1983 ****

TEACHING INPUT OPTIONS										
Teacher Name	Number of Learners	Number of Pinpoints	Number of Phases	Number of Changes	Median Phase Length	Number of Timings	Median Timings Per Day	Percent Accuracy Building	Percent Fluency Building	
Becky	6	24	53	29	Days= 18	485	0.45	32	68	
Alecia	2	5	16	11	15	84	0.41	80	20	
Jean	4	22	84	62	8	221	0.38	42	58	
Nadia	2	9	34	25	14	193	0.64	74	26	
Jill	4	6	9	3	14	70	0.86	89	11	
Susan	2	10	55	45	5	918	3.00	51	49	
Carol	5	33	113	80	7	1654	2.18	58	42	
Lynn	6	16	70	54	4	345	1.00	3	97	
TOTALS	31	125	434	309	xx	3960	xx	xx	xx	
Highest=	6	33	113	80	18	1654	3.00	89	97	
Median=	4	13	54	37	11	283	0.75	54	45	
Lowest=	2	5	9	3	4	70	0.38	3	11	
Hi/Lo Mult=x3.0		x6.6	x12.5	x26.6	x4.5	x23.6	x7.9	x29.6	x8.8	
TEACHING AND LEARNING OUTCOMES										
Teacher Name	Percent Cel > x2.0	Median Cel Correct	Percent Cel < x1.25	Percent Cel > /2.0 Err	Median Cel Error	Total Cordys	Total Erdys	Performance Standards Attained	Total Ogs	Total Lops
Becky	9	1.13	75	11	1.14	1172	1331	11	5532	790
Alecia	0	1.11	75	0	1.01	200	184	0	995	22
Jean*	1	1.08	80	8	1.01	944	874	3	7361	1575
Nadia	4	1.61	4	53	2.35	502	1371	5	19357	2487
Jill	33	1.72	44	0	1.27	194	121	0	2304	175
Susan	56	2.44	2	47	1.55	879	1205	11	27289	1549
Carol	28	1.56	34	41	1.62	1685	3938	12	46675	3591
Lynn	56	2.44	4	9	1.01	942	582	68	25488	554
TOTALS	xx	xx	xx	xx	xx	6518	9606	xx	135001	10743
Highest=	56	2.44	80	53	2.35	1685	3938	68	46675	3591
Median=	19	1.59	39	10	1.21	910	1074	8	13359	1169
Lowest=	0	1.08	2	0	1.01	194	121	0	995	22
Hi/Lo Mult=x56		x2.2	x40	x53	x8.7	x8.7	x32.5	x68	x46.9	x163

* Jean was teaching in an afternoon tutorial program. The children were seen only twice a week. The other teachers usually saw their students four times a week. We try to schedule a Monday, Tuesday, Thursday, Friday teaching week. In our experience, 2 and 3 day teaching weeks produce poor learning.

Table 1

Explanations of Headings for the Teaching and Learning Database:
Teacher Report-- Teaching and Learning Outcomes

<u>Heading</u>	<u>Explanation</u>
Learner	Name of student
Skill--Pinpoint	Learning channel and pinpoint description
Phase	Assigns sequential number to phases within pinpoint
Set	Number of units in teaching set, e.g., number of spelling words in teaching set. Some pinpoints don't have a set number, e.g., reading
Focus	A= accuracy building B= fluency building
Tmgs	Number of timings during the phase
CalDays	Phase length in calendar days
Tmgs/Day	Average number of timings/day for phase
CFF	First frequency of phase for correct movement-- on the celeration line
CLF	Last frequency of phase for correct movement-- on the celeration line
EFF	First frequency of phase for error movement-- on the celeration line
ELF	Last frequency of phase for error movement-- on the celeration line
PfStdA	Record floor value used if errors are zero Performance standard attained during the phase-- Great Falls performance standards used
CelCor	Celeration(mov/min/week) for corrects-- a multiplier unless less than 1
CelErr	Celeration(mov/min/week) for incorrects-- a divider unless less than 1
Cordy	Celeration for corrects multiplied by the number of calendar days in the phase; a measure of productivity
Erdy	Analogous to Cordy, but using celeration for errors
Ogs	Last frequency of phase(on the celeration line) minus first frequency of the phase(on the celeration line) times the number of units in teaching set
Lops	Analogous to Ogs, except calculated with error frequency change
Ogs/Day	Number of Ogs divided by number of calendar days in the phase
Lops/Day	Number of Lops divided by number of calendar days in the phase

Some Results

Figure 3 summarizes our work for Spring semester 1983. Eight teachers taught 31 learners 125 pinpoints and made 309 changes. Changes represent either a move to the next pinpoint or an attempt to improve learning or performance. There were a total of 3960 timings. We have found a high positive correlation between median timings per calendar day and median celerations for corrects.

Variability among teachers is large. The range of this variability may be seen by looking at the rows displaying Hi/Lo Multipliers, the last data row of each panel. The number of learners taught has a X3 range. At the other extreme, we find great variability in the number of timings and number of changes. Also, notice the differences in focus of learning. Ninety-seven percent of Lynn's phases were committed to fluency building. Jean, Susan and Carol each had a pretty even split between accuracy and fluency building. Alecia and Jill concentrated on accuracy building--reducing errors.

Looking at the outcome measures, we see that the median celeration for corrects across all eight teachers was X1.59. The median percent of the celerations for corrects $> X2.0$ was 19. Looking at the less favorable outcomes, we see a median of 39% of the celerations for corrects $< X1.25$. A large proportion of these celerations were on motor skill pinpoints taught to physically handicapped children early in the practicum. The median celeration for errors was /1.21. with a median of 10% $> /2.0$. Although it is difficult to make the data on cordys, erdys, ogs, and lops meaningful in this brief article, let's look at how these units may be used. Becky, working with elementary age physically impaired/multiply handicapped children had a relatively low median celeration for corrects--X1.13. Yet she was the second most productive teacher in terms of cordys, with a total of 1172. This means that, although the learning rates of her students were relatively low, these rates were sustained over a large number of days. In contrast, Susan produced one of the highest median celerations for corrects, but was ranked fifty in terms of total cordys. She produced rapid learning for relatively short phases--high efficiency, median productivity. The difference between cordys and erdys for a teacher describes the relative productivity between fluency and accuracy building.

Summary

We have described how to make a database that will be "friendly" and suit local needs of Precision Teachers. The equipment, software and

knowledge needed puts this type of database within reach of many Precision Teachers. We have also suggested some of the functions this kind of PT database will serve well. Precision Teaching provides a technology capable of producing consistently effective individual instruction. The basis for this seems to be the high quality, sensitivity, and visibility of the data produced. However, a large number of local databases are needed to provide the broadest possible foundation for an increasingly effective technology for teaching and learning.

It seems certain that we will all come into increasingly frequent contact with databases of all kinds as we progress further into the information age. An interesting feature of any database is that it accumulates new uses, once a base of quality data exists and access to the data is made easy. The development of professional sports is an excellent example of this phenomenon. Over the years new player and team statistics have been invented and incorporated into the database of the team and ultimately the league. The database is used with great skill by the press, broadcast media and team owners to build and sustain interest in the individual player, team, league and sport. The database provides a language of, and facts about, the sport. Imagine a conversation about baseball without comparisons of batting averages, earned run averages, or standings in the league.

The uses our practicum students made of the database they generated makes us believe that teaching and learning can be easy to talk about accurately and nonpejoratively--and can be almost as much fun as discussing baseball, football, basketball or hockey. There will certainly be fewer knee injuries! To paraphrase Braves' manager Joe Torre, **"Teaching, and training teachers by hunch is a lot of fun, but a little data couldn't hurt."** Help save (to disk) Precision Teaching. Create a database!

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Chart-sharing

GROUP LANGUAGE ACTIVITY TO INCREASE RECALL OF FACTS

Carole Peterson and Rosemary Holman
SIMS Project

Background

The activity described in this article was conducted in an Oral Language class with eight severely learning and language disabled junior high students. This class is part of the SIMS Project, which provides a highly structured data-based program of individualized instruction for severely learning disabled junior high students. SIMS stands for Systematic Instructional Management Strategies, terms which describe the learning environment designed to systematically establish individualized academic and social goals for each student and to continuously monitor and evaluate student progress toward these goals. The Oral Language class, which meets daily for one hour, is co-taught by a learning disabilities teacher and a speech clinician.

The students participate in a 15 minute group activity focusing on language objectives from orally presented material. These include: 1) participating five times in a discussion, 2) answering questions appropriately, 3) answering questions in complete sentences, 4) asking questions appropriately, 5) identifying the main idea. The following activity evolved from attempts to design more oral language probes that could be used to monitor the group as a whole. The purpose of this probe was to increase recall of facts from orally presented

material.

Method

During the group time, the learning disabilities teacher read and asked questions from a selection in the Mott Basic Language Skills Program. The sections focused on the lives of Charles Lindberg, Walt Disney and Althea Gibson. A short discussion followed reviewing the important information with the students. A one-minute group timing of think/say facts was conducted. The students were assigned seats for this activity so that the first student responding rotated weekly. Each student was given five seconds to initiate a response before moving on to the next student. The learning disabilities teacher monitored this through visual and oral cues. The speech clinician counted the responses as either correct, incorrect, or a repeat on a master tally sheet and this sheet was reviewed with the students before a second timing was done that week. This procedure was performed and the results were charted once a week for seven weeks. To determine an aim, the following measures were taken into consideration:

1. Guidelines set forth by Unique Curriculums Unlimited (10-30 ideas said from material read);
2. A free frequency was taken by instructing the group to think/say material that they had mastered (naming different kinds of food); The group named 29 foods in one minute;
3. A frequency aim was calculated by multiplying the frequencies for the first and second timings each by 50%, and adding these amounts to each frequency. This measure was suggested by the California Guideline for Rate Survey developed by the California Child Service Demonstration Center.

The group aim was set at 13 facts/minute for both weekly timings. When the group reached this aim by the fourth week, a new aim was calculated and set at 20 facts/min. It was at this point that the teachers decided to use the following interventions in an attempt to see how close the students could get to their free frequency:

1. The students predicted the number correct for each timing based on the previous week's data and/or the first timing for that week;
2. Tangible reinforcers were given when predicted aims were met;
3. Thirty second practice timings were conducted and a strong emphasis was placed on giving one or two word facts; and