Lori Chamberlain, BCBA PaTTAN Autism Initiative

The Role of Fluency in programming



Bureau of Special Education Pennsylvania Training and Technical Assistance Network



Pennsylvania Training and Technical Assistance Network

### PaTTAN's Mission

The mission of the Pennsylvania Training and Technical Assistance Network (PaTTAN) is to support the efforts and initiatives of the Bureau of Special Education, and to build the capacity of local educational agencies to serve students who receive special education services. PDE's Commitment to Least Restrictive Environment (LRE)

Our goal for each child is to ensure Individualized Education Program (IEP) teams begin with the general education setting with the use of Supplementary Aids and Services before considering a more restrictive environment.

# What do you think of when you hear the word Fluency...

## Introduction

• <u>https://youtu.be/zL2O5idRETo</u>



## Definitions 44

 From Wikipedia: Fluency is a <u>speech</u> <u>language pathology</u> term that means the smoothness or flow with which sounds, syllables, words and phrases are joined together when speaking quickly.

## Basic understanding of fluency

In the sense of proficiency, "fluency" encompasses a number of related but separable skills:

<u>Reading</u>: the ability to **easily** read and understand texts written in the language;<sup>[2]</sup>

Writing: the ability to formulate written texts in the language;

<u>Speaking</u>: the **ability to produce** speech in the language and **be understood** by its speakers.

Listening Comprehension: the ability to follow and understand speech in the language;

<u>Reading comprehension</u>: the level of **understanding** of text/messages.

## Key points

- Fluency is accuracy and rate.
- Fluency builds comprehension

Fluency is ... the ability to read text accurately and quickly.

Fluency is important because ... it frees students to understand what they read.

Fluency practice ... is essential for students to bridge the gap between word recognition and comprehension.

Reading Fluency can be developed by ... having students engage in repeated oral reading and modeled fluent reading.

- The Partnership for Reading

## Don't Panic

The New Addition Timed Practice (0-2)							
1	0	2	0	1	0	2	0
+2	+0	+7	+2	+7	+5	+4	+7
0	1	2	1	1	2	1	1
<u>+8</u>	+0	+6	+1	+5	+1	+8	+9
2	2	0	2	0	2	1	2
+0	+2	+6	+3	+9	+5	+3	+8
1	0	2	1	2	2	1	2
+4	+1	+7	+6	+9	+2	+5	+3
1	2	0	2	1	0	1	1
+7	+4	+3	+9	+4	+4	+9	<u>+3</u>

Consight FORD & Destinguished and All Ratio Reported Previous Interface at the second and the second s

see i Destructures an

## Math





 Procedural fluency is the ability to apply procedures accurately, efficiently, and flexibly; to transfer procedures to different problems and contexts; to **build or modify** procedures from other procedures; and to recognize when one strategy or procedure is more appropriate to apply than another.



Legacy from Skinner and Ogden Lindsley

Farewell my lovely (Skinner, 1976) lative record! I shall not miss the records so much as the kinds of experiments that could scarcely be reported without them. There is no point in publishing a block of sloping straight lines if the only important fact is the slope; better a point on a graph. But what has happened to the curves that were curves? What has happened to experiments where rate changed from moment to moment in interesting ways, where a cumulative record told more at a glance than could be described in a page? Straight lines and steady states are no doubt important, but something is lost when one must reach a steady state before an experiment begins. There was a special kind of orderliness in a smooth curve lasting a few minutes or at most an hour. It suggested a really extraordinary degree of control over an individual organism as it lived its life from moment to moment. Shall we never again see things as fascinating as the slight overshooting when a pigeon switches from the ratio to the interval phase of a mixed schedule, or learns to use a clock in timing a fixed interval, or "sulks" for an hour after a short bout of fixed-ratio responding injected into a long variable-ratio performance, or slowly accelerates as it raps out "just one more" large fixed ratio on a straining schedule? These "molecular" changes in probability of responding are most immediately relevant to our own daily lives. They seem to me much more useful in the interpretation and design of contingencies which bring about the kinds of changes likely to be of technological interest. There is no denying the importance of the methods and equipment which have been devised for long-sustained research, but there is also much to be said for an experiment that lasts half an hour-and for a quick and comprehensive look at the fine grain of the behavior in the cumulative curve.

> B. F. SKINNER Harvard University

## B.F. Skinner and Fluency

- Involves the rate of responding.
- Skinner considered rate of response and the cumulative response recorder to be his major contributions (Skinner 1976)
- "Rate is a universal datum"





## CUMULATIVE RECORDER

#### Precision Teaching Cumulative response recording features: standardized for the three major species studied in free overant conditioning (see Table 1). This was achieved by changing the speed gears that turned the paper drums, thus changing the bottom time lines of the charts. Standard grids were printed for pasting on the cumulative records for publication. (5). Displays major changes. Note that the grids above represent about equal angular changes (12 to 18 degrees) for major changes in frequency 1. Self recording: "Made by the rats themselves" (Skinner, 1938, p.60) 2. Objective and reliable: "the experimenter doesn't intervene" 3. Slope: 2 dimensions (number per minute). 4. A Stopespare standard be read with a frequency and calibration the exact number per minute for different angles of slope. Cumulative records published without grids show that the author is not 5. Displays major changes (equal angular changes for major changes in using the requency little more than a graphical table of number

6. Frequencies displayed on a multiply scale. (eventually learn the value of the slope) to assess learning / magnitude of changes.

Precision Teaching took the slope (number per minute) of Skinner's cumulative records and charted it up the left of the standard celeration chart on a logarithmic scale. Calendar days were charted across the bottom, taking 140 days (20 weeks) to cover one school semester. The chart was made to fit landscape form, the horizontal on the 11-inch side of an 8.5 by 11-inch page. The size was designed to fit on the projection stage of overhead projectors and computer display screens.

The frequencies up the left of the chart went from 1 per day through 1

diagonal corner to corner slope is times 2 and 34 degrees on all the charts. The standard is in the meaning of the slope just as was the case with the cumulative record. In fact, the cumulative record would more properly have been called the standard frequency record, describing it by its slope rather than by its vertical scale.

As an example, Figure 1 displays Ann's standard celeration chart for her 40 spelling words from lessons 3 and 4 of her spelling book (from Mc Greevy, 1981). Ann is 9 years old, in 4th grade, and calls this "my learning

### Standard Celeration chart: Sample graph

- Dots: behavior increasing
- X: errors decreasing.





# 4. The cumulative record would more properly have been called the standard the frequency record, describing it by its slope rather than by its vertical scale.

Precision Teaching took the slope (number per minute) of Skinner's cumulative records and charted it up the left of the standard celeration chart on a logarithmic scale. Calendar days were charted across the bottom, taking 140 days (20 weeks) to cover one school semester. The chart was made to fit landscape form, the horizontal on the 11-inch side of an 8.5 by 11-inch page. The size was designed to fit on the projection stage of overhead projectors and computer display screens.

The frequencies up the left of the chart went from 1 per day through 1

diagonal corner to corner slope is times 2 and 34 degrees on all the charts The standard is in the meaning of the slope just as was the case with the cumulative record. In fact, the cumulative record would more properly have been called the standard frequency record, describing it by its slope rathe: than by its vertical scale.

As an example, Figure 1 displays Ann's standard celeration chart for her 40 spelling words from lessons 3 and 4 of her spelling book (from Mc Greevy, 1981). Ann is 9 years old, in 4th grade, and calls this "my learning

#### Precision teaching

#### 3. The Standard Celeration Chart



Lindsley (1990b) provides a brief history of the Standard Celeration Chart.

- Adjusting the curricula for each learner to maximize learning.
- The instruction can be by any method or approach.
- The most effective applications of Precision teaching has been when it is combined with Direct Instruction (Johnson, 1989, Maloney & Humphrey, 1982)
  - Decisions are made on a weekly basis but data is recorded daily.
  - Precision teaching began in 1965. In a special education classroom at KU.
  - Haughton expanded the work in the 1970s (university of Oregon).

# Lindsley 1962

 Laboratory research had shown human behavior frequencies to be 10 to 100 times more sensitive to changes in procedures than percent correct

![](_page_18_Picture_2.jpeg)

# Comparison of measurement: are the skills of equal strength ?

**Fluency measures** 

![](_page_19_Figure_2.jpeg)

**FIGURE 2.2.** Comparison of performance frequencies across three groups from an unpublished pilot study conducted by Frances George and Deborah Pease, published in Barrett (1979). This replication of the original, created by Scott Born, is reproduced with permission of The Association for the Severely Handicapped.

#### **Percent correct**

![](_page_19_Figure_5.jpeg)

**FIGURE 2.3.** Comparison of performance accuracies across three groups from an unpublished pilot study conducted by Frances George and Deborah Pease. This figure is a reproduction by Scott Born of the original, created by Carl Binder, who has granted permission for its use.

(Lindsley, p. 254)

- "Rate is a universal datum" Skinner
- in Skinner's statement, I saw the opportunity for putting all behavior of all organisms on a frequency spectrum, as previously had been done with light, sound and electricity. In our laboratory research on chronic psychotics, I had record the frequencies of human plunger pulling, pacing, talking, looking and listening (Lindsley, 1956, 1960, 1962). Once we had all behaviors plotted on a frequency spectrum, I was convinced major behavioral discoveries would soon follow.

![](_page_20_Figure_3.jpeg)

![](_page_21_Figure_0.jpeg)

### **Ogden Lindsley**

Background in biology and engineering.

Example of light qualities (differences on a frequency spectrum) "accomplishes wonders of radiance" (P.254) Behavioral Fluency is the combination of accuracy plus speed of responding that enables competent individuals to function efficiently and effectively in their natural environments.

(Binder, 1996)

## **Behavioral Fluency**

## Other terms equated with fluency:

#### "automatic"

(Haughton, 1972a)

#### "second nature performance"

(Binder, 1990)

#### "doing the right thing without hesitation"

(Binder, 1988b)

"Stability or predictability of performance" (Barrett 1977a)

"immediately accessible" (Gagne, 1970,1974) "Performed with perfect confidence"

(Gagne & Briggs, 1974)

"Fluency features resemble mastery." (Binder, 1996).

![](_page_24_Figure_0.jpeg)

Retain & maintain what they have learned

![](_page_24_Figure_2.jpeg)

Remain on task or endure for sufficient periods of time to meet realworld requirements Even in the face of distraction

3

![](_page_24_Figure_5.jpeg)

And apply, adapt, or combine what they learned in new situations

## Effects of fluency:

When learners achieve certain frequencies of accurate performance

pursued research in which "rate of responding is the principal measurement of the strength of an operant"

![](_page_25_Picture_1.jpeg)

![](_page_25_Picture_2.jpeg)

![](_page_26_Picture_0.jpeg)

Fluency represents a new paradigm

*In the analysis of complex behavior and the design of instruction* 

![](_page_26_Figure_3.jpeg)

# Accuracy is not sufficient

Haughton observed that the mere presence or accuracy of a response class in the repertoire of a learner is not sufficient to ensure progress through a curriculum sequence that depends on that response class as a prerequisite or component.

Just because someone can do something doesn't mean it is a mastered skill.

#### Component/Composite

Principle of minimum component behavior frequencies.

Set the stage for significant improvements in efficiency of instructional programming.

Increase the frequency of composite skills by increasing the frequency of the component skills.

Increase complex behaviors by increasing the rate of responding/ strength of the component skills.

# Haughton analogy

Like atoms requiring a certain valence or energy to combine

behavioral elements require a certain frequency to form compound response classes.

## David Palmer Atomic Repertoires

![](_page_30_Picture_1.jpeg)

A set of fine-grained units of behavior, each under control of a distinctive stimulus, that can be evoked in any permutation by the arrangement of corresponding stimuli

## Building complex human behaviors

- Building blocks of complex behavior arise from other response classes that have been shaped bit by bit.
- By appropriate arrangement of these discriminative stimuli, an indefinite number of permutations of atomic units can be evoked.
- Behavioral atom: "a string of atomic responses can be specified by a small set of instruction, and once the responses have occurred in the correct sequence, they may hang together as a unit under control of prevailing contingencies."

## "

The secret of attaining excellence is to always maintain close attention to every detail of performance 'each one done correctly, time and again, until excellence in every detail becomes a firmly ingrained habit'

Chambliss (1988,1989): p. 371.

Atomic Repertoires.

## Examples of atomic repertoires

![](_page_33_Figure_1.jpeg)

## Example

- Follow this instruction (read it silently first)
- Put your right thumb on the back of your neck and say "fall de rall dee dum" after I clap my hands.

![](_page_34_Picture_3.jpeg)

![](_page_35_Picture_0.jpeg)

## Example 2

- Follow this direction (read silently first):
- Do Seiunchin Kata (Shorin-ryu). The Bunkai is up to you. Maintain Shiko-dachi. Start when I get to ryoku.
Complex behaviors formed by atomic repertoires

- Echoic behavior:
  - Speaker as a listener
  - Parity
  - Grammar
  - Shapes language
- Imitation
  - Used in novel situations
  - Observational learning.

- Tacting behavior:
  - Recall strategy
  - Joint control
  - Responding as a listener
  - Observational learning



We want our learners to perform complex skills...

We must teach the basics not only accurately but fluently.

### Vargas (1977)





Teaching is not only producing new behavior, it is also changing the likelihood that a student will respond in a certain way. Since we cannot see a likelihood, we look instead at how frequently a student does something. We see how fast he can add. The student who does problems correctly at a higher rate is said to know addition facts better than one who does them at a lower rate. (p. 62).

"What many educators assumed to be 'learning disabilities' or 'learning problems' seemed to wane when students were allowed and encouraged to practice key components of complex behavior to the point at which they could perform each component at relatively high frequencies."



Fluency as a teaching tool

#### Gilbert (1978)



**Educational programs** will be more effective in the long run if they produce a more focused, but truly mastered, repertoires rather than a broad but fragile repertoire.

#### Tiemann and Markle (1990)



Analyze and sequence curriculum to encourage generativity



The emergence of new behavior based on the principle of contingency adduction.



When the basics are fluent, later learning becomes easier rather than more difficult.

Basic Math fact



More complex math problem

## 253 + 314 + 322

#### Component-Composite

Examples from Research involve fluency with:

- Reading
- writing
- computational math
- Fine and gross motor control (Big 6+6)
- Physical, occupational and language therapist.
- Self care and vocational skills. (practicing components in isolation prior to combining them into chains).

#### Issues with fluency

Drill and practice

- Lack of reinforcement
- Working too much under aversive control

Prolonged practiced when the frequencies are low

- Skills are not ready for fluency building.
- There is no goal, aim or insufficient goals/aims.



## Are a specific and precise objective of an overall goal



# Educational aims should be personalized to fit each student.

Haughton, 1972

### Considerations for fluency aims

- Accuracy rate of correctness/incorrectness during run-throughs.
- Speed responses per minute.
- Duration endurance, attention span, and resistance to distractions during the timing.
- Stability the ability to engage in the skill easily in the face of distractions
- Retention and maintenance of skills and knowledge.

#### REAPS

- Retention
- Endurance
- Application
- Performance
- Standards

- We should set aims that are empirically determined levels of performance ensure retention and application of skills.
- Achieving high performance frequencies increase the likelihood that students would maintain attention to task over extended durations of performance in the face of distraction.

#### Fluency within Intensive teaching

- Use card sort to keep instruction at a fast pace.
- Consider any answer that takes longer than 2 seconds an error.

- Keeps responses fluent.
- Keeps problem behaviors and distractions at a minimum.
- Avoids errors on basic skills.



#### Pace of Instruction

Faster responding results in less problem behavior and/or off task behavior.

# In a teaching session:

 you can tell fluency by how much time between the direction or S<sup>d</sup> and the response.

#### When more practice is needed:

#### When someone says: he can do that but

- He is distracted
- He is not retaining skills
- He can do it but not all the time
- Slow to respond in intensive teaching or NET for a certain skill.

### Programming for fluency



### When to consider TACT fluency

When slow at responding with tacts during Intensive teaching

Slow at responding with tacts in Natural environment

If student has difficulty such as distractions, memorization issues, generalization issues, prompt dependency/spontaneous issues.

#### MORE considerations for tact fluency

Should probe/teach tact fluency before more complex programs: Intraverbals.

Should probe/teach tact fluency before joint control programs.

If student has problems with more advanced programs (retention, acquisition, generalization) go back.

#### Prerequisites for tact programs

articulation of the picture/tact is clear.

student should not make frequent errors on tacts.

student has at least 50 tacts

Must have instructional control!

### General guidelines

#### Probe baseline performance:

- Look for the fastest time.
- Does the student need to stand or sit?
- Also check to see what is fastest: if you point or if the student points.
- What field size? Start with the most successful. (never less than 4) start with 6 at minimum.
- Start with a 10 second sprint.

Don't say "what is it?" For every picture.

Make sure responding is easy and student is successful...

Run a minimum of three trials a day. Best to do so at least twice a day.

Pick the best performance to graph.

## When starting out:

Set up tact fluency for the student: if they can tact a lot of pictures/items and it is understandable but they are not doing it at a fluent pace.

Differential reinforcement is important!

#### Make it fun! Like a game!

Reminders about reinforcement for fluency programs. Use a promise reinforcer: have the best reinforcer out that the student loves! Say If you go really fast you will get the \_\_\_\_\_. (even if he doesn't "understand").

# Use differential reinforcement

Evaluate the previous performances to determine the best times for delivery of reinforcement.

Did instructor determine a reinforcer that Student wanted at the moment?

Did instructor provide reinforcement for appropriate behaviors and appropriate responding?

Did instructor provide differential (better) reinforcement for

specific behaviors targets for increase and for more

independent responses? (the best score during fluency)

- Notes on ways to differentially reinforce:
  - $\,\circ\,$  More quantity of the reinforcer
  - **O Better quality**
  - Larger magnitude
  - $\,\circ\,$  More time in contact with reinforcer

If Student engages in undesired behaviors or behaviors targeted for reduction, did instructor withhold reinforcement?

## Data collection

No matter how many times you practice you only convert the best score for the day and graph the best one.

Conversion to response per minute.



9 responses in 10 seconds converts to 9x6 to get the responses per minute.

Conversion for a 15 second timing: responses x4

20 second timing: responses x3

30 second timing: responses x2.



### Sample graph

#### Common errors

Using the same pictures every time you run tact fluency

Or rotating through 3 sets of pictures.

Use any of the pictures in the card sort that are known. Don't separate out for fluency only.

Run a probe before doing the fluency session:

• if the student errors on a tact, take that picture out of the array.

• If the student has poor articulation for a tact, take it out of the array.

If student points to a picture but says the one before or after... this is a procedural error that should be corrected.

### Tact Fluency program decisions

Decisions to make when an aim is hit.

- Do I increase the aim? (This is generally where to start for Tacts)
- Do I increase the field size?
- Do I build endurance and increase the timing sprint?
  - 10 seconds 15 seconds 20 seconds 30 seconds 1 minute?

When do we end a fluency program:

- When an aim is hit for 3 consecutive days.
- When the student can perform the skill with endurance
- When complex skills or composite skills are acquired easily.

### Imitation fluency

When to consider Imitation fluency program

Student should have at least 20-30 imitations acquired before looking at an imitation fluency program. If student has these difficulties: distractions, To teach multiple memorization issues, step imitation (2-3 generalization issues, prompt sequenced) dependency/spontaneous deficits. To build "generalized imitation": imitate any novel movement.

### Imitation fluency probe general directions





Sample imitation fluency poster
Set up imitation fluency for the student. (if they are all imitating pretty much anything (not 2-3 step imitations).

Differential reinforcement is important!

Example: I gave a small amount of reinforcement for the 5 responses, gave even more when he beat that number and got 8 then he got the most reinforcement for 9.

More considerations.

moving faster than the student Don't deliver the S<sup>d</sup> before the student even imitates the last action.

# Only go as fast as the student.

#### **Common errors**

Using imitations that require taking eyes off the instructor

## "Do this" touch feet

#### More on errors

### Imitation Fluency program decisions

Decisions to make when an aim is hit.

- Do I increase the aim?
- Do I increase the field size?
- Do I build endurance and increase the timing sprint?
  - 10 seconds 15 seconds 20 seconds – 30 seconds – 1 minute?

When do we end a fluency program:

- When an aim is hit for 3 consecutive days.
- When the student can perform the skill with endurance (at least 30 seconds).
- When complex skills or composite skills are acquired easily.

Imitation fluency aim is 48-72 range.

If the student hits the aim for 3 days, then increase the timing not the aim

Keep the aim the same. For the aim, anything 48 responses per minute and higher is sufficient.

Make a big deal about hitting the aim! Or even just improving the responses.

End program when the student hits the aim for 3 consecutive days with a 30 second timing. Imitation fluency decisions

# Data collection

No matter how many times you practice you only convert the best score for the day and graph the best one.





9 responses in 10 seconds conversion: 9x6 to get the responses per minute.

Conversion for a 15 second timing: responses x4

20 second timing: responses x3

30 second timing: responses x2.

# Echoic fluency



When to consider echoic fluency Articulation issues: In speech if the student can emit the sound some of the item but not all of the time.

As a prerequisite for joint control programming. ( 2 words, 3 words, etc)

> If student has difficulty such as distractions, memorization issues, generalization issues, prompt dependency/spontaneous behavior deficits.

Disclaimer: you must have instructional control with echoics.

#### Data example.





- First teach echoic skill in Intensive teaching.
- When have a variety of echoics acquired in IT (50+ per sound).
- L-Sounds: baseline 64 L-words tested as echoics. Emitted less than 80% of the time in conversation.
- R-sounds: baseline 22 R-words as echoics. 39 R-words taught in Intensive teaching. A total of 61 R-words tested or taught. Emitted less than 80% of the time in conversation.

#### L-word fluency data.



#### R-word Fluency data.



## NET data: Lword (in Gen. Ed)

#### % correct L-words General education setting



■ % correct Gen. Ed teacher ■ % correct ASD Teacher

## Conversation with an adult: L-words



## NET data in Gen. Ed: Rwords



## Conversation with Adult: Rwords



#### Results

The student emitted sounds before fluency program in NET conversation less than 80% of the time. His articulation improved after the echoic fluency programs. He was able to emit the sounds more than 80% of the time in NET conversation after fluency instruction.

Fluency programming increased the rate of responding for the student and his articulation improved in conversation with L-words and R-words.

The articulation improved at a faster rate in the second program.

Decisions to make when an aim is hit.

- Do I increase the aim?
- Do I build endurance and increase the timing sprint?
  - 10 seconds 15 seconds 20 seconds 30 seconds – 1 minute?

When do we end a fluency program:

- When an aim is hit for 3 consecutive days.
- When the student can perform the skill in the NET
- When complex skills or composite skills are acquired easily.

Echoic Fluency program decisions

# Listener Responding fluency





## Carl Binder, 2000.



Teachers have found that when students achieve fluency in important prerequisite skills and knowledge they do not forget. Instead, more advanced work becomes easier rather than harder and **learning** becomes fun rather than tedious.

#### References

- Binder, Carl. (1996). Behavioral Fluency: Evolution of a New Paradigm. *The Behavior Analyst.* No. 2 (Fall). Pp.163-197.
- Binder, Carl. (2004). In Response: A Refocus on Response-rate Measurement: Comment on Doughty, Chase, and O'Shields (2004). *The Behavior Analyst.* No. 2 (Fall).
- Donahoe, J and Palmer C. (1994) *Learning and Complex Behavior.* Boston: Allyn and Bacon.
- Ericsson, Krampe, & Tesch-Romer. (1993) The Role of Deliberate Practice in Acquisition of Expert Performance. *Psychological Review*. V 100. No. 3, 363-406.
- Fabrizio, M. and Moors, A. (2003). Evaluating Mastery: Measuring Instructional Outcomes for Children with Autism. *European Journal of Behavior Analysis*. No 1 & 2. Pp. 23-36.
- Johnson, K, Street, E.M.(2013) Response to Intervention and Precision Teaching. New York: The Guildford Press.

#### References.

- GOOGLE.(2017). Procedural fluency in mathematics National council of teachers of america. www.nctm.org/standards-and-position...\procedural-fluency-in mathematics. (June, 20, 2017).
- GOOGLE. (2017). Definition of Fluency. (June, 20, 2017).
- Lindsley, O. (1991). Precision Teaching's Unique Legacy from B.F. Skinner. *Journal of Behavioral Education*. Vol. 1. No. 2. Pp. 253-266.
- Palmer, D.C. (2012). The Role of Atomic Repertoires in Complex Behavior. *The Behavior Analyst.* No. 1. (Spring). Pp. 59-73.
- Palmer, D.C. (ND) Achieving Parity: The Role of Automatic Reinforcement. Smith College.
- Palmer. D.C. (1991). A Behavioral Interpretation of Memory. In L. J. Hayes & P.N. Chase (Eds), *Dialogues on verbal behavior* (pp. 261-279). Reno, NV: Context Press.
- Palmer, D.C. (ND). The Speaker as Listener: The Interpretation of Structural Regularities in Verbal Behavior. Smith College.

- Skinner, B.F. (1957) Verbal Behavior. Acton Mass: Copley Pub. Group.
- Skinner, B.F. (1974) About Behaviorism. New York: Knopf.
- Skinner, B. F. (May 15, 1958). Letter to Percival Symonds. Harvard University Archives: HUG(FP) 60.20 BFS subject file 19321979, Box 2, Folder B9.
- Stokes, T.F and Baer, D. (1977). An Implicit Technology of Generalization. *Journal of Applied Behavior Analysis*. No2 (Summer). Pp. 349-367

#### Contact Information

#### www.pattan.net

Lori Chamberlain

C-lchamberlain@pattan.net



Bureau of Special Education Pennsylvania Training and Technical Assistance Network

**Commonwealth of Pennsylvania** 

Tom Wolf, Governor