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IN MEMORY

On 11 July 1985, after a courageous battle with cancer, Eric Haughton passed away. As many of you know, Eric was one of the pioneers of Applied Behavior Analysis and Precision Teaching. He was "chart parent" and friend to many of you. He served as a contributing editor for this journal since its inception in 1980. Most recently, Eric served as a member of the Early Childhood Education faculty at Loyalist College in Belleville, Ontario, Canada.

Eric taught us that the little "guys and girls" really do know best. He also taught us the value of tool movements and fluency. Wherever Eric went, his enthusiasm for steep celerations and high-frequencies remained.

To this editor and to many of you, Eric was a valued friend and colleague. We will miss him.

Eric, this issue is dedicated to you. Thank you for sharing with us your friendship, your guidance, your enthusiasm, and your love for children and learning. Thank you for all that you taught us. As we work with children, we will try to remember.

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FREQUENCIES THAT ENSURE SKILL COMPETENCY

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Abstract: A review of the literature suggests that optimum proficiency criteria for specific academic skills have not been determined. Specifying relatively high frequency aims appears to be crucial to student competence and independence. To determine the optimum proficiency levels of particular skills, the effects of training to various standards on the subsequent acquisition of more complex skills has been examined. Single case designs were used in a series of investigations in which subjects were trained to either a high, medium, or low frequency of saying letter sounds or writing answers to math facts. Following this, each subject was evaluated in terms of growth on a subsequent skill. While some frequencies produced little growth in related skills, others were found to enhance skill acquisition. An analysis of these data suggest that optimum performance criteria may be established that will ensure an adequate rate of academic progress.

The issue of skill proficiency is one of the most important issues in education today. It involves the evaluation of all students, preschool through college. The issue is of such concern that laws have been enacted to ensure that students are proficient in certain skills. For example, minimum competency standards are required by various states for public school students and teacher education students.

Teachers make decisions daily concerning the advancement of a student from one skill to the next. Hopefully, the student will be "proficient" in the skill before he or she is advanced. Though there are many methods used to determine proficiency--norms, peer comparison, teacher judgment, etc.--a measurement system based on frequency yields more information than other units of measurement for most academic skills(White & Haring, 1980). Unlike percent, frequency correct and

incorrect measures both fluency and accuracy. Frequency is particularly crucial in that it can be used to discriminate between a child who has acquired a skill and one who is proficient. For example, one student may be able to recite the alphabet with 100% accuracy, but at a very slow frequency, such as 40 letters per minute. Another student may recite the alphabet with 100% accuracy, but a faster frequency of 175 letters per minute. Both students have acquired the skill of reciting the alphabet, but the second student is proficient.

Some disagreement exists concerning what constitutes the optimum proficiency in specific skills. However, enough data are now available to suggest tentative proficiency levels for many academic tasks. These data have resulted primarily from several Precision Teaching projects and are generally based on extensive samplings of student performance. Mercer, Mercer, and Evans(1982) compiled these data on suggested proficiency aims. Among many selected academic tasks reviewed are the following:

1. hear-write letters of the alphabet random-- 80-110 letters per minute
2. see-say isolated sounds-- 80-100 sounds per minute
3. see-say words in a list-- 80+ words per minute
4. see-write answers to math facts-- 55-75 digits per minute

Another way to establish proficiency criteria for a particular skill is to observe progress on the next related skill in a hierarchy of skills. Haughton(1972) found that the proficiency level a child attains on a particular skill makes a critical difference in the progress on the next related skill.

To determine the optimum proficiency levels of particular skills, the effects of training to various standards on the subsequent acquisition of more complex skills has been examined by Evans, Mercer, and Evans(1983). In this study, the effects of training three groups of learning disabled students to say consonant and short "a" sounds to frequencies of 40, 60, and 80 sounds per minute on the subsequent acquisition of saying CVC (consanent-vowel-consanent with "a" as the vowel) trigrams was investigated. Although the results seemed to favor the high frequency(80 sounds per minute) group, there was little difference between the groups. The authors concluded that the effects of higher frequencies should be investigated.

STUDY I

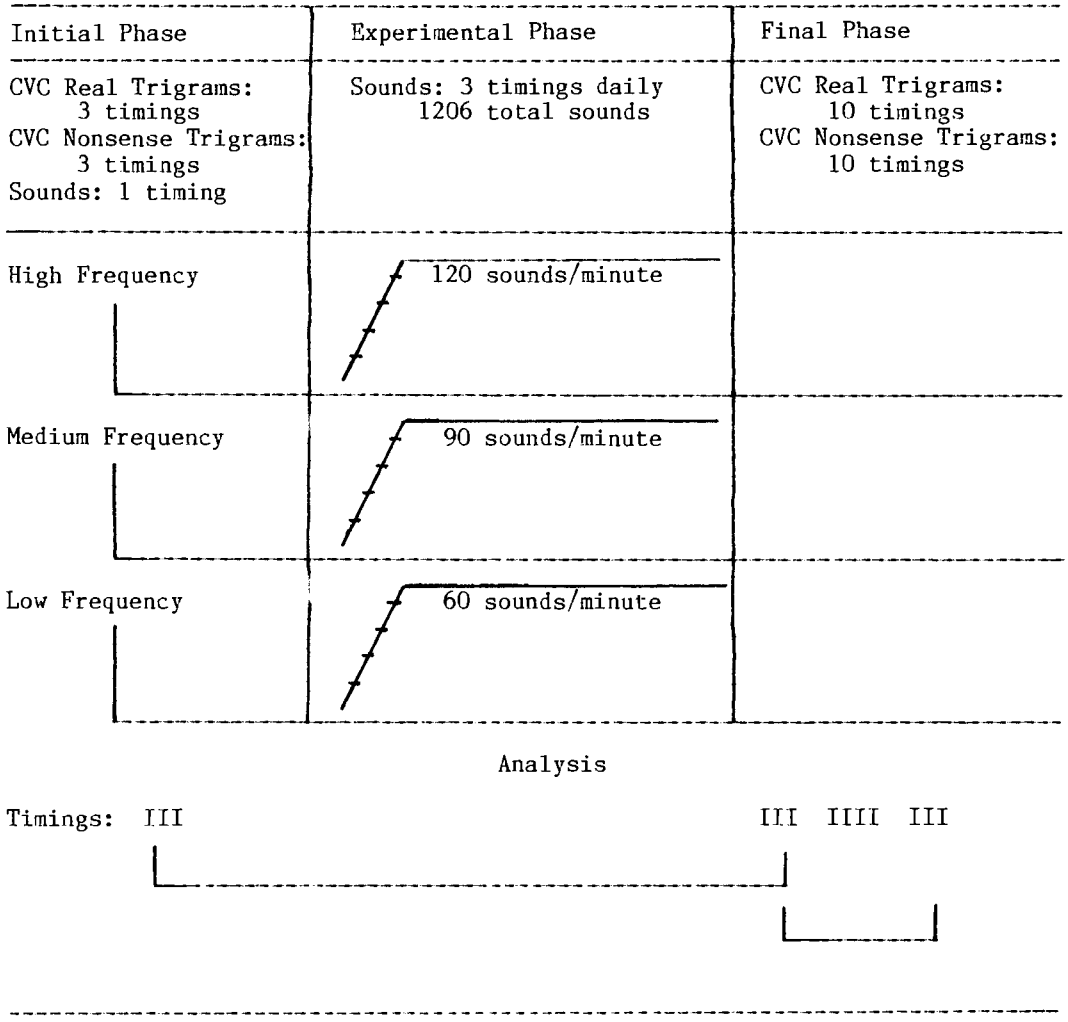
The first study was conducted to determine if there is a relationship between the frequency of saying letter sounds and performance on saying CVC real and nonsense trigrams when amount of practice is controlled. The procedure, similar that employed by Evans, Mercer, and Evans(1983), involved three phases(see Figure 1). During the initial phase, nine first graders were matched on saying CVC real and nonsense trigrams and randomly assigned to the high, medium, or low frequency experimental groups. During the experimental phase, each subject was trained to a different criterion: a low, medium, or high frequency of saying letter sounds, i.e. 60, 90, or 120 sounds per minute.

The subjects in the high frequency experimental group were presented three one-minute timings daily until the criterion of 120 correct sounds per minute with five or less errors was attained. Praise and informational feedback were given upon completion of each timing. Once the criterion frequency was attained, it was held constant by using a controlled reader. After the first subject reached the criterion of 120 sounds per minute correct, his frequency was maintained by using the controlled reader for additional timings until he said a total of 1206 consonant sounds. This total was then used as a criterion for all other subjects during this phase so that each subject had an identical amount of practice saying sounds.

During the final phase, each subject was administered 10 one-minute timings on each of the subsequent skills of saying CVC real and nonsense trigrams.

Frequency multipliers were used to measure the gain from the median timing of the initial phase to the median of the first three timings

Figure 1
Study I: Experimental Design



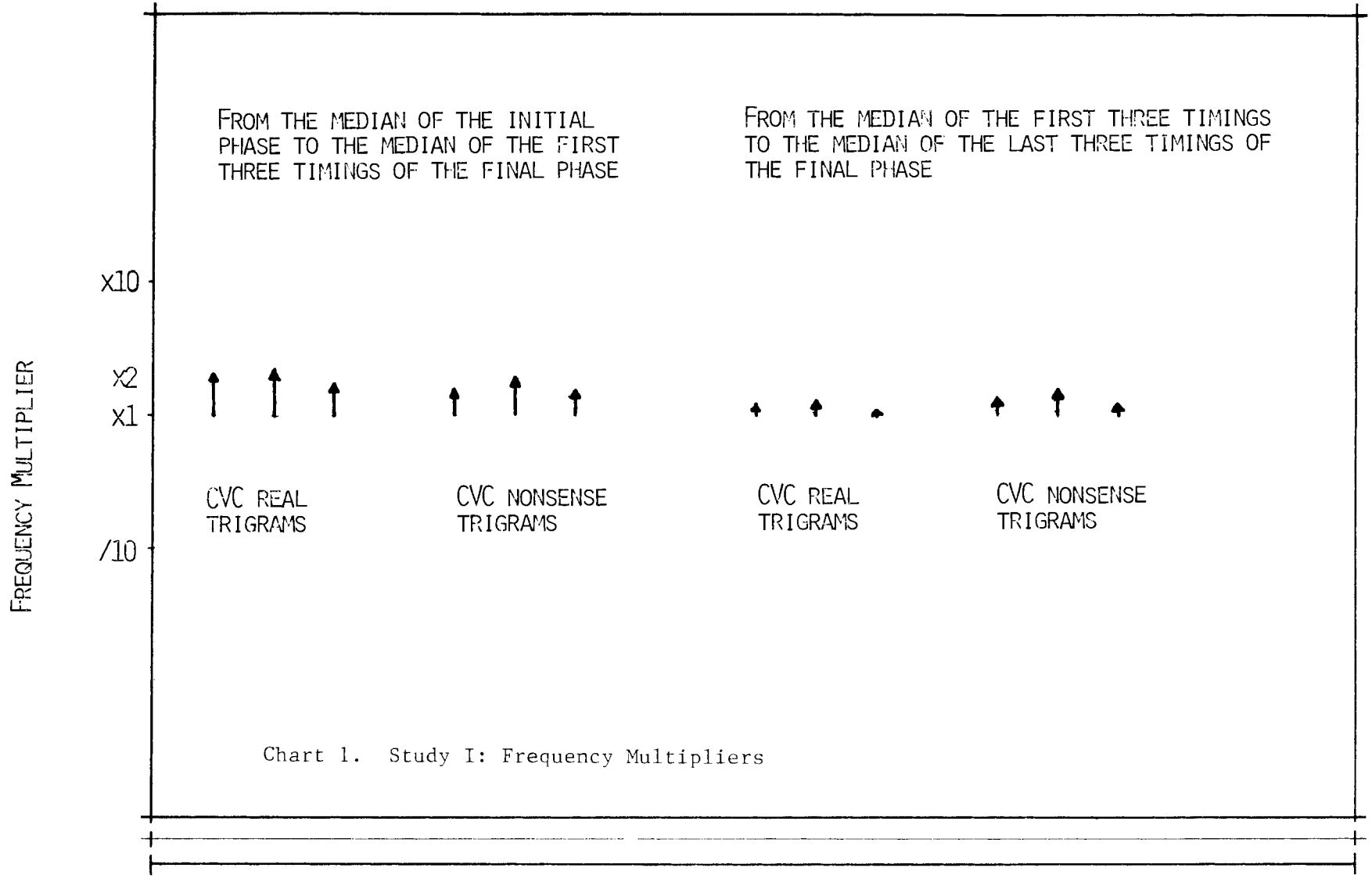


Chart 1. Study I: Frequency Multipliers

EVANS AND EVANS

NINE FIRST GRADERS SAY REAL AND NONSENSE CVC TRIGRAMS

Table 1
Study II: Data Summary

	"+1 facts"	"+2 facts"	Mean Number of Math Skills				
Timings:	III	IIIIIIIII	N.S.	Op.	P.S.	Mea.	S & G
Low Frequency Group(N=10)	Frequency Range- 11-30	Median Frequency: Initial- 8 Final- 9 Frequency Multiplier: x1.1	8	8	4	7	3
Medium Frequency Group(N=10)	Frequency Range- 31-48	Median Frequency: Initial- 19 Final- 30 Frequency Multiplier: x1.6	14	12	9	7	5
High Frequency Group(N=10)	Frequency Range- 52-82	Median Frequency: Initial- 28 Final- 50 Frequency Multiplier: x1.8	26	25	18	13	9

N.S.- Number Skills
Op.- Operations
P.S.- Problem Solving
Mea.- Measurement
S & G- Shapes & Graphs

during the final phase of CVC real and nonsense trigrams. Frequency multipliers were also used to measure the gain from the median of the first three timings to the median of the last three timings during the final phase of CVC real and nonsense words. In both measures, the most growth occurred in the medium frequency experimental group and the least amount of growth occurred in the high frequency experimental group(see Chart 1).

These data suggest a relationship between the frequency of saying letter sounds and progress on saying CVC real and nonsense trigrams. In this study, it appears that the optimum rate of saying letter sounds in relationship to subsequent progress in saying CVC trigrams is 90 sounds per minute.

STUDY II

A second study was completed with a class of first grade students. Each student was administered three one-minute timings on writing answers to addition facts (+1's with sums to 10). The students were assigned to a high, medium, or low group depending on the frequency of answering addition facts. Students were then administered nine one-minute timings on writing answers to addition facts (+2's with sums to 10). Frequency multipliers were determined based on the median of the first three timings and the median of the last three timings on +2 addition facts. Information was also summarized concerning the average number of math skills mastered by each group in the school math program(see Table 1).

Although optimum aims were not established in this second study, it was clearly demonstrated that the proficiency level a child attains on writing answers to addition facts makes a significant difference in progress on subsequent related math skills.

CONCLUSION

The proficiency levels that children attain on specific skills do make a critical difference in progress on related skills. A relationship between rate of saying letter sounds and progress on saying CVC real and nonsense trigrams was demonstrated in this research. A relationship between rate of writing answers to math facts and progress on related math skills was also demonstrated.

The conclusions from these studies suggest that there is a need for further investigation of the specific role that frequency plays in subsequent learning. A major focus of this research should concern the identification of proficiency frequencies in a variety of skills and subject areas. By empirically identifying these frequencies, instructional goals can be established that ensure competency and efficiency in education.

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AIM*STAR WARS

[Setting Aims that Compete]

Owen R. White
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Episode V: Uneasy Truce

In previous episodes we met a host of Learner Rebels and Learner Knights as they struggled to overthrow the bonds of the Evil Normie Empire. Now we turn to the final