

Ten Products of Fluency

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Background

This article reports the content of my presentation in the panel titled "Fluency Research: Questions, Parameters, and Designs" on 29 May 1995 at the 21st annual convention of the Association for Behavior Analysis in Washington, DC. I handed out a single sheet with the ten products of fluency listed down the left side and lined spaces to the right in which the audience could write their research ideas opposite each fluency product. I then described each of the ten fluency products in turn and briefly suggested how each might be measured.

More product research is needed

Berquam's (1981) dissertation on retention is one of the few controlled researches on fluency products. Binder's (in press) current article cites a few more. But many more are needed as the power of our basic applied research attracts academic interest. Published controlled research articles will gain fluency and a little academic respectability, but not the attention of public education.

Aim for even higher gains

Only massive educational results will attract public attention, as demonstrated by Johnson and Layng's 2 grade level gains in 16 hours of instruction at Malcolm X College. Even that attention may be transient and not enough to force large scale public educational curricular adoption. Even greater gains might be necessary to **force** public school adoption. So, let's not drop our guard. Let's keep working to produce even greater gains. Times four per week academic celerations are possible. Even times sixteen per week celerations occasionally occur by chance now. No student brains and no fingers have started smoking from being used too fast in our classrooms yet!

Early 1 minute timings in elementary schools

The first step toward fluency was taken in 1968 when Eric Haughton and his students Clay and Ann Starlin moved from monitoring the frequency of all classroom performance (35 to 50 minutes) each day as I had urged to monitoring only a 10 minute sample each day. Starlin (1970) at first did this so that teachers, who were still doing the timings and charting for the students, could get to each child during a class session each day. I (Lindsley, 1964) had urged the direct technology transfer of "direct and continuous measurement" from laboratory free operant conditioning to academic performance in public school classrooms. Haughton (1971a), Clay Starlin (1971) and Ann Starlin (1971) soon moved on to only 1 minute timings per day for each child, but several timings each day, and each timing with a different pinpoint for each learner. These, originally called probes, were used to diagnose functionally in which of several areas a student most needed help.

Kunzlemann, in close contact with Haughton, was using 1 minute timings a day for 5 successive days to diagnose learning problems from 13 different tool skill movement cycles covering 6 say and 7 write behaviors (Kunzlemann, Cohen, Hulten, Martin, and Mingo, 1970, p. 280). These brief timings were considered mainly diagnostic, even though one of their three alternative suggested remedies was to continue with daily one minute timings.

Spread of 1 minute timings throughout North America

At first, I resisted my students departing from the continuous measurement of the laboratory free-operant towards what seemed to me mere samples or tests. I also reacted negatively to the term “probe”, which not only called up images of a cold metallic object being poked into a tooth or other body cavity, but also implied that the timing was not the performance itself, only an indicator of some underlying behavior. Soon, Haughton and Kunzelmann and their students were producing such excellent learning results from one minute daily practice sessions that I admitted my error in resisting the one minute timings. At this point, I was proud of the fact that I had students so fine that just a few years out of graduate school, they made major discoveries. I was more proud of the fact that I could learn from my students and give them the highest compliment of all, which was to rapidly adopt their discoveries and distribute 1 minute timings throughout the hemisphere in symposia and workshops.

Workshop free-abbreviate timings

In the spring of 1972, I was using one minute timings at the start and end of workshops and in university classes to measure the participants’ gain in knowledge in a way that would be comfortable and have meaning. Because the first timing should be fluent and therefore fun and not threatening, participants freely abbreviate facts about themselves for one minute. Then they “correct them” by sharing what their abbreviations meant with their neighbor. This is a great warm-up exercise and a lot of fun. It also teaches how to abbreviate, how to count abbreviations, and how to structure facts for fluent abbreviation. Next, the participants free-abbreviate facts about the day’s class topic. This provides the before teaching base-line and demonstrates to the participants that pre-testing need not be unpleasant - it can be fun! At the end of the session, a closing one minute free-abbreviate of the class daily topic was run to determine how much each participant had learned in the session. Collecting these before and after frequencies on a Standard Celeration Chart at the overhead projector showed the students how their performance compared with others in the class. The frequency distributions also showed how much the class middle had shifted up (always a doubling and often times five). The distributions also showed the participants that group distributions are spread normally - the same distance up as down on a multiply scale. So the Standard Celeration Chart normalizes performance distributions. Haughton and Kunzelmann called these “think-write” timings, but I, a dyed-in-the-wool, Hunter, Kimble, and Skinner trained behaviorist, renamed them “free-abbreviate”.

University SAFMEDS, essay and lecture timings

In fall of 1975, I started using one minute sessions with flash cards and practice sheets charted on daily Standard Celeration Charts by the students in my graduate class in the Supervision of Instruction at the University of Kansas. By the fall of 1978, I was using flash cards practiced to fluency and called SAFMEDS (Say All Fast a Minute Each Day Shuffled) in all five of my University graduate classes. These were used both as learning aids and grading criteria. Soon, all of the student tasks for all of my courses were either one-minute fluency timings or 10 minute essay or 10 minute lecture timings. For example, the learning tasks and grading criteria for my graduate course in the Supervision of Instruction for the Spring Semester 1979 are summarized in the following table:

<u>Topic</u>		<u>Learning Picture Facts</u>		
see - say SAFMEDS	1 minute	8	25	40
free-write essay	10 minutes	20	60	80
free-say lecture	10 minutes	20	80	120
		<u>Supervision of Instruction Facts</u>		
free-abbreviate	1 minute	10	35	50
free-write essay	10 minutes	20	60	80
free-say lecture	10 minutes	20	80	120
Letter Grade Earned		C	B	A

To get the letter grade at the bottom of a column the student had to perform at or above the number of facts listed in each of the six timings in that column. No averages or medians were permitted. The students could stop and start over in their final check-out grading timings with their instructor. Also, students could repeat timings as often as they wished to earn a higher grade. They were permitted even to take an "incomplete" grade for the course and come in during the next semester, after they had more practice, and earn a higher grade. Most students earned A's in the course, and the number of facts required was gradually increased each semester until by 1989, the criteria for A was 75 facts in one minute for Learning Picture see-say SAFMEDS and 100 facts in one minute for Supervision of Instruction free-abbreviate facts.

Brief history of term fluency

In 1969 to 1971, Eric Haughton (1971a, 1971b, 1972) and Harold Kunzelmann (Kunzelmann, Cohen, Hulten, Martin, and Mingo, 1970) were researching and writing about the need for taking student performance far beyond 100% accuracy to what they called proficiency. Later, in 1974, Haughton started using the term fluency in place of proficiency. By 1976, White and Haring referred to fluency in their special education training textbook. However, Koenig and Kunzlemann (1980) continued using the term proficiency in their district-wide computerized learning screening programs.

Brief definition of fluency

Webster's Third International Dictionary (Gove, 1961) defines fluency as "fluent quality: smoothness, ease, and readiness esp. of utterance." Haughton (1980) described fluency as "quality plus pace." Binder (1990) used the more accepted definition within Precision Teaching of "accuracy plus speed." Most all workshop participants know fluency and use it correctly prior to instruction.

Defining products of fluency: Retention, Endurance, Application, Performance Standards

Eric Haughton originally named the first two fluency products: Retention and Application in his acronym **R/APS** (**R**etention / **A**pplication **P**erformance **S**tandards) in 1981. Eric saw retention and application as criteria for determining performance standards. He aimed at frequencies that would guarantee both retention without regular practice and application in the real world (generalization) without specific practice. The frequency that produced these was the performance standard goal. Retention and application were used to develop aims for the different pinpoints.

Later that year, Haughton (1981) added endurance and expanded his acronym to **REAPS** (**R**etention, **E**ndurance, **A**pplication, **P**erformance **S**tandards). This expanded Haughton's number of fluency products to three, with performance standards actually making a fourth. These can be considered the defining products of fluency. During 1982 and 1983, Eric continued furthering fluency and REAPS, but spent most of his creative time on matrices of learning channels and their relationship to performance standards (Haughton, 1982, 1984).

Late in 1984, Eric started his nineteen month battle with liver cancer which prevented his further development of fluency products. Eric finally succumbed on 11 July 1985 (Lindsley, 1986). I am certain that, had he lived, Eric would have expanded the number of products of Fluency.

New Products discovered in University Classes

By 1981, I had 5 five years experience aiming at fluency in all my graduate classes. This was two classes a semester, three semesters per year for a total of thirty classes in 5 years. Each class had about 25 students, and each student learned two decks of about 75 to 100 SAFMEDS for a total of 50 fluency learnings per class. The 30 classes, with 50 charted SAFMEDS learnings in each class, yielded 1500 SAFMEDS learning charts with graduate level adult learners. Several products not stressed by Haughton in his REAPS acronym jumped out of this mass of data. These products are described in the order in which they appeared.

Stability

First, as an aviation cadet in World War II, I had to daily practice repeating my army serial number, the names of his company officers and Air Force generals, the names of both friendly and enemy fighters, the words to Air Force marching songs and other verbal chains until they could be recited perfectly at any time on call from an upperclassman at 100 to 300 words per minute. Similarly repeated high speed practice of emergency aircraft exit drills, and field disassembly and assembly of the Army 1911A1 automatic pistol blindfolded in one minute, was part of my official military training. This was said to produce performance under stress in battle, in emergencies, or in a snow storm or sand storm without error. The same stability and resistance to distraction occurred when my graduate students approached fluency in their one minute SAFMEDS practice sessions. Only the beginners who were making the mistake of starting at slow frequencies had their pace broken by the noise of the other students saying their SAFMEDS and slapping them down on the chair arms close by.

This prompted me to convert the **S** in Haughton's **REAPS** to **Stability** - a fifth product of fluency.

Fun In workshops and university classes it became clear that fluent performing was fun, and participants laughed and giggled when comparing their frequencies correct after a fluent timing. Fluent timings were so much fun that they were used as “ice breakers.” When asked to perform a task in which they were not fluent, adults always grumbled, groaned, and made critical comments. For these reasons, we learned to start and stop workshops and class sessions with fluent timings. For example, we might start with abbreviating facts about themselves, and close with facts about the town or university. This is similar to band directors and athletic team coaches starting practice sessions with fluent performance and closing them with fluent performance to keep up team spirit.

Fluent timings are so exhilarating and so much fun that they can be used at any time in a lecture or workshop to perk up participants when they are beginning to doze, or gossip, or look uncomfortable. Just call a one minute timing. Correcting of the timing with a neighbor is always fun and will take 10 to 15 minutes after the timing to discuss it until the room quiets down.

These experiences led me to name **fun** as a sixth product of fluency.

Understanding I started my graduate students in class each semester with their first week’s assignment to make their first deck of SAFMEDS. In the second class meeting, they started saying their cards as close to 60 per minute as they could. Correct frequencies were low and the error frequencies high, and there was no time spent on explaining what the words and symbols on the cards meant. One by one, a student would demand to know what some particular word meant. The rote learning of the cards produced a strong need to know meaning. Some students always figured out on their own what some cards meant and told the meanings to others. The push of rote learning had produced the nicest interest in understanding that I had ever witnessed in my classes. Even when I was trying to “teach to understanding”, I had never seen such interest in the content meaning. It is almost as if once a term or symbol has been forced into a student’s fluent, motor repertoire, automatically, questions are asked about it.

As a result of this experience, I began urging teachers who wanted to generate understanding to produce fluency first; for then, students would take care of getting understanding on their own. This was maximally efficient, because no valuable classroom time was wasted on teaching understanding relationships that the students already knew, or would learn on their own. The teacher only had to answer requests for meaning and understanding that the students had not figured out on their own.

For these reasons I listed **understanding** as the seventh fluency product.

No cheating

The eighth fluency product, no cheating, seemed obvious to anyone who has taught or practiced to fluency. But other teachers who continuously fussed with the problems of student cheating did not realize that fluency totally eliminates cheating. Different versions of practice sheets or tests are not needed. Students need not be separated by empty chairs during group timings. There is just no way a student can look at another's practice sheet fast enough to get answers above 60 per minute. There is just not enough time. Looking at another's sheet slows him/her up. Cheating slows him/her up. There is no way a student can bring another student's behavior with him/her to a grading check-out session. A student can fake his/her chart, or paper, but not his/her performance or speed.

For these reasons I listed **no cheating** as the eighth fluency product.

**Fluency
REAPS FUN**

I used the acronym Fluency **REAPS FUN** describing eight products of fluency in workshops and classes throughout the 1980's and finally published it in 1992.

Confidence

Over the last two years, I realized that the urging we gave our teachers of developmentally delayed children in the late 1960's to not stop practicing when their handicapped learners reached normal frequency range, but to practice them far above normal frequencies to championship levels, was to develop the children's confidence. Since their charts seldom leveled off, the students could build speed up to super fluent frequencies beyond normal adult range. When disabled people can write letters, or do basic add facts, or count items faster than brothers, sisters, parents and teachers, they gain real confidence - a confidence that no amount of verbal stroking can achieve. Carl Binder (1990) called attention to "confidence" as a benefit of fluency in the title of an article describing fluency to industrial trainers. These events prompted adding the ninth product of **confidence**.

Generativity

Haughton's (1972) original discovery that smooth, fluent application occurs when component tool skills were truly fluent at frequencies from 40 to 100 per minute became the aim for most precision teachers. To them, creativity, problem solving, and improvising depended on fluent component skills. In the middle 1970's we tried to produce "curriculum leaps" (Stromberg & Chappell, 1990) from fluent tool skills. We saw all these as a special cases of Haughton's Application product of fluency.

Johnson & Layng (1992, 1994), and Layng, Jackson, and Robbins (1992), have recently related the selectionist language and laboratory research on contingency adduction (Andronis, 1983) and generativity (Epstein, 1985, 1990) to fluency based instructional design and the Morningside Precision Teaching approach, (Johnson, 1992) in particular. Although "leaps" is one syllable and follows our rules for choosing Precision Teaching words (Lindsley, 1991) more closely, I have once again temporarily accepted the discoveries of the next generation and use the term "generativity" though the six syllables still grate. You can keep "leaps" on the back burner if you prefer.

For these reasons I called the tenth product **generativity**.

**Fluency
REAPS FUN
CG**

These ten products of fluency are the benefits of teaching and learning to fluency.

The acronym for these ten products of fluency is “**REAPS FUN CG**”

R Retention
E Endurance
A Application
P Performance standards
S Stability

F Fun
U Understanding
N No cheating

C Confidence
G Generativity

Research studies supporting these products are detailed in the excellent and comprehensive current article by Binder (in press). The purpose here is merely to list the fluency products and single them out for potential laboratory research.

Fluency products are fluency benefits

It should be clear to persons justifying fluency practice beyond the levels of 100% accuracy to school boards, the government, and corporation officers that these products are actually benefits to the learner. The products also benefit the teaching agency which can save real dollars in increased worker performance, increased worker confidence and attitude, and decreased training costs provided by generativity.

Proof these are separate products

Some might argue that these ten products are all different aspects of the same thing, for example “endurance.” But, the proof that they are separate is that one must use separate measures to record them. To record “fun” we would have to count smiles and laughs. To record “confidence” we would have to count feelings of doubt and feelings of assurance while on a sales call, or just before and just after one. In each fluency product, we must use a different count or measure. Therein lies their identity.

Suggested fluency product measures

To further clarify product separateness, a suggested measure to use in recording the presence of each fluency product is listed below opposite each product. The measures are not the only such measure, nor necessarily even the best such measure for each product. Several different tactics for measuring each product are possible. These suggestions are only listed to point out how each product requires its own unique measures. These measures identify it.

Retention	How much drop in the practiced frequency occurs after specified weeks or months without practice?
Endurance	How many minutes or hours (beyond the daily practice period) can the performance continue without error or decrease in frequency?
Application	How much drop in the practiced frequency occurs when performing in real world settings different from the practice setting?
Performance	What frequency aim produces retention, endurance, stability and application?
Stability	Does total bounce (measured proportionally on the Chart) decrease as fluency is reached? How many strong distracters do not interrupt performance?
Fun	Count performer laughs and smiles while performing or have them rate their fun on a 19 point multiply scale.
Understanding	What portion of the fact meanings are immediately known? What portion of the meanings are figured out by learners? What portion of the meanings are asked of the teacher?
No cheating	Compare cheating incidents between fluent and dysfluent practice.
Confidence	Frequency of confident compared with fearful statements made just prior to and just after an important performance.
Generativity	Frequency of composite skills that leap up, without having been specifically taught, from fluent tool skill components.

Fluency product independence

The degree of independence of these fluency products - their ability to be independently manipulated by different types of fluent performance lies out there as an interesting research area. Our experience so far suggests that with adults at the same levels of fluency, you get more fun from the point-see-say channel in chorus, than when the learner point-see-says by himself/herself in public. This is merely one example of the kind of operation that might demonstrate product independence in which you change the amount of one product without changing the others.

Fluency products may continue to multiply

This list of fluency products has steadily grown over the past fifteen years since Haughton (1981) first called attention to **R/APS**. The more we practice fluency, there is every indication that we may discover still more beneficial products. Even though we have been talking about curriculum leaps since the middle 1970's, it is only in the last two years that generativity emerged as a powerful product and should be listed separately as a benefit.

Recently Stephen Graf (personal communication, August 1995) suggested an 11th product which he called "Stress Inoculation." According to Graf, it would be measured by how little emotional or game stress disturbs a fluent performer. At first thought this seems fairly close to a special case of "Stability." However, time will tell if it is useful enough and different enough to add it as an 11th product benefit.

It is exciting to think that something just as powerful might be lurking out there, in that lovely unknown, undiscovered, just waiting for us.

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