

# ***Everybody Needs Fluency!***

Carl Binder, Ph.D. New York Academy of Medicine April 2, 2004  
“Working Together” Conference on Autism

## ***Everybody Needs Fluency!***



**Carl Binder, Ph.D.**

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## **My Background**

- Early 1970's: graduate study with B.F. Skinner - *Rate of Response*
- 1973-82: Behavior Prosthesis Lab & Classroom
  - Beatrice Barrett, Ogden Lindsley, Eric & Elizabeth Haughton
  - *Precision Teaching*, curriculum design, teacher-training
  - Research and application with multiple-diagnosis populations
  - Applications with all regular and typical school populations
- 1982-present: writing, teaching, consulting - *Fluency*
  - Regular and special education
  - Corporate training and performance improvement
  - Replication of effects across broad range of learners
  - Writing and speaking about fluency-based instruction

***A lot has changed since 1999...***

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## The Challenge of *Competence*

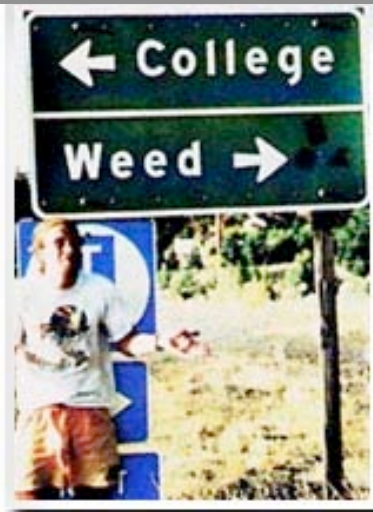
- Students **not remembering** what they learned?
- Problems **paying attention** or staying on task?
- Working so hard on the mechanics of reading, math, or writing that **it's “hard to think”** when applying them?
- Self-care, vocational, and academic skills really hard to teach? **Chained skills falling apart?**
- School getting **harder rather than easier** over time?
- Skills **don't seem “functional”** in real world application?

**Why?**

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**While we know that there are *many* explanations for educational failure...**



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At the heart of the problem is  
a misunderstanding about what it  
means to be **“good at” something**

*...and how we measure it.*

**The largely *unconscious* assumption  
that mastery = 100% correct.**

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## ***Champions in the Making!***



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## What is Fluency?

- You will have exactly 1 minute.
- Write (abbreviate) as many words or phrases as you can think of in association with this term.

*Kindly don't start.....*

*....until I say....*

**"Please begin!"**

## Others' Free Associations about "Fluency"

- quick, smooth, fluid
- confident, automatic
- never forget it, retention
- without thinking, natural
- competent, capable
- no hesitation
- proficient, masterful
- accuracy and speed
- can apply it, transfer
- expert, really knows it
- fun, likes to do it
- practice, repetition
- Carnegie Hall
- know it by heart
- creativity, improvisation
- foreign language
- don't have to worry
- faster than thought
- good as it gets
- ...and more....

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## Fluency: The *True* Definition of *Mastery*

Fluency = Accuracy + Speed

= Quality + Pace

= Doing the Right Thing without Hesitation

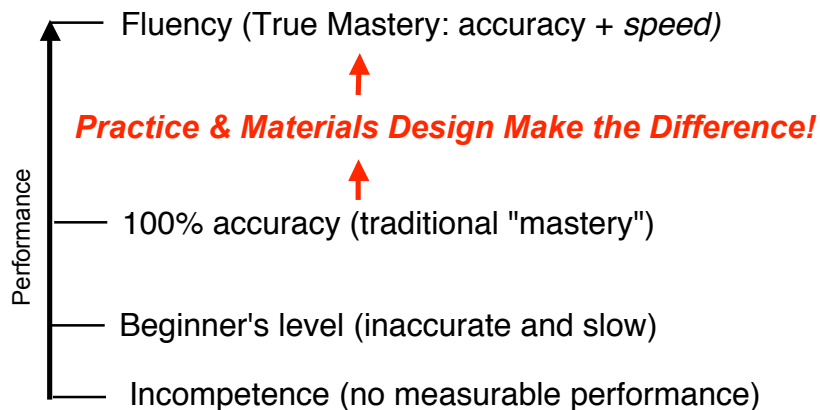
= Automatic or "Second Nature" Response

= **True Mastery**

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## Levels of Performance



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## B. F. Skinner’s Most Important Contributions



“My most important contributions were **rate of response** and the cumulative response recorder.”

Hall, M. H. (1967). An interview with "Mr. Behaviorist": B. F. Skinner. *Psychology Today*, 1(5), 20-23, 68-71.

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## Likelihood = Rate of Response

“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.”

– Dr. Julie Skinner Vargas, 1977, p. 62

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## **Lindsley Brings Response Rate to Education**

“Children are not retarded. Only their *behavior* in average environments is sometimes retarded. In fact, it is modern science’s ability to design suitable environments for these children that is retarded.....The purpose of this paper is to suggest techniques.... **for maximizing the behavioral efficiency of exceptional children** who show deficits when forced to behave in average environments. These suggestions evolved from the methods and discoveries of free-operant conditioning.”

Ogden R. Lindsley, 1964  
Direct Measurement and Prosthesis of  
Retarded Behavior, *Journal of Education*

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**Beatrice Barrett**

**Ogden Lindsley**

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## Barrett on Time and Behavior

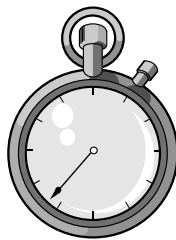
“.... behavior occurs *in* time, it *takes* time to occur, and it occurs *through* time. Time is, therefore, a fundamental parameter of behavior.”



Beatrice H. Barrett  
*The Technology of Teaching Revisited*  
Cambridge Center for Beh. Studies, 2002  
[www.Behavior.org](http://www.Behavior.org)

***“You can take behavior out of time.... but  
....you can’t take the time out of behavior.”***

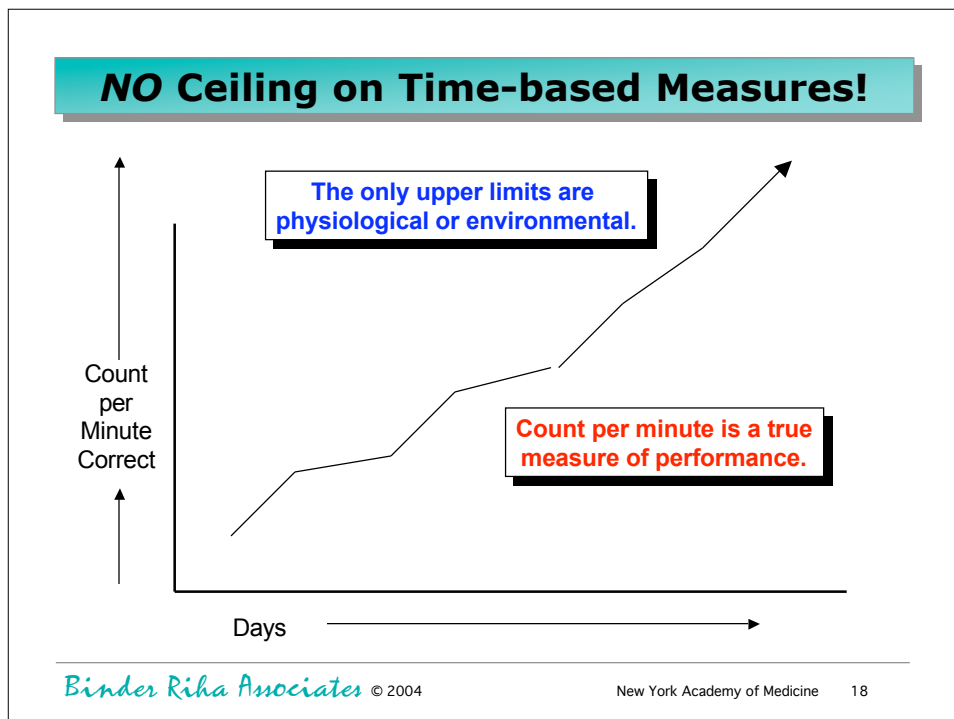
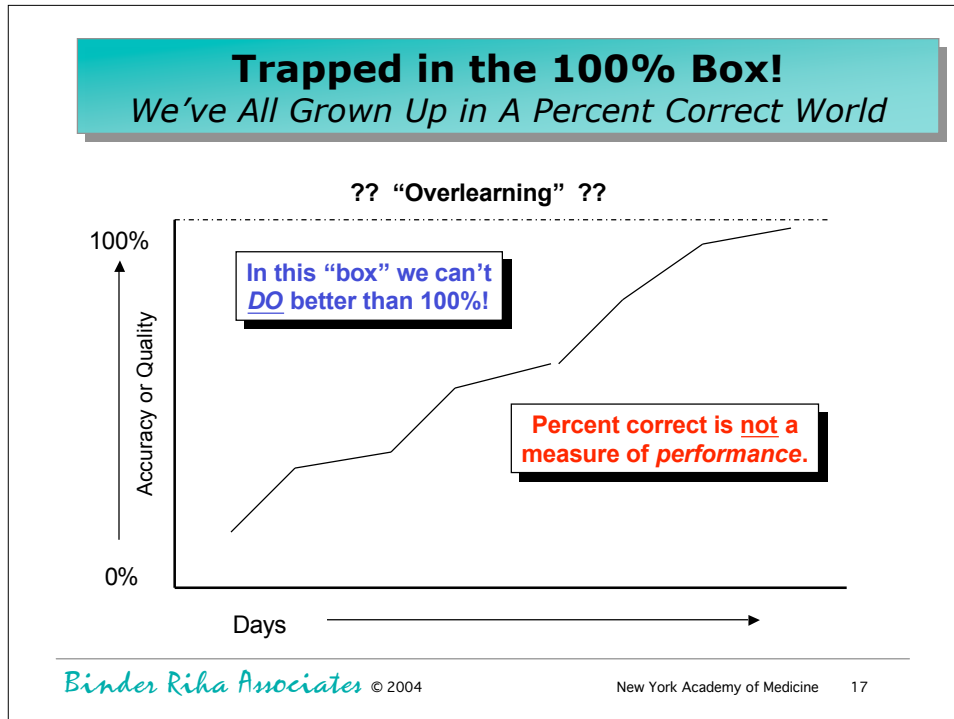
*- Dr. Eric Haughton*





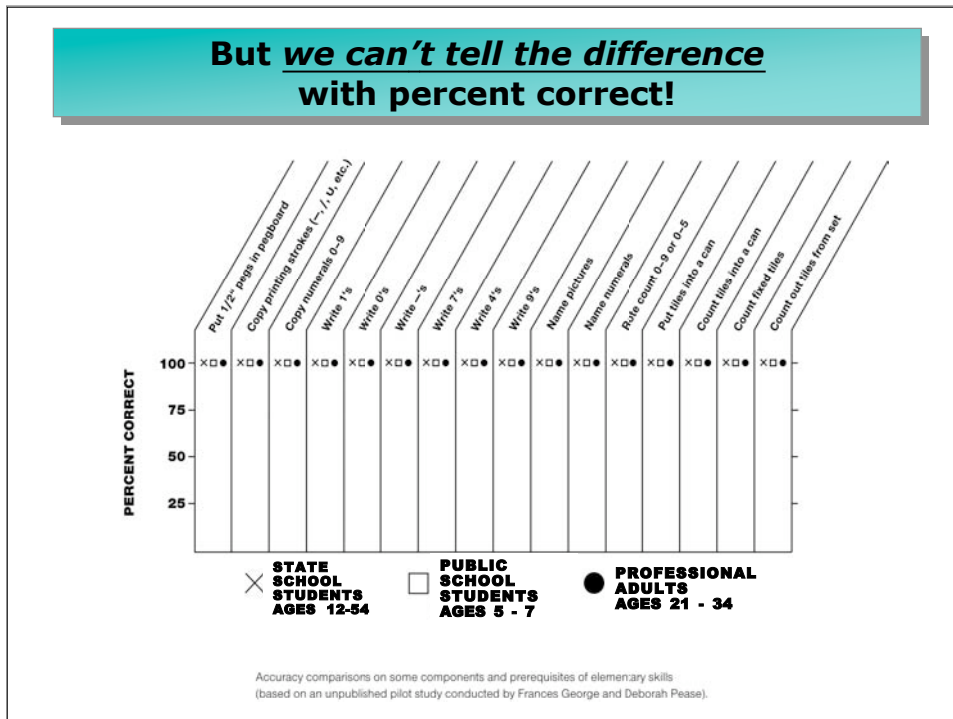
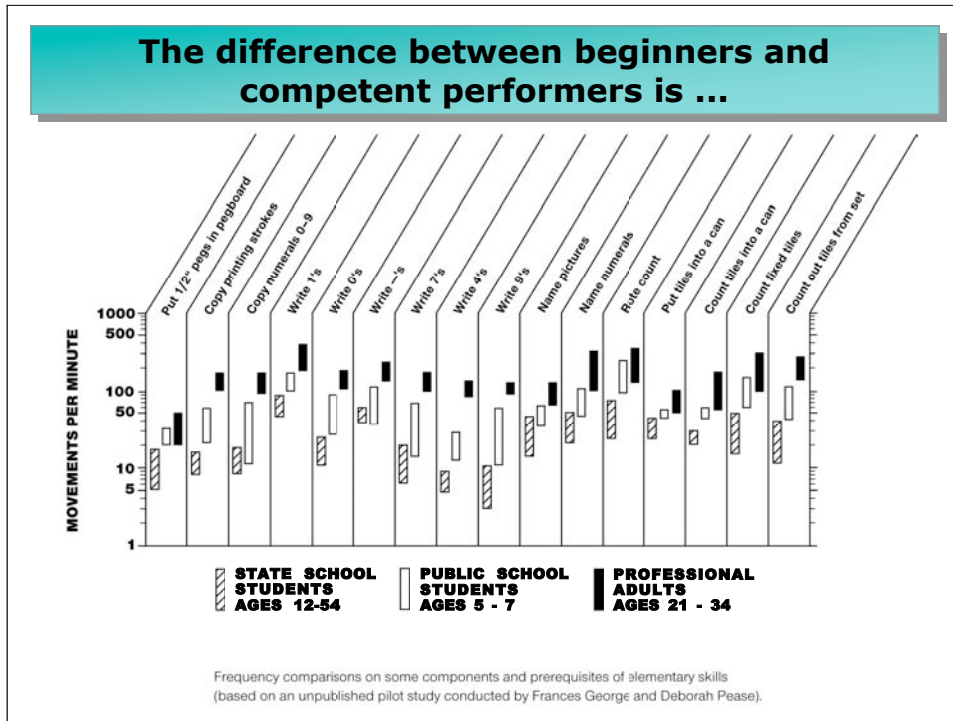
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## Percent Correct *Handicaps* our Students!

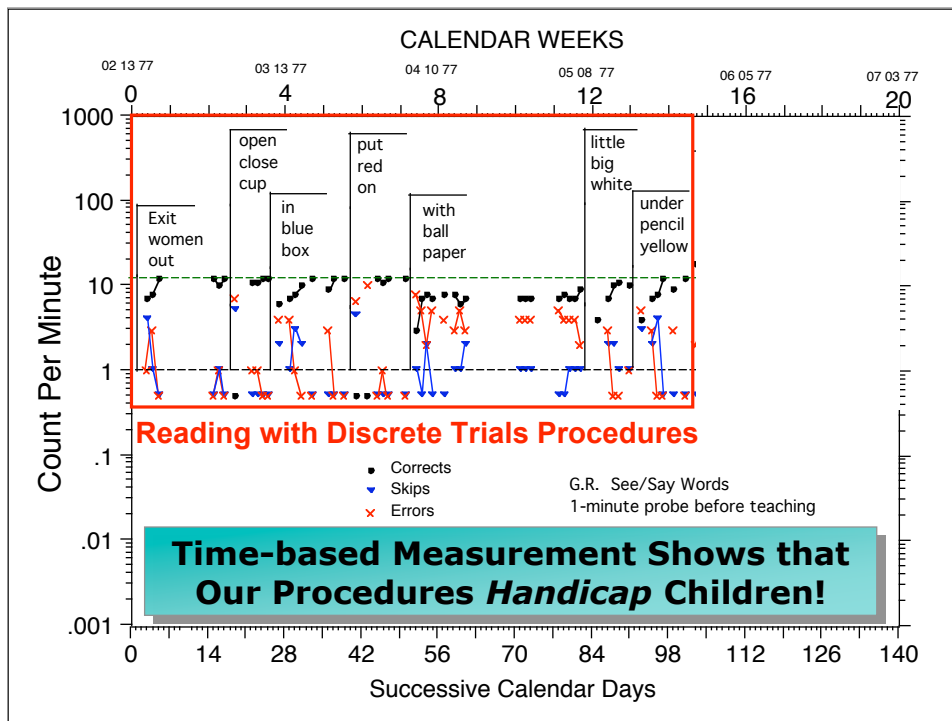
“When only a percentage correct scale is used to measure skill performance.... it is impossible to distinguish among various levels of skill proficiency.

When we fail to measure along the time dimension, we impose a serious constraint on our expectations for handicapped students, as well as on the likelihood that we will work to “normalize” their skill proficiencies.”

Carl Binder  
Data-Sharing Newsletter, Sept, 1978  
Behavior Prosthesis Laboratory

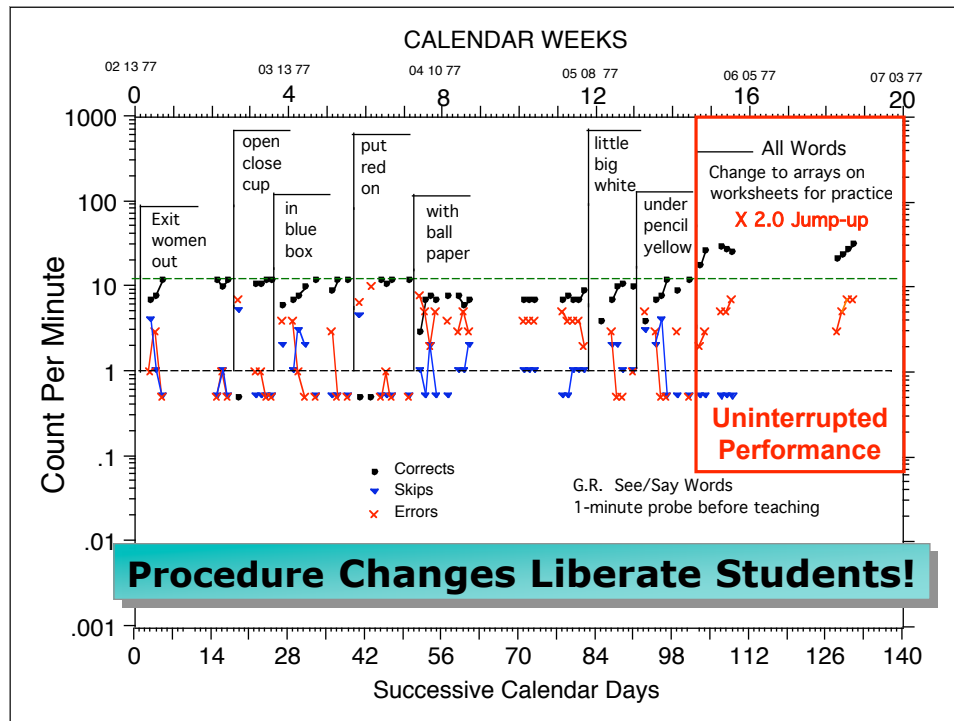
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## Coaches Know about Fluency

“Skill, as it pertains to basketball, is the knowledge and the ability, *quickly* and properly, to execute the fundamentals. Being able to do them is not enough. They must be done *quickly*. And being able to do them quickly isn't enough, either. They must be done *quickly and precisely at the same time*. You must learn to react properly, almost instinctively.”

*John Wooden, 1988  
They Call Me Coach, page 87  
Chicago: Contemporary Books*

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## **Surgeons Practice to Achieve Fluency**

“Having *good hands* is a primary determinant of a surgeon’s success in the operating room.”

*Dr. Tim Deer  
Center for Pain Relief  
Charleston, WV*

**Some surgeons-in-training practice making stitches on pigs feet and tomatoes.**

## **Michael Jordan on Practice**

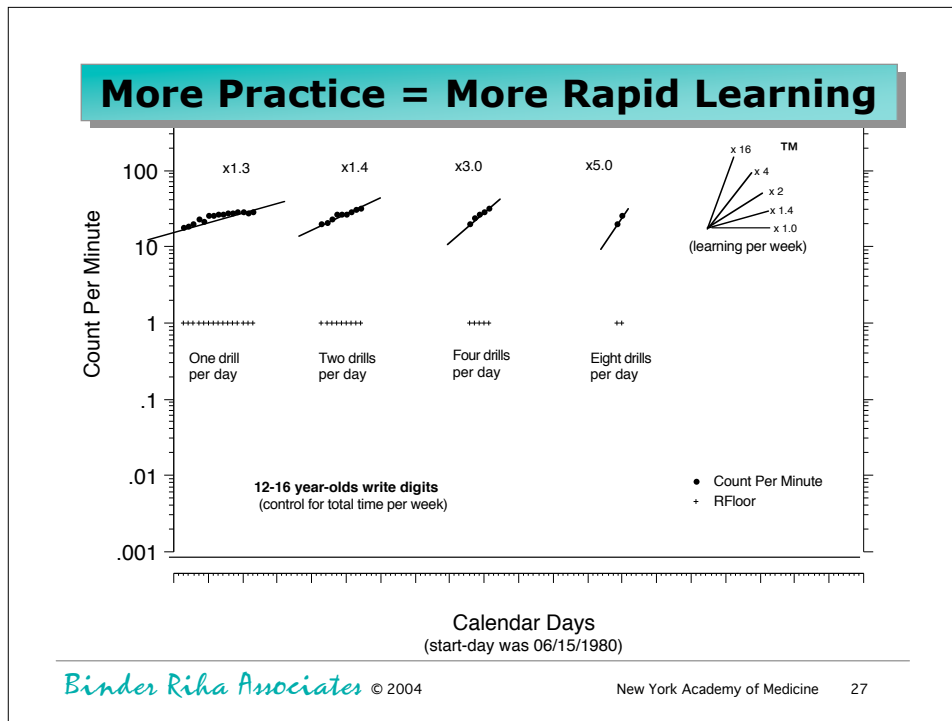
“If you want to get better at anything, you have to practice. There’s no other way to do it. For me practicing is fun. I enjoy improving myself, and I enjoy developing new skills.”

*Michael Jordan, 1991  
Television Spot*

**But with percent correct measures we can’t see the results of practice!**

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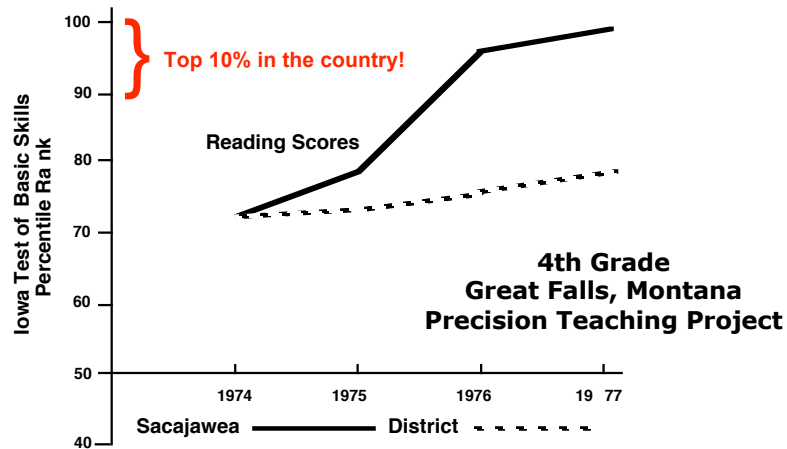
### Typical Outcomes of Building Fluent Behavior

- Severely disabled students acquire and maintain vocational and self-help skills after years of failure (*Amego School, Boston, 1976*)
- 1-2 grade levels gained in 6-week summer school (*Morningside Academy, Seattle, for over 18 years*)
- Newly trained customer service reps surpass productivity benchmarks within weeks (*AT&T Wireless Services, Anaheim, CA*)

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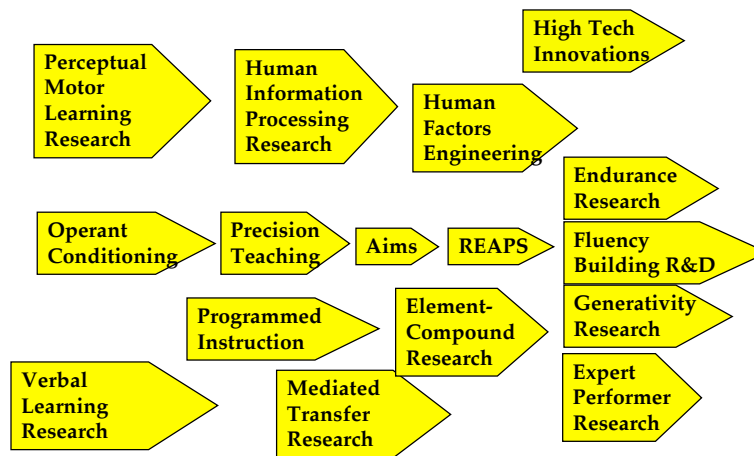
## Unprecedented Cost-effectiveness! Adding 20-30 minutes of timed practice per day



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## Scientific/Technical Contributions to Fluency Development Methods



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## **Examples of Fluent Behavior**

- Tapping a surface: 250-350 per minute
- Writing Digits: 140 to 160 characters per minute
- Arithmetic: 70 to 110 computations per minute
- Keyboarding: 60 to 90 words per minute
- Brainstorming: 20 to 30+ ideas per minute
- 3-point basketball shots: 15-25 hits per minute

**Let's measure ourselves.**

## **Outcomes Associated with Fluency**

### ***Improved:***

- **Retention and maintenance** of skills and knowledge
- **Endurance**, attention span, resistance to distraction
- **Application or transfer of training** to more complex tasks and subsequent learning (generativity, creativity)

**Valuable Learning Outcomes!**



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## **And....Fluency is Fun!**

**“You know, when you learn how to do something  
and to do it well, you begin to *enjoy* it.”**

*Mamie “Peanut” Johnson  
American Negro League Pitcher*

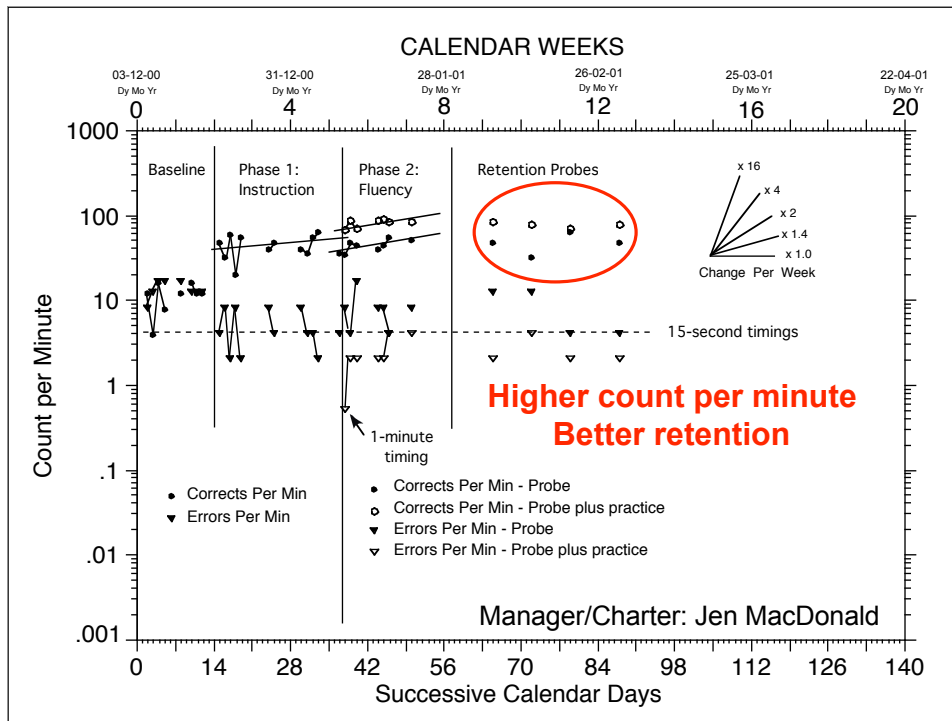
## **Defining Fluency Standards: REAPS – An Empirical Challenge**

**Retention – Endurance – Application  
Performance  
Standards**

We must identify Performance  
Standards that *optimally support*  
Retention, Endurance, and Application.

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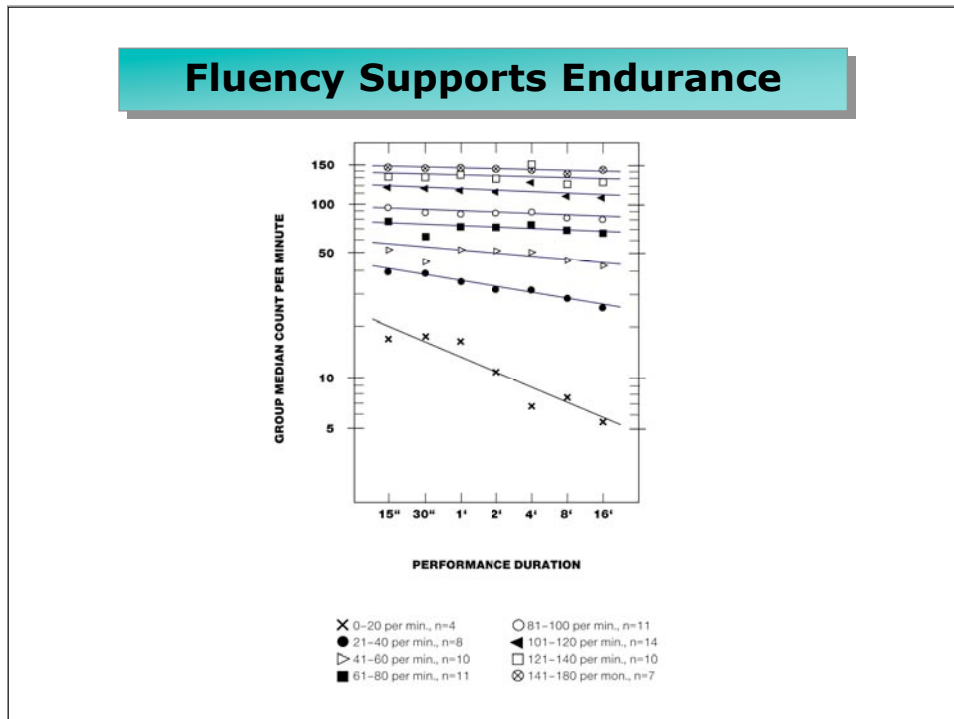
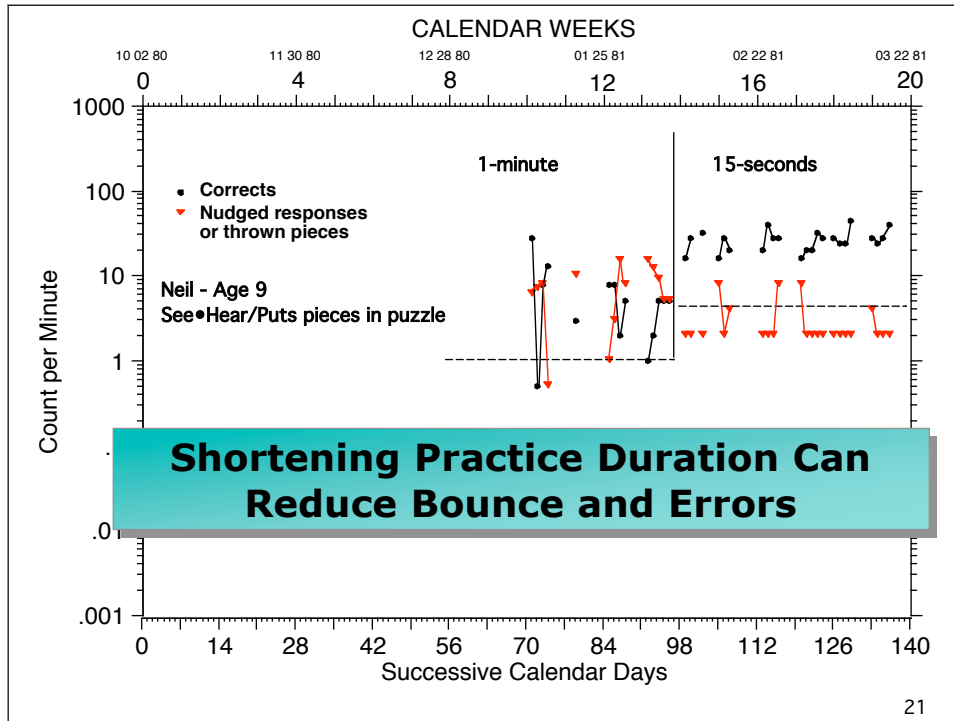
## An Early Observation of Endurance

"I've been putting some of my kids on 10 second timings. They've spent weeks on 1 minute timings and haven't made it. But within a few sessions at 10 seconds some of them attained REAPS. Now we are increasing the timings and so far they haven't dropped out of the range. I'll let you know what happens. It may be a quicker way of getting to REAPS. The endurance is the part they don't have."

Anne Desjardins  
Reported in *Data-Sharing Newsletter*  
April, 1981, #34 page 3

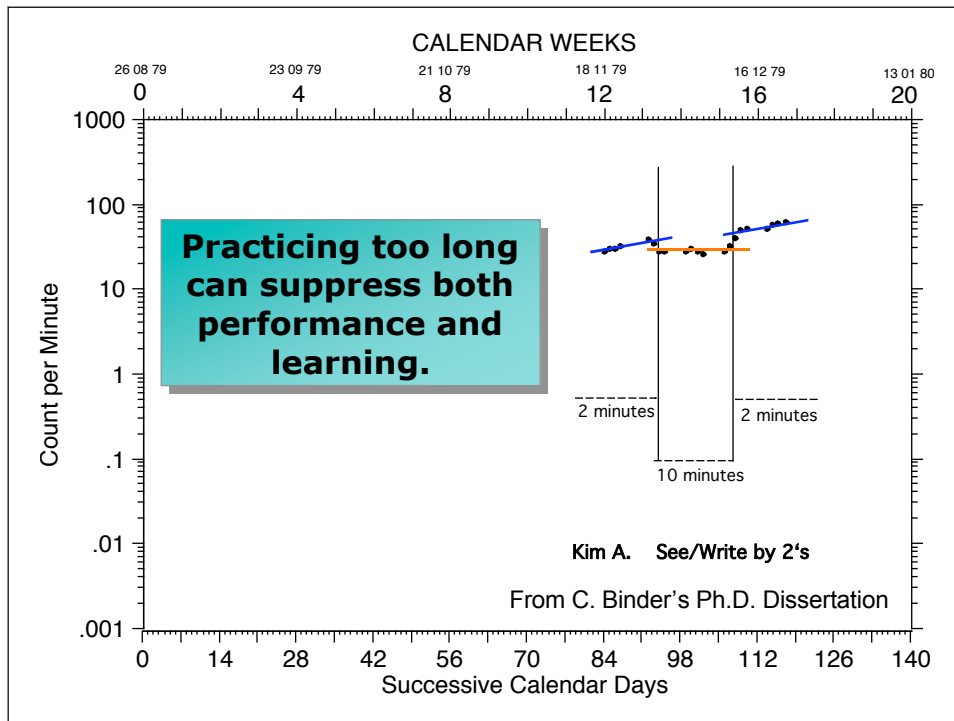
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## Using What We Know about Endurance

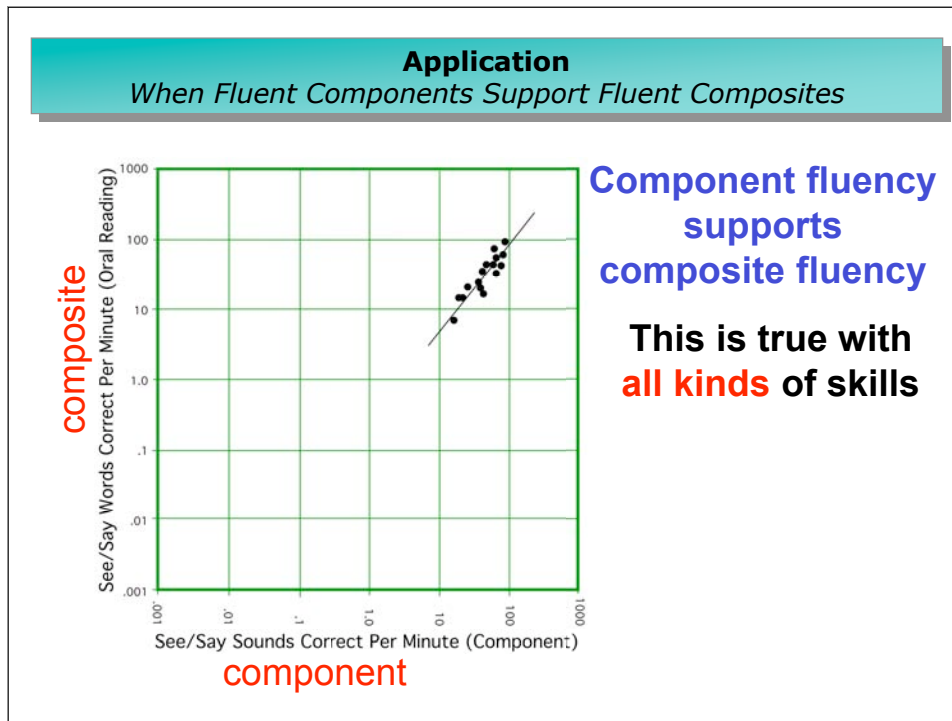
In the beginning, many brief practices may be more productive than a few long ones.

10 or 15-second “sprints” are best to start with many cases.

Let's experience it....

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## Ray Charles on *Practicing Components*

**ROBERT SIEGEL:** You practice a lot?

**RAY CHARLES:** Whenever I can. I don't -- I don't practice as much as I would like to, because I'm not around a big piano all the time. But I try to, you know, I try to practice a little bit every day for the most part.

**ROBERT SIEGEL:** And when you practice, I mean, do you practice the tunes that you'll be playing at the next concerts.....?

**RAY CHARLES:** Oh, no, no, no, no, no, no, no, no, no, no, no.....

**ROBERT SIEGEL:** I guess the answer is no, you're saying?

**RAY CHARLES:** No. No. I practice things like scales and chords and movement of my hands and things like that, because, I mean, I -- what I'm going to play on stage, I know. What I'm practicing for is to try to improve what I might play, you know. You gotta practice. I mean you gotta keep your fingers loose, you gotta keep your mind active, you know, because what your mind think of -- the question is: what your mind think of, can your fingers play it?

**ROBERT SIEGEL:** Right.



*Interview on National Public Radio  
Celebrating Ray Charles 50 years in recording  
September 23, 1997*

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## Application

### *Combining Components into Composites*

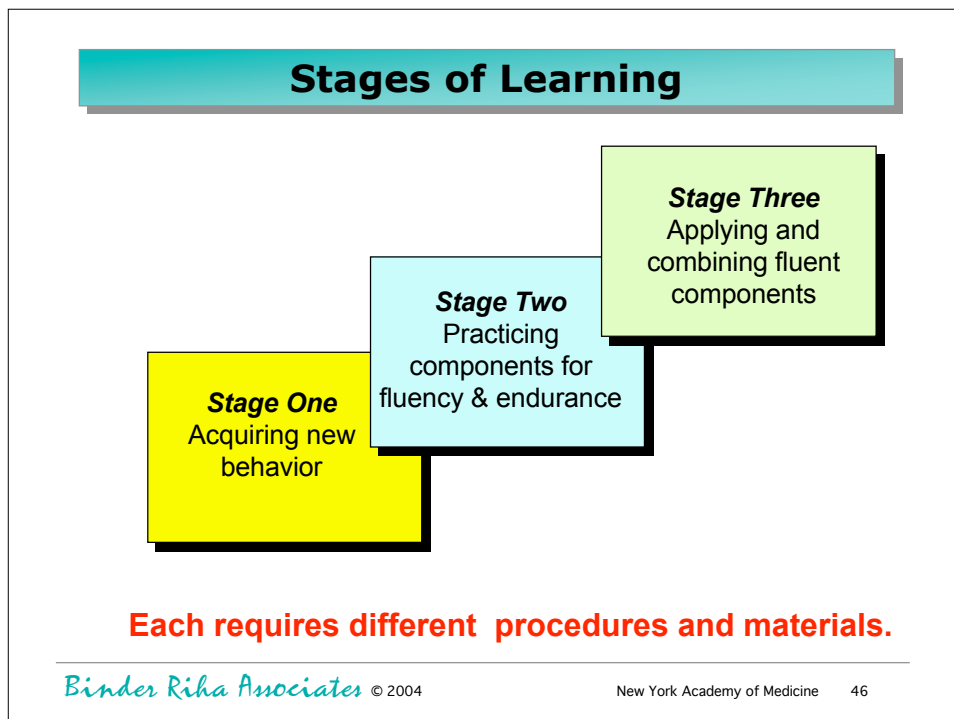
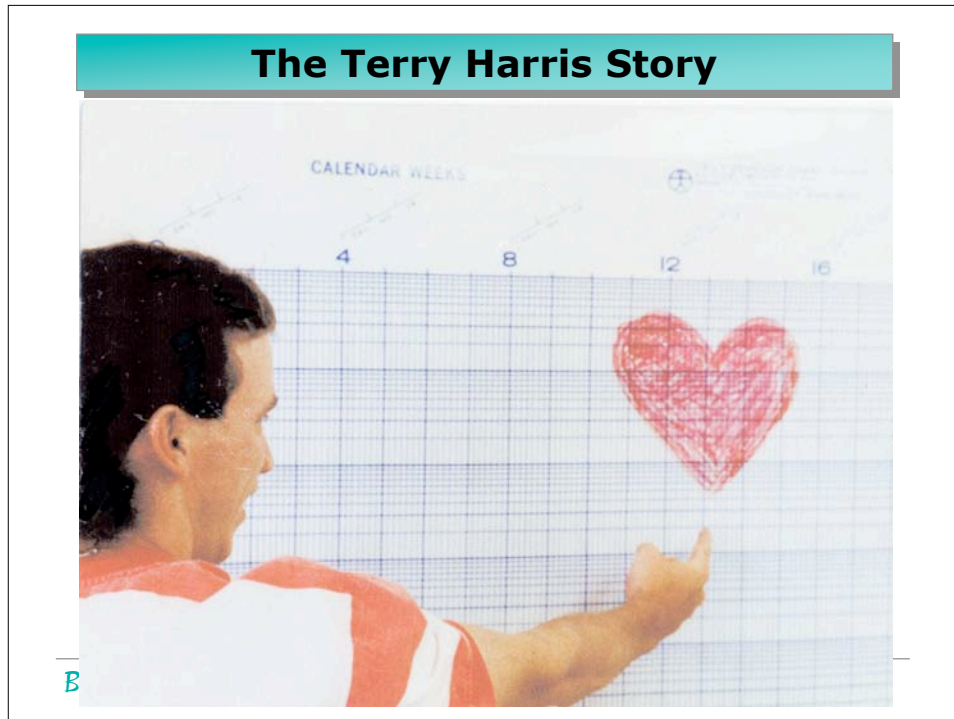
- Links and Chains
- Discriminations and skilled movements
- Coordinated movements
- Elements of associations or equivalent terms
- Language used to describe these relationships:
  - Part / Whole
  - Tool Skill / Basic Skill
  - Element / Compound
  - Component / Composite

## Examples of Components

Composite / Whole Skill	Components
Putting on clothes	Reach, point, touch, grasp, place, release (“The Big Six”)
Writing your name	Make tallies, circles, loops, diagonals, crosses, etc.
Getting in and out of bed	Head, trunk, hip, leg, arm movements
Reading aloud	Break words into sounds, combine sounds, say sounds for letters, blend sounds, etc.
Using flashcards to learn picture names	Grasp cards, flip cards, “deal” cards, say words, etc.

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## Boiling It Down About Practice...

- **Reasons traditional “drill & practice” fails:**
  - lacks explicit fluency criterion as goal
  - long durations stretch endurance and attention
  - often the “chunks” are too big
- **Reasons well engineered practice succeeds:**
  - explicit time-based goal for practice
  - brief durations allow peak performance
  - builds fluent elements before application

## Tactics for Building Fluent Behavior

- *Get out of the student's way.*
- Accentuate amount of work completed and passage of time; reinforce higher completion rates.
- Use **maxi-guiding** – fast physical guidance - “feel what it’s like to be fast.” With motor components.
- Move from discrete to *continuous imitation*.
- Focus on behavior *components* that students practice repeatedly using *many more sets of materials*
- Use **sprints**, encourage **bursts** of behavior.



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## More Tactics for Building Fluent Behavior

- Fade procedures and materials from one-at-a-time, to *arrays* or *clusters* of items to allow more continuous performance,.
- Leave materials in *left-to-right arrays*, then use pointing *cues to move students along*.
- Prompt and reinforce “keep going” to *build continuous behavior* in students with histories of heavy consequences.
- “*Coaching and Cheerleading*” combines paced prompting (“hustles”, nudges, etc.) and non-interrupting reinforcers.
- *Ask the student* what would make her faster.

And keep inventing materials and procedures that expand the *parameters of pupil freedom!*

## About the *Discrete Trials vs. Free Operant* “Debate”

- **GOAL:** *multiply response opportunities to achieve FLUENT behavior.*
- FREE students from unnecessary constraints as quickly as possible.
- THEN *accelerate performance toward fluency* using continuous measurement to guide you.
- ALWAYS *monitor behavior frequencies – even during discrete trials.*
- *ADJUST correction procedures, feedback, etc. based on correct and error frequencies and trends.*
- *CHANGE procedures, materials, and instructional sequences to find opportunity multipliers and accelerate behavior toward fluency.*

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## **Some Summary Statements**

One cannot distinguish between expert  
and non-expert performance without  
*measuring the time dimension.*

It is essential to design materials and  
procedures to encourage rather than  
obstruct the development of fluent  
performance.

---

If we do *not* measure the time  
dimension, we will likely fail to build  
environments that support fluency.

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Achieving fluent performance often, if not always, involves the development of *fluent component behavior* prior to or at the same time as development of composite behavior.

Often the greatest obstruction to fluency development is simply *a lack of opportunity* to achieve fluency on critical components before being expected to perform composite applications.

It is helpful to view learning as occurring in three stages: 1) *initial learning* for accuracy or quality; 2) *practice of components* for fluency and endurance; and 3) *application or combination of components* into composite behavior.

Many programs fail to produce mastery because they skip or minimize the 2nd stage and prematurely plunge learners into the 3rd stage before they can fluently perform key components.

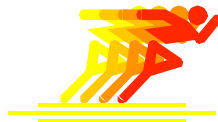
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## **Some Additional Resources on Fluency and Autism**

- **Helpful Resources** page at our web site:  
[www.Binder-Riha.com/publications.htm](http://www.Binder-Riha.com/publications.htm)
- Precision Teaching web sites -- links from  
[www.Celeration.org](http://www.Celeration.org)
- Dr. Rick Kubina, Penn State University -- speaking  
later at this conference
- Michael Fabrizio and Alison Moors, Fabrizio/Moors  
Consulting, Seattle 206-324-3805

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**Discussion?**

***Thank You.***