USING PRECISION TEACHING IN A SECONDARY SCIENCE CLASS

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This paper will discuss the benefits of using Precision Teaching in a Personal-Social Adjustment (PSA) special education secondary science class, grades 7 through 12. These benefits include providing: 1) the student and teacher with a daily progress check; 2) the student with an opportunity to use science vocabulary; 3) teacher evaluation of individualized methods and materials; 4) learning pictures which may over time be related to other behaviors; and 5) a measure of accountability for the teacher.

DAILY PROGRESS CHECKS

The teacher used Precision Teaching in each of her science classes. The students had been enrolled in secondary science from zero to four years. There were a maximum of eight students per class, with reading levels from second to twelfth grade. Because the students were grouped heterogeneously, up to six different levels of science courses were taught within a 50 minute class period.

Each student completed a daily progress check. This check consisted of a one-minute timing, during which students responded as quickly as they could to a specific task. The results were charted on the Standard Behavior Chart. This Chart provided celerations and learning pictures used by teachers to make instructional decisions.

OPPORTUNITIES TO USE SCIENCE VOCABULARY

Learning science vocabulary is similar to learning a foreign language. Many words used in science have a foreign sound and must be used repeatedly to understand and retain their meaning. The various activities used were designed to increase each student's science vocabulary. We started with naming 53 pieces of science equipment and supplies frequently used in the laboratory. The intent was to familiarize the students with the different lab pieces they would be using. The teacher laid all the equipment on the table. The students named the equipment as quickly as they could for one minute--stethoscope, test tube, filter paper, beaker, alcohol burner, flask, geranium, meal worm, spatula, depression slide, etc.--53 pieces of equipment. If they completed naming them, they would start through them again. From this activity the students would then chart the number correct and the number wrong. Chart 1 shows Greg's celerations and learning pictures. On the first day he named 12 pieces of equipment correctly in one minute. As time went on, his correct responses increased by x1.5 per week to 80 per minute. Each day Greg also charted his misses and his skips. In the beginning he did not know 40 of the pieces of equipment, but, as Chart 1 indicates, he was able to decrease his errors and skips to zero.

During the second activity the students named 11 basic parts of the microscope and 19 major bones of a skeleton model. The skeleton and the microscope had red tape on the parts the students identified. Again, the students were given one minute to point to and name each marked part or

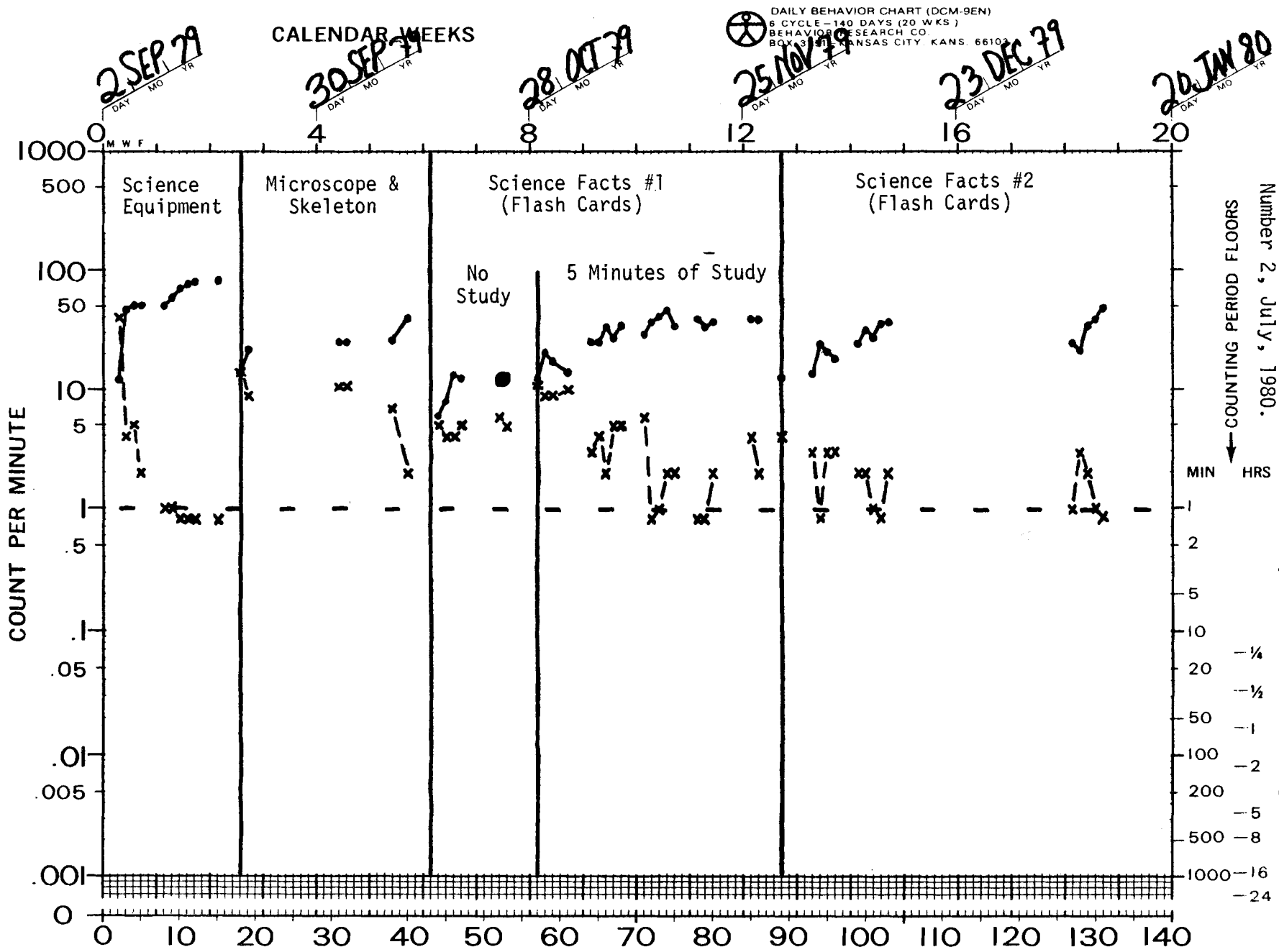

Chart 1. Greg's Learning Pictures

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A. CALKIN	A. CALKIN	J. MILLER	GREG	16	10th gr.	SEE-SAY
SUPERVISOR	ADVISER	MANAGER	BEHAVER	AGE	LABEL	COUNTED
CAPITAL CITY HIGH SCHOOL	TOPEKA, KANSAS					ANSWERS
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER		

bone. Greg's progress on this task is also shown in Chart 1. The errors did not drop as rapidly as during the first phase, perhaps because of infrequent progress checks.

The third activity of the first semester involved reading questions on the front of flash cards and responding with single word answers for one minute. The answers were printed on the back of the cards. The science fact questions probed for general information needed for most of the science curricula to which the students were assigned. Samples of the questions include: 1) What is the metric unit for length? 2) What is the magnification of a microscope with a x10 eyepiece and a x40 objective lens? 3) What is the name for the study of living things? 4) Name the part of the cell which controls a cell's life processes.

The teacher first used the flash cards with no study, hoping that by reading the cards day after day and seeing the answer each student would learn this information. As we see in Chart 1, Greg's corrects were increasing, but his errors were remaining the same. The teacher decided to add 5 minutes of daily study. After about 5 days, Greg and the teacher began to see "JAWS" learning (corrects increasing and errors decreasing).

The fourth activity was then individualized to match the area of science in which the student was working and to intervene if he/she had not had a successful experience in the third activity. One group of students, who were studying biology, were timed on a second set of science fact cards, which contained questions specifically related to the material discussed in their textbook. A second group of students, who were studying life science, were timed on naming the organs of the various systems in the human body. The students had diagrams of the digestive system, nervous system, excretory system, and respiratory system with arrows indicating each organ to be named. A third group of students, who were using a primary level workbook, Land Animals, were timed on spelling the names of various animals which they were studying. Each correct letter written in the appropriate blank was counted as a correct response.

Greg continued with a second set of science facts flash cards. As seen in Chart 1, his corrects increased and his errors decreased to zero.

EVALUATING INDIVIDUALIZED METHODS AND MATERIALS

As seen in Chart 1, Greg showed double improvement (corrects increasing and errors decreasing) in 4 of the 5 phases. His greatest improvement occurred in the first phase, where his corrects increased x1.5 per week and his errors decreased by /4.5 per week. During the third phase, science facts #1 without study, Greg showed single improvement (corrects increasing). However, when 5 minutes of daily study was added, Greg showed double improvement.

Other students, such as Brian, were having problems with science facts, so we individualized. Brian's Chart (see Chart 2) indicates that during phases 1 and 2 he showed double improvement. The 2 learning pictures during science facts #1 indicated that these phases were difficult for Brian to do and to learn. It took four weeks of one minute timings (including no study and with study phases) before he reached the crossover point, the point where he had more correct responses than incorrect responses. Noting the extended amount of time for Brian to reach the

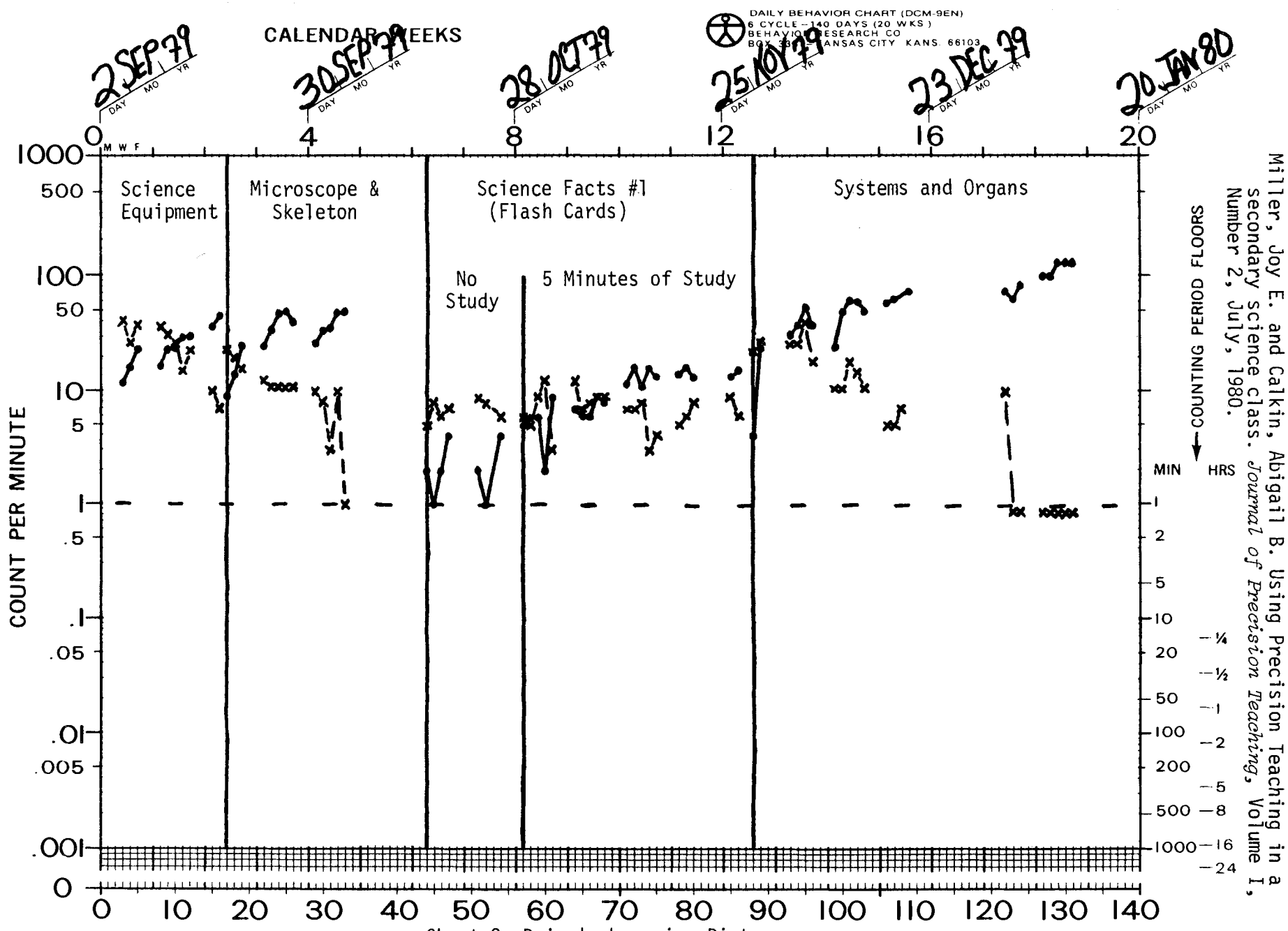

Chart 2. Brian's Learning Pictures

SUCCESSIVE CALENDAR DAYS

A. CALKIN — SUPERVISOR
A. CALKIN — ADVISER
J. MILLER — MANAGER
BRIAN — BEHAVER
14 — AGE
8th — LABEL
SEE-SAY — COUNTED
CAPITAL CITY HIGH SCHOOL TOPEKA, KANSAS — DEPOSITOR / AGENCY
TIMER
COUNTER
CHARTER
ANSWERS

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crossover point and observing his frustrations with the science fact cards, the teacher made the decision to switch Brian to a less frustrating learning experience. During phase 4, systems and organs, Brian's corrects and errors crossed over within one week of timings.

LEARNING PICTURES MAY BE RELATED TO OTHER BEHAVIORS

Teaching methods and interventions are not the only cause for abrupt changes in learning pictures. Circumstances outside the classroom may effect changes in the pictures. The charts can give information when a student may be experiencing some sort of change or problem. An example of this is Sarah's Standard Behavior Chart (see Chart 3). Sarah, a resident patient of the State Hospital, had double improvement learning pictures through the first three activities. During phase 5, science facts #2, her learning picture maintained until after Christmas vacation, when it showed single improvement. The holiday season is time of anxiety for many hospital residents. Sarah was going home during this time and the anticipation of getting away from the hospital to be with her family may have affected her learning. When things became more routine for Sarah after the holidays her learning again improved.

A MEASURE OF TEACHER ACCOUNTABILITY

The teacher summarized all the students' learning pictures. Sixty-one (61) phases showed double improvement, 14 single improvement, 9 maintaining and 8 worsening. The learning pictures were also superimposed to provide celeration collections. Charts 4 and 5 illustrate these collections for corrects and incorrects. The median celeration of each phase is represented by an extended line, while the value of that median is displayed below the celeration collection. Comparing Charts 4 and 5 indicates that the "widest JAWS" occurred during science equipment. From the celeration collections and the learning picture summary, the teacher concluded that the students' learning experiences had been successful.

A COMMENT

A comment taken from Greg's report on timings summarizes Precision Teaching from a student's viewpoint. Greg wrote, "I feel that all these tests help me in understanding my science work. I understand technical words and meanings. They have helped me to use the right equipment for experiments and how to use a microscope properly. Also, I can see these timings helping other kids. Since these kids are competing, it makes them study so they can beat their classmates. I feel that is good incentive because the kids have fun doing it."

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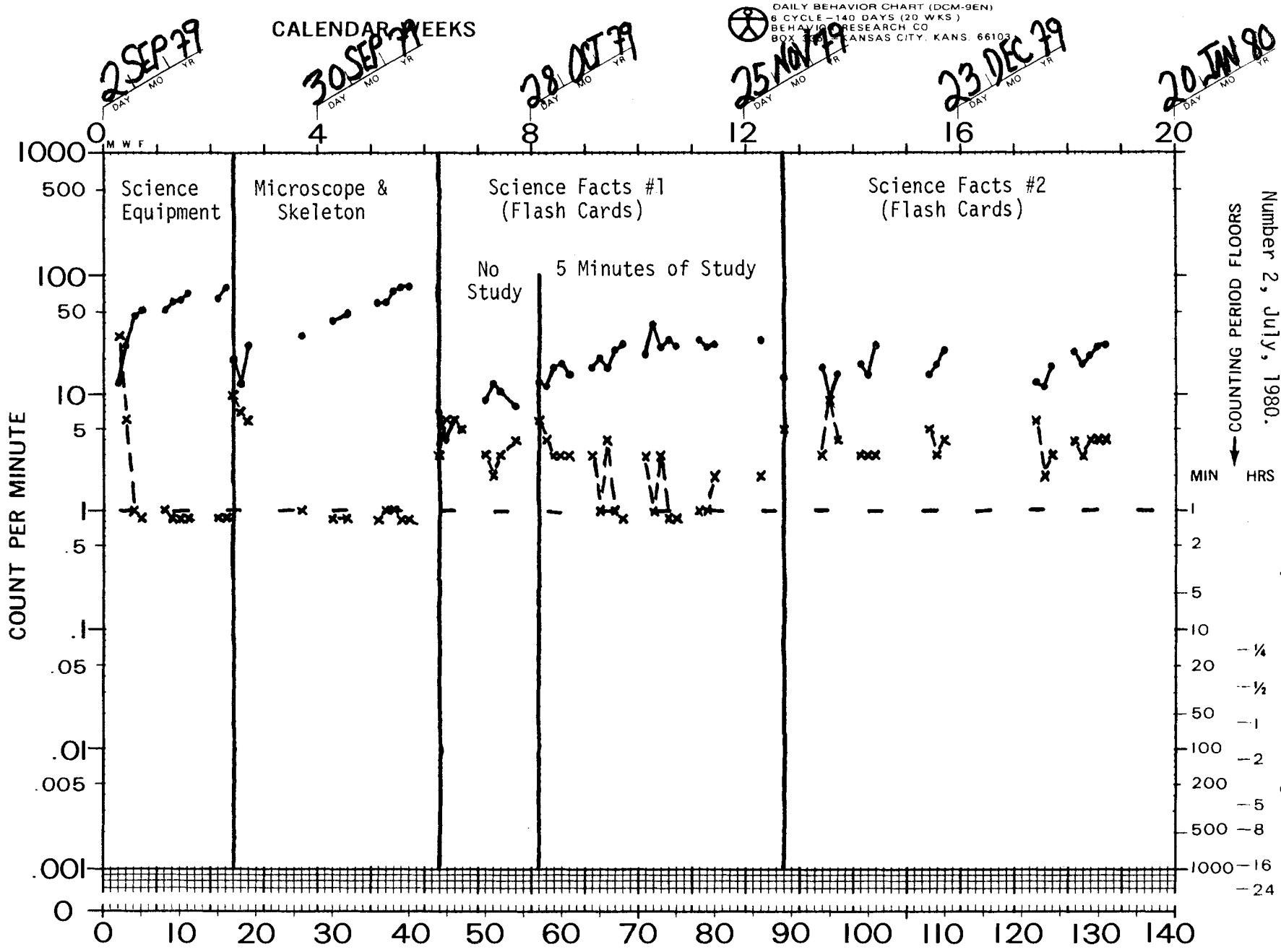

Chart 3. Sarah's Learning Pictures
SUCCESSIVE CALENDAR DAYS

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A. CALKIN	A. CALKIN	J. MILLER	SARAH	14	9th	SEE-SAY
SUPERVISOR	ADVISER	MANAGER	BEHAVER	AGE	LABEL	COUNTED
CAPITAL CITY	HIGH SCHOOL	TOPEKA, KANSAS				ANSWERS
DEPOSITOR	AGENCY		TIMER	COUNTER	CHARTER	

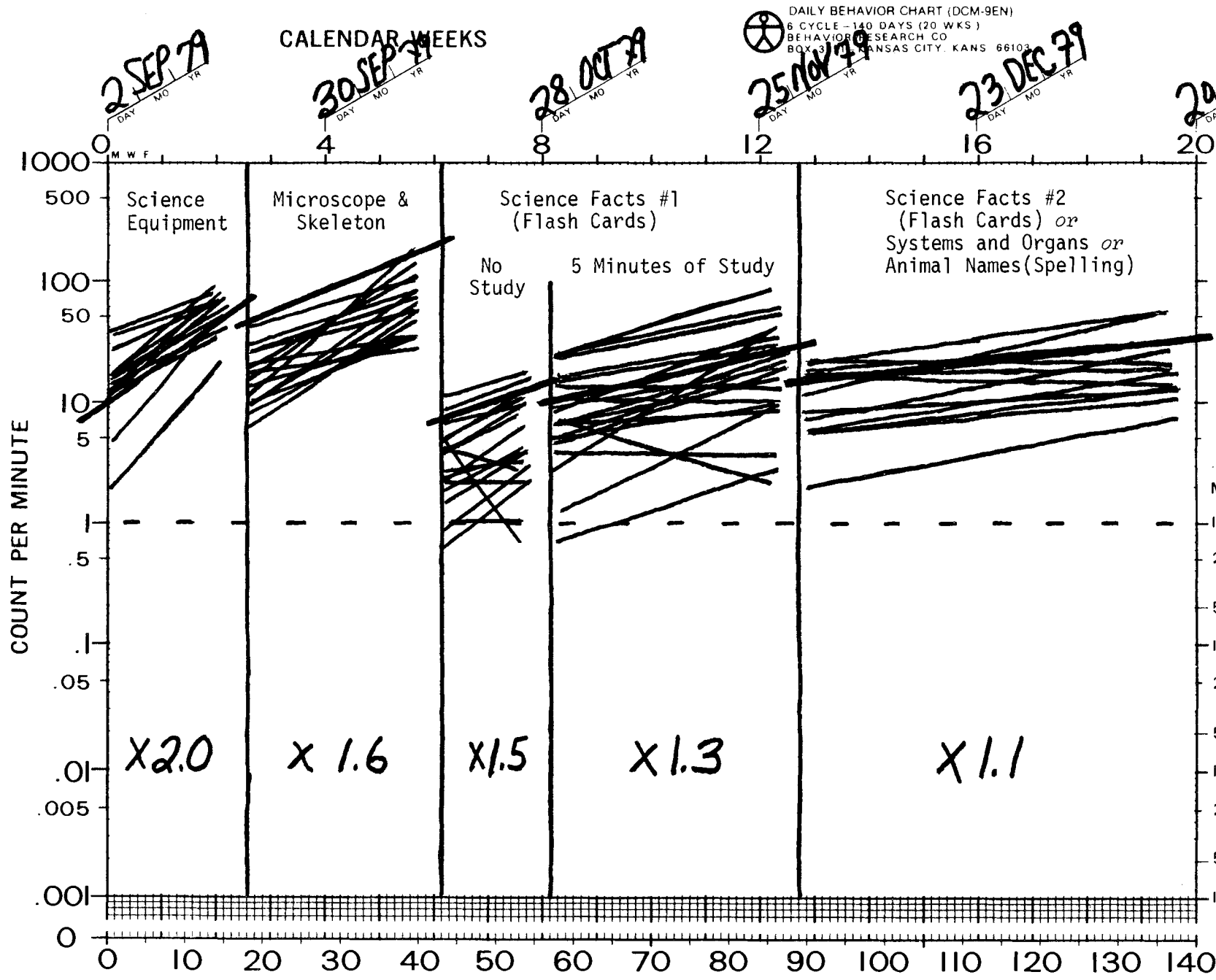

Chart 4. Celeration Collection- Corrects

A. CALKIN — SUPERVISOR
A. CALKIN — ADVISER
J. MILLER — MANAGER
CAPITAL CITY HIGH SCHOOL TOPEKA, KANSAS — DEPOSITOR / AGENCY
STUDENTS IN SCIENCE CLASS — BEHAVER / AGE / LABEL
SEE-SAY — COUNTED
ANSWERS
TIMER
COUNTER
CHARTER

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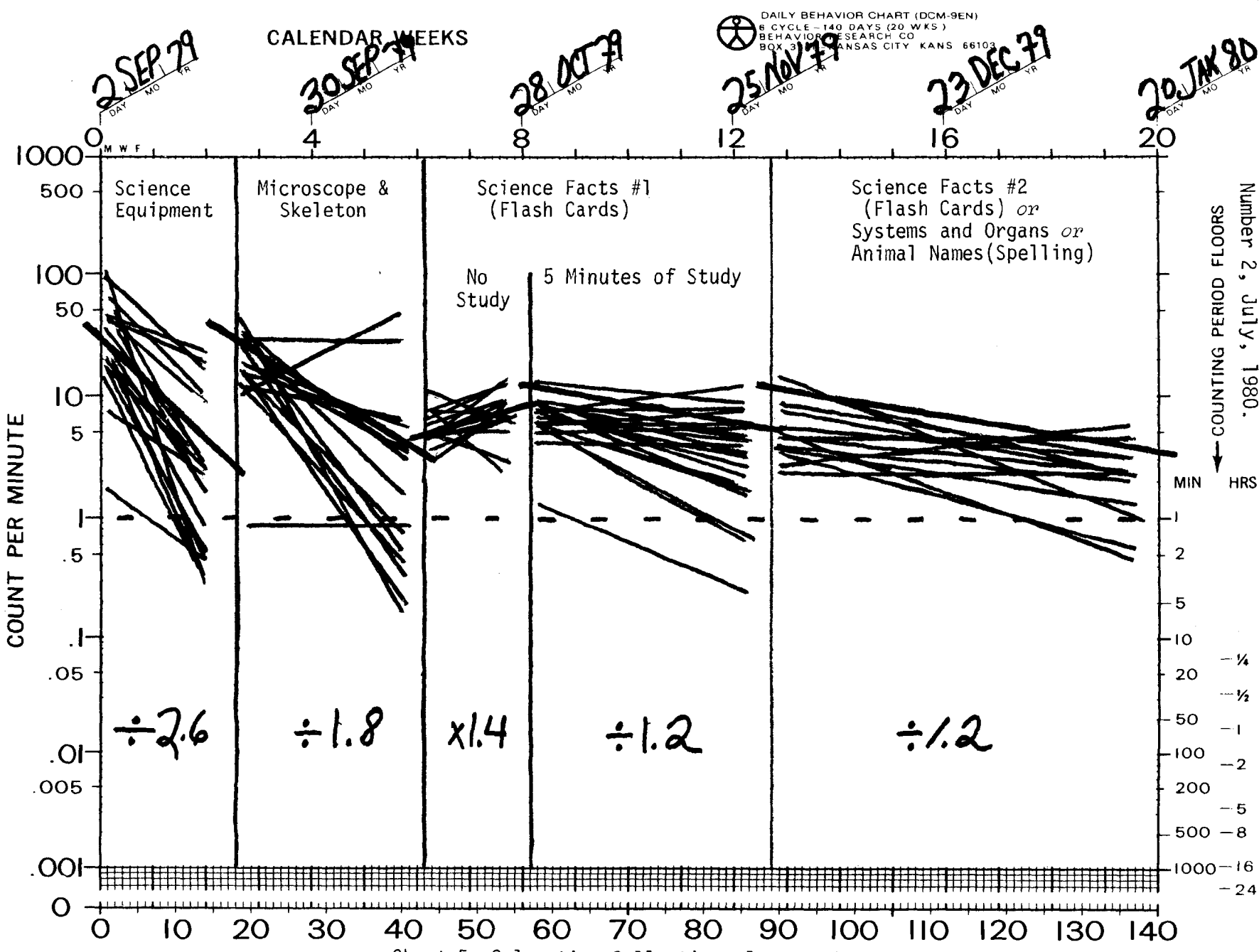

Chart 5. Celeration Collection- Incorrects

A. CALKIN — SUPERVISOR
A. CALKIN — ADVISER
J. MILLER — MANAGER
STUDENTS IN SCIENCE CLASS — BEHAVER
AGE
LABEL
SEE-SAY — COUNTED
CAPITAL CITY HIGH SCHOOL TOPEKA, KANSAS — DEPOSITOR, AGENCY
TIMER
COUNTER
CHARTER
ANSWERS

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