Teach Your Children Well

by

Michael Maloney, Anne Desjardins, and Pam Broad

Three mature behavioral technologies--Behavior Analysis, Direct Instruction (DI) and Precision Teaching (PT) were integrated into a comprehensive academic program to produce substantial gains in basic skills for 19 elementary special education students in a private school setting. Results indicated development of fluent performances on a common set of 16 academic pinpoints in tool, basic and advanced skills in reading, writing, reading comprehension, spelling, grammar and arithmetic. Posttest scores on standardized tests showed a mean increase of 2.4 years during the first year of the program. All students were successfully reintegrated into regular education classrooms.

During the last three decades, much has been made of the "crisis in education" at all levels. It has been reported in the professional and public press, been the subject of government commissions, including a presidential commission. It has attracted the attention of industry and leading business figures and has been the subject of task forces including one by the Association for Behavior Analysis (Barrett, et al., 1990).

One of the consistent concerns has been the continual failure of school systems to deal with children at risk of failure because of special needs or as a result of other factors which mitigate against academic success. Simultaneously educators, administrators, politicians and policy makers have continued to overlook research which clearly demonstrates that certain pedagogical approaches are almost always successful in remediating the difficulties of students at risk of failure.

The Follow Through Project (*Education as Experimentation*, 1976) clearly demonstrated that Direct Instruction (Engelmann, 1969) developed at the University of Oregon and Behavior Analysis, the University of Kansas model, were the only two consistently effective models in the Follow Through experiment (Bushell et al., 1974).

The Sacajewea Project in Great Falls, Montana (Beck, 1974) also gave clear evidence that the use of Precision Teaching in elementary classrooms dramatically improves student performances in basic academic skills.

While these technologies have been demonstrated effective in their own right, no attempt at integration occurred until the middle 1970's when an informal integration developed at Hastings County Board of Education in Belleville, Ontario as the result of the work of several behavioral consultants. Eric and Elizabeth Haughton with expertise in Precision Teaching, Linda Youngmayr and Linda Olen with expertise in Direct Instruction and Michael Maloney, a behavior management consultant, began to cooperate in staff development presentations. A large number of teachers were trained in one or more of these methods during a three year period. Resistance to some or all of the applications eventually resulted in the Hastings County Board withdrawing support from the project, despite clear empirical evidence of its efficacy.

The current study is the first planned integration of these three proven behavioral approaches in a private setting to determine their combined effectiveness. This work was done primarily as academic remediation and secondarily as applied research. It suffers from all of the design faults associated with in situ research but has sufficiently strong results to warrant further consideration.

The integration involved bringing students under instructional control using behavior analytic procedures, teaching concepts and operations using Direct Instruction programs and measuring progress using Precision Teaching techniques. It also involved giving sufficient practice using Direct Instruction student materials and specially designed practice materials similar to those in the Sacajewea Project. It included bringing student performances to fluent levels. Fluent performances are those which are within a specific range of rates for correct responses and errors (learning opportunities). This range was operationally defined as the level at which the behavior was produced quickly and accurately, and did not deteriorate without daily practice.

Method

Subjects. The subjects were 19 elementary school students, age 10 to 15, enrolled in a full-time remedial academic program at the Quinte Learning Centre. Students were nominally enrolled in Grades 3 - 8, but were significantly behind their age and grade level peers. Pretest scores on standardized tests indicated that these students were 1.8 years below grade level.

Procedures: Pre- and post-testing procedures. Students were pretested using the Wide Range Achievement Test and the Canadian Test of Basic Skills during the first week of classes. The same tests were administered during the final week of the school year. These measures were taken to allow sharing data with educational professionals who are less than fully cognizant of behavioral measures.

Direct Instruction procedures. Students were administered placement tests for the Direct Instruction programs in reading, reading comprehension, spelling, expressive writing and arithmetic. Each student was placed in groups of 5 - 8 pupils in each of 5 DI programs. Direct instruction groups met at least once a day for each DI program and completed at least one lesson per day in each program. Classes in each program were generally held at the same times each day. Progress was checked using the 5 lesson mastery tests within DI programs.

Precision Teaching procedures. Students were taught to chart using the daily standard celeration chart (Maloney, 1982). At any given time, each student's program contained 10 to 15 pinpoints in reading, spelling, grammar, math and tool skills. Students were provided practice sheets with examples and non-examples of the concept or operation being learned, such as the final "e" rule in spelling or the rule for analogies in reading comprehension. Several different forms of most practice sheets were available. Students also started at random points on the practice sheets to minimize order effects. They did a daily measurement on each pinpoint, charted their scores, completed the worksheets as practice and consulted with their teacher regarding progress on each pinpoint. Program changes were made if the data showed no improvement for three consecutive days. Once a student reached the fluency range, the behavior was measured weekly for three consecutive weeks. If no deterioration occurred in terms of the rate and the quality (accuracy) of the behavior, the pinpoint was replaced with a new one. Where necessary, pinpoints were returned to weekly or daily measurement. Class data was summarized on the 15th of each month and presented to the parents and students at a monthly pot-luck dinner meeting. Parents were taught to read the daily charts and to review their child's progress at each meeting. Participation at the monthly meetings was stipulated in the contract between the school and the clients.

Behavior Analysis procedures. A token economy was developed to allow the class to earn free-time activities by earning points as a group. Points were awarded for following four classroom rules and were lost for failure to follow the classroom rules which were posted on the blackboard. Activities and the points required to earn them were negotiated with the students.

The classroom rules were:

1. Work quickly and quietly.
2. Bring all materials to class.
3. Keep your hands and feet to yourself.
4. Say only good things.

It was found that virtually any classroom behavior could be subsumed under these four rules. The rules were used as prompts and as feedback to the children. Students learned to recite the rules, and if an infraction occurred, were asked to determine which rule they had failed to follow. Examples of following the rules were also requested when points were awarded to the class.

Results

Standardized Test Scores. Results of the standardized tests indicate a median increase of 2.4 years on the Wide Range Achievement Test, and a median increase of 2.3 years on the Canadian Test of Basic Skills.

Standard Celeration Chart Data. Since each student typically had between 10 and 15 pinpoints at any given time, there were an abundance of both individual and group data that could be reported. A representative sample of 16 pinpoints common to each student's program is reported here. These 16 pinpoints in 6 areas include:

Oral Reading:	See/Say Story 11 CRP-B
	See/Say Story 22 CRP-B
Grammar:	See/Mark Nouns
	See/Mark Verbs
	See/Mark Sub/Pred
Spelling:	Hear/Write Root Words
	See/Write Final E Rule
	See/Mark Morphographs
	See/Write CVC Rule

Reading Comprehension:
See Deduction/Write Conclusion
See Analogy/Write Conclusion

Arithmetic: See/Write Math Facts
See/Write 2 digit facts
See/Write Fractions

Tool Skills: Think/Write Numbers
Think/Say Numbers

The data regarding each pinpoint is outlined below, beginning with the Oral Reading. All data are reported for all students currently completing that pinpoint. High, low and median scores are reported for both corrects and learning opportunities. These data are conservative in that students who reached fluent levels were given new tasks, were no longer keeping data on that specific pinpoint and were no longer reported in that month's data.

Results on Chart 1 indicate that students read Story #11 from the Corrective Reading Program, Decoding Level B for a period of one minute. Results indicated that in September, the poorest reader was able to read only 28 words per minute, the median score for the class was 70 words/min. and the best reader decoded 275 words/minute. By October, the least skilled reader was at 120 words/min., the median score was 200/min. with a high score of 290/min. Scores continued to increase until the end of December, when all students read Story 11, "Ron and His Hot Robe", at 200-250 words per minute. Learning opportunities decreased from a high of 12 per minute in September to a high of 4 per minute in December.

These data on Chart 2 indicate the reading rates for the same students on their second oral reading passage, Story #22 of the Corrective Reading Program, Level B, Decoding. The lowest score by October 15 was 140 words/min. The median score was 200/min., with the highest score at 290/min. In November, December and January, the high score remained at 290 words/min; the median, at 200; and the lows at 100, 140 and 140 respectively. February's scores were 250 for the high, 200 as a median and 190 as the low.

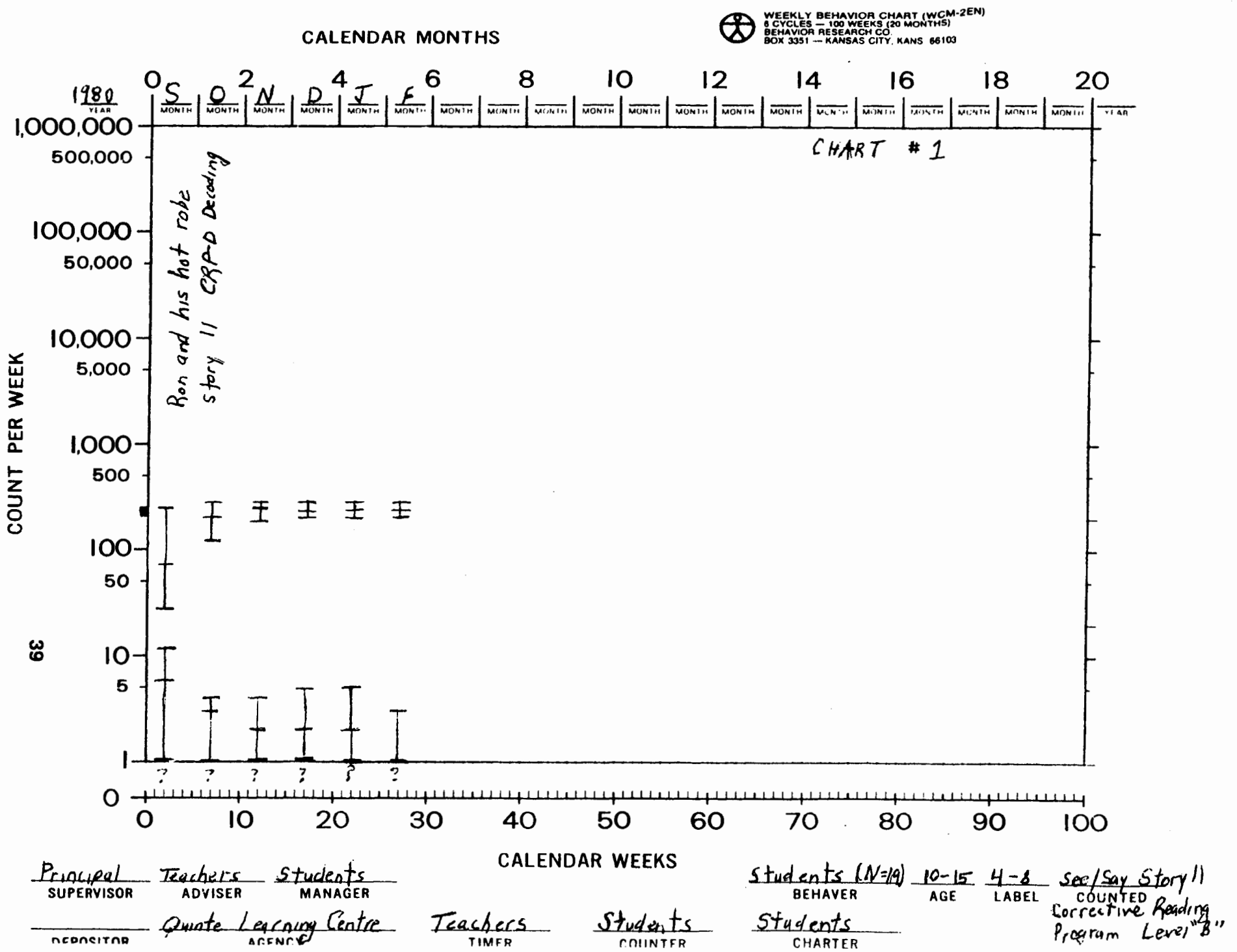
The pinpoint on Chart 3 was from the grammar track of the Corrective Reading Comprehension Program, Level B, which among many other things, teaches students parts of speech. Results indicated that students were able to discriminate the subject from the predicate of a sentence at a median rate of 32 sentences per minute. The most competent student discriminated 85 subjects/minute, while the least competent marked 10 subjects per minute during the first month of instruction and practice. Learning opportunities ranged from 10 per minute to 1 per minute, with a median of 4 per minute. By October, the highest score reached 90 per minute, the median was 70/min. and the lowest was 30/min. Learning opportunities dropped to zero. By November, the high score became 110/min., the median 90/min. and the low 60/min. Learning opportunities were not reported. In December, the high score remained 110/min., the median became 100/min., and the lowest score was 90/min. No learning opportunities were reported.

Results shown in Chart 4 indicate that students could underline nouns in sentences at a median rate of 32 nouns per minute. The best performance was 100 per minute, while the lowest performance was 12 nouns underlined per minute. By October, the high score was 110 per minute, the median was 55 per minute, and the low score was 20 per minute. In November, the high score remained at 110 per minute, the median score was 90 per minute and the low score was 55 per minute. By December, the high score was 100/minute, the median was 90/minute, and the low was 80/minute. In January, all scores were 100/minute.

Results depicted on Chart 5 describe the students' performances in discriminating verbs in sentences. In September, the best performance was 80 verbs per minute. The median was 30 verbs/min. and the low was 10/min. In October, the high became 110/min., the median was 50, and the low was 30 verbs per minute. By November, the high was 130/min., the median was 90/min., and the low was 70/min. In December, the high was 110, the median 100, and the low 90 per minute.

Data in Chart 6 show the students' performances on a reading comprehension task from the Corrective Reading Program, Level B, Comprehension, writing the conclusions to deductions. The first data reported was for November, the first month that students attempted this task. November's data indicated a high score of 10 conclusions to deductions written per minute. The median was 6/min., and the low was 2/min. By December, the high score remained 10 per min., the median score was 9/min., and the low score was 8 per minute.

Chart 7 depicts monthly student performances in another reading comprehension task from the same


WEEKLY BEHAVIOR CHART (WCM-2EN)
6 CYCLES — 100 WEEKS (20 MONTHS)
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CALENDAR MONTHS
1980 YEAR
S MONTH
O MONTH
N MONTH
D MONTH
J MONTH
F MONTH
YEAR
CHART # 1
Ron and his hot rods
story 11 CRPD Decoding
COUNT PER WEEK
1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0
CALENDAR WEEKS
0
10
20
30
40
50
60
70
80
90
100
Principal SUPERVISOR
Teachers ADVISER
Students MANAGER
Students (N=19) BEHAVER
10-15 AGE
4-8 LABEL
See/Say Story 11 COUNTED
Corrective Reading Program Level "B"
DEPOSITOR
Quinte Learning Centre AGENCY
Teachers TIMER
Students COUNTER
Students CHARTER

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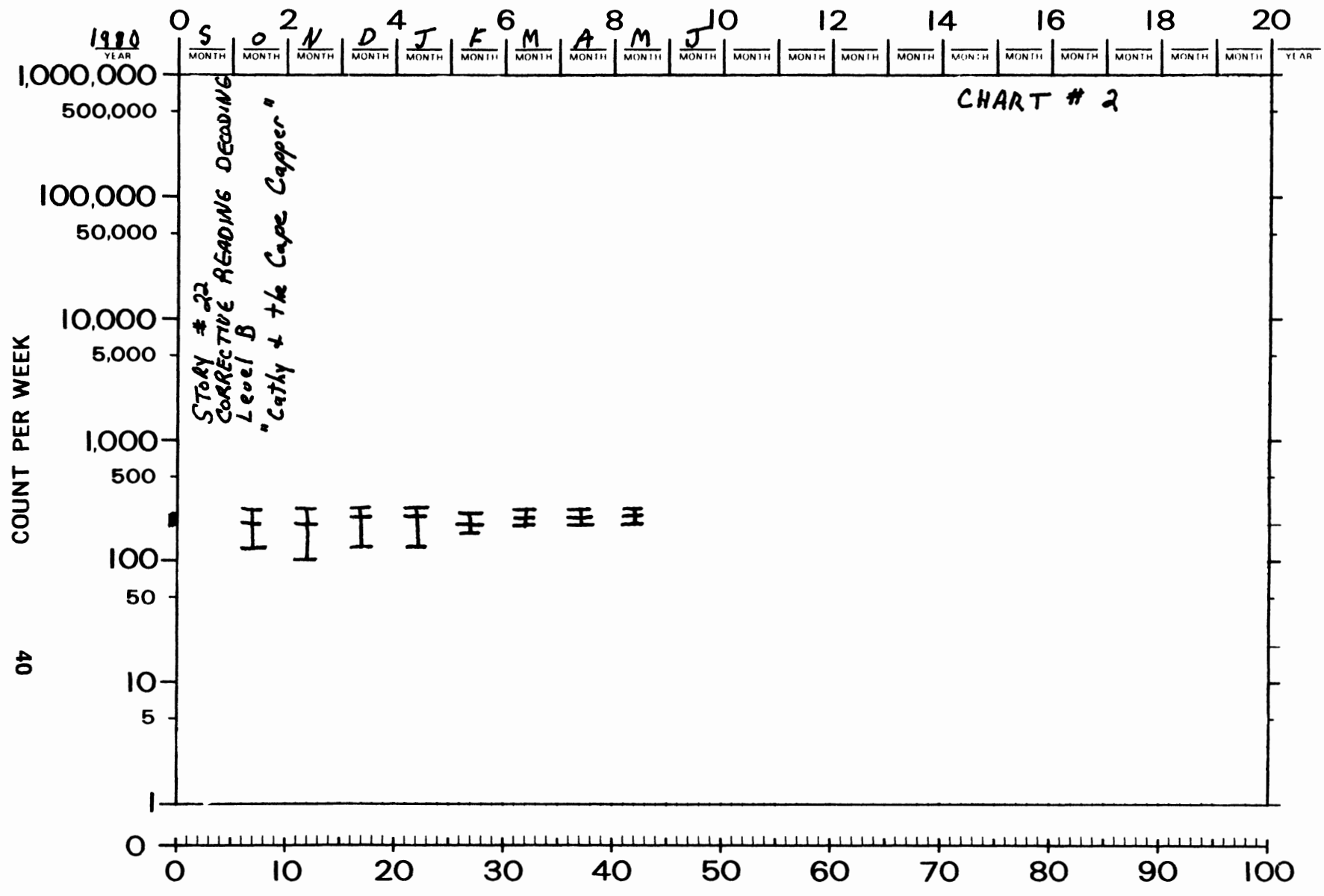

PRINCIPAL SUPERVISOR | TEACHERS ADVISER | STUDENTS MANAGER

STUDENTS (N=19) BEHAVER | 10-15 AGE | 4-8 LABEL | See/Say Story #22 COUNTED

Corrective Reading Program - Level B

QUINTE LEARNING CENTRE | TEACHERS | STUDENTS | STUDENTS

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CALENDAR MONTHS

0 2 4 6 8 10 12 14 16 18 20

1980 YEAR | S MONTH | O MONTH | N MONTH | D MONTH | J MONTH | F MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | YEAR

CHART #3

COUNT PER WEEK

1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0

Sue/picked up a chip. His arm/was broken

?

0 10 20 30 40 50 60 70 80 90 100

CALENDAR WEEKS

PRINCIPAL SUPERVISOR | TEACHERS ADVISER | STUDENTS MANAGER | STUDENTS (N=9) BEHAVER | 10-15 AGE | 4-8 LABEL | See Sentences COUNTED Mark Subject + Predicate

DEPOSITOR | QUINTE LEARNING CENTRE AGENCY | TEACHERS TIMER | STUDENTS COUNTER | STUDENTS CHARTER

WEEKLY BEHAVIOR CHART (WCM-2EN)
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CALENDAR MONTHS

0 2 4 6 8 10 12 14 16 18 20

1980 YEAR | S MONTH | O MONTH | N MONTH | D MONTH | J MONTH | F MONTH | M MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | YEAR

CHART # 4

COUNT PER WEEK

1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0

The grey wolves ate meat.
He stopped to eat.

42

0 10 20 30 40 50 60 70 80 90 100

CALENDAR WEEKS

PRINCIPAL SUPERVISOR | TEACHER ADVISER | STUDENTS MANAGER

STUDENTS (N=19) BEHAVER | 10-15 AGE | 4-8 LABEL | See Sentences COUNTED

QUINTE LEARNING CENTRE | TEACHER | STUDENTS | STUDENTS

Mark Nous

WEEKLY BEHAVIOR CHART (WCM-2EN)
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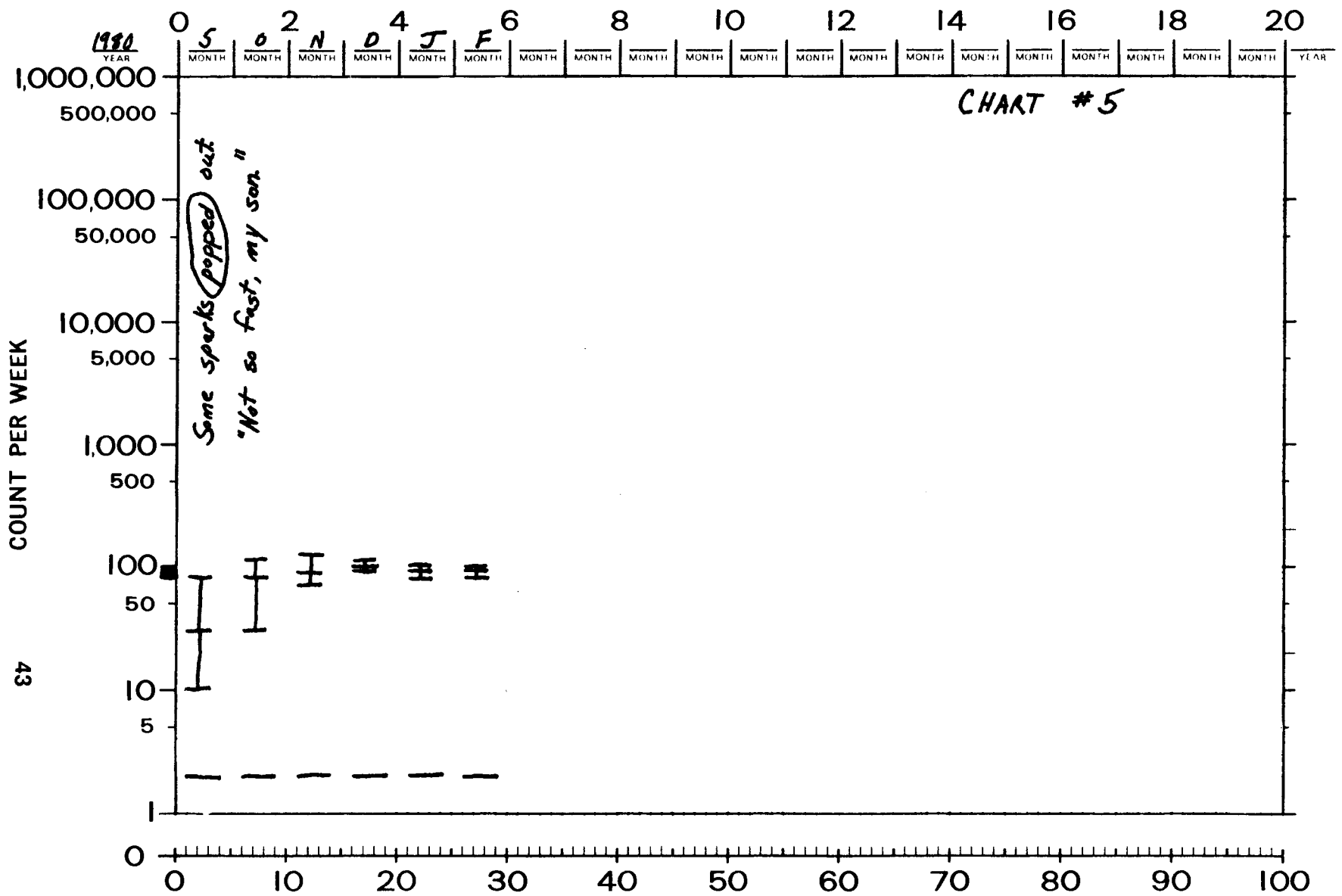

43

PRINCIPAL — SUPERVISOR
TEACHERS — ADVISER
STUDENTS — MANAGER
STUDENTS (N=9) — BEHAVER
10-15 — AGE
4-8 — LABEL
See Sentences — COUNTED
Mark verbs

DEPOSITOR
QUINTE LEARNING CENTRE — AGENCY
TEACHERS — TIMER
STUDENTS — COUNTER
STUDENTS — CHARTER

WEEKLY BEHAVIOR CHART (WCM-2EN)
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CALENDAR MONTHS

0 2 4 6 8 10 12 14 16 18 20

1980 YEAR | S MONTH | O MONTH | N MONTH | D MONTH | J MONTH | F MONTH | M MONTH | A MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | YEAR

CHART # 6

COUNT PER WEEK

1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0

Every person has a skull.
John is a person.
So _____

All birds eat.
A perch is a fish.
So _____

0 10 20 30 40 50 60 70 80 90 100

CALENDAR WEEKS

44

PRINCIPAL — SUPERVISOR
TEACHER — ADVISER
STUDENTS — MANAGER

STUDENTS (N=19 — BEHAVER
10-15 — AGE
4-8 — LABEL
See Deductions — COUNTED

Write Conclusions

TEACHER'S STUDENTS STUDENTS

WEEKLY BEHAVIOR CHART (WCM-2EN)
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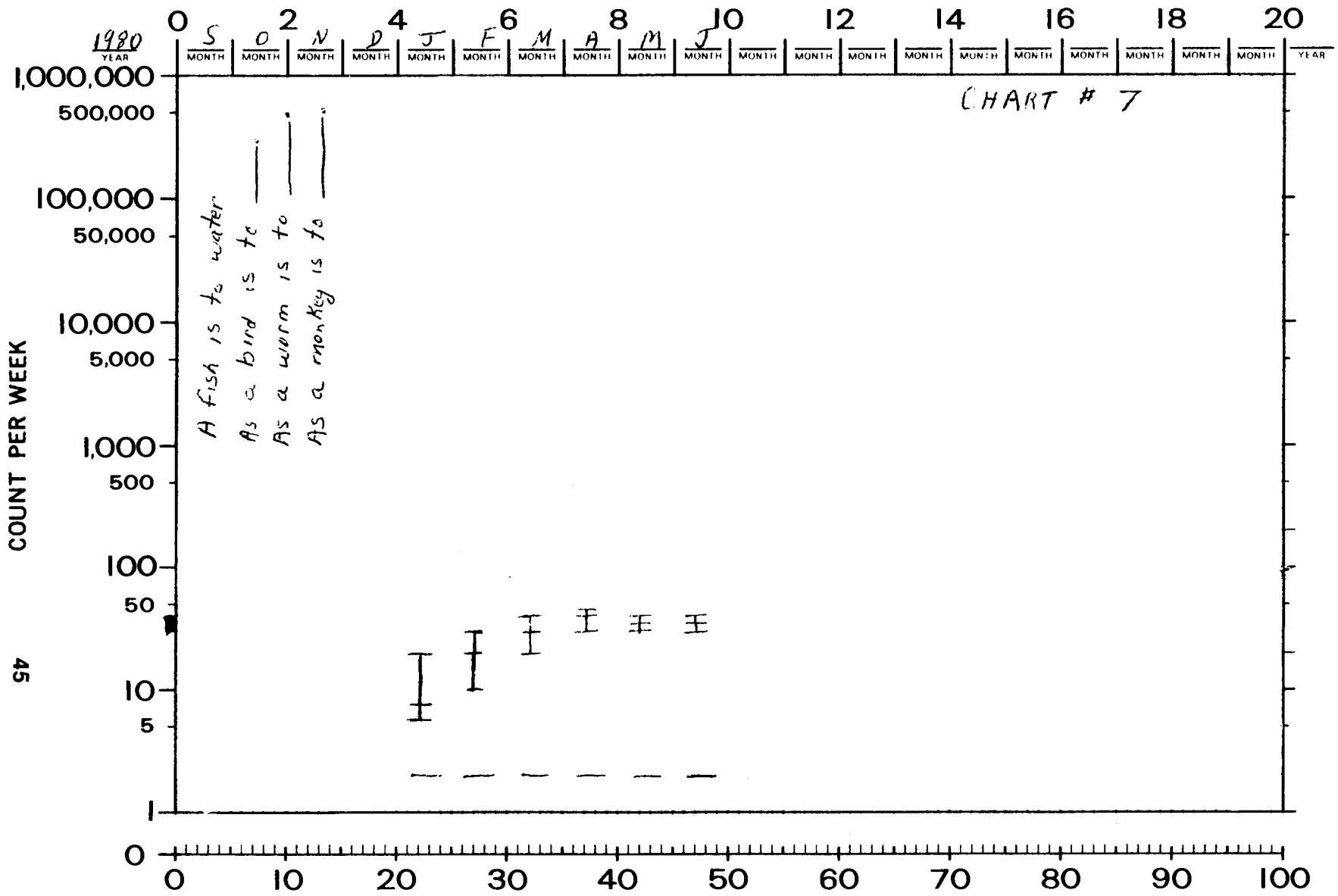
CALENDAR MONTHS



PRINCIPAL — SUPERVISOR
TEACHERS — ADVISER
STUDENTS — MANAGER
STUDENTS (N=A) — BEHAVER
10-15 — AGE
4-8 — LABEL
See analog — COUNTED
write conclusion.
____ — DEPOSITOR
QUINTE LEARNING CENTRE — AGENCY
TEACHERS — TIMER
STUDENTS — COUNTER
STUDENTS — CHARTER

program--completing analogies. No data was available until January, when the first students attempted this topic. The high score for See/Write conclusions to analogies was 20 analogies per minute, the median was 8 and the low was 6 per minute. In February, the high became 30/min., the median was 20/min. and the low was 10/min. In March, the high became 40/min., the median 30/min., and the low was 20/min. In April, the high was 45/min., the median was 40/min. and the low was 30/minute.

Data from Chart 8 report progress from the Morphographic Spelling program. Students were asked to divide words into morphographs. September's data showed the top performer was at 120 words per minute. The median was 90/min,. and the low was 25/min. Learning opportunities ranged from 10 per minute to 1 per minute with a median of 4 per minute. By October, the high score was 115/min., the median was 95/min., and the low was 55/min. By December, the high was 125/min., the median was 110/min., and the low was 95/minute. Learning opportunities were at zero.

Student performance for writing root words from the appendices of the Morphographic Spelling student's workbook when these words were presented at 60 words per minute are summarized on Chart 9. In September, the best score was 30 words/min., the median score was 20/per min., and the lowest score was 6 words per minute. In October, the high score was 30 words/min., the median score was 20 words/min., and the low score was 20 words per minute.

Data on Chart 10 describe the students' performances in discriminating the use of the final "e" rule in a word before adding an ending in such words as "hoping" but not in words such as "hopeless." The first data, in October, indicated that the students' highest rate of applying this rule to examples and non-examples on a practice sheet was 17 words per minute. The median for the class was 10 per minute, and the low was 8 per minute. By November, the high was 35 words per minute, the median was 17 words per minute, and the low was 10 words per minute. In December, the high became 30 words per minute, the median became 22 words per minute, and the low was 16 words per minute. January's data showed a high of 30 words per minute, a median of 25 words per minute and a low of 20 words per minute. During February, the high was still 30 words per minute, the median was 28 words per minute, and the low was 25 words per minute. Learning opportunities were at zero.

Data on Chart 11 depict the students' use of the CVC rule from the Morphographic Spelling program, which teaches doubling the final consonant in words such as "running" but not in words such as "runless." The first data, for November, indicated a high score of 18 words per minute, a median score of 13 words/min., and a low score of 8 words/minute. In December, the high score was 26 words per minute, the median score was 15 words/min. and the low score was 10 words/minute. The January data showed a high score of 30 words/min., a median score of 22 words/min. and a low score of 10 words/min. The February data had a high of 30, a median of 25, and a low of 21. In March, the high was 30, the median 28 and the low 25.

Developing tool skills to enable students to perform at fluent levels on basic and complex skills are indicated on Chart 12. Number writing at 160 digits per minute is a tool skill for writing math facts at 80 facts per minute. These data indicated a high score of 160 digits per minute in September, a median score of 100/min. and a low score of 50 digits per minute. October's results indicated a high score of 200, a median score of 130 and a low of 80 per minute. November's data showed a high of 200, a median of 150 and a low of 120. December and January were nearly identical with highs of 200, medians of 180 and lows of 150 and 160 respectively.

A second tool skill pinpoint indicated on Chart 13 involves counting backwards at fluent rates as a preskill for subtraction. September's high was 200 counts per minute, the median was 100/min., and the low was 65 per minute. October's data showed a high of 220 per minute, a median of 150 per min. and a low of 80 per minute. While November's data showed improvements with a high of 220, a median of 190 and a low of 140, the data from December indicates more variability with a high of 270, a median of 200 and a low of 100. January results were a high score of 240, a median score of 200 and a low of 150 digits per minute. Learning opportunities for September range from a high of 8 to a median of 5 and a low of zero.

The arithmetic data selected in Chart 14 is for subtraction facts and operations. The first data is for facts of 18. In September, the best score was 92 facts per minute, the median 51 fact/min. and the low at 6 facts per minute. By October, the high became 100 facts per minute, the median was 60, and the low was 30. November's high remained at

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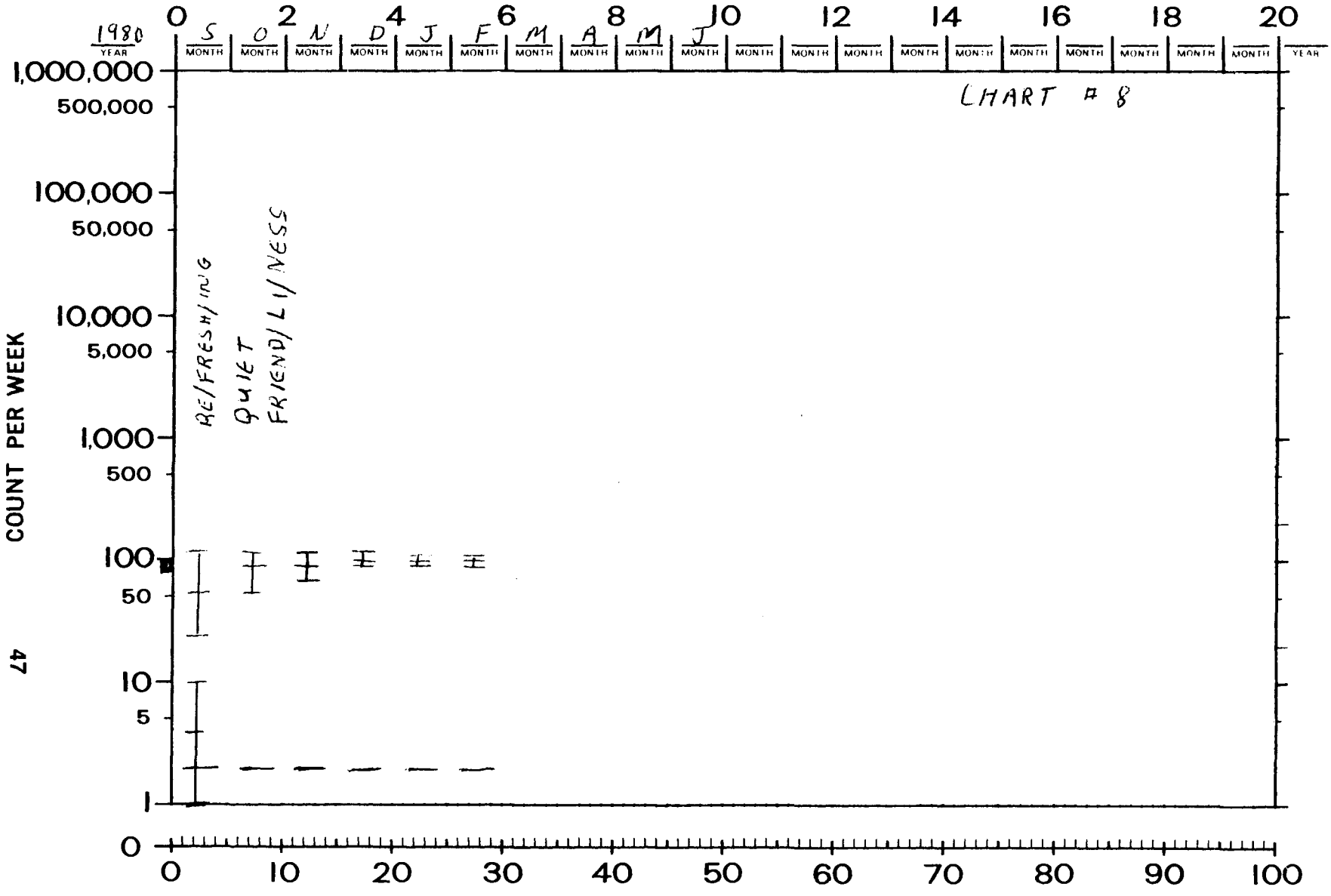
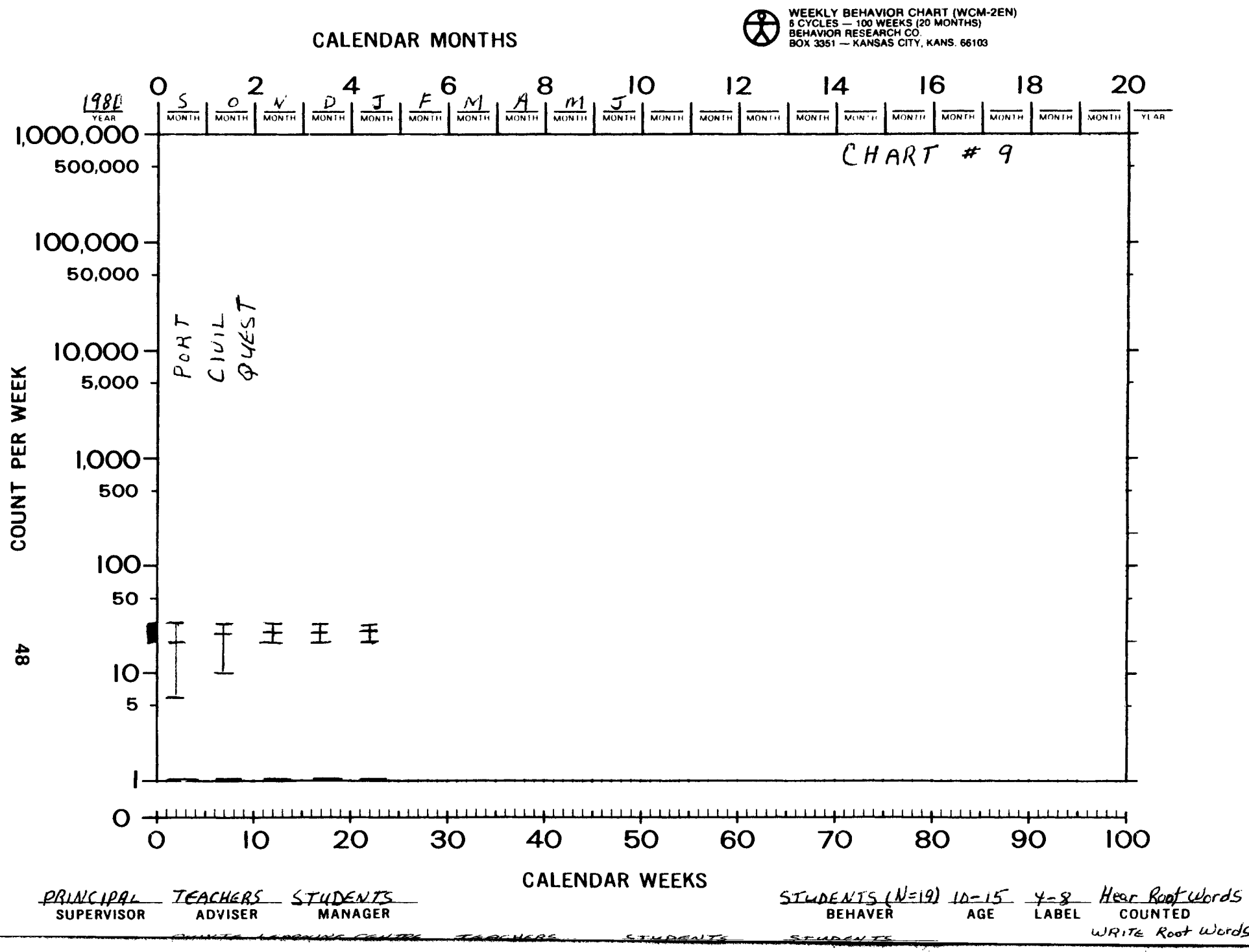


PRINCIPAL — SUPERVISOR
TEACHERS — ADVISER
STUDENTS — MANAGER
STUDENTS (N=19) — BEHAVER
10-15 — AGE
4-8 — LABEL
SEE WORDS — COUNTED
MARK MORPHOGRAPHS

DEPOSITOR
QUINTE LEARNING CENTRE — AGENCY
TEACHERS — TIMER
STUDENTS — COUNTER
STUDENTS — CHARTER


WEEKLY BEHAVIOR CHART (WCM-2EN)
5 CYCLES — 100 WEEKS (20 MONTHS)
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CALENDAR MONTHS
0 2 4 6 8 10 12 14 16 18 20
1980 YEAR
S MONTH
O MONTH
N MONTH
D MONTH
J MONTH
F MONTH
M MONTH
A MONTH
M MONTH
J MONTH
MONTH
YEAR
CHART # 9
1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0
COUNT PER WEEK
48
PORT
CIVIL
QUEST
0 10 20 30 40 50 60 70 80 90 100
CALENDAR WEEKS
PRINCIPAL SUPERVISOR
TEACHERS ADVISER
STUDENTS MANAGER
STUDENTS (N=19) BEHAVER
10-15 AGE
4-8 LABEL
Hear Root Words COUNTED
WRITE Root Words

QUINTE LEARNING CENTRE | TEACHERS | STUDENTS | STUDENTS | WRITE Root Words

WEEKLY BEHAVIOR CHART (WCM-2EN)
6 CYCLES — 100 WEEKS (20 MONTHS)
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CALENDAR MONTHS

0 2 4 6 8 10 12 14 16 18 20

1980 YEAR | S MONTH | O MONTH | N MONTH | D MONTH | J MONTH | F MONTH | M MONTH | A MONTH | M MONTH | J MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | YEAR

CHART # 10

COUNT PER WEEK

1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0

HOPE + ING = HOPING
HOPE + FUL = HOPEFUL

0 10 20 30 40 50 60 70 80 90 100

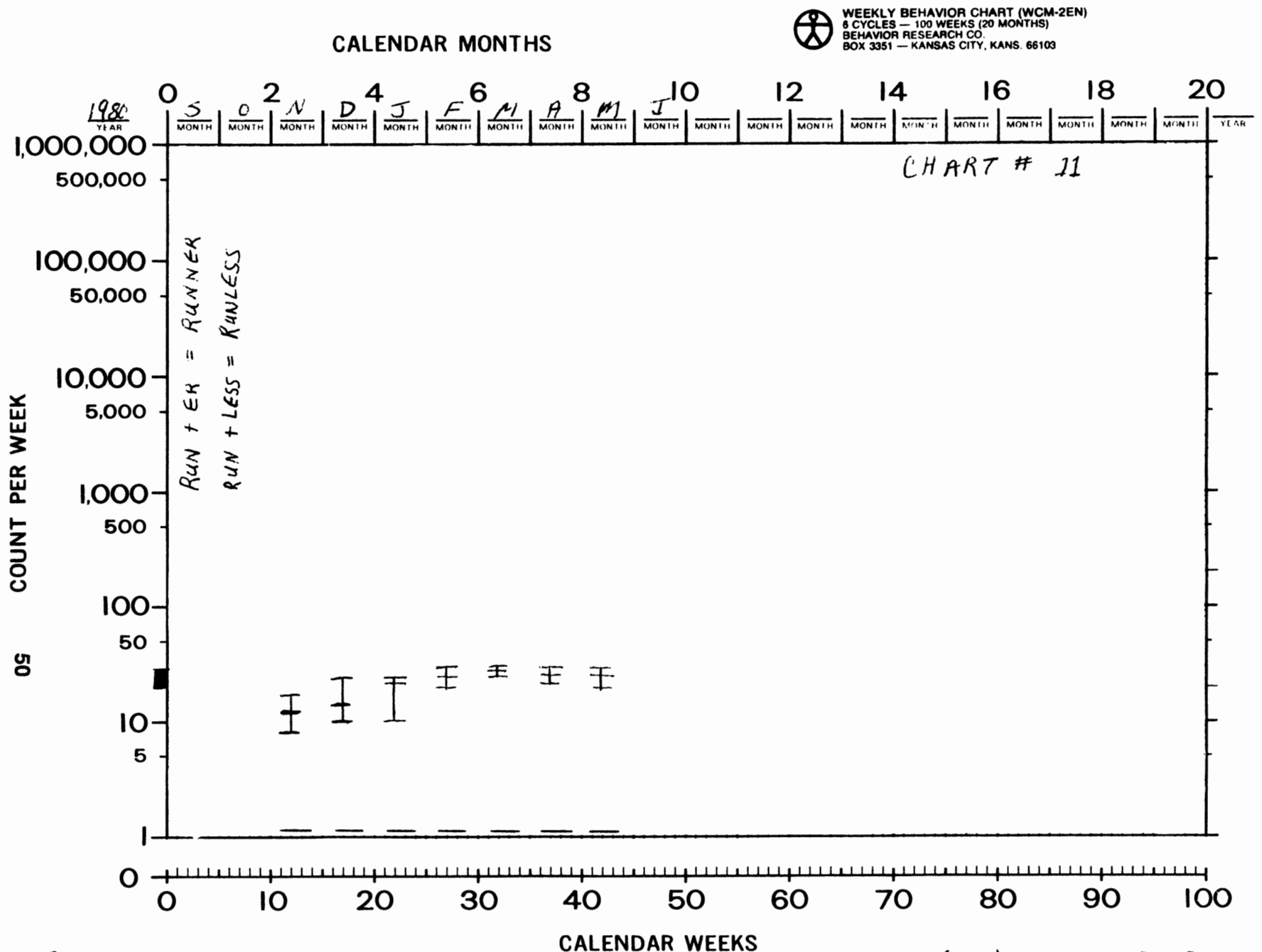
CALENDAR WEEKS

PRINCIPAL SUPERVISOR | TEACHERS ADVISER | STUDENTS MANAGER

STUDENTS (N=19) BEHAVER | 10-15 AGE | 4-8 LABEL | See Words COUNTED

write words 45/19
final "e" rule

DEPOSITOR | QUINTE LEARNING CENTRE AGENCY | TEACHERS TIMER | STUDENTS COUNTER | STUDENTS CHARTER

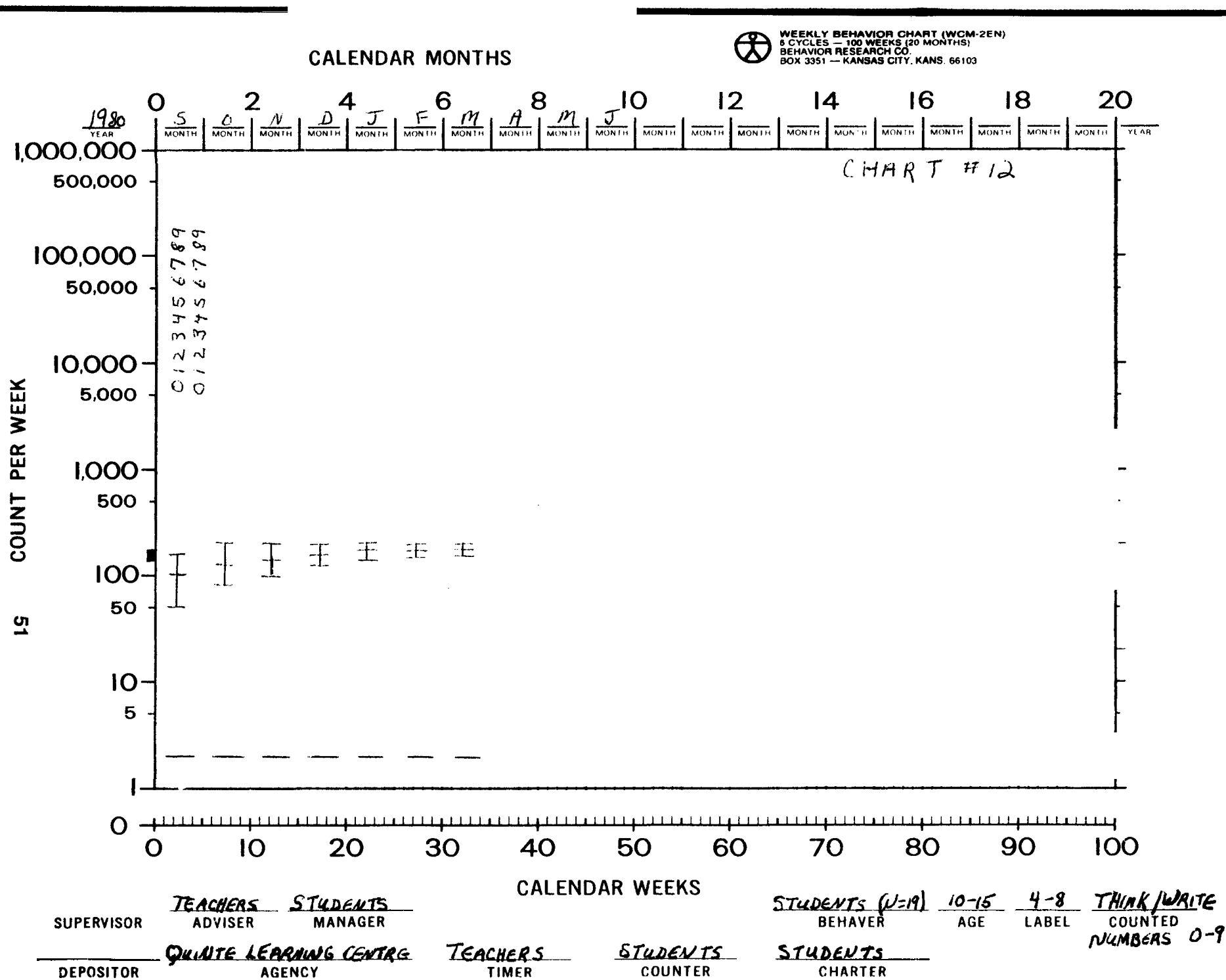


PRINCIPAL SUPERVISOR | TEACHERS ADVISER | STUDENTS MANAGER

STUDENTS (N=19) BEHAVER | 10-15 AGE | 4-8 LABEL | See Words COUNTED

QUINTE LEARNING CENTRE TEACHERS STUDENTS STUDENTS

WRITE WORDS USING "CVC" RULE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6 CYCLES — 100 WEEKS (20 MONTHS)
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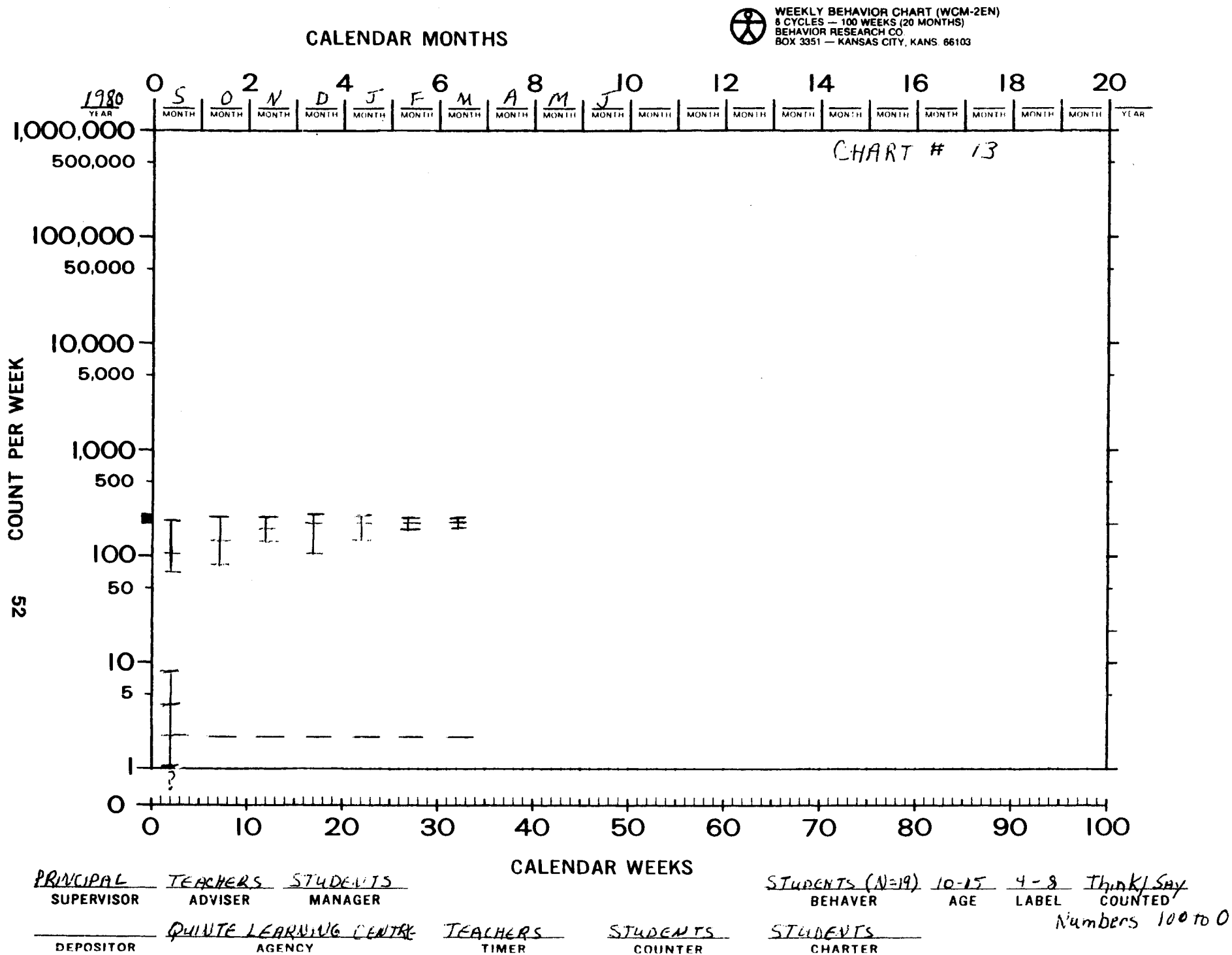
CALENDAR MONTHS
0 2 4 6 8 10 12 14 16 18 20
1980 YEAR
S MONTH
O MONTH
N MONTH
D MONTH
J MONTH
F MONTH
M MONTH
A MONTH
M MONTH
J MONTH
MONTH
YEAR
CHART #12
1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
COUNT PER WEEK
51
0 10 20 30 40 50 60 70 80 90 100
CALENDAR WEEKS
TEACHERS ADVISER
STUDENTS MANAGER
SUPERVISOR
STUDENTS (N=19) BEHAVER
10-15 AGE
4-8 LABEL
THINK/WRITE COUNTED
NUMBERS 0-9
DEPOSITOR
QUINTE LEARNING CENTRE AGENCY
TEACHERS TIMER
STUDENTS COUNTER
STUDENTS CHARTER


WEEKLY BEHAVIOR CHART (WCM-2EN)
6 CYCLES — 100 WEEKS (20 MONTHS)
BEHAVIOR RESEARCH CO.
BOX 3351 — KANSAS CITY, KANS. 66103
CALENDAR MONTHS
0 2 4 6 8 10 12 14 16 18 20
1980 YEAR
S O N D J F M A M J MONTH
YEAR
CHART # 13
1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0
COUNT PER WEEK
52
0 10 20 30 40 50 60 70 80 90 100
CALENDAR WEEKS
PRINCIPAL SUPERVISOR
TEACHERS ADVISER
STUDENTS MANAGER
STUDENTS (N=19) BEHAVER
10-15 AGE
4-8 LABEL
Think/Say COUNTED
Numbers 100 to 0
DEPOSITOR
QUINTE LEARNING CENTRE AGENCY
TEACHERS TIMER
STUDENTS COUNTER
STUDENTS CHARTER

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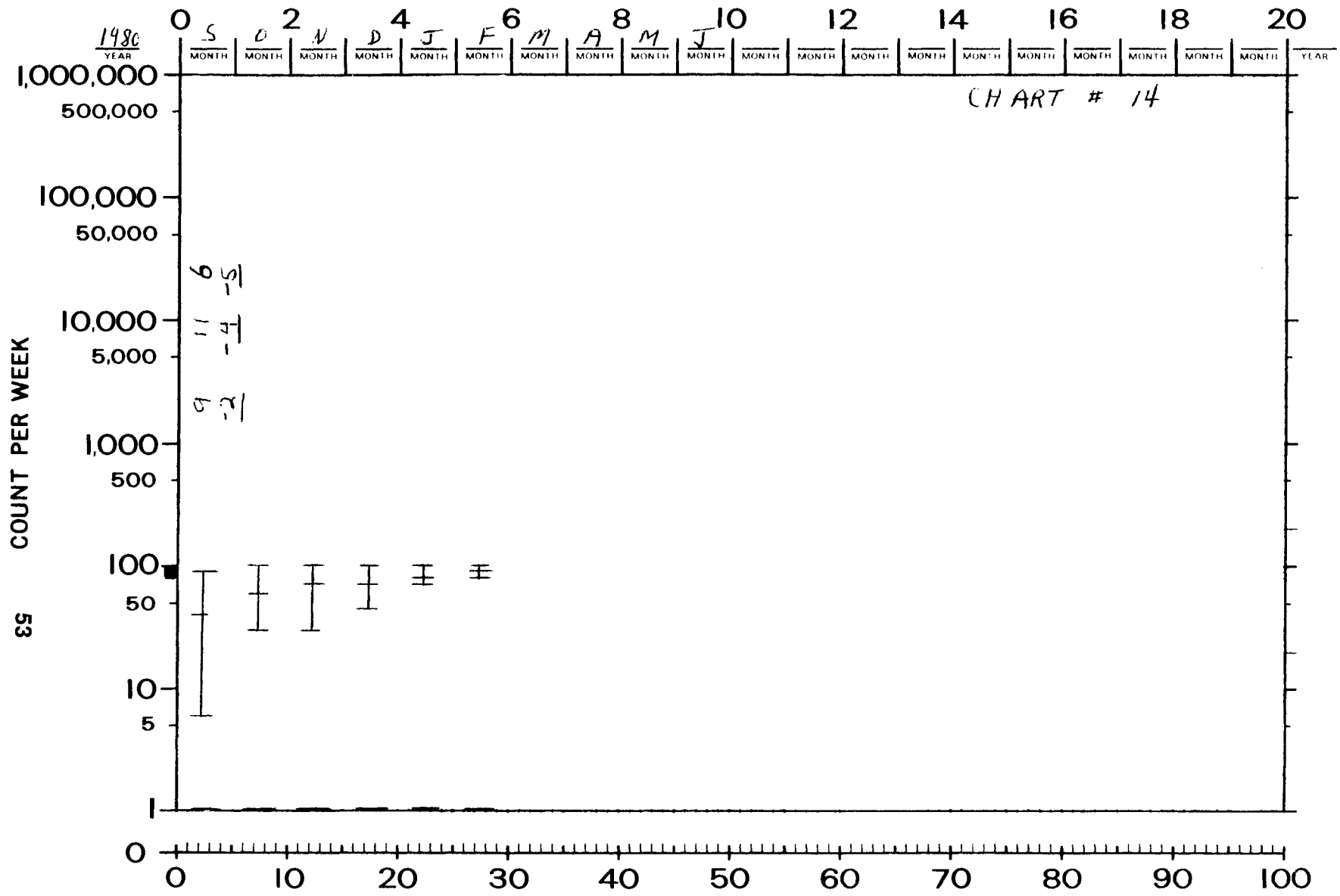
CALENDAR MONTHS



PRINCIPAL — SUPERVISOR
TEACHERS — ADVISER
STUDENTS — MANAGER

STUDENTS (N=19) — BEHAVER
10-15 — AGE
S-8 — LABEL
SEE QUESTIONS — COUNTED
WRITE ANSWERS - facts of 18

DEPOSITOR
QUINTE LEARNING CENTRE — AGENCY
TEACHERS — TIMER
STUDENTS — COUNTER
CHARTER

100, the median rose to 70 and the low to 45 facts per minute. December and January results described highs of 100, medians of 80 and 90 respectively and lows of 70 and 80 respectively.

The data on 2-digit subtraction facts without regrouping on Chart 15 indicated only two students in October, a high of 40 problems per minute and a low of 15 problems per minute. November and December data was virtually identical with highs of 50 problems per minute, medians of 26 and lows of 15. January, February and March had identical highs of 50 per minute, increasing medians of 35, 40 and 45 respectively and lows of 25, 30 and 40 respectively. No learning opportunities data were reported.

The final data presented in Chart 16 describe writing fractions operations using subtraction of simple fractions. The pinpoint was first attempted in December, yielding a high of 30 problems a minute, a median of 18 and a low of 6 problems per minute. In January, the high became 50 per minute, the median became 40 and the low was 15. The high remained at 50 for February, March and April. The medians were stable at 40, 40, and 45 problems per minute for those three months. The lows increased from 25 in February to 30 in March and to 40 in April.

Discussion

These data indicate a number of important findings for students who are considered at serious risk of failure at school. In the first place, these students were consistently able to develop fluent performances across a wide range of curriculum. Their performances were consistently as good, and in most cases better than their "normal" peers. Their performances, for that matter, were as fast and error-free as those of their teachers. This is remarkable in that they were typically asked to perform tasks which were somewhat more difficult than those found in the Sacajewea project. These measurements involved practice sheets that often had both examples and non-examples of concepts or operations forcing the student to decide whether a rule applied. They may also be more difficult than a standard DI implementation where aims for rated performance are much lower and where mastery tests measure quality of response without emphasis on pace.

Often in the past, these students failed to learn concepts and operations as completely as their peers. They almost never reached levels of mastery as indicated by their initial performances on any of these or other topics. Incomplete learning may deteriorate more quickly and easily than fluent performances, resulting in a relative loss of the amount learned due to lack of mastery. This, coupled with curriculum which moved forward because of temporal considerations, would help account for students' previous lack of success.

The Quinte Learning Centre setting provided clear instruction, sufficient practice and measured standards which determined when new curriculum was introduced. The consistent gains, as seen in these data, were clearly attributable to the ways in which these students were given instruction, practice, feedback based on performance data, precise expectations and clearly evident rules. Developing skills to fluent levels allowed the students to gain control of their curriculum. They not only learned, but they learned to learn. They learned Engelmann's adage that "if you work hard, you get smart."

Fluency on one pinpoint also seemed to assist in faster acquisition of similar skills in related tasks. Initial oral reading scores on Story 22, the second passage, showed a x5 increase over the initial reading of the first story for the poorest reader. It showed a x2.5 increase for the median score and even a modest increase for the already fluent highest score. It should be noted that the high scores on much of the September data were reported by the same student, who had just spent 8 weeks in Quinte's summer school program. Initial scores on subsequent stories continued to increase until students began reading aloud at 200-250 words per minute on initial reading of new material. The same increase was in the initial attempts on math facts scores in subtraction.

These data suggest that fluency is a fairly stable phenomenon across students on the same task, (e.g 200-250 words per minute in oral reading, 30 words/min. in writing, 80 math facts/min., etc.). The overall trend in the data showed a consistent reduction of variability across all pinpoints as student performances approach fluency. As expected, the largest changes in performance were always seen in the scores of students with the lowest initial scores. Moreover, students were consistently able to reach fluent levels of performance on a wide range of academic material. The high scores across all students on any pinpoint show a large degree of consistency. There may be an artificial "ceiling effect" in the data which occurred because students changed pinpoints upon reaching that particular range and level of accuracy.

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0 2 4 6 8 10 12 14 16 18 20

1980 YEAR | S MONTH | O MONTH | N MONTH | D MONTH | J MONTH | F MONTH | M MONTH | A MONTH | M MONTH | J MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | YEAR

CHART # 15

COUNT PER WEEK

1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0

23 49 51 88
-12 -27 -10 -24

0 10 20 30 40 50 60 70 80 90 100

CALENDAR WEEKS

PRINCIPAL — SUPERVISOR
TEACHERS — ADVISER
STUDENTS — MANAGER
STUDENTS (N=19) — BEHAVER
10-15 — AGE
4-8 — LABEL
See Questions — COUNTED
write answers
2 digit subtraction
_____ — DEPOSITOR
QUINTE LEARNING CENTRE — AGENCY
TEACHERS — TIMER
STUDENTS — COUNTER
STUDENTS — CHARTER

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1980 YEAR | S MONTH | O MONTH | N MONTH | D MONTH | J MONTH | F MONTH | M MONTH | A MONTH | M MONTH | J MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | MONTH | YEAR

CHART # 16

COUNT PER WEEK

1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1
0

$7\frac{4}{5} = 7\frac{4}{5}$

$7\frac{3}{4} = 7\frac{3}{4}$

0 10 20 30 40 50 60 70 80 90 100

CALENDAR WEEKS

PRINCIPAL	TEACHERS	STUDENTS			STUDENTS (N=19)	10-15	4-8	See Question
SUPERVISOR	ADVISER	MANAGER			BEHAVER	AGE	LABEL	COUNTED
								write answer
	QUINTE LEARNING CENTRE	TEACHERS	STUDENTS	STUDENTS				SUBTRACT FRACTION
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER				

Fluency was generally higher than expected. It was the same for all students, regardless of age, grade, or label. Initially fluency was operationally defined as the score the teacher could achieve on the pinpoint. The students soon taught us that their practiced performances were, as a rule, about x1.5, our initial attempts. Known fluency standards from the work done at Hastings County were integrated into the project.

Students were able to maintain fluent levels of performance on weekly and monthly probes using the levels that had been established. Such fluent performances across all students across all pinpoint into question the stated reasons for the lack of success of these pupils in other settings. Literally every student learned skills which they had failed to learn previously. Moreover, they learned them to levels their "regular" peers and even their teachers could not match. These data seriously question the expected levels of performance of students at any "grade." Specifically, they call into question the assumptions that children with "learning disabilities" need different standards, "adapted" curriculum--or, for that matter, need to be at risk of failure at all.

All of the students, regardless of age, grade or label, were able to complete a variety of Direct Instruction programs to the levels stipulated in the program guides. The post-test scores on standardized tests were x3 the gains usually reported for children diagnosed with "learning disabilities."

These results are not attributable to a difference in teacher-pupil ratio. Many classrooms of children with "learning disabilities" have a ratio of 1 to 6 or better. The program is also cost-effective. Tuition fees for Quinte Learning Centre were less than the total special education grant subsidy available for these students at the local school board. Especially given the academic growth, these program costs are much lower than other settings. Similarly these results are not a function of some "naturally gifted" teachers who worked their "special magic" on these particular children. The same kinds of results have been reported by Kent Johnson and his staff at Morningside Learning Centre, by Aileen and Ian Spence at The Learning Incentive and by Laural Alkenbrack at the Lennox Learning Centre. The "special magic" is the ability to deliver effective instruction, sufficient practice, daily measurement and data-based decision making with the diligence which is the hallmark of any effective teacher.

As was clearly demonstrated by the use of these technologies singly, for Directly Instruction and Behavior Analysis in the Follow Through Project, and for Precision Teaching in the Sacajewea Project, any of these three methods could remediate academic problems. These data suggest that an integration creates a synergism which increases the effectiveness of any one method.

Conclusion

These methods used together produced dramatic results, but a great deal more investigation needs to be done. Precision Teaching would benefit by incorporating the instructional design components of Direct Instruction into the tasks they teach and measure. Direct Instruction would be strengthened by the inclusion of the concepts of fluency and daily measurement from Precision Teaching. Behavior Analysis might be well served to consider the heightened emphasis on instruction and measurement of PT and DI, as well as the judicious use of rewards.

There is much to be done to clarify notions of fluency, its characteristics, and the most facile means of reaching fluent levels of performance on all types of skills. The question of retention, rates of decay and re-learning of performances at or near fluent levels is largely unexplored territory with significant ramifications for teaching and training. The impact of these combined technologies on the rate of acquisition of new skills needs to be determined, as well as the relative contributions of each component on particular tasks. Fortunately, these are empirical questions and can be answered with careful experimentation.

One main effect stands out clearly in these data, despite their blemishes and warts, namely that with the use of the best behavioral technologies, all students learn.....if you teach your children well.

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