A Case Study Using SAFMEDS to Promote Fluency with Skinner's Verbal Behavior Terms

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Using a deck of 60 Say All Fast a Minute Every Day Shuffled (SAFMEDS) cards, a learner established a fluent verbal repertoire related to the key terms of Skinner's (1957) analysis of verbal behavior. This learner was required to see the phrase printed on the front of the card and to say the term printed on the back. Regular timings were recorded over the course of 3 weeks. Results showed an improving learning picture over time – an increase in correct responses and a decrease in incorrect, or "not yet" responses. During the 3rd week of practicing the SAFMEDS set, the learner achieved the fluency aim of 40 cards correct and 2 or fewer not yet responses in a 1- minute timing. Follow-up timings, conducted 3, 4, and 11 weeks after the learner achieved the fluency aim, showed a general maintenance of the performance in both speed and accuracy in the absence of daily practice.

One of the primary components of Precision Teaching learning is behavioral fluency, a performance characterized by both speed and accuracy (Binder, 1988). One of the tools used in Precision Teaching to achieve a fluent performance with some verbal repertoires is Say All Fast a Minute Every Day Shuffled (SAFMEDS). During the 1970s, Ogden Lindsley developed and promoted SAFMEDS as a tool to promote behavioral fluency (Eshleman, 2000). They incorporate behavioral principles, and they also include frequency as the primary datum of interest, which Skinner considered one of his major contributions to the field of behavior analysis (Graf & Lindsley, 2002; Skinner, 1976). SAFMEDS also permit free-operant responding, where the learner is able to respond at his or her own pace, unencumbered by artificial ceilings (Binder, 1996; Lindsley, 1996a). By employing SAFMEDS to reach a fluent performance in a specific content area, specific products of fluency may be achieved, such as the retention of information, endurance over extended amounts of time, stable responding in the face of distractors, application of material to novel situations, and the ability to meet performance standards (Lindsley, 1992; Lindsley, 1996b).

The acronym SAFMEDS outlines the task's main procedural guidelines. The word Say specifies that the learner should make an overt, audible response for each card. Unlike flashcards, a learner is instructed to begin working with the deck as a whole (Say All), rather than with only a few cards at a time. When using SAFMEDS (Fast), learners should respond as quickly as possible during a timing that is typically brief in duration (e.g., a Minute). Learners should practice Every Day rather than attempt to "cram" before a deadline, and they should Shuffle the deck before each timing to prevent a serial learning effect in which responding is dependent on the order of the cards (Eshleman, 2000).

Responding during SAFMEDS timings is measured by a count of the number of "corrects" and "not yets" the learner produces during a brief timing (see Vargas, 2009, p. 135, for use of "not yet" referring to incorrect responses). If the learner says the correct word or phrase on the back of a card, he or she places that card into a "corrects" pile; if the learner emits an incorrect or incomplete response, or no response at all (a "skip"), he or she places the card in a "not yets" pile. This process continues throughout the timing; once the timing ends, the learner or another individual counts the

number of cards in both the "corrects" and "not yets" piles. Each timing results in a total count of correct responses and a total count of not yets. This count is divided by the length of the timing, and it is then converted into a standard frequency of corrects and not yets per minute.

Learning channels were an important development in the field of Precision Teaching. Eric Haughton created a taxonomy of learning channels, such as SeeSay, SeeWrite, and HearDo (Graf & Lindsley, 2002). These can be viewed as behavioral "throughputs" in which a learner contacts the environment through one or more of the five senses (i.e., See, Hear, Taste, Touch, or Sniff) and then operates on the environment (e.g., Say, Do, Write, Touch, etc.).

SeeSay is the learning channel typically used with SAFMEDS (Eshleman, 2000). The learner sees the text or picture on the front of the card, and then says the word(s) written on the back (without looking at them). Although the back of the card contains printed text, the stimuli on the front of the card may vary by deck and may include a graphical representation or other picture, a term or phrase, or a full definition. In this project, the pinpointed learning channel for the verbal behavior SAFMEDS was "See phrase, Say term." Typically, the text displayed on the front of the card had a greater number of words than the response printed on the back, which the learner was required to say.

According to Skinner's (1957) analysis of verbal behavior, a SAFMEDS response can be considered an intraverbal if the display text on the front of the card and the performer's response do not have point-to-point correspondence: in other words, a paired associate. With SAFMEDS, the goal is to establish a fluent intraverbal repertoire for the learner that is related to the subject matter on the cards – the current topic being Skinner's terminology related to his analysis of verbal behavior.

METHOD

Participant

The learner was a 28-year-old female graduate student enrolled in an Applied Behavior Analysis PhD program whose previous experience using SAFMEDS was that she had been assigned sets of SAFMEDS for other courses. She had also independently constructed and used two sets for other academic purposes. For the present study, the learner was required to use a set of SAFMEDS to fulfill one requirement of a graduate- level course on Skinner's (1957) *Verbal Behavior*. She conducted SAFMEDS timings independently and charted her ongoing progress by plotting frequency data on a Standard Celeration Chart (Figure 1).

Setting, Apparatus, and Materials

Practice timings typically occurred in the learner's home, either in the living room area while she sat on a couch, or in the bedroom while she sat on the bed. No other individuals were present. Following the test-out date when the fluency aim was achieved, all follow-up timings occurred either in the learner's home or at a desk in a small office. During these follow-up timings, either the learner was alone or one or two other individuals were also in the office. One 60-card set of verbal behavior SAFMEDS was used for this project (see Figure 2), as well as a small battery - operated timer, a data sheet, and a Daily per Minute Standard Celeration Chart (displayed in Figure 1).

Independent and Dependent Variables

The dependent variables were the number of correct and not yet responses the learner emitted during a 1- minute timing. A correct response was defined as an occasion when the learner said the term out loud as it was listed on the back of a SAFMEDS card. A not yet response was defined as an occasion when the learner laid down a card without stating an answer, or an occasion when the

Figure 1. Daily per Minute Standard Celeration Chart indicating the learner's performance with the Verbal Behavior SAFMEDS over time. At the one minute line, dots indicate the frequency of correct responses per minute and Xs indicate the frequency of not yets per minute. Dots at the bottom portion of the chart show the total number of SAFMEDS timings conducted per day.

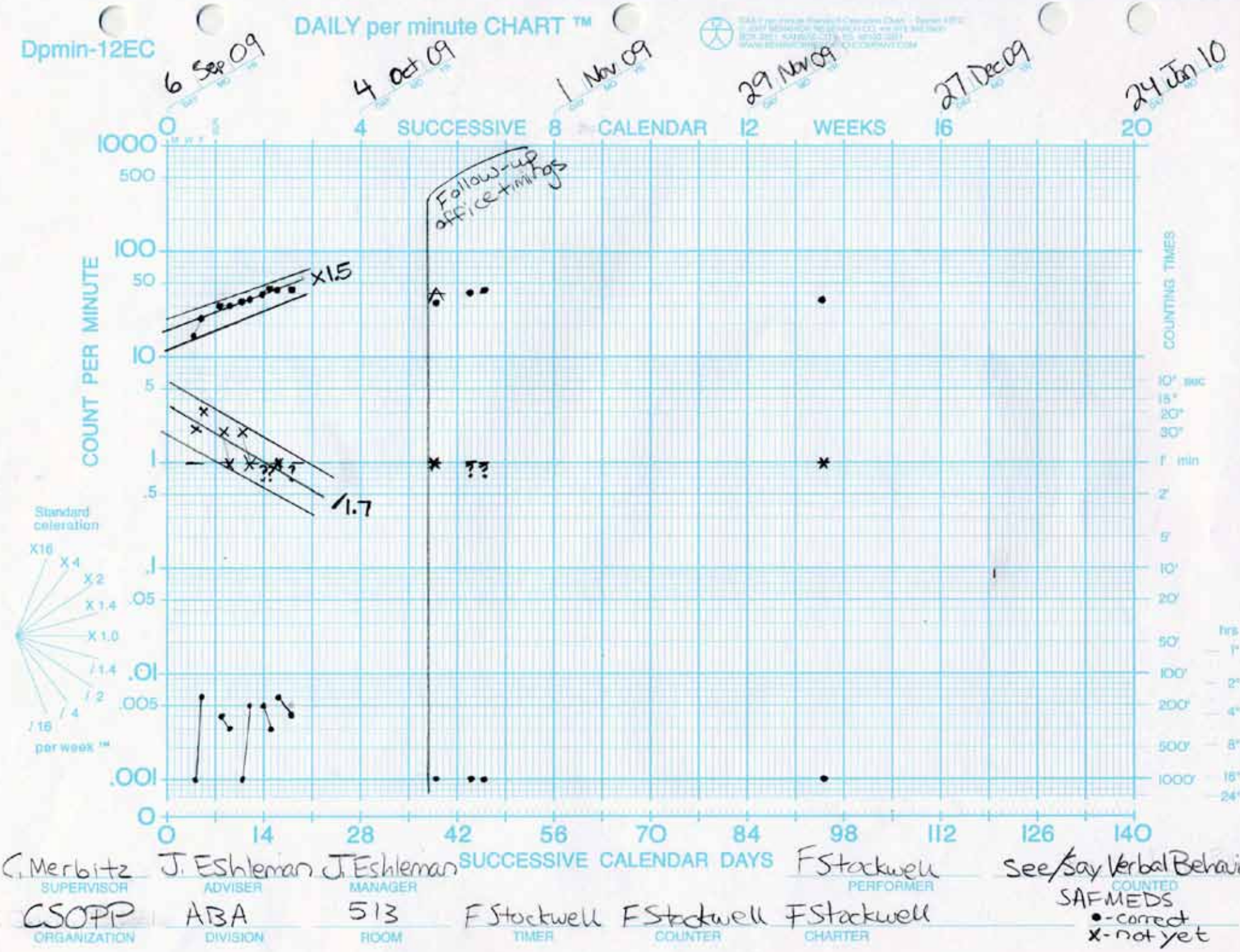
Dpmin-12EC
DAILY per minute CHART ™
6 Sep 09
4 Oct 09
1 Nov 09
29 Nov 09
27 Dec 09
24 Jan 10
0 4 SUCCESSIVE 8 CALENDAR 12 WEEKS 16 20
COUNT PER MINUTE
1000
500
100
50
10
5
1
.5
.1
.05
.01
.005
.001
0
x1.5
/1.7
Follow-up office timings
COUNTING TIMES
10" sec
15"
20"
30"
1' min
2'
5'
10'
20'
50'
100'
200'
500'
1000'
hrs 1" 2" 4" 8" 16" 24"
Standard celeration
X16 X4 X2 X1.4 X1.0 /1.4 /2 /4 /16
per week ™
0 14 28 42 56 70 84 98 112 126 140
SUCCESSIVE CALENDAR DAYS
C. Merbitz SUPERVISOR
J. Eshleman ADVISER
J. Eshleman MANAGER
F Stockwell PERFORMER
See/Say Verbal Behavior COUNTED
CSOPP ORGANIZATION
ABA DIVISION
513 ROOM
F Stockwell TIMER
F Stockwell COUNTER
F Stockwell CHARTER
SAFMEDS
•-correct
x-not yet

Figure 2. Sample SAFMEDS used during timings. The learner read the text on the left and said the term on the right out loud.

FRONT	*BACK*
Responding reinforced through mediation of another person	**Verbal behavior**
Persons who shape a listener's repertoire	**Verbal community**
Mediator who delivers S^r+	**Listener**
Vocalization produces same sound pattern as S^d	**Echoic**
Verbal operants under functional control of nonverbal stimuli	**Tacts**
Response under EO control and reinforced by characteristic consequence	**Mand**

learner stated a response that did not closely match what was printed on the back of the card.

The principal independent variable, present up to the date the learner met the aim, was the performance aim of 40 or more correct responses and 2 or fewer not yets during a 1- minute timing. This response requirement was not present during follow-up timings. The course instructor set the fluency aim. To determine that 40 correct responses per minute was a reasonable aim for students enrolled in the course, the instructor conducted and charted a series of timings on 1 day while using the same set of SAFMEDS (Eshleman, personal communication, September 9, 2009).

Once the number of not yet responses reached a frequency of 2 or fewer per minute and the number of corrects remained below the fluency aim of 40-per-minute correct, the learner added an additional step to the pre-timing preparation. While studying the cards in an untimed fashion before the timing began, the learner made a separate pile for the cards which she responded to correctly, but took longer than approximately 1 second to say. After cycling through all the cards in this untimed fashion, the learner conducted a 1- minute timing with only the cards in the "long latency" pile. These data were not recorded on the data sheet. Immediately following the unrecorded practice timing with the cards that required more than 1 second to respond to, the learner used the entire deck of cards in one or more other practice timings. The exact date of this intervention was not recorded.

Procedure

Preparation. SAFMEDS timings began during the 2nd week of the learner's course entitled "Critical Analysis of Verbal Behavior Research."

Before each timing, the learner engaged in untimed study of the SAFMEDS by looking at the front of each card individually and producing the answer on the back of the card, either overtly or subvocally. For all not yet responses, she placed the corresponding card in a pile separate from the corrects and reviewed them an additional time before the start of the timing. Before the start of each timing, the learner shuffled the cards and then pressed the "START" button on the timer with her right hand.

Timing. During each practice timing, the learner sat in an upright position and held the cards in her left hand. For each card visible at the top of the pile, she made a vocal response, and then she flipped the card over with her right hand and set it down on the nearby flat surface. She placed cards corresponding to correct responses in a "corrects" pile and cards that were skipped or responded to incorrectly in the "not yets" pile. This procedure continued for the 1- minute duration of the timing. The learner again pressed the "START" button on the timer when it began to beep, signaling the end of the 1- minute timing. A dot on the bottom portion of the chart (Figure 1) shows the number of timings completed each day. Timings occurred on 10 of the 14 days the learner was in possession of the SAFMEDS before the test-out with the course instructor. During these 10 days when timings occurred, the learner completed between 1 and 6 timings each day.

Data recording and charting. After turning off the beeping timer, the learner set down the pile of unused SAFMEDS (those not responded to during the timing) and counted the cards in the pile of corrects. She wrote this total count on the data sheet, in the column labeled "# Corrects." Next, the learner counted the number of cards in the pile of not yets and wrote the total count in the column labeled "# Not Yets." On the same row of the data sheet, she also recorded the date, length, and location of the timing, as well as the total number of responses and percent correct for that timing. The learner then plotted the number of correct and not yet responses for that timing on the corresponding day line of a Daily per Minute Standard Celeration Chart. If multiple timings were conducted on that date, she selected the best timing and charted it. The "best timing" was defined as that with the highest number of corrects, regardless of the number of not yets (Fabrizio, 2003; White, 1984). If multiple timings resulted in the same number of correct responses, she charted the timing with the lowest number of not yets. To indicate a frequency of 0 occurrences for either corrects or not yets, she drew a question mark on the chart, just below the counting time floor (Pennypacker, Gutierrez, & Lindsley, 2003).

Follow-up timings. During the follow-up timings, the learner conducted only 1 timing on each of these 4 days. Before the timing, the learner reviewed each card in an untimed manner and rehearsed subvocally; then she conducted a 1 timing and charted the data in a manner identical to the timings described above.

RESULTS

Throughout the course of the timings for this project, the data on the Standard Celeration Chart showed a "jaws" learning picture, indicating an improvement in performance – an increase in corrects over time and a decrease in not yets over time (Graf & Lindsley, 2002). The number of corrects achieved during timings ranged from 16 per minute to 44 per minute. The number of not yets observed during timings ranged from 0 per minute to 4 per minute. The frequency of correct responses over time showed a X1.5 celeration and a bounce of approximately X2. The frequency of not yet responses over time showed a /1.7 celeration and a bounce of approximately X3. No outliers occurred in these data.

Subsequently, 4 follow-up timings were conducted to assess the maintenance of responding: Their frequencies were 32 correct and 1 not yet per minute; 40 correct and 0 not yets; 42 correct and 0 not yets; and 34 correct and 1 not yet, respectively. Data showed that the aim for this project (40 or more corrects and 2 or fewer not yets in 1 minute) was achieved 3 weeks before the test-out date, as indicated by the "Aim" symbol on the chart (Figure 1).

DISCUSSION

Through the use of SAFMEDS, the learner acquired a fluent SeeSay intraverbal repertoire on the terminology of Skinner's analysis of verbal behavior. The 1-minute daily SAFMEDS timings occurred over the course of 3 weeks and during 4

follow-up timings; correct and not yet responses were plotted on a Daily per Minute Standard Celeration Chart. The data showed a favorable pattern of learning over time (an increase in corrects and a decrease in not yets), and the learner successfully met the aim the instructor had set: To emit at least 40 correct responses and 2 or fewer not yet responses in 1 minute. Follow-up data collected 3 weeks, 4 weeks, and 11 weeks after the test-out date showed that the level of performance generally maintained over time in the absence of daily practice.

It is uncertain whether an equally favorable outcome would have resulted with other types of SAFMEDS sets; potential variables affecting follow-up performance may include differences in SAFMEDS characteristics, such as the number of words read or spoken for each card or whether the front of the cards display pictures or printed text. In addition, the continued use of the terms and their definitions within and outside the academic course, as well as novel applications of the information, may have contributed to the maintenance of correct responding. One prominent issue of stimulus control for this set of SAFMEDS relates to the required learning channel of "See phrase, Say term." Although correct responding in this specific learning channel occurred at high rates, there is no guarantee that fluent responding in the reverse learning channel "See term, Say phrase" was established. Performing a "See term, Say phrase" learning channel may be just as important to using the information learned in the learner's environment, if not more so.

SAFMEDS are a key component of Precision Teaching, and they are also compatible with the practices most common in the rest of the field of Precision Teaching. Fluency is the goal of SAFMEDS timings as well as for other Precision Teaching-based interventions. During SAFMEDS timings, the behavior of the learner is directly observed in situ and recorded; the frequency of a behavior as it occurs in real-time is the primary phenomenon of interest, and timings are typically brief (Barrett, 2002). Data from SAFMEDS timings are charted on a Standard Celeration Chart so the instructor and/or the learner can make data-based instructional decisions by viewing the learner's charted progress and resulting learning picture. Finally, the emphasis of Precision Teaching on training component skills is consistent with the use of SAFMEDS to promote fluency with basic terminology, including those outlined in Skinner's (1957) analysis of verbal behavior.

REFERENCES

Barrett, B. (2002). *The technology of teaching revisited: A reader's companion to B.F. Skinner's book*. Concord, MA: The Cambridge Center for Behavioral Studies.

Binder, C. (1988). Precision teaching: Measuring and attaining exemplary academic achievement. *Youth Policy Journal, 10*, 12-15.

Binder, C. (1996). Behavioral fluency: Evolution of a new paradigm. *The Behavior Analyst, 19*, 163-197.

Eshleman, J. E. (2000). *SAFMEDS on the Web: Guidelines and Considerations for SAFMEDS*. (Retrieved October 20, 2009 from http://standardcelerationcharttopics.pbworks.com/SAFMEDS-on-the-Web)

Fabrizio, M.A. (February and March 2003). *A parent's introduction to fluency: Parts I and II*. The OARacle, Alexandria, VA: The Organization for Autism Research. (Retrieved June 27, 2010 from http://www.researchautism.org/newsletter_view2.asp?ID=15)

Graf, S. A. & Lindsley, O. R. (2002). *Standard Celeration Charting 2002*. Poland: OH: Graf Implements.

Lindsley, O. R. (1992). Precision teaching: Discoveries and effects. *Journal of Applied Behavior Analysis, 25*, 51-57.

Lindsley, O. R. (1996a). The four free-operant freedoms. *The Behavior Analyst, 19*, 199-210.

Lindsley, O. R. (1996b). Is fluency free-operant response-response chaining? *The Behavior Analyst, 19*, 211-224.

Pennypacker, H. S., Gutierrez, Jr., A., & Lindsley, O. R. (2003). *Handbook of the Standard Celeration Chart*. Concord, MA: The Cambridge Center for Behavioral Studies.

Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.

Skinner, B. F. (1976). Farewell, my lovely! *Journal of the Experimental Analysis of Behavior, 25*, 218.

Vargas, J. S. (2009). *Behavior analysis for effective teaching*. New York: Routelage.

White, O. R. (1984). Performance Based Decisions: When and what to change. In R. P. West and K.R. Young (Eds.), *Precision Teaching Instructional Decision Making, Curriculum and Management, and Research*. Logan, UT: Department of Special Education, Utah State University.

APPENDIX A

VB Course, Sec A SAFMEDS Set 1 Aim: 40/min Start: 10 Sep 2009 Stop: 10 Dec 2009

Day	Date	# Corrects	# Not Yets	Total Responses	% Correct	Observer
R	9/10	16	2	18	89	N/A
F	9/11	19	4	23	76	N/A
F	9/11	14	5	19	74	N/A
F	9/11	21	2	23	91	N/A
F	9/11	21	1	22	95	N/A
F	9/11	22	3	25	88	N/A
F	9/11	16	3	19	84	N/A
M	9/14	23	2	25	92	N/A
M	9/14	24	1	25	96	N/A
M	9/14	23	2	25	92	N/A
M	9/14	30	2	32	94	N/A
T	9/15	29	0	29	100	N/A
T	9/15	30	1	31	97	N/A
T	9/15	29	1	30	97	N/A
R	9/17	33	2	35	94	N/A
F	9/18	33	1	34	94	N/A
F	9/18	33	0	33	100	N/A
F	9/18	34	1	35	97	N/A
F	9/18	31	1	32	97	N/A
F	9/18	36	1	37	97	N/A
SUN	9/20	38	0	38	100	N/A
SUN	9/20	38	1	39	97	N/A
SUN	9/20	38	1	39	97	N/A
SUN	9/20	39	0	39	100	N/A
SUN	9/20	40	0	40	100	N/A
M	9/21	42	0	42	100	N/A
M	9/21	41	0	41	100	N/A
M	9/21	45	0	45	100	N/A
T	9/22	37	2	39	95	N/A
T	9/22	42	1	43	98	N/A
T	9/22	35	1	36	97	N/A
T	9/22	44	1	45	98	N/A
T	9/22	44	0	44	100	N/A
T	9/22	42	0	42	100	N/A
R	9/24	44	0	44	100	N/A
R	9/24	44	0	44	100	N/A
R	9/24	43	0	43	100	N/A
R	9/24	32	1	33	97	N/A
R	10/15	33	1	34	97	N/A
T	10/20	40	0	40	100	N/A
R	10/22	42	0	42	100	N/A
R	12/10	34	1	35	97	N/A