DYSLEXIA AND THE NEED TO READ: H.R. 3033, THE RESEARCH EXCELLENCE AND ADVANCEMENTS FOR DYSLEXIA ACT

HEARING

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTEENTH CONGRESS

FIRST SESSION

September 30, 2015

Serial No. 114–41

Printed for the use of the Committee on Science, Space, and Technology

Available via the World Wide Web: http://science.house.gov

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September 30, 2015

DYSLEXIA AND THE NEED TO READ: H.R. 3033, THE RESEARCH EXCELLENCE AND ADVANCEMENTS FOR DYSLEXIA ACT

WEDNESDAY, SEPTEMBER 30, 2015

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Committee met, pursuant to call, at 10:07 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Lamar Smith [Chairman of the Committee] presiding.

Congress of the United States
House of Representatives
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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Committee on Science, Space, and Technology

Dyslexia and the Need to READ: H.R. 3033, the Research Excellence and Advancements for Dyslexia Act

Wednesday, September 30, 2015
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Witnesses

Ms. Barbara Wilson, Co-Founder and President, Wilson Language Training

Dr. Paula Tallal, Senior Research Scientist, Center for Human Development, University of California, San Diego; Adjunct Professor, Salk Institute for Biological Studies; Founder and Director, Scientific Learning Corporation

Dr. Rachel Robillard, Assistant Director, 504 Services and Response to Intervention, Austin Independent School District

U.S. House of Representatives
Committee on Science, Space, and Technology

Dyslexia and the Need to READ:
H.R. 3033, the Research Excellence and Advancements for Dyslexia Act

HEARING CHARTER

Wednesday, September 30, 2015
10:00 a.m.
2318 Rayburn House Office Building

Purpose

At 10:00 a.m. on Wednesday, September 30, 2015, the Science, Space, and Technology
Committee will hold a hearing titled *Dyslexia and the Need to READ: H.R. 3033, the
Research Excellence and Advancements for Dyslexia Act.* The purpose of this hearing is
to discuss H.R. 3033, the Research Excellence and Advancements for Dyslexia Act.
Topics for the hearing include: the need for federal legislation to address dyslexia in the
American populace, the importance of early identification for children and students with
dyslexia, professional development needed for teachers and administrators for students
with dyslexia, and what special curricula and educational tools would be most helpful.
Witnesses will address what research and development would be most beneficial for
practical applications to overcome dyslexia based on their personal experience and
expertise.

Witnesses

- **Ms. Barbara Wilson**, Co-Founder and President, Wilson Language Training

- **Dr. Paula Tallal**, Senior Research Scientist, Center for Human Development,
  University of California, San Diego; Adjunct Professor, Salk Institute for Biological
  Studies; Founder and Director, Scientific Learning Corporation

- **Dr. Rachel Robillard**, Assistant Director, 504 Services and Response to Intervention,
  Austin Independent School District

Background

Dyslexia is a difficulty to read fluently and with accurate comprehension despite a
normal or above-average intelligence. It is the most common learning disability, with
an estimated 17-20% of the population suffering from some form of dyslexia.[1] While
dyslexia is considered a learning disability, many talented people—especially in science,
engineering, and the creative arts—have been diagnosed with dyslexia, including Albert
Einstein, Thomas Edison, and John Chambers, CEO of Cisco Systems.[2][3]

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[1] http://www.yalescientific.org/2011/04/the-paradox-of-dyslexia-slow-reading-fast-thinking/
[2] http://www.dyslexia.com/famous.htm

The Committee held a hearing titled *The Science of Dyslexia* in fall 2014 where witnesses identified the need to better translate research results to practical applications, early identification of children with dyslexia, professional development for teachers and others in working with dyslexics, and curricula development and other tools for children with dyslexia.[4]

In July, Chairman Smith introduced H.R. 3033, the Research Excellence and Advancements for Dyslexia (READ) Act, with bipartisan co-sponsors.[5] The READ Act requires the president's annual budget request to Congress include a line item for the Research in Disabilities Education program of the National Science Foundation (NSF). It also requires the NSF to devote at least $5 million annually to dyslexia research, which would focus on best practices in the following areas:

- Early identification of children and students with dyslexia
- Professional development about dyslexia for teachers and administrators
- Curricula development and evidence-based educational tools for children with dyslexia

The READ Act does not increase federal spending. It authorizes multi-directorate, merit-reviewed, and competitively awarded dyslexia research projects using funds appropriated for the NSF Research and Related Activities account and the Education and Human Resources Directorate.

The bill is attached for reference.

1 Attachment:

H.R. 3033, the Research Excellence and Advancements for Dyslexia (READ) Act

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[3] http://www.businessinsider.com/cisco-ceo-john-chambers-talks-dyslexia-2014-7
[4] For more information on the hearing, see: https://science.house.gov/legislation/hearings/full-committee-hearing-science-dyslexia.
[5] https://science.house.gov/news/press-releases/smith-bill-supports-dyslexia-research

Chairman SMITH. The Committee on Science, Space, and Technology will come to order.

Without objection, the Chair is authorized to declare recesses of the Committee at any time.

Welcome to today's hearing, "Dyslexia and the Need to READ: H.R. 3033, the Research Excellence and Advancements for Dyslexia Act."

Let me say we welcome everyone here today but particularly those who are under 18, and it's nice to see them represented in the audience.

I'm going to recognize myself for an opening statement, and then the Ranking Member.

Today's hearing is on H.R. 3033, the Research Excellence and Advancements for Dyslexia, or READ, Act, and the need to prioritize investments in dyslexia research conducted by the National Science Foundation.

I want to thank the many co-sponsors of the READ Act, especially former Science Committee Member, Representative Julia Brownley. We co-chair the bipartisan Congressional Dyslexia Caucus. The caucus now has more than 100 Members of Congress. Together, we champion an increased public awareness of dyslexia, which affects an estimated 8.5 million schoolchildren and one in six Americans in some form.

Despite this huge number, many Americans remain undiagnosed, untreated and silently struggle at school or work. Too many children undiagnosed with dyslexia have difficulties in the classroom and sometimes drop out of school and face uncertain futures.

In a hearing last year on the science of dyslexia—one of the best-attended hearings of this Committee—experts testified how research in the area of neuroscience has led to practical ways of overcoming dyslexia and why more research was necessary. Parents and teachers both must receive training in how to identify and test students for dyslexia. And the development of special curricula and educational tools can better enable students to read at their fullest potential.

The expert witnesses at our hearing were clear, Dyslexia is the most common reading disability, yet those who suffer from it often have normal or above-average intelligence. There is no proven correlation between dyslexia and intelligence. Albert Einstein had dyslexia, and Leonardo da Vinci, Galileo, Nicholas Tesla, Thomas Edison and Steve Jobs are a few of the most recognized, brilliant innovators and inventors who overcame dyslexia.

With more research, greater awareness of how to identify dyslexic students, better curricula and more resources in the hands of parents, teachers and students, we can develop the potential of many of those students who might become the next Einstein. But if you can't read, it's hard to achieve.

The READ Act is a step in the right direction to help those with dyslexia. The bill ensures that our children have the means to succeed.

The READ Act requires the National Science Foundation budget to include a specific line item for the Research in Disabilities Education program. The bill authorizes at least $5 million annually for merit-reviewed, competitively awarded dyslexia research projects.

It uses funds already appropriated for the NSF Research and Related Activities account or the Education and Human Resources Directorate for those projects. It does not increase overall federal spending at the NSF.

The READ Act supports the practical research our expert witnesses said is most needed: early identification, professional training for teachers and administrators about dyslexia, and evidence-based educational tools and curricula. This is well within the scope of NSF's current science, technology, engineering, and mathematics education programs.

Our witnesses today have personal experiences with this issue. They routinely help students with dyslexia in the classroom and identify students who can benefit from additional instruction tailored for their unique situation. They develop practical curricula to help children and adults with dyslexia. And some are parents of dyslexic students who want to make a difference not only in their children's lives but also in the lives of others.

And we'll put something up on the big screen right now. October is Dyslexia Awareness Month. One year ago, in conjunction with our Science of Dyslexia hearing, the Web site Understood.org was launched. This Web site provides some tests for dyslexia and other resources. Since Understood.org went live, over six million people have visited the Web site and it now attracts about one million different visitors each month.

After today's hearing, I would like to welcome Members of the Committee to a reception in room 2325 down the hall being hosted by the National Center for Learning Disabilities along with the International Dyslexia Association, Decoding Dyslexia, the Learning Disabilities Association of America, Dyslexia Advantage, and Learning Ally. By the way, I said just Members of the Committee, I mean everybody in this room is welcome to that reception down the hall in that direction.

For many people, dyslexia is considered a disability. But if we change the way we approach this subject, we can turn that disability into an opportunity for a brighter and more productive future.

[The prepared statement of Chairman Smith follows:]

PREPARED STATEMENT OF COMMITTEE CHAIRMAN LAMAR S. SMITH

Welcome to today's hearing on H.R. 3033, the Research Excellence and Advancements for Dyslexia or READ Act, and the need to prioritize investments in dyslexia research conducted by the National Science Foundation (NSF).

I thank the many co-sponsors of the READ Act, especially former Science Committee Member, Representative Julia Brownley. We co-chair the bipartisan Congressional Dyslexia Caucus.

The caucus now has more than 100 Members of Congress. Together, we champion an increased public awareness of dyslexia, which affects an estimated 8.5 million school children and one in six Americans in some form.

Despite this huge number, many Americans remain undiagnosed, untreated and silently struggle at school or work. Too many children undiagnosed with dyslexia have difficulties in the classroom and sometimes drop out of school and face uncertain futures.

In a hearing last year on the science of dyslexia—one of the best-attended hearings of this Committee—experts testified how research in the area of neuroscience has led to practical ways of overcoming dyslexia and why more research was necessary.

Parents and teachers both must receive training in how to identify and test students for dyslexia. And the development of special curricula and educational tools can better enable students to read at their fullest potential.

The expert scientists at our hearing were clear: Dyslexia is the most common reading disability yet those who suffer from it often have normal or above-average intelligence. There is no proven correlation between dyslexia and intelligence.

Albert Einstein had dyslexia. And Leonardo da Vinci, Galileo, Nicholas Tesla, Thomas Edison and Steve Jobs are a few of the most recognized, brilliant innovators and inventors who overcame dyslexia.

With more research, greater awareness of how to identify dyslexic students, better curricula and more resources in the hands of parents, teachers, and students, we can develop the potential of many of those students who might become the next Einstein.

But if you can't read, it is hard to achieve. The READ Act is a step in the right direction to help those with dyslexia. The bill ensures that our children have the means to succeed.

The READ Act requires the National Science Foundation's (NSF) budget to include a specific line item for the Research in Disabilities Education program. The bill authorizes at least five million dollars annually for merit-reviewed, competitively awarded dyslexia research projects.

It uses funds already appropriated for the NSF Research and Related Activities account or the Education and Human Resources Directorate for these projects. It does not increase overall federal spending at the NSF.

The READ Act supports the practical research our expert witnesses said is most needed: early identification, professional training for teachers and administrators about dyslexia, and evidence-based educational tools and curricula. This is well within the scope of NSF's current science, technology, engineering, and mathematics (STEM) education programs.

Our witnesses today have personal experiences with this issue. They routinely help students with dyslexia in the classroom and identify students who can benefit from additional instruction tailored for their unique situation.

They develop practical curricula to help children and adults with dyslexia. And some are parents of dyslexic students who want to make a difference not only in their children's lives but also in the lives of others.

October is Dyslexia Awareness Month. One year ago—in conjunction with our Science of Dyslexia hearing—the website Understood.org was launched. This website provides some tests for dyslexia and other resources.

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For many people, dyslexia is considered a disability. But if we change the way we approach this subject, we can turn that disability into an opportunity for a brighter and more productive future.

[The bill follows:]

H. R. 3033

To require the President's annual budget request to Congress each year
to include a line item for the Research in Disabilities Education program
of the National Science Foundation and to require the National Science
Foundation to conduct research on dyslexia.

IN THE HOUSE OF REPRESENTATIVES

JULY 13, 2015

Mr. SMITH of Texas (for himself, Ms. BROWNLEY of California, Mr. JOHNSON
of Ohio, and Mr. BEYER) introduced the following bill; which was re-
ferred to the Committee on Science, Space, and Technology

A BILL

To require the President's annual budget request to Congress
each year to include a line item for the Research in
Disabilities Education program of the National Science
Foundation and to require the National Science Founda-
tion to conduct research on dyslexia.

1   *Be it enacted by the Senate and House of Representa-*

2   *tives of the United States of America in Congress assembled,*

3   **SECTION 1. SHORT TITLE.**

4   This Act may be cited as the "Research Excellence

5   and Advancements for Dyslexia Act" or the "READ Act".

6   **SEC. 2. FINDINGS.**

7   The Congress finds the following:

2

1   (1) Dyslexia is defined as an unexpected dif-
2   ficulty in reading by an individual who has the intel-
3   ligence to be a much better reader.

4   (2) As many as one out of six, or 8,500,000,
5   American school children may have dyslexia.

6   (3) Since 1975, dyslexia has been included in
7   the list of qualifying learning disabilities under the
8   Education for All Handicapped Children Act of
9   1975 and the Individuals with Disabilities Education
10 Act.

11 **SEC. 3. RESEARCH IN DISABILITIES EDUCATION.**

12   (a) PROGRAM.—Nothing in this Act alters the Na-
13 tional Science Foundation's Research in Disabilities Edu-
14 cation program for fundamental and implementation re-
15 search about learners (of all ages) with disabilities, includ-
16 ing dyslexia, in science, technology, engineering, and
17 mathematics (STEM). The National Science Foundation
18 shall continue to encourage efforts to understand and ad-
19 dress disability-based differences in STEM education and
20 workforce participation, including differences for dyslexic
21 learners.

22   (b) LINE ITEM.—The Director of the National
23 Science Foundation shall include the amount requested for
24 the Research in Disabilities Education program in the
25 Foundation's annual congressional budget justification.

1 SEC. 4. DYSLEXIA.

2   (a) IN GENERAL.—The National Science Foundation

3 shall support multi-directorate, merit-reviewed, and com-

4 petitively awarded research on the science of dyslexia, in-

5 cluding the early identification of children and students

6 with dyslexia, professional development for teachers and

7 administrators of students with dyslexia, and curricula

8 and educational tools needed for children with dyslexia.

9 Research supported under this subsection shall be con-

10 ducted with the goal of practical application.

11   (b) FUNDING.—The National Science Foundation

12 shall devote at least $5,000,000 annually to research de-

13 scribed in subsection (a), to come from amounts made

14 available for the Research and Related Activities account

15 or the Education and Human Resources Directorate. No

16 additional funds are authorized to be appropriated under

17 this section. This Act shall be carried out using funds oth-

18 erwise appropriated by law.

○

Chairman SMITH. That concludes my opening remarks, and the Ranking Member, the gentlewoman from Texas, Ms. Johnson, is recognized for hers.

Ms. JOHNSON OF TEXAS. Thank you very much, Mr. Chairman, and good morning. I appreciate that you are holding this hearing. I want to thank all of our witnesses for being here today, and I look forward to hearing your testimony.

I have known several people who have dyslexia. Although dyslexia is a lifelong condition, if someone gets proper diagnosis and instructions, they can succeed in school and go on to have successful careers. I would not be surprised if we didn't have some examples in this room today. I know some very personally who are very successful.

The Science, Space, and Technology Committee oversees most of the federal nondefense R&D, but we do not directly oversee the lead agency for dyslexia research, which is NIH. Moreover, we do not oversee the Department of Education, which supports educational programs and provides services for students with learning disabilities, including dyslexia. However, we do oversee the National Science Foundation, which supports fundamental research that provides a foundation for dyslexia research as well as educational research. Although several of the directorates at NSF fund research that contributes to the science of dyslexia, the majority of the NSF-funded research relating to dyslexia is supported by the Social, Behavioral, and Economic Sciences Directorate, and the Education and Human Resources Directorate—two important NSF Directorates. For example, the Social, Behavioral, and Economic Sciences Directorate funded the Science of Learning Centers program, which supported six large-scale, long-term, interdisciplinary centers that have made significant contributions to learning research.

I look forward to hearing from Dr. Tallal about the Temporal Dynamics of Learning Center of which she is a co-Director. This Center focuses on understanding the role that timing plays in learning and applying that research to improving educational tools and practices. Since processing language is one of the fastest things that we do, it is clear that timing plays a critical role in understanding speech and language. While the Centers program is not awarding new grants, SBE continues to be a leader in funding the science of learning research.

Today we are going to talk about H.R. 3033, the Research Excellence and Advancements for Dyslexia, or the READ Act. This bill would require NSF to have a line item for the Research in Disabilities Education program in NSF's Education Directorate and to fund at least $5 million a year on dyslexia research. The research would be on the science of dyslexia, including the early identification of individuals with dyslexia, professional development for teachers and school administrators, and curricula development and educational tools. I fully support funding more research in language-based learning disabilities, including dyslexia.

But I do have to point out that this bill does not provide NSF with additional money to fund that research. Rather, it requires NSF to use existing funding. Although I support more funding for dyslexia research, in the current environment of flat research budg-

ets, I would have liked to see additional money provided for the priority in the bill.

But with that said, I do support the goals and intentions of the legislation, and I want to thank our witnesses for being here today. I look forward to the testimony, and I thank you, Mr. Chairman, and I yield back.

[The prepared statement of Ms. Johnson of Texas follows:]

PREPARED STATEMENT OF COMMITTEE RANKING MEMBER
EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman, for holding this hearing. I want to thank the witnesses for being here today. I look forward to hearing your testimony.

I have known several people who have dyslexia. Although dyslexia is a lifelong condition, if someone gets proper diagnosis and instruction, they can succeed in schools and go on to have successful careers. I would not be surprised if we have some examples of that in the room today. The Science, Space, and Technology Committee oversees most of the federal nondefense R&D, but we do not directly oversee the lead agency for dyslexia research, which is NIH.

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But with that said, I do support the goals and intentions of this legislation.

I want to thank the witnesses for being here today. I look forward to your testimony and the Q&A.

Thank you, Mr. Chairman, and I yield back the balance of my time.

Chairman SMITH. Thank you, Mrs. Johnson.

Before I welcome our witnesses, I want to note that unfortunately Geraldine Tincy Miller from the Texas State Board of Education is not able to testify today due to a death in her family late

last week. Ms. Miller shepherded bills through the Texas State Legislature to help students with dyslexia and has been an advocate on the issue for many decades.

Without objection, I would like to include in the hearing record the history of dyslexia law that Ms. Miller wrote and provided to the Committee.

[The information appears in Appendix]

Chairman SMITH. I would also like to include in the hearing record a letter we received yesterday from Dr. Sally Shaywitz of the Yale Center for Dyslexia and Creativity. Dr. Shaywitz testified last year before the Science Committee. Her letter states, in part, "The READ Act will help to put knowledge into the science of dyslexia and to action more quickly. Everyone who is a parent, teacher or researcher working with a dyslexic child should support H.R. 3033, the READ Act." And without objection, that'll be made a part of the record as well.

[The information appears in Appendix I]

Chairman SMITH. Let me go to our witnesses.

Our first witness, Ms. Barbara Wilson, is the Co-founder and President of Wilson Language Training, which provides professional support to American educators. Ms. Wilson oversees graduate and clinical courses to help students with language-based learning disabilities. She has over 30 years of experience in working with people with dyslexia. Ms. Wilson received her bachelor's degree from Fitchburg State University and her master's in education from Simmons College in Massachusetts.

Our next witness, Dr. Paula Tallal, is the Senior Research Scientist at the Center for Human Development at the University of California San Diego. She also serves as an Adjunct Professor at the Salk Institute for Biological Studies and is the Founder and Director of the Scientific Learning Corporation. Dr. Tallal is a Cognitive Neuroscientist and board-certified Clinical Psychologist who has authored over 200 professional publications and holds several patents. Dr. Tallal received her bachelor's degree from New York University and her Ph.D. from Cambridge University.

Dr. Rachel Robillard, our final witness, is an Assistant Director in the Austin Independent School District where she helps to provide accommodations to students with disabilities. She is recognized for the many improvements she helped implement in how the school district approaches dyslexia evaluation and intervention. She previously taught in several Austin Schools and has taught in the Teacher Preparation program at the University of Texas as well as in the Educational Psychology Departments at both the University of Texas and Texas State University. Dr. Robillard remains an Adjunct Faculty at both universities. Dr. Robillard received her bachelor's degree in elementary education and Spanish and her master's and Ph.D. in educational psychology from the University of Texas in Austin.

We welcome you all, and Ms. Wilson, if you'll begin?

TESTIMONY OF MS. BARBARA WILSON,
CO-FOUNDER AND PRESIDENT,
WILSON LANGUAGE TRAINING

Ms. WILSON. Thank you, Chairman Smith, for your dedication to individuals with dyslexia and to all here working for the betterment of their lives.

This is a critical time as many states are recognizing the existence of dyslexia but need further guidance on how to prepare their teachers to effectively teach these students and how to implement the instruction with success.

Thirty years ago, I was hired to test students in grades K–12 referred for an educational evaluation. I quickly realized that by far the most common reason for referral was the inability to read. Following testing, I led the team meeting to determine an instructional plan. At first, I enthusiastically shared what we would do to teach the child to read. Unfortunately, that soon changed as I did many three-year reevaluations that demonstrated that what we were doing was not working. In fact, after three years without progress, the students became even more desperately behind.

My search to help these students led me to Massachusetts General Hospital's Language Disorders Unit, where I did clinical training with individuals diagnosed with dyslexia using a methodology called Orton-Gillingham. I was excited to see that it worked, and also discouraged that this teaching knowledge was limited in reach, often only available in private schools costing $20,000 or more per year.

For five years I continued at Mass General Hospital part-time, teaching adults diagnosed with dyslexia. Concurrently, I founded the Wilson Learning Center with my husband, Ed. Students who had long struggled despite IEPs and teachers' efforts came to the Center to learn to read.

During this time, I developed the Wilson Reading System. Soon I was invited to meet with special-education directors from 10 nearby school districts who asked me to work with their staffs. Parents were demanding that they teach like we did at the Center. Thus, I shifted focus in 1988 to provide both curricula and professional learning to teachers in public schools.

My work with adults taught me that it was possible to teach these individuals to read, but if they don't learn to do this while still in school, too often their paths in life are filled with significant failure and distress.

I wish I could tell you that the beginning of my story could not be repeated in 2015 because all teachers are now well prepared to teach students with dyslexia. Sadly, that is not true. The same scenario plays out over and over again across this country today. A student cannot read and is referred to special education where teachers are unprepared to teach them.

It should not be this way. Research has identified the necessary instruction the individuals with dyslexia need, as the previous panel on the science of dyslexia shared with you.

Teachers desperately want to teach their students how to read, but most teaching degree programs do not include the in-depth practical work needed to gain the skills to do this with their most

challenged students. School districts throughout the country have recognized this gap and contract with us to provide the necessary training. At times, we are brought in as the result of a due-process hearing for a student who is desperately behind. Our extensive training yields a certification and includes expert supervision of teachers as they work with a student who has a significant reading disability. Teachers who previously had earned their reading or special-education degrees often express, "Why didn't I learn to do this before?"

Wilson has certified 25,000 dyslexia specialists in public schools in 50 states, and we now partner with six universities that embed the certification into their teaching degree programs.

Individuals with dyslexia can absolutely learn to read if working with a knowledgeable teacher under the right conditions. I've witnessed thousands of students who were unable to reach even basic words when they were past elementary grades later learned to read with a well-trained teacher, go on to college, and often chose careers in engineering and science.

Technology aids such as audio books can assist these students, but they should not replace instruction that will actually teach the student how to read independently. Further advances in technology will help us scale effective instruction to students, but teachers are also an important part of the equation. Providing teachers with knowledge and skills is necessary but not sufficient. Implementation science informs us that successful results will only be realized if a school is structured to enable these students to provide the needed instruction.

I believe that the READ Act is important to bridge the gap between what research says and what we should do for students with dyslexia and what is actually done in our schools today.

Thank you.

[The prepared statement of Ms. Wilson follows:]

Testimony before the U.S. House of Representatives
Committee on Science, Space, and Technology

Statement of:

Barbara A. Wilson, M.Ed.
Co-founder and President, Wilson Language Training
Oxford, MA

Topic: Teacher Professional Learning to Teach Students with Dyslexia
September 30, 2015

Thank you Chairman Smith for your dedication to individuals with dyslexia and to all here working for the betterment of their lives.

I believe we are at a critical juncture in time. Many states have established dyslexia laws and others are following suit, but they need further guidance on how to prepare their teachers to effectively teach these students and how to implement the instruction with success. In addition to offering a consistent definition of and requirements for screening students for dyslexia, the key is for these laws to expect that teachers be prepared to effectively teach students with dyslexia how to read.

My work in this field began more than thirty years ago. As a new college graduate with a degree in special education, I was hired to test students who were referred for an educational evaluation. It was in a small town in Massachusetts, so I did this for grades K-12. I quickly realized that by far the most common reason for referral was the inability to read. Following the testing, I also conducted the team meeting with parents and teachers to determine an instructional plan. At the beginning, I enthusiastically shared what we would do to teach the child to read. Unfortunately, that soon changed as I did many three-year re-evaluations which demonstrated that what we were doing was not helping. In fact, after three years without progress, the students became even more desperately behind.

My search to help these students led me to Massachusetts General Hospital's Language Disorders Unit where I was given the opportunity to complete a year-long clinical training with individuals diagnosed with dyslexia using a methodology called Orton-Gillingham. This type of teaching is also referred to as Multisensory Structured Language (MSL) or Structured Literacy instruction.[i] I was excited to discover a way to teach these individuals how to read and write, but also discouraged to learn that this teaching knowledge was limited and only available in private schools costing parents, or school districts, $20,000 per year or more at that time.

Rather than return to my evaluation position, I continued working part-time at Mass General with adults diagnosed with dyslexia, which I did for the next five years. Concurrently, I founded the Wilson Learning Center with my husband, Ed.

Students who had struggled for years in public school settings, despite IEPs and teachers' efforts to help, came to the Center to learn to read. It was during this time that I developed the Wilson Reading System®. Soon, I was invited to a meeting with the special education directors from ten nearby school districts who asked me to work with their staffs because parents were demanding the instruction that their children received at the Center.

Thus began our work, which has continued since 1988 – that is, providing both curricula and professional learning to teachers in public schools so that individuals with dyslexia can learn how to read, write, and become successful. My work with adults taught me that it was possible to teach individuals with dyslexia how to read, but if they don't learn to do that while still in school, too often their paths in life are filled with significant failure and distress (Alliance for Excellent Education, 2008, Fletcher & Lyon, 1998, and Snow, Burns, & Griffin, 1998). In addition to the deeply personal impact, the societal impact is significant.[ii]

I wish I could tell you that the beginning of my story could not be repeated in 2015 because all teachers are now well prepared to teach students with dyslexia. Sadly, that is not true. The same scenario plays out over and over again across this country today: a student doesn't learn how to read, and the student is referred to special education where teachers are unprepared to provide effective reading instruction (Joshi et al., 2009, and Fletcher & Lyon, 1998).

However, it should not be this way. Research has identified the necessary instruction that individuals with dyslexia need (NICHD, 2000). We are also learning from neuroscience how

effective instruction affects the brain. In one study in which our program was used, implementation with qualified instructors led to improved brain function as well as rewiring of the brain to function similarly to the brain of a good reader (Keller & Just, 2009, and Meyler, Keller, Cherkassky, Gabrieli, & Just, 2008).

Teachers go into teaching with a real desire to teach children. But most teaching degree programs do not include the in-depth work needed for them to gain the practical skills to effectively teach individuals with dyslexia, and therefore they lack the knowledge needed for this formidable task (Joshi, 2009, Washburn, et al., 2011, and Moats & Foorman, 2003). School districts throughout the country have recognized this gap and contract with us to provide their teachers with the necessary training. At times, we are brought in as the result of a due-process hearing to prevent an outside placement in a private school. Often it is simply in the interest of helping their students succeed.

Today, we conduct training in schools across America. The extensive training we provide yields a certification. To date, Wilson has certified 25,000 teachers. To achieve this requires a commitment to study, in detail, the structure of the English language and how to break it down into its simplest components. Teachers learn this through an online course and a year-long clinical experience within a public school or other setting where they are provided expert supervision as they work with a student who has a significant reading disability.

Upon completion of the first level of certification, teachers become well-equipped to help students acquire reading skills during an intensive intervention. Although these teachers previously had earned their reading and special education degrees, they commonly express, "why didn't I learn how to do this before?" To support this effort, Wilson is partnering with 6 universities that embed our certification into their degree program and offer 10 graduate credits upon successful completion of the certification work.

Teachers should be learning the in-depth knowledge and skills in their teacher preparation programs. Several years ago, The International Dyslexia Association (IDA) created a document to guide the requirements for teacher preparation called *Knowledge and Practice Standards for Teachers of Reading*. I was one of the authors. Its intent is to promote teacher preparation programs to incorporate the key elements necessary for teachers to succeed with all

students, including those with dyslexia. Teacher preservice programs that align with these standards will go a long way toward improving the preparation of teachers.

I am here to tell you that individuals with dyslexia can absolutely learn to read and write if working with a knowledgeable teacher under the right conditions. I have witnessed thousands of students who were unable to read even basic words when they were past the elementary grades, later learn to read with a well-trained teacher, and go on to college and beyond—often with careers in engineering and science. Technology must play a role in scaling up effective instruction, but we must not lose sight of the tangible and intangible factors that a skilled, diagnostic, and determined teacher will bring to the equation. In an earlier testimony, you heard Landmark College describe its instructional approach. There, they use teachers certified in the Wilson Reading System to deliver effective instruction in combination with technology solutions.

I am a believer in technology aids such as audiobooks, but these accommodations should not replace instruction that will actually teach students how to read independently. First and foremost, there is a way to teach these students how to read, as has been discussed in previous testimony. Therefore, it is wrong to only provide accommodations that will still limit students' life experiences, such as giving them the confidence to travel independently beyond their known neighborhoods and truly believe in their own intelligence. Since they *can* learn to read and write, we must teach them.

Providing teachers with highly skilled training is a tremendous first step. However, successful results can only be realized if the school day and resources are structured in a manner that enables these highly skilled teachers to provide the needed instruction. All too often, even with highly skilled teachers on staff, the schedule of the school prevents teachers from providing this instruction. As we know, students cannot benefit from an intervention they never receive (NIRN, 2013; Duda & Wilson, 2015).

In a recent white paper I co-authored with Dr. Michelle Duda for Literate Nation (*Using Implementation Science to Close the Policy to Practice Gap*), we discuss the importance of policymakers attending to research from implementation science in order to increase the odds that policies will affect classroom or school practice in the expected way (Duda & Wilson, 2015). The point we share from implementation science is that selecting an effective intervention

is not sufficient. We must also utilize effective implementation methods and provide enabling contexts (Fixsen, Blasé, Duda, Naoom, & Van Dyke, 2010). This is what the National Implementation Research Network (NIRN) refers to as the Formula for Success:

$$\text{Effective Intervention} \times \text{Effective Implementation} \times \text{Enabling Context} = \text{Intended Outcomes}$$

(Fixsen, Blase, Duda, Naoom, & Van Dyke, 2010)

There is a major gap between what research says we should do for students with dyslexia and what is actually done in our schools, and using practices that align with the science of implementation can help bridge that gap.

As October is National Dyslexia Awareness Month, this hearing is timely. I appreciate you giving me the opportunity to share my experiences and draw attention to the need for increasing the preparation of teachers so that they can successfully teach individuals with dyslexia to read and write. Thank you.

Recommended Research Topics

- How do various student profiles respond to different curricula? Continue study to understand the link between the different profiles of students with dyslexia and the kind of curricula they need. This is essential to understand how best to help all students.
- What are the key elements of instruction for students beyond the elementary grades? Although early identification and treatment is ideal, it is "never too late." However, we need to know what the critical elements of instruction are for these older students.
- What are effective teacher training models? Study the long-term outcomes of students who are taught with the different models.
- What are effective technology solutions? Determine which of these work with different student profiles, including different age brackets.
- What does it take to bridge the implementation gap? That is, how do we scale effective teaching models with a clear understanding of the implementation requirements.
- How do students with dyslexia fare in college and careers once they learn to read and write? Research the link between improvement in reading and writing skills for students with dyslexia and their subsequent college and career readiness.

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[i] Multisensory Structured Language (MSL) or Structured Literacy instruction is explicit, systematic, cumulative, and diagnostic while incorporating visual, auditory, kinesthetic-tactile approaches to learning. The content of instruction is focused on the structure of the English language and includes: phonology and phonological awareness, sound-symbol associations, syllable instruction, morphology, syntax, and semantics. (International Dyslexia Association, n.d., and The International Multisensory Structured Language Education Council, n.d.)

[ii] Research has shown a strong connection between poor literacy skills and a high high-school dropout rate, which in turn leads to high incarceration rates, high unemployment rates, and a low income level. Sadly, for juveniles in the criminal justice system, estimates of learning disability are as high as 75-90% (Mentor & Wilkinson, 2005). How many of these have dyslexia? As you heard from Dr. Sally Shaywitz, Co-Director of the Yale Center for Dyslexia & Creativity, "Dyslexia is the most common...of the learning disabilities, affecting 80% to 90% of all individual identified as learning disabled." (The Science of Dyslexia, 2014).

About Barbara A. Wilson, M.Ed.

Barbara A. Wilson is the co-founder and president of Wilson Language Training, whose mission is to provide professional learning and ongoing support to literacy educators across the country. She has been dedicated to individuals with dyslexia for over 30 years since her work at Massachusetts General Hospital Reading Disabilities Clinic where she taught adults with dyslexia how to read. Barbara authored the *Wilson Reading System*® based on that work and reading research. Barbara oversees graduate courses and clinical practicums on teaching reading to students with a language-based learning disability, which lead to Wilson certification. This certification is an integral component for several university programs that are accredited by the International Dyslexia Association (IDA). Barbara provides a voice for students with dyslexia, with presentations – keynotes and workshops – at more than 300 national and international conferences. She has authored a chapter titled, "Instruction for Older Students with a Word-Level Reading Disability," which is in the third edition of *Multisensory Teaching of Basic Language Skills*, edited by Judith Birsh. She has consulted on several research grants for older students, and was invited to the White House to speak to the President's Domestic Policy Adviser on Education regarding the issue of literacy in America's middle and high schools. Barbara also leads Wilson's work with school districts in their RTI implementations and has authored two additional programs, *Wilson Just Words*® for older students with a word-level deficit and *Fundations*® for students learning to read in K-3. Barbara currently serves on several committees for IDA and provides professional expertise for other organizations dedicated to reading and dyslexia.

Chairman SMITH. Thank you, Ms. Wilson.
And Dr. Tallal.

**TESTIMONY OF DR. PAULA TALLAL,
SENIOR RESEARCH SCIENTIST,
CENTER FOR HUMAN DEVELOPMENT,
UNIVERSITY OF CALIFORNIA, SAN DIEGO;
ADJUNCT PROFESSOR,
SALK INSTITUTE FOR BIOLOGICAL STUDIES;
FOUNDER AND DIRECTOR,
SCIENTIFIC LEARNING CORPORATION**

Dr. TALLAL. Good morning. I'm Paula Tallal, and I'm a Research Scientist and Co-founder of Scientific Learning Corporation, a neuroscience-based educational software business that has been actively translating research aimed at remediating language and reading problems for almost two decades.

Today I'll testify to the fact that there is an epidemic of reading failure that we have both the scientific evidence and novel interventions to treat effectively. What we do not have is an effective roadmap for implementing evidence-based tools and technologies on a broad scale or a mandate for our schools to use these evidence-based advances to help millions of struggling readers.

The heartfelt message I wish to convey to you today is that while failing to learn to read is not life-threatening, it certainly can be life-destroying.

There's ample research that demonstrates that the factors that cause reading failure begin well before the child enters formal education. This research has shown that even in infancy, the precursors to reading failure can be identified reliably in the form of slow and inconsistent auditory processing. This auditory-processing constraint cascades over the early years of life, disrupting the development of succinct phonological representations in the brain, oral language and ultimately reading.

Processing the individual sounds or phonemes inside of words is the fastest thing the human brain has to do. In order to learn to read, a child must become aware that words are made up of individual phonemes and it is the sounds that the letters represent. This process is called phonological awareness. Decades of research has demonstrated that failure to become phonologically aware is at the heart of reading failure.

Put simply, when it comes to auditory processing, children with language learning problems are operating on the equivalent of dial-up speed while good language and reading skills require a child to operate on the equivalent of high-speed internet.

Traditional tools for teaching reading, regardless of how expertly or how often they're applied, will not work for most struggling readers until these more foundational skills are remediated. Throughout life but especially early in life, the brain is literally shaped anatomically and physiologically by experience. This experience-driven organization of the brain is called neuroplasticity. Understanding neuroplasticity and the variables that drive it has the potential to absolutely revolutionize interventions for struggling

readers by directly remediating their auditory perceptional phonological awareness and language problems.

In 1994, I began a collaboration with Dr. Michael Merzenich, a world expert on neuroplasticity, with the goal of integrating advances in neuroplasticity and learning disorders. In the ensuing 20 years, both behavioral and neuroimaging studies have demonstrated that the foundational auditory processing and language skills known to lead to reading failure are highly modifiable and can be brought into the normal range in just a few months using intensive neuroplasticity-based training exercises disguised as computer games.

We founded Scientific Learning Corporation to translate these research advances into practice in classroom tools that could broadly be scaled and efficacy tested in real-world classrooms. These evidence-based educational tools are distributed under the brand name Fast ForWord and Reading Assistant and have been used in over 12,000 U.S. schools with as many as 70,000 students a week. The cumulative efficacy data obtained when schools implement these programs rigorously is very positive, especially when compared longitudinally to students' previous performance using traditional methods.

Thomas Gibbs Elementary School in St. Mary's Parrish, Louisiana, is one of the many schools that have used Fast ForWord and Reading Assistant. Before implementing these tools, only 19 percent of fourth-grade students scored basic or above in language arts on their statewide achievement tests, placing the school in the bottom quartile statewide. After two years of use, Thomas Gibbs School had moved into the top quartile statewide with 81 percent of students now scoring basic or above in language arts.

So here's my news flash. Research shows that reading success relies on a solid foundation of rapid and consistent auditory process and oral language. Traditional reading approaches presuppose that a child has these foundational skills, but this is just not the case. Not providing educators with evidence-based tools to remediate the foundational processing skills that are well known to be precursors to reading failure is equivalent to demanding that a builder construct the third floor of a school without having the tools to build a sufficiently strong first and second floor, and then wondering why the school keeps collapsing.

I'd like to close with some recommendations for H.R. 3033. As Ms. Johnson mentioned, NSF has already recognized the gulf between scientific knowledge and translation into education and set out to bridge this gulf by creating six Science of Learning Centers including the Temporal Dynamics of Learning Center at the University of California San Diego, which I co-direct. The ten years of funding of these Science of Learning Centers is coming to a close. My first recommendation is to capitalize on the advances these Centers have already made to design professional development courses on the new science of learning specifically as applied to early identification and remediation of learning impairments. We must leverage existing federal investment.

My second recommendation focuses on improving the translational method itself. Translation and dissemination into classrooms on the scale needed to address our epidemic of reading

failure is painfully and frustratingly slow. What is urgently needed are actionable methods that result in determining the equivalent of a one-lane country road from the laboratory into the classroom into a bidirectional superhighway to improve the prospects of the millions of children with reading impairments for decades to come.

Thank you for the opportunity to speak to this important bill, and I look forward to your questions.

[The prepared statement of Dr. Tallal follows:]

Statement of
Paula Tallal, Ph.D.
Professor, Center for Human Development, University of California
San Diego and the Salk Institute for Biological Studies
Co-Founder and Director, Scientific Learning Corporation

before the

Committee on Science, Space, and Technology
United States House of Representatives

Good morning Chairman Smith, Ranking Member Johnson, other Committee members, and members of the panel. Thank you for the opportunity to speak with you this morning about HR 3033, briefly share with you my work, identify the opportunities for translating research knowledge into practical applications and new technologies that will improve the outcomes for students with dyslexia and language based learning problems, and specific recommendations for HR 3033.

I want to commend the Committee for raising the visibility on such an important need. Significant research progress has been made in our understanding of the neurobiological and environmental factors that lead to reading failure, as well as the interventions most likely to lead to improved reading outcomes, as reflected in last year's hearing testimony. What is urgently still needed are actionable methods for using evidence based laboratory research to achieve demonstrated improvement in our students' literacy outcomes.

This legislation has the potential to construct a more effective, bi-directional highway to facilitate communication between research scientists and educators, with the express goal of developing and assessing the efficacy of novel, research informed educational tools, curricula and technologies for children with language-based learning problems. I specifically call your attention to my use of the more inclusive diagnostic classification, "language-based learning problem". This acknowledges that research has shown a direct link and considerable overlap between children diagnosed with oral and written language problems. The research emphasizes that dyslexia usually begins well before the child fails to learn to read and both oral and written language problems can be predicted by slow and inconsistent response to sounds much earlier in life.

Background

My name is Paula Tallal and I am a Professor, Research Scientist, Board-certified Clinical
Psychologist, Inventor and a Co-Founder and Director of a neuroscience-based
educational software business, Scientific Learning Corporation. I am the Co-Founder
and was Co-Director of the Center for Molecular and Behavioral Neuroscience at
Rutgers University, where I was a Board of Governor's Professor of Neuroscience for
twenty-five years. I recently moved to San Diego where I currently hold academic
appointments at both the University of California San Diego and the Salk Institute for
Biological Studies, and am a Co-Director of The Temporal Dynamics of Learning Center,
an NSF Science of Learning Center that is entering its tenth year and has received
approximately $34,000,000 in funding. I received my Ph.D. from Cambridge University
in 1974, where I first began my career-long research focus on the essential role of rapid
auditory temporal processing in determining individual differences in language and
literacy development and disorders.

Over the past 40 years, I have received continuous research funding from NIH, NSF and
private foundations and had a leadership role in research programs amounting to over
$50,000,000 to study the neurobiological and environmental factors underlying
individual differences in language and literacy development and disorders, including
dyslexia, as well as the temporal dynamics of learning. At the federal level, I have been
invited to present a Decade of the Brain Lecture to members of the U.S. Congress and
Senate, write a Congressional Report on Language Disorders, present a Congressional
Briefing on Learning Disabilities to the Congressional Biomedical Research Caucus, and
was chosen to be the sole Commentator for the entire field of Psychology by the Library
of Congress for their Bicentennial Celebration on "Frontiers of the Mind in the Twenty-
First Century". I was appointed to serve on the Task Force for *both* Language Disorders
and Learning Disorders for the Diagnostic & Statistical Manual of Mental Disorders, 4th
Edition (DSM-IV), the clinical manual that sets diagnostic descriptive criteria for
cognitive, psychological and mental disorders, including language-based learning
disorders. I am a Co-inventor on dozens of U.S. patents and won the Thomas Alvin
Edison Patent Award for innovative research leading to the development of the Fast
ForWord® series of neuro-educational training programs.

In addition to my academic credentials, I am one of the few scientists who have actively
pursued the practical application and translation of the science of language based-
learning disabilities out of the research laboratory and into classrooms and clinics on a
broad scale. With this goal in mind, in 1996 I Co-Founded Scientific Learning
Corporation, a publicly traded company that creates and markets neuroscience-based
and efficacy tested language and reading educational software training programs to
schools and clinics, under the trademarks Fast ForWord® and Reading Assistant®. To
date, Scientific Learning Corporation's products have been provided to over 2.5 million
children in 55 countries who are struggling with language (including English language
learning) and/or reading development.

Given my diverse background and experience, I have a unique understanding of the intersection of three worlds: 1) the research scientist studying the neurobiological and environmental factors contributing to language based learning disorders; 2) the educators who are tasked with improving the literacy and other academic outcomes of a growing number of struggling students in the U.S; and, 3) the inventor/entrepreneur who has helped build a thriving education software business for developing, scaling up, distributing and assessing the efficacy of new tools and technologies for classrooms and clinical intervention.

My expertise at the intersection between these worlds has particular relevance to H.R. 3033, the "Research Excellence and Advancements for Dyslexia Act" or the "READ Act". Specifically, my expertise as a *scientist* conducting longitudinal studies on language based learning disabilities has relevance for the requirement in H.R. 3033 for the "NSF to support multi-directorate, merit-reviewed, and competitively awarded research on the science of dyslexia, including the early identification of children and students with dyslexia." The opportunities I have had to present scientific research on the neurobiological and environmental factors leading to reading failure to thousands of educators and clinical professionals who serve children with language-based learning disabilities has relevance for " professional development for teachers and administrators of students with dyslexia." My business experience as a Co-Founder and Director of Scientific Learning Corporation, the first neuroscience-based education software company, founded by neuroscientists, has particular relevance for designing and assessing the efficacy of "curricula and educational tools needed for children with dyslexia." Most specifically, having over 40 years experience conducting NIH and NSF funded research, combined with 20 years of real-world experience translating this research to the classroom provides me with unique insight into the overall goal of conducting research that "has the goal of practical application."

This testimony will present three components for the Committee to consider in its deliberations on H.R. 3033, the READ Act:
1. Research
2. The "Translational to Education" Roadmap
3. Recommendations

<u>Research</u>
The really good news: Science is there for those who are dyslexic. As my colleague, Dr. Sally Shaywitz from Yale University stated last year in her testimony to this committee, "In dyslexia, science has moved forward at a rapid pace so that we now possess the data to reliably define dyslexia, to know its prevalence, its cognitive basis, its symptoms and remarkably, where it lives in the brain and evidence-based interventions which can turn a sad, struggling child into not only a good reader, but one who sees herself as a student with self-esteem and a fulfilling future."

The bad news: We do not have a knowledge gap, but an action gap. Again, from Dr. Shaywitz's testimony, "In dyslexia, remarkably in America, in the year 2014, we have not a knowledge gap but an action gap. We have the knowledge, but it is not being put into policy and practice and far too many children and adults, too, are suffering needlessly. There is an epidemic of reading failure that we have the scientific evidence to treat effectively and we are not acknowledging or implementing it. It is our hope that hearing the depth and extent of the scientific knowledge of dyslexia will alert policy makers to act and to act with a sense of urgency."

NEWSFLASH: Decades of scientific research show that reading success relies on a solid foundation of rapid and consistent auditory processing (listening) and oral language (particularly phonological) skills, and that weakness in these two areas predispose a child to subsequent reading failure. For a variety of neurobiological and environmental reasons, an increasing number of children are entering our education system with insufficiently developed speed of auditory processing, cognitive and oral language skills. Schools are in the business of teaching students how to read, not how to process faster or to speak. Traditional reading curricula, tools and approaches presuppose that a child has sufficient foundational auditory processing and linguistic skills to succeed. **Not providing educators with those tools and technologies that have already been shown to explicitly remediate the rapid auditory processing, cognitive, phonological and other oral language skills that are well known to be precursors to reading failure is equivalent to demanding that they construct the third floor of a school without having the tools to build a sufficiently strong foundational first and second floor, and then wondering why the school keeps collapsing.**

The Language to Literacy Continuum
There is ample prospective, longitudinal research that demonstrates the factors that ultimately cause reading failure begin well before a child enters formal education. Using both behavioral and electrophysiological techniques, my colleague Dr. April Benasich at Rutgers University demonstrated that infants as young as 7 months of age, who are destined to have language-based learning deficits later in life, already have differences in the speed at which they can process simple auditory tones that are presented rapidly in succession. Using an infant's temporal integration threshold at 7 months of age and gender, it was possible to predict 93% correctly those toddlers who at age 3 years scored in the "impaired" range on the Verbal Scale of the Stanford Binet Test of Intelligence. It is important to emphasize that children with slower auditory processing were *not intellectually impaired* on non-verbal components of intelligence nor did temporal integration thresholds predict non-verbal intelligence. This dissociation demonstrates the specificity of the relationship between auditory temporal integration thresholds and language-based learning.

Research by many groups of scientists has shown that infants' and young children's ability to discriminate between speech sounds (phonemes) that are distinguished solely by rapid acoustic changes (less than 100 milliseconds), such as consonant-vowel

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syllables, also predicts reading abilities later in life. Today, there is a significant body of evidence that has substantiated that individual differences in the speed and consistency of auditory processing is a good predictor of individual differences in language-based learning abilities. The research also confirms that slow auditory processing of both speech and non-speech acoustic cues characterize children who struggle with language and literacy development. **To use an analogy, when it comes to processing (listening to) auditory information, children with language-based learning problems are operating on "dial-up" speed while those with good language skills are operating on "high speed internet".**

Auditory Processing Can Be Assessed and Addressed at Any Age

Using a straightforward electrophysiological test, Dr. Nina Kraus and colleagues from Northwestern University recently demonstrated that future language difficulties could be predicted from the brain's response to speech in noise at age 3; the biological response to sound predicted the same children's language skills a year later. Moreover, the same model of neural sound processing tracked with children's actual reading abilities in school-age children. This research demonstrates that a simple test, that measures how a young brain responds to sound, predicts who is likely to have language and reading difficulties long before they begin to read. In children already experiencing reading failure, it is now possible to objectively determine which specific aspects of sound processing may be the bottleneck underlying a child's reading difficulties. **The good news is that research has shown that addressing this bottleneck with classroom listening interventions can improve a child's reading ability and fundamentally rewire the brain for healthier learning and communication skills.**

Why is the precision and speed of auditory processing important for learning language?

Listening to and processing ongoing speech is the *fastest* thing the human brain has to do. Our brain does not know what language we are going to have to learn to speak. In order to learn to talk, we first have to *learn to listen* to and chunk information into meaningful segments in the rapidly changing, complex acoustic sounds around us. The most pervasive and consistent sound patterns we hear as infants and young children are the sounds of our native language. Our brains use these repetitive sound patterns to establish the statistical probability that certain chunks of sounds will repeat, that certain sound patterns follow others to form phonemes, syllables and words in our language, and eventually, that certain words follow others to form the grammatical rules of our language. These essential processes must be *learned* and are highly dependent on repetitive environmental exposure. The more opportunities a young brain has to hear phonemes, syllables, words and sentences presented in a clear and predictable manner, the faster its auditory neurons will be able to establish distinct, neural firing patterns (representations) of the individual speech sounds (phonemes) that form the building blocks for both spoken and written language. **In other words, frequently talking with and reading to infants and young children will increase the likelihood of future reading success.**

Why is the precision and speed of auditory processing important for learning how to read?

In order to learn to read a child must become aware that words are made up of individual sounds, and it is these *sounds* that the letters represent. This process is called "phonological awareness". **Decades of reading research, specifically research on dyslexia, has demonstrated that failure to become phonologically aware is at the heart of reading failure.**

What are the risk factors leading to deficits in phonological awareness?

There have been decades of research showing that there are a number of genetic, neurobiological as well as environmental factors predisposing a child to have deficits in phonological awareness and subsequent reading failure.

Key factors include:

1) Family History of Language Impairment. One well established risk factor is being born into a family that already has one or more individuals with a history of language-learning impairments (LLI). Dr. April Benasich has done comprehensive psychological and electrophysiological evaluations comparing infants that do or do not have a family history of LLI. Her large data set shows that the single most important variable that differentiates between these babies is their **speed of auditory processing**. Babies with a positive family history of LLI are significantly slower in processing simple auditory tone sequences than babies with a negative family history, and 50% of these family history positive babies are at increased risk of developing a language-based learning disability.

2) Low Socio-Economic-Status. Another risk factor is *linguistic impoverishment*, which has been shown to accompany socio-economic poverty. In their landmark studies published in "Meaningful Differences in the Everyday Experiences of Young American Children", Professors Betty Hart and Todd Risley, University of Kansas, demonstrated that by the age of 4 years, children born into low socio-economic families are exposed to 30 million fewer words than those born into high socio-economic families. This has become known as the "30 million word deficit". This linguistic impoverishment deprives a child of receiving the essential auditory neural stimulation required to establish distinct phoneme representations, build vocabulary, and develop age appropriate oral language skills. Furthermore, longitudinal research has shown that even when children are equated in reading ability at age 5, by age 13 **children who had low oral language development when they entered school are more than five years behind in reading compared to their peers with high oral language skills.**

3) English Language Learners. Children for whom English is not their native language are also at great risk of becoming struggling learners. Not only does oral language comprise upwards of 80% of the school curriculum, many of these children have not had sufficient language stimulation *in English* to set up the distinct phonological representations for

English phonemes that are required for phonological awareness in learning to read English.

These risk factors are not mutually exclusive. Unfortunately, many of our struggling readers have more than one of these risk factors that further compound their struggle to learn to read and become proficient readers.

The Challenge for our Schools

For a variety of social, cultural and economic reasons there are increasing numbers of children with one or more neurobiological and/or environmental risk factors that predispose them to have weak English language skills when they enter school, fail to learn to read, and hence fall further and further behind as they move through our education system. Despite increased funding through Title 1 and IDEA, according to the latest National Assessment of Educational Progress (NAEP) scores, more than 60 percent of fourth and eighth graders struggle with reading and require targeted instructional support. Almost half of students of color, from low-income families and/or from urban areas enter fifth grade with reading skills *below the basic level*. These outcomes mean that **millions of young people lack rudimentary reading skills essential for academic or occupational success.**

Why Have Schools Failed to Focus on Improving Students' Fundamental Auditory Processing and Linguistic Capacities?

Given the substantial body of research that has consistently shown that learning to read requires:

- a solid foundation of fundamental auditory processing (listening) skills;
- oral language skills (specifically phonological awareness)

and substantial resources have been directed to improving reading outcomes of U.S. students, why have schools failed to focus on improving the auditory processing and oral language skills of struggling readers?

Schools traditionally have been in the business of teaching children how to read, not how to listen or speak. A wide variety of curricula are available for teachers that are designed to teach reading. However, the vast majority of this presupposes that the student already has established sufficient spoken English language skills as well as the distinct neural firing patterns for phoneme representations that are required for the child to become phonologically aware and, hence, benefit from traditional reading instruction (phonics and/or whole language). Even when teachers recognize that many of their struggling students do not have the foundational perceptual, cognitive or linguistic skills essential for them to be able to achieve with traditional reading instruction, they do not believe there is anything they can do about this other than try their best to "teach around" these deficits. It is commonly believed that children enter school with differing genetically and/or environmentally endowed brain capacities and that teachers must just make-do with these individual differences in neural capacity.

However, significant breakthroughs in the neuroscience of learning have demonstrated that this view is fundamentally wrong! **For children who have not acquired sufficient foundational perceptual, cognitive or linguistic skills essential to achieve with traditional reading instruction, they require *explicit "catch-up" interventions* in these areas before traditional reading instruction can be effective.**

Neuroplasticity: The Brain that Changes Itself

One of the basic tenets of modern neuroscience is that, "Neurons that fire together nearly simultaneously in time, wire together", and the more often a pattern of neurons fire together, the more likely a clear representation of important patterns in the external world will be established. Being able to predict what is about to happen next is highly reinforcing to the brain and repeated exposure allows the brain to process faster, more consistently and more automatically. **Throughout life, but especially early in life, the brain is literally shaped anatomically and physiologically by *experience*. This repeated scenario of stimulus, neural firing, and reward, leads to experience-driven organization of the brain. This is called "neuroplasticity".**

Decades of neuroscience studies have explicitly identified what variables are needed to most efficiently and effectively drive neuroplasticity of the perceptual and cognitive systems shown to predispose a child to become a struggling reader. The needed variables include: 1) frequent, intense input (repetition, repetition, repetition), 2) adaptive training (moving from easier to harder items, based on individual performance), 3) sustained attention and 4) timely reward (timed to trigger neurochemical signals in the brain that indicate, "that was a good one, save it!"). **Understanding neuroplasticity, and the variables that drive it, has the potential to revolutionize interventions for children with auditory perceptual, cognitive, phonological awareness, language and reading problems.**

Fast ForWord [*]: A model system for translating neuroplasticity-based training research into educational programs

Research shows that for the vast majority of dyslexics, before they begin to fail to learn to read in the early school years they already have failed to establish a strong oral language system as toddlers and preschoolers. Even before they begin to struggle with oral language development, they already are showing signs of aberrant auditory processing (listening) skills, particularly the speed and consistency of the brain's response to rapidly successive sounds. This cascade from auditory perceptual weakness, to oral language weakness, to reading failure, which I have called the **Language to Literacy Continuum**, follows the child from infancy into adult life, if not corrected.

When a child shows signs of reading failure, the traditional interventions focus on providing more one-on-one instruction or specialized therapy, coupled with more time devoted to reading instruction in the classroom. While this may help some children, the

numbers of children not responding to this traditional intervention approach speak for themselves. **How long is it going to take for educators to realize that the traditional tools for teaching reading, regardless of how expertly and how often they are applied, do not work for most struggling readers until more foundational perceptual, cognitive and linguistic skills are remediated?**

In 1994, my lab joined forces with the University of California San Francisco (UCSF) lab of Dr. Michael Merzenich, a recognized leader in physiological neuroplasticity research. Our goal was to create neuroplasticity-based neural training exercises for children with language-based learning impairments that would 1) speed up auditory processing, attention and memory, and 2) provide highly intense, individually adaptive, linguistic training, ranging from phonology to grammatical comprehension. **My earlier studies had shown that we could significantly improve speech perception in children with language disorders by using computers to *enhance* the acoustic structure of speech by *slowing down* the fast changing components within syllables and words.**

We capitalized on this knowledge by creating a computer algorithm that could find all of the fastest changing components within phonemes and syllables in the context of ongoing speech and extend and enhance them in real time. Using neuroplasticity training principles, we hypothesized that we could improve the precision of phonological discrimination, vocabulary development and grammatical comprehension by providing language impaired children speech therapy type exercises that began by using this easier *enhanced speech* signal. As the child began to progress in their linguistic abilities, the goal was to reduce the amount of acoustic *enhancement* so that the child would be able to process regular, fast speech and language at more age appropriate levels.

Our initial studies were done with children with language-based learning impairments in my Rutgers lab. Children with language impairments were quasi-randomly assigned to two matched groups that received the same language training, one group with *computer enhanced* speech and *temporal training* and the other with natural speech. The outcome results from these studies were stunningly positive, and published in two papers in *Science* in 1996. Results showed that within only four weeks of daily intensive intervention, this novel, neuroplasticity-based training approach resulted in highly significant improvements (1.5 – 2 years growth) in temporal thresholds, speech discrimination, language processing and grammatical comprehension. **This was the first demonstration in children to demonstrate that fundamental perceptual thresholds were "plastic" well beyond critical periods of development and could be significantly sharpened with neuroplasticity-based training.**

The "Translational to Education" Roadmap
It was clear that this new intervention approach had considerable promise as a clinical and educational tool for children with language-based learning problems. However, we had little experience in knowing how to go about translating our scientific advances into

practice in real-world clinics and classrooms. Despite growing mandates for scientists to translate their research into practical application, **similar to the goal of this current READ bill H.R. 3033, there wasn't then, nor is there now, agreed upon guidelines or a "roadmap" to follow that lead scientists through the complex, iterative maze of actual translational application into classrooms *on a broad scale*.** With the help of technology transfer offices at our respective Universities, we were encouraged to co-found a company to accomplish our translational goals, and Scientific Learning Corporation (SLC) was founded in 1996.

Scientific Learning Corporation has developed two major lines of educational software products for students K-12, that are marketed under the brand names Fast ForWord[*] and Reading Assistant[*]. Fast ForWord[*] (Language and Reading series) is individually adapting educational software designed as interventions tools for elementary, middle or high school students struggling with English language development, phonological awareness, and reading to build the Language to Literacy Continuum. Fast ForWord Language[*] programs are designed to provide explicit training in the fundamental auditory processing, cognitive and oral language skills that research has shown are deficient in struggling readers. **It is essential to note that once a child develops these foundational perceptual and linguistic skills that are the building blocks for reading, only then are they ready to succeed with explicit reading instruction.** The Fast ForWord[*] Reading series was designed to provide explicit training in K-12 reading instruction.

Reading Fluency
A hallmark of dyslexia is slow and effortful (non-fluent) reading. Research has shown that the best way to improve reading fluency is to have a student read out loud to an adult who corrects the student's reading errors in real time. Unfortunately, there is limited time for teachers to provide the struggling reader the amount of individual attention they need to develop fluent reading. Many new technologies provide increased opportunities for helping the struggling reader receive the individualized practice that they need. For example, as a "virtual tutor" Reading Assistant[*] uses state-of-the-art voice recognition software that allows a child to read stories out loud off of a computer and receive real-time correction of errors.

Over the past twenty years Fast ForWord[*] and Reading Assistant[*] have been used in over 12,000 U.S. schools and, currently, during peak seasons, as many as 70,000 students a week are using these programs. While no method works for all students in the hands of all scientists or schools, and there are certainly examples of studies that have failed to find significant language and/or reading improvements after Fast ForWord[*] use, the *cumulative* efficacy data based on standardized language and reading measures, electrophysiological and brain imaging data, as well as high-stakes state-wide achievement test scores, obtained when school and clinics implement these programs rigorously is very positive, especially when compared longitudinally to students' and schools' performance before the use of these products. For example, before

implementing Fast ForWord[*] in 1996 at Thomas Gibbs Elementary School in St. Mary's Parish, Louisiana, only 19 percent of their 4th grade struggling students scored basic or above in Language Arts and 9 percent in Math on their State-wide achievement test, placing this school in the bottom quartile state-wide. After implementing Fast ForWord[*] a year later achievement scores had increased to 40 percent in Language Arts and 47 percent in Math. Reading Assistant[*] was added to the curriculum in 2007. By 2008, the school had moved into the top quartile State-wide, with 81 percent of students scoring basic or above in Language Arts and 72 percent in Math. **Building foundational processing, cognitive and language skills not only improved Language Arts scores, but also generalized to improved scores in Math.**

Other evidence of efficacy comes from the What Works Clearing House (that ranked Fast ForWord[*] - Language the number one program for improving language for English Language Learners. Of the eleven programs that met the stringent evaluation standards of the What Works Clearing House, Fast ForWord[*] showed an Improvement Index of 31 (on a -50 to +50 scale); the average index of the other programs ranged from +21 to -1). Specific examples of these types of efficacy data are presented in the PowerPoint supplemental materials accompanying this testimony. Additional efficacy data from hundreds of schools and clinics, as well as scientific studies can also be found at www.scientificlearning.com/results.

Lessons Learned over a 20 Year Period from a Real-World Translation Effort
It is important to emphasize that one of the great advantages of software programs and technologies is that they are not necessarily "evergreen" -- that is, they can be easily adapted and improved over time. As they move through the translational process over years of use, this advantage allows for an ongoing, iterative process between the consumer (educators, clinicians, students, parents) and the producers (scientists, developers, business professionals) for continuously refining and re-evaluating usability and efficacy in real-world settings, based on actual data and feedback from the users. The disadvantage from the scientists' perspective is that it is cost prohibitive to continuously conduct what many scientists consider the "gold-standard", double-blind, randomized control trials in real-world settings on products that are constantly adapting and changing over time.

Another conflict is that while scientists publish study results in peer-reviewed journals, outcome data from schools are made publicly available primarily as State-wide Achievement test scores. This conflict of goals creates considerable tension between scientists and end users throughout the translation process. **We need to develop new methodologies acceptable to both scientists and educators for assessing efficacy of non-evergreen (particularly, but not exclusively software based) curricula, tools and technologies that take into account *cumulative* data collected by end users themselves, across many different settings and over many years.**

The New Science of Learning
NSF recognized the gulf between scientific knowledge pertaining to learning and translation of this knowledge into education practice and set out to bridge this gulf by creating a new focus on the "Science of Learning". Over the past 15 years, the Social and Behavioral Sciences Directorate, under the leadership of Dr. Soo- Siang Lim, has established six multidisciplinary, multi-university Science of Learning Centers. These Centers were tasked with integrating research across multiple scientific disciplines that address learning, per se, and focus on how this knowledge might be translated to educators. I have been fortunate to be a Co-Director of one of the Science of Learning Centers, The Temporal Dynamics of Learning Center at the University of California San Diego. Our Center focuses on the role of time and timing in learning from milliseconds to days, weeks and months. **These Science of Learning Centers are limited to 10 years of funding and will not be renewed. H.R. 3033 "READ bill" should capitalize on advances from these Centers that 1) have particular promise for Professional Development pertaining to the Science of Learning and 2) further translation to education, specifically as applied to early identification and remediation of auditory processing, cognitive, language and reading impairments.**

<u>Recommendations</u>
HR 3033 is a vehicle to build on the sound scientific research sponsored to date by NIH and NSF. This bill can guide NSF's investment portfolio in dyslexia toward the development of a roadmap for effective, ground-breaking translation of research into application. Representative characteristics of such a roadmap include:

- Development of criteria for ranking and giving priority to research proposals focused on translation to education, with specific attention to the **feasibility and plan for scaling up new curricula, tools and technologies for broad dissemination to classrooms and clinics.**
- Identification of incentives for educators to collaborate with scientists to evaluate effectiveness and impact in real world classroom environments including adequate and **sustained professional development and time to evaluate various methods to determine the efficacy in their classroom.**
- Identification and use of new tools and technologies, based on scientific discovery, to determine how new tools and technologies compare directly against traditional reading instruction the school is currently using in terms of improvement on high stakes tests. Recognition that translation of scientific knowledge from the laboratory to education may be best achieved by the use of new technologies. In other words, **let computers (and other innovative technologies) do what computers do best, so teachers can do what teachers do best.**
- Development of a new research method specifically designed for testing and accumulating data on the efficacy of educational programs and products across multiple, real-world classrooms or clinical settings. The bridging of the "laboratory-classroom gap" requires a new, ecologically feasible model that

creates a bi-directional, collaborative, systemic approach that leverages the strengths, competencies, knowledge, and expertise of both the researcher and classroom teacher. **New research methods should allow for *cumulative* efficacy data of a variety of types (peer-reviewed, published laboratory results, longitudinal high-stakes test data from schools, State and Federal Agency evaluations such as What Works Clearing House) on non-evergreen (continuously changing versions) curricula, tools and technologies.**

- Development of a new training grant or other funding mechanism focused on "Translation of the Science of Learning to Education" **to support seasoned educators or clinicians who wish to pursue a Master's or Ph.D. degree while continuing to work, to do translational laboratory research in their own clinic or classroom.**
- Development of a new funding mechanism to support **collaborative networks of scientists, teachers and clinicians to work together on bi-directional professional development curriculum and translational research.**

Summary

In closing, I want to thank the Committee for allowing me the opportunity to share 3 key components for consideration in the development and implementation of H.R. 3033:

1. Federal investment (NIH, NSF) in research has been instrumental in providing a data driven understanding of language-based learning impairments, including dyslexia, and have specifically shown that foundational rapid auditory processing, cognitive and oral language skills are essential for building strong reading skills.
2. Educational technologies, specifically those based on an understanding of how the brain learns and changes based on experience (neuroplasticity) can play a significant role in addressing learning and reading challenges.
3. The next logical step for Federal investment should focus on the development of a more ecologically feasible "translational to education" roadmap to bridge the gap between research scientists, school administrators and classroom teachers to apply data driven research into real world application including evaluation and assessment of impact.

As I mentioned at the beginning of this testimony "What is urgently still needed are actionable methods for using evidence based laboratory research to achieve demonstrated improvement in our students' literacy outcomes." Legislation such as HR 3033 has the ability to guide and inform public policy on this critical issue and improve the prospects of millions of children for decades to come.

Mr. Chairman, I would be happy to respond to any questions you or the other Members of the Committee may have.

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September 2015

Paula Tallal, Ph.D.
Biography

Paula Tallal, Ph.D. received her Ph.D. in Experimental Psychology from Cambridge University in 1973. She was on the faculty of Johns Hopkins University and the University of California San Diego before being recruited to Co-found the Center for Molecular and Behavioral Neuroscience at Rutgers University in 1987. Tallal has received Rutgers' highest academic award, Board of Trustees Award for Excellence in Research and holds the University's highest academic rank, Board of Governors Professor of Neuroscience. In 2014, Tallal moved to San Diego where she is currently on the faculty at The Salk Institute for Biological Studies as well as the Center for Human Development at the University of California San Diego.

For the past 40 years, Dr. Tallal has led NIH and NSF funded multidisciplinary research teams and has published over 200 papers on the neurobiological basis of speech, language and reading development and disorders. She was selected by the Library of Congress to be the Commentator for the Field of Psychology at its Bicentennial Celebration.

In 1996, she co-founded the Scientific Learning Corporation (SCIL), a neuroscience company dedicated to developing and delivering research-based, perceptual, cognitive, language and reading training programs broadly aimed at improving academic outcomes, where she continues to serve on the Board of Directors. She is the Co-inventor on dozens of patents and won the Thomas Alvin Edison Patent Award for her innovative research leading to the development of the Fast ForWord® series of neuro-educational training programs. Tallal was honored for her innovations in understanding the role of temporal dynamics in rapid pattern recognition and prediction in learning by being selected as the 2012 Inventor of the Year by the New Jersey Inventor's Hall of Fame.

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Chairman SMITH. Thank you, Dr. Tallal.
And Dr. Robillard.

**TESTIMONY OF DR. RACHEL ROBILLARD,
ASSISTANT DIRECTOR,
504 SERVICES AND RESPONSE TO INTERVENTION,
AUSTIN INDEPENDENT SCHOOL DISTRICT**

Dr. ROBILLARD. Thank you, Mr. Chairman, Ranking Member
Johnson, and distinguished Members of the Committee for inviting
me to testify today. I appreciate the opportunity to appear before
you to discuss the importance of focusing on the issue of dyslexia,
a disability affecting one in six students that unfortunately goes
largely unnoticed in federal policies.

I currently coordinate all student 504 services for the Austin
Independent School District, where I oversee our district's Dyslexia
Services program. Our department works with each of the 129 Aus-
tin campuses to provide professional development and guidance to
help teachers understand the indicators of dyslexia, so we can iden-
tify students as early as possible and provide the intervention
that's needed. This is a significant change from the previous model,
and progress is still not as swift as we would like.

We had approximately 2,000 students identified with dyslexia
when I began this process in 2013. With concerted effort, we've now
identified around 5,000 students, but that is still only about five
percent of our overall student population in AISD.

In May of 2014, at the urging of a member of our Board of Trust-
ees, we began allocating funds to provide teacher training so that
some teachers could become certified academic language therapists,
or CALTs. A CALT can provide the most advanced and efficacious
type of dyslexia intervention available. Our goal is to have at least
one CALT for every campus. Eighteen months into the program,
we're now 61 teachers toward that goal. This effort, fully funded by
local dollars, comes at great cost to the district and only provides
training for one teacher per school. However, additional profes-
sional development including training and materials is made avail-
able for all K–12th grade teachers so they can better understand
dyslexia and how to deliver curriculum in an accessible manner for
all of the identified students.

Dyslexia impacts 10 to 20 percent of students in K–12 with vary-
ing levels of severity. Ideally, teacher preparation programs would
include coursework dedicated to identifying and teaching students
with dyslexia, a disability which has a high rate of impact on lit-
eracy acquisition regardless of socioeconomic status or race.

Ultimately, the greatest impact would be provided by training all
pre-service teachers to identify and teach dyslexic students, making
the possibility of having specialized reading task forces for dyslexia
at each campus a natural byproduct.

In my position coordinating 504 services as well as in my private
practice as a neuropsychologist, I strongly encourage support for
the READ Act. Having specified annual funds devoted to dyslexia
research that focuses on best practices in early identification, pro-
fessional development for teachers and administrators, and cur-
riculum development and evidence-based educational tools for chil-
dren with dyslexia can only improve the opportunities of all stu-

dents to have access to an education that allows each of them to learn to read.

At the university level, this would lead a shift toward increased pre-service development in areas that address basic reading deficits and their neurobiological etiology as well as the understanding of language development and how it's influenced by dyslexia. A few universities have such programs but most do not address dyslexia in any format during pre-service training. Lack of teacher training and understanding the indicators of dyslexia causes students to be missed or even misidentified as having other learning issues. Teachers deserve this training.

Identifying dyslexia is only the first step of the process. To fully address learning difficulties for dyslexic students, we must keep the disorder in mind when designing classroom instruction, implementing technology plans, planning for social and emotional learning, understanding how to provide parent support and engagement, and training our administrators to be knowledgeable about appropriate identification and intervention.

Dyslexia is not a disorder that can be compartmentalized. It is not just a deficit but it carries with it inherent strengths that have been recognized for decades. These might include other areas of academic strength, creative ways of thinking, more acute perceptual reasoning, and many other traits.

When dyslexia goes unidentified and undiagnosed, these strengths are often suppressed and the lack of understanding frequently leads to both student and staff frustration. It is not uncommon for unidentified dyslexic students to become unmotivated or to have behavioral problems, and they often perform significantly below potential academically. Unidentified, their underlying strengths may never be discovered.

The READ Act is a necessary flotation device to bring scientific knowledge about dyslexia up to a more universal understanding and to enhance our ability to make the practical application of science to practice more seamless for educators and students. Policies such as found in the READ Act will allow dyslexic students access to early identification as well as appropriate literacy instruction and the opportunity to develop their potential to the fullest.

Our prison population is replete with dyslexic individuals who have been identified too late. While dyslexia identification and intervention is not likely to be the entire answer to the school-to-prison pipeline, it certainly seems to be a key factor that if better understood could be addressed in a systematic and effective manner. We will all benefit at every level by investing in research concerning dyslexia and all issues related to that disorder.

Thank you for inviting me to testify.

[The prepared statement of Dr. Robillard follows:]

Statement of Rachel W. Robillard PhD

Concerning H.R. 3033, the Research Excellence and Advancements for Dyslexia Act

Before the Subcommittee on Research and Technology Committee on Science, Space, and

Technology

U.S. House of Representatives

September 30, 2015

Thank you Mr. Chairman, Ranking Member Johnson, and distinguished members of the Committee, for inviting me to testify today. I appreciate the opportunity to appear before you to discuss the importance of focusing on the issue of dyslexia; a disability affecting one in six students that, unfortunately, goes largely unnoticed in federal politics. My name is Rachel Robillard, and although I am not here representing any specific entity, I am a member of the College of Education faculty at both the University of Texas at Austin and Texas State University in San Marcos. I also currently coordinate all Student 504 Services in the Austin Independent School District, where I oversee our district's Dyslexia Services program. Our department currently works with each of the 129 Austin campuses to provide professional development and guidance to help teachers understand the indicators of dyslexia so we can identify students as early as possible, but this is a significant change from the previous model of identification and intervention, and progress is still not as swift as we would like. We had approximately 2000 students identified with Dyslexia when I began this process in 2013, and with concerted effort, we have now identified around 5000 students, or about 5% of our overall student population.

In May of 2014, at the urging of a member of our Board of Trustees, we began allocating funds to provide teacher training so that some teachers could become Certified Academic Language Therapists (CALTs); a CALT can provide the most advanced and efficacious type of dyslexia intervention available. Our goal is to have at least 1 CALT for every campus, trained to deliver the highest quality dyslexia intervention possible; 18 months into the program we are

now 61 teachers trained toward the goal. This effort, fully funded by local dollars, comes at great cost to the district, and only provides training for one teacher per school; however, additional professional development, including training and materials, is made available for all K -12th grade teachers so they can better understand dyslexia, and how to deliver curriculum in an accessible manner for all identified students. Dyslexia impacts 10-20% of students in K-12 with varying levels of severity. Ideally, teacher preparation programs would include coursework dedicated to identifying and teaching students with dyslexia, a disability which has a high rate of impact on literacy acquisition, regardless of socio-economic-status or race. Ultimately, the greatest impact would be provided by training *all* pre-service teachers to identify and teach dyslexic students, making the possibility of having specialized reading task forces for dyslexia at each campus a natural byproduct.

In my position coordinating 504 Services, as well as in my private practice as a neuropsychologist, I strongly encourage support for the READ act. Having specified annual funds devoted to dyslexia research that focuses on best practices in early identification, professional development for teachers and administrators, and curriculum development and evidence-based educational tools for children with dyslexia can only improve the opportunities of all students to have access to an education that allows each of them to learn to read.

At the university level it would lead a shift toward increased pre-service development in areas that address basic reading deficits and their neurobiological etiology, as well as the understanding of language development, and how it is influenced by dyslexia. A few universities have such programs, but most do not address dyslexia in any format during pre-service training. Lack of teacher training and understanding the indicators of dyslexia causes students to be missed, or even mis-identified as having other learning issues. Teachers deserve to be adequately trained in this area while they are in their pre-service/university-based programs; provisions made by the READ act can help initiate this shift.

Identifying dyslexia is only the first step of the process. To fully address learning difficulties for students with dyslexia, we must also keep this population in mind when designing classroom instruction, implementing technology plans, planning for social and emotional learning, understanding how to provide parent support and engagement, and training and re-training our administrators to be knowledgeable about identification and intervention that is appropriate for this large group of students. Dyslexia is not a disorder that can be compartmentalized; it is not just a deficit, but carries with it *inherent strengths* that have been recognized for decades. These might include other areas of academic strength, creative ways of thinking, more acute perceptual reasoning, and many other traits. When dyslexia goes unidentified and undiagnosed, these strengths are often suppressed; and the lack of understanding frequently leads to both student and staff frustration. It is not uncommon for unidentified dyslexic students to become unmotivated or have behavioral problems, and they often perform significantly below potential academically. Unidentified, their underlying strengths may never be discovered.

The READ act is a necessary flotation device to bring scientific knowledge about dyslexia up to more universal understanding, and to enhance our ability to make the practical application of science to practice more seamless for educators and students. Policy, such as that found in the READ act, will allow dyslexic students access to early-identification, as well as appropriate literacy instruction, and the opportunity to develop their potential to the fullest. Our prison population is replete with individuals who have been identified with dyslexia, but never given appropriate intervention. While identification and intervention is not likely to be the entire answer to how to diminish prison populations, it certainly seems to be a key factor, that if better understood, could be addressed in a systematic and effective manner. We will all benefit on every level by investing in research concerning dyslexia, and all issues related to the disorder.

I began this journey when I went through teacher training in the early 70's. At that time, we did not have state or federal laws pertaining to dyslexia or any type of special education for

students with disabilities; those were just coming into being and were not a part of my original teacher training. I realized very quickly; however, working in predominately low socioeconomic-status (SES) schools, that reading was the key to getting students a good education and to getting them to a place where they could be self-sufficient learners and productive citizens. I soon went back to complete a masters in curriculum and instruction and, in the process, went through a training called "The Texas Hill Country Writing Project." This project focused specifically on how reading and writing are related, and understanding how to teach both effectively. It was during this training that I started seeing the connections between reading and life-long learning, but it wasn't until I started my second masters in Program Evaluation that I really understood the long-term impact reading, or an inability to read, had on student's lives. For my thesis, I had the opportunity to work with the Leadership Academy at Gardner-Betts, our juvenile detention center in Austin. I was asked to create a data-base to store information concerning the students who attended the Leadership Academy, a positive, peer-interaction model that focused on education, particularly reading, and compare those students to their counterparts in the typical detention center. It was then that I started to really understand that a diagnosis of dyslexia translated into a very high population in our prisons.

In 2004, research from professors at the University of Texas indicated that about 80 percent of prisoners in the United States had dyslexia or another reading disability. This statistic was one that motivated me as I later began working on my PhD in school psychology, with a specialty in neuropsychology. One of the goals of my training was to better understand exactly how the brain processes information, and to use that research for practical application, to help those with disabilities access school and the world in a better way. I was also very interested in the emotional development of students with disabilities, including dyslexia, and how the disability impacts individuals through their lifetimes. Just prior to starting on my PhD, I was working at the University of Texas as a coordinator for pre-service teachers. The cohorts who had me for instruction were exposed to basics about the risk-factors associated with dyslexia, and were also given instruction in how to teach the fundamentals of reading; however, when they went into the field, many of the districts they worked with would not allow explicit reading

instruction that is essential for dyslexic students, and we often had to be creative in getting them the practice they needed for this. This was 1999, during a period of time when the "whole-language" approach to teaching reading was popular, and the teaching of basic reading skills was not taught to pre-service teachers in an explicit manner. We organized small pockets of pre-service teachers who provided teacher training for the in-service teachers to help expose them to the risk factors for dyslexia. We couched the training as "practicum student requirements," so they would be allowed to present these ideas to the faculty members at their host schools.

After completing my doctorate, I had the opportunity to teach at Texas State University where I worked with the graduate program that trained school psychologists. At this point I was moving from training teachers to training school psychologists, but again found that there was no curriculum that addressed dyslexia in any way. School psychologists were taught how to evaluate for, and diagnose a learning disability, but did not have an understanding about how to diagnose dyslexia, or even how that might be similar or different from diagnosing a learning disability in reading for special education. Not all dyslexic students may meet criteria for a specific learning disability as defined by IDEA; however, many have the disability, and qualify for support under Section 504 of the ADAAA. When diagnosing dyslexia it is important to take into consideration mitigating circumstances, such as early intervention, exposure to other reading support, etc., as our dyslexic students frequently have very involved parents who have tried to provide intervention, that may have been good, bad or indifferent, but nevertheless, intervention does matter and does influence testing results. Sometimes previous intervention can cloud the picture of whether or not a student has dyslexia and good training is necessary to understand how to tease that out during an evaluation.

We are fortunate in the state of Texas to have a strong support for our dyslexic students. The "State Dyslexia Handbook" is the guide for public schools in Texas as to how to identify and teach dyslexic students. Texas has a long history of supporting the teaching of reading that includes a focus on early identification and intervention for children who

experience reading difficulties. The State Board of Education (SBOE) first approved the Texas Education Agency handbook "Dyslexia and Related Disorders: An Overview of State and Federal Requirements" in January 1986. The handbook has been revised several times, with the most recent revision in July of 2014, "The Dyslexia Handbook," that provides guidelines for public school districts to follow as they identify and provide services for students with dyslexia. The Handbook also provides school districts and parents/guardians with information regarding the state's dyslexia statutes and their relation to 2 federal laws: the Rehabilitation Act of 1973, Section 504 as amended in 2008 (§504), and the Americans with Disabilities Amendments Act and the Individuals with Disabilities Education Act of 2004 (IDEA 2004).

Research, to date, allows us to know dyslexic students have weakness's in phonological processing, in working memory, and in rapid naming, particularly rapid naming of letters. We also know that about 40% of our students with dyslexia have some form of executive functioning deficit that may contribute to reading difficulties in a significant manner, but explicit understanding about the ways these disabilities interact is still unclear. Additionally, a small body of research is beginning to understand the effects of dyslexia on social and emotional development, and the long-term impact of these on student's lives. All of these areas of research would benefit from explicit funding relegated to better understanding each of these facets of the disorder and how they affect the individuals diagnosed with dyslexia, as well as their families and communities.

Recently, the State of Texas included wording in legislation that indicated all institutions of higher learning in Texas should include instruction for pre-service teachers concerning dyslexia. As this was an unfunded mandate, progress in implementation has been slow. TEA has helped to create learning modules for teachers so they can access information about dyslexia, including indicators, other risk-factors, screening, and actual intervention. The modules are not mandatory, however, the regional service centers are making them more available, and the hope is that the modules will make learning about dyslexia conveniently accessible to all Texas teachers. That same legislation requires all Texas school districts to report all students

identified with dyslexia to the Texas Education Agency (TEA) each year, so the state can keep track of them, and can better understand the level of support needed for these students. Capturing this data is helping to change the conversation about dyslexia, just based on sheer numbers. While schools want to do the right thing, most districts have grossly under-identified the dyslexic population, and reporting these numbers clearly has served to encourage many to begin to look at this issue in a more systematic way. In AISD, we are aiming to have a Certified Academic Language Therapist (CALT), the most highly trained dyslexia interventionist, on every campus. That is a huge step, and it was influenced by the State reporting that clearly indicated we were significantly behind in addressing this population. This has compelled us to take action.

Texas has dyslexia laws going back to the 1980's, and has had 30 years of state legislation to address the disorder. Even so, identification and intervention for students with dyslexia is not always as swift as we would like it to be. Giving our State law the support, through Federal government recognition of the need for research in this area would only enhance what is already taking place. In the Austin Independent School District (AISD) we have taken the State Dyslexia Mandate seriously, and have made a concerted effort to train teachers to look for early indicators, and to evaluation and intervene with dyslexic students as early as possible, preferably before the 3rd grade. This has come with great effort and support from the local school board, as well as the upper administration of the district; however, many teachers and administrators continue to lack understanding of the disorder, and why early identification and intervention are necessary. Having additional support and recognition for dyslexia from the Federal level will be helpful in providing the necessary importance to the issue.

The Department of Education (DOE) has been considering addressing the use of the term dyslexia in the form of guidance, but have not yet issued any guidance on the use of the term "dyslexia," Currently, the DOE has the Individuals with Disabilities Education Act (IDEA) which governs the Special Education Process. Under IDEA, in order to be diagnosed for dyslexia for special education purposes, you must exhibit a pattern of strengths and weaknesses that is significant enough to not only have the diagnosis, but to indicate that the need for remediation

is so significant the student is functioning two standard deviations below what is expected for their age. We do not want to wait until students need the intervention in order to not fail and drop out, what we want for our students in Texas, and all of the United States, is the ability to identify and intervene with these students early and well, and to avoid any additional risk-factors associated with the inability to learn to read.

We want our students who even have mild dyslexia, who may not be eligible for services by the definition of what a reading disability is for IDEA, to have access to identification and intervention. Those students diagnosed with a reading disability under IDEA only capture a small percentage of students with dyslexia. Many more have the disorder, to a less severe degree, but will struggle with reading and learning their entire lives because they were not identified and did not receive intervention. Figuring out who these students are, and using all of the educational tools possible to intervene,will save our nation a substantial amount of special education and school psychology funding. Teaching students to read has been highly correlated with better attendance, better disciplinary reports, and better graduation rates. The funding we will save in disciplinary action, dropout repercussions, and truancy effects will also be substantial. In Texas we serve most dyslexic students through 504 Plans. These students remain a part of their general education cohort, and receive accommodations in the regular education setting to help them access their education. More and more, these accommodations are in the form of assistive technology tools that are able to even the educational playing field for our dyslexic students. The READ act will be essential in furthering the research to continue to refine and create these tools to help dyslexic students read with as much facility as their non-disabled counterparts. We are fortunate that we do recognize that many dyslexic students can benefit greatly from accommodations and intervention provided by Section 504 plans, and while we may not always stellar in early diagnosis of dyslexia, and we sometimes do not apply intervention with as much fidelity as could be desired, we are beginning to bring awareness about the disorder to the forefront of teacher preparation, and training for teachers and administrators is becoming more prevalent. It has taken years of training and several thousand dyslexia evaluations that I have personally eye-balled, to be able to really understand what I am

looking at when I review a score profile for a dyslexic student. Additional time and effort have to be applied to then be able to understand which interventions and accommodations will be best for each student. But if we begin to systematically provide good pre-service training for all teachers that include the significant indicators of dyslexia, we will have a good start to the process of identifying these students to that end.

Important indictors for dyslexia include understanding the student's abilities for RAN (Rapid Automatic Naming), working memory, and phonological awareness. Rapid naming helps us to understand the student's ability for processing speed, letter naming and quick cognitive shift; skills inherent in the task of reading, Working Memory is important for reading, as you can imagine that if you are taught a sight word today, and you have very poor working memory, the likelihood that you are going to remember that sight word tomorrow, or even in an hour, is very reduced. The phonological awareness prong may be the most telling in the story of dyslexia, as students who struggle in this area do not have the the ability to hear sounds that make up words in spoken language. This includes recognizing words that rhyme, deciding whether words begin or end with the same sounds, understanding that sounds can be manipulated to create new words, and separating words into their individual sounds.

Another area for which it would be helpful to have a better understanding about dyslexia would be in the use of speech pathologists to identify the early indicators in students they see through the early Child-Find process for Preschool Programs for Children with Disabilities (PPCD). Because speech pathologists are often the first to work with students in the educational setting, we may be able to use their evaluations to learn about oral language problems and other deficits that may lead to early identification and intervention for dyslexic students. In our district we use a simple screener for phoneme-grapheme awareness that is available in Spanish and English, to screen all students for some of these indicators. The State Dyslexia Mandate also requires the teacher to administer an oral fluency measure prior to referral for dyslexia evaluation, and this is particularly important for students who are predominantly Spanish speaking, as fluency is the strongest indicator for dyslexia in that

language. While these screeners give us a little information about the indicators for each student, they are not well-normed, or developed to encompass all of the main indicators. The READ act could provide an avenue for research in this area as well.

Currently, the classroom teacher has little to do with the identification or intervention for the dyslexic student; this could also be affected in a positive manner by additional research. If we learn how we can best train a classroom teacher to administer good screening tools, and to help refer students for dyslexia evaluation early, we could begin to intervene at appropriate times with these students. Classroom teachers could also be instrumental in learning basic dyslexia interferon, and translating good practice for teaching dyslexic students into all areas of the curriculum, not just the reading curriculum.

Understanding dyslexia is also import and to us as a nation because we have an alarming level of untreated dyslexics in prisons. It is possible, that if we learn to identify them at an early stage, and address their literacy needs appropriately, that we might reduce those numbers considerably, and use the savings for more productive endeavors. No other single mental or physical disorder is found to this great extent in our prison populations. While those in prisons were identified to be around 80% in 2008, the newest research published in July 2015 indicates this has move upward to around 85% at this time.

I spent several years working as a school psychologist at the high school level in a low SES school. There I saw many students come through who could not read and because they could not read they were seeing me for depression, anxiety, and all sorts of motivational issues. They were in constant fear of dropping out of school, and often, the root of the problem was that no one ever diagnosed them with dyslexia and they did not know how to read. When I asked about interventions we had on the campus to help these students learn how to read, I was surprised, and appalled, to find out there was nothing.

This is where my personal perspective comes into play. I am old. I am getting ready to retire, and although I have made this a life mission, the work in not even close to done. I have held this banner high and pushed hard on a lot of people in the last few years to make some things happen and to put some things into place to better identify and intervene with dyslexic students. None of these efforts or accomplishments is a given, and I worry that when I retire, the momentum we have amassed in getting dyslexia well addressed for our students in my current district will not be sustainable. I would like to see us give dyslexia more importance at a federal level so that there is significance given to it that will translate into having all states recognize why addressing the identification and intervention for these students is important. The State of Texas does at least recognize dyslexia, many do not. We need to not only recognize this pervasive disability, but we need to *do* something about it. I have spent many years as a neuropsychologist in private practice diagnosing dyslexia, only to have my patient's schools disregard the diagnosis, sometimes partially, but often completely. Unless the parent has the ability to provide the student with private tutoring, or intervention with an Academic Language Therapist, the student often did not get the support need to become a life-long reader, and frequently additional issues, such as low self-esteem, anxiety and depression became unnecessary, but additional hurdles. Support for the READ act will begin to address these issues. Thank you for inviting me to testify.

Short Bio- Robillard 2015

Rachel was raised in Venezuela, came to Austin to for college, and never left. She taught in several AISD schools before completing her Master's in Curriculum & Instruction. She was the first principal of a school she helped to start in Austin before leaving to work in the private sector as a trainer for a large business-products company. Rachel returned to school to earn a Master's in Program Evaluation, and her PhD in Educational Psychology. She completed a Post-Doctoral Fellowship in Neuropsychology and maintains a small private practice. Rachel has served as a School Psychologist in AustinISD, and has taught and supervised in the Teacher Preparation Program at the University of Texas, as well as in the Educational Psychology Departments (Neuropsychology and Bilingual School Psychology) at both the University of Texas and Texas State University; she remains adjunct faculty for both universities. Rachel returned to AISD in 2013 to lead the 504 Services Department and to revamp the district's approach to dyslexia evaluation and intervention.

Chairman SMITH. Thank you, Dr. Robillard.

It's my understanding that the gentleman from California, Mr. Takano, has an urgent need to get to another meeting, so I'm going to recognize him first for questions with the understanding, of course, that he join the caucus and cosponsor the bill.

The gentleman from California is recognized.

Mr. TAKANO. Mr. Chairman, I am already a member of the caucus, I discovered, and I will announce my support and cosponsorship of the bill.

Chairman SMITH. The gentleman is recognized for an extra minute.

Mr. TAKANO. Thank you.

Mr. Chairman, I am so grateful for this hearing. I am so grateful for the work you've already done and your leadership. If we can do something about dyslexia in this country, we will have done a great thing to help alleviate so much unnecessary suffering among all sorts of people in our country. So I thank you, thank you, thank you as a former teacher of 22, 23 years.

I've got to tell you, I began my teaching career armed with an Ivy League degree, and I could analyze literature but I was little prepared for the first ten years of my teaching career to deal—I didn't even know I had dyslexic children in my classroom and kids, and it wasn't until I did a literacy training that I began to even scratch the surface. And once I began to identify them—profoundly dyslexic students—I would try to get them into special ed, but special ed was not equipped—the teachers did not know how to address it. They had no more knowledge about what to do with dyslexia than I did.

I had to try to teach myself but of course with all the other things that are going on with a classroom teacher, that sort of training—I mean, I needed training, and I'm just eager, Mr. Chairman, to go visit—I hope that we might have a chance to go visit some of these facilities and what they're doing. I would like to know what it is—I mean, I learned things like the inside-out strategy, you know, with blended sounds at the beginning. I had a kid that could not read the word "strip" because there were three consonants that begin that word, and they struggled with it, but if we began from the inside out and said "rip, trip, strip," that was a strategy that improved their ability to decode those words. I learned about phonemic awareness. There is a science to this stuff, and so I am excited.

I've asked my staffer to take a look at how we can review the prison population and figure out how many of our prisoners are dyslexic. That is an important thing for us to know.

So I am just so excited about this hearing, and there's so much that can come of this.

So Dr. Tallal, I want to ask you a question. Why do so many English-language learners and children from poverty struggle with learning to read?

Dr. TALLAL. Thank you for that really insightful question.

There's a good deal of research which I have covered directly in my written testimony that I would ask you to review, specifically on children from poverty and English-language learners. I would like to say that children from poverty also have linguistic impover-

ishment. That is, that research has shown that the difference between children from high-socioeconomic-class families and low-socioeconomic-class families is a 30-million-word gap in the sheer number of words they have ever been exposed to.

What we know from neuroplasticity research is that we literally have to set our own brains up based on experience, and the most important experience we get as an infant is the sounds of our own native language. Language experience is what we have to use to establish these basic phonological categories to build our efficient and automatic auditory, rapid auditory processing systems, and if we don't hear words, we're just not going to have them, and so the end product is a problem with rapid auditory processing, language developmental delay, subsequently not having the foundations for literacy.

For children who are English-language learners, they have not heard the sounds, the phonological sounds, that are important for learning English, so they have to be given these sounds in a very systematic way.

Mr. TAKANO. Systematic?

Dr. TALLAL. Yes.

Mr. TAKANO. So the phonemic awareness, it's often very tedious. It takes a lot of creativity for the teacher to be able to develop that.

Dr. TALLAL. This is where technology can come in.

Mr. TAKANO. Ah.

Dr. TALLAL. Now, what technology has to offer is the ability to offer more intense learning trials per unit time than can ever be provided by a teacher no matter how well trained they are because computers just can deliver much more information with stimulus, response, correction and timely rewards. So, what we often say at Scientific Learning Corporation is let computers do what computers do best, which is the repetition, repetition, repetition that the brain needs to set up its own auditory and linguistic systems, so that teachers can do what teachers do best. We need to focus on giving teachers these new and improved technological tools that allow them to build these fundamental processing and linguistic skills so that by the time they try to use their more traditional methods, they will actually have the ability for them to work.

Mr. TAKANO. So the technology is really the basis—the foundation, the physical foundation, the stimulus response, the neural pathways in the brain——

Dr. TALLAL. Right.

Mr. TAKANO. —to develop that fluency in being able to decode words at the very physical level. We all have this phenomenon—we know this phenomenon of "I read it but I don't understand it," and that's where the teacher comes in to be able to—after the student is able to physically decode the words to be able to work with that student in comprehension and the critical thinking. So we need the teacher in the process but at the very——

Dr. TALLAL. Absolutely.

Mr. TAKANO. But at the very—but this—I hear what you're saying because for the teacher to be able to do this with every single student in a very tedious, systematic way, too much labor involved and not the best use, but if there's a technology, that's really promising news.

I have taken my six minutes, Mr. Chairman. I've got to ironically get to Education and Workforce Committee. We've got to do supplemental—I hope you will urge Chairman Kline and the Subcommittee Chairman to also delve into this is great bipartisan project. I love this, so thank you.

Chairman SMITH. Great. I thank you, Mr. Takano. And also, let me say I think Mr. Takano may be the only former teacher on this Committee, so we appreciate the perspective that he brings. By the way, if he's not the only former teacher, I will be hearing about it shortly.

I'll recognize myself for questions, and let me address my first one to Ms. Wilson.

You developed a reading system that led to "rewiring of the brain to function similarly to the brain of a good reader." That is amazing. Can you describe that to us briefly?

Ms. WILSON. Yes. The reading—do you mean describe the reading system briefly?

Chairman SMITH. Yes, if you can.

Ms. WILSON. Yes. The Wilson Reading System is based on Orton-Gillingham principles of instruction, or multisensory structured language instruction. MSL programs work with students to build up their understanding of the language structure right from the beginning. So as you heard earlier, the student needs to understand how to process sounds and understand from what they hear how sounds work in words, and so you go right back to the very beginning and do that with your students.

That's the beginning step. The students really need to understand how that sound system relates to the structure of words in syllables and understanding prefixes and suffixes. Phonology is one piece and morphology another. Morphology is the study of the smallest units of meaning within words.

Chairman SMITH. Right.

Ms. WILSON. So students need to understand everything about language structure and its words, its sentences and text structure.

Chairman SMITH. Okay. Thank you.

By the way, you're familiar with a Shakespeare quote that says, "All's well that ends well"?

Ms. WILSON. Yes.

Chairman SMITH. It sounds like you're saying all's well that begins well.

Chairman SMITH. Dr. Tallal, let me ask you a question, and that is, what is the best way to detect dyslexia earlier, just kind of what we're talking about across the board.

Dr. TALLAL. Well, interestingly, the precursors to dyslexia can be detected quite reliably even in infancy in the form of slow auditory processing, and my colleague, Dr. April Benasich at Rutgers University found that children that were born into families with a family history of language learning problems were 50 percent more likely to develop reading problems later in life. She subsequently showed that the speed of auditory processing of simply detecting differences between two brief tones separated by small gaps of time was the single best predictor in 7-month-old babies to subsequent oral language development. Oral language development subsequently is the single best predictor for reading and reading failure.

So there's this cascade which I call the language-to-literacy continuum, which begins with slow auditory processing, which interrupts the brain's ability to effectively and efficiently process the sounds of language which are necessary, are the necessary components, as we're hearing, for being able to hear the small sounds in words and learn that those are the letters that are in the words, and you can't really learn to read without that.

Chairman SMITH. Great. By the way, I liked your earlier metaphors between the dial-up versus the high-speed internet and the country road versus the superhighway. That's a nice description.

Dr. TALLAL. Thank you.

Chairman SMITH. Dr. Robillard, this is really just following the trend here, but what do you think is the quickest and most efficient way to test and identify those with dyslexia?

Dr. ROBILLARD. We have good tools. I think that we need to be applying them a lot earlier than we typically do. The tools that we have I think could be improved upon, and I thoroughly agree that that oral language, our speech pathologists that identify our students at 3 and four years old for PPCD programs in schools would certainly be our allies in really identifying these students very early. The screening that they do for that process could be expanded on fairly easily to identify these students that are needing this early intervention.

Chairman SMITH. Okay. Good.

I'd like to ask you all a question, and we can start with Ms. Wilson. If you will each give me two strengths that you all think are inherent with those with dyslexia? Ms. Wilson?

Ms. WILSON. Absolutely the perceptual strengths. So often they make wonderful architects and have incredible ability to see in different ways visually. Also, I think that they are often intuitive and are great at reading people and reading situations, and I have seen that in so many students who are dyslexic, that they are great at perceiving other people's emotions and strengths.

Chairman SMITH. Okay. Dr. Tallal?

Dr. TALLAL. Yes, I would agree that visual perceptual strengths are often characteristic of individuals with dyslexia. I don't know which came first, the inability to process the rapid auditory signals and so the brain had to compensate by developing stronger visual processing, but I never cease to be amazed at the number of cameramen who come to do interviews or whatever. It's not the person doing the interview, it's the cameraman who will often come up to me after the interview often with tears in his eyes about his own personal struggle with dyslexia and the shame, so that's one.

The other is perseverance and hard work. I mean, don't ever tell me that these kids aren't trying or don't care. They try so hard. They just don't have the neural capacities set in place, and we can give that to them. I mean, that's what's exciting. We have the tools now to help them build this foundational structure, and then everything else we're hearing about is going to work better.

Chairman SMITH. Absolutely.

Dr. Robillard?

Dr. ROBILLARD. So I would agree with the perceptual reasoning. I think that they're typically very creative thinkers too. They have to think differently. They're typically very bright and they figured

out ways to compensate for not being able to read, and so that helps them be very creative thinkers, so they're often the people that come up with that solution that nobody else thought of. And I think the second characteristic that I see over and over again that I think helps partially with that perseverance piece too, is they have a great sense of humor.

Chairman SMITH. Excellent. Thank you all very much.

The Ranking Member, the gentlewoman from Texas, Ms. Johnson, is recognized for her questions.

Ms. JOHNSON OF TEXAS. Thank you very much, Mr. Chairman.

I have not yet signed on to this bill, not because I don't believe in it but because I need some clarifications on how extensive the research is going to be.

And so Dr. Tallal, I'd like to know, you talked about some research that you were doing and where some of it is coming to a close. What we're proposing here, is that going to extend your research or make it more comprehensive so we'll get all students ailments involved in the research? Or tell me where you are.

Dr. TALLAL. Well, this might seem unusual for a research scientist who has depended on government grants for a long time for my research, but I would agree with Dr. Sally Shaywitz last year that we have the knowledge that we need to improve the outcomes of millions of children. We're just not using it effectively. We don't have an appropriate roadmap so my suggestions that I put into my longer report as well, my written report, is that we capitalize on what we already know, and that we really focus on the translational path itself because it's so slow and tedious. We've been at this 20 years, and we have very effective methods, but it's only been used at 12,000 schools, and that's just a drop in the bucket. We know that we can do better but the translational method itself needs a lot of work, and NSF can help with that. First of all, when someone proposes to do a research study that says that it aims to improve translation to education, show me the plan for where it shows how it's going to be scaled up to the heterogeneous schools, teachers with different kinds of training, and students that's going to work because that is not a simple thing.

Doing it in your own laboratory with well-trained scientists is one thing. Getting it to work in the hands of Mrs. Smith or Mr. Jones in the Thomas Gibbs School, that's a very different thing, and to do that over and over again in 55 countries, which we've done, takes a lot of knowledge. We need to use some of that knowledge.

Ms. JOHNSON OF TEXAS. Have you read the bill?

Dr. TALLAL. Yes, I have.

Ms. JOHNSON OF TEXAS. What would you do to improve it?

Dr. TALLAL. I would focus on this translational process itself and including the professional development part, and I would recognize that we need a two-way highway, a two-way superhighway. Too often as researchers, we think our job is to do outreach and teach everyone what we know. I've learned as much from educators who are sitting in classrooms every day that are struggling with the process as I can teach them. It's got to be a two-way and a two-directional street, so I would put something in the bill that really reinforces and gives teachers and educators themselves the oppor-

tunity not only for professional development but I've even suggested the possibility of training grants or degrees for higher education where teachers can do their own Ph.D.'s in their own classrooms to try out some of the methods that are already coming from research.

Ms. JOHNSON OF TEXAS. Thank you very much.

Ms. Wilson, would you like to comment?

Ms. WILSON. I agree that implementation is the gap that we need to address, and the more we can focus on that aspect of the bill, I think that would be ideal because research has told us what we need to do and we have seen what works in schools. It is possible in public schools.

I recently coauthored with Dr. Michelle Duda a white paper for Literature Nation that talked about the policy to implementation gap. There is a science to implementation called implementation science, and it talks about you can have an effective intervention but that's only a small piece of it. You need to have effective implementation and enabling context so there's actually a formula that has been proven by implementation science and it takes those three pieces of the formula to get the intended results. I would like to have some of the research look at looking at putting into practice that formula.

Ms. JOHNSON OF TEXAS. Thank you very much.

Yes?

Chairman SMITH. Would you yield me the balance of your time quickly?

Ms. JOHNSON OF TEXAS. Yes——

Chairman SMITH. Thank you. I wanted to get——

Ms. JOHNSON OF TEXAS. —reluctantly.

Chairman SMITH. Ms. Wilson, a question I didn't get to ask you a while ago is, what's the difference in your approach to young people versus adults when it comes to dyslexia?

Ms. WILSON. That's a wonderful question. I am so glad you asked that because I would also love to see research focus more on "it's never too late," because as important as early intervention is, and we know how important that is. In fact, if you do not identify a student early and start teaching an intervention in fourth grade as opposed to first grade, it takes four times as long to teach that student how to read. So, what happens as the student gets older? There's a lot more failure that you're working to overcome. We know that IEPs after fourth grade often do not include the types of things that students with dyslexia need.

Chairman SMITH. By the nodding of heads, everybody else agrees with you. Good point. Thank you.

The gentleman from Arkansas, Mr. Westerman, is recognized for his questions.

Mr. WESTERMAN. Thank you, Mr. Chairman, and Mr. Chairman, I would also like to thank you for your lead that you've taken on this issue. I know I'm a freshman here, but we talked about this earlier, and I was excited that you're working so hard on this. I told you about my wife, who's a special-ed teacher, and the biggest advocate for me is her asking if I would sign on to the Dyslexia Caucus, have I sponsored this bill yet.

I'm also happy that we've got a great bipartisan issue that we can work on because it's for children in this country, and it's really for our future, and it's so important that we teach children to read at an early age because it helps them out all through life. We all understand that.

As a matter of fact, as has been mentioned today, there's a large body of research on dyslexia. We know what it is, we know how to fix it, we know how to identify it. We've even got fabulous technology that we can use in the process to help correct dyslexia. But it's almost as if we've found the cure for cancer, we've developed the drugs to heal cancer but we can't get those drugs into the pharmacy and out to the people who need them.

So I see this huge issue with implementation, and I can tell you a personal story on this. I was in the state legislature and I helped sponsor a bill in Arkansas to create our dyslexia law much like Texas has done, and the bill passed. Then we found out that the schools were totally unprepared to implement this law. The teachers were not trained for it. We found out that this training is not in the institutions of higher education. I was glad to see, Ms. Wilson, that you said there are six universities that are implementing your program into their training, but I think we've got a huge gap at the higher education level in training teachers, and actually I think we're training teachers in reading programs that may even be detrimental to helping children with dyslexia.

So I want to put a plug in for my home state. We're doing a forum next March. Dr. Shaywitz is going to be there as a keynote speaker. I'm doing this in conjunction with our Department of Education. I'm going to have a forum there, and the focus of my forum's going to be how do we improve this implementation gap, and I just want to get your ideas on the areas we need to address to help the implementation, to get the teachers and the schools and the administrators trained and motivated to apply these fabulous tools that we've got so that we can help these kids and reap all the benefits of that, and I'll start with Ms. Wilson.

Ms. WILSON. I find that special-education teachers are very motivated. They themselves recognize that they don't have the skills, and I think we heard that earlier as a teacher when you're working with students and you're not making a difference, you know it. So I think the motivation is there. They just don't know what to do, and so the work with schools and school districts really has to begin with the administration and educating the administration as to what is needed for the professional learning.

We develop plans with school districts called COMPASS plans which are comprehensive plans that occur over one or two years to help train teachers. We first work with the school district to see where there are gaps, do they have teachers that are trained and——

Mr. WESTERMAN. I don't have a lot of time. I talked too much.

I understand there are ways you can go into individual schools, but in the bigger picture, we've got to train teachers at the higher-education level, and I've seen a resistance for the departments of higher education to take in these new—take on these new programs. How do we infiltrate that and get teachers taught this so that when they come out of college, they're ready to help children?

Ms. WILSON. That is a major gap. The International Dyslexia Association (IDA) has also taken on that issue. A paper was written, The Knowledge and Practice Standards for Teachers of Reading, and it's a great document that really outlines both the knowledge and the skills that teachers need. It really specifies that this is what we should be doing in colleges of education. I was one of the coauthors of that papaer and IDA is now working to get the word out to universities. There's so much need absolutely at the university level.

Mr. WESTERMAN. Thank you, and I guess I'm negative on yielding.

Chairman SMITH. Thank you, Mr. Westerman.

The gentlewoman from Connecticut, Ms. Esty, is recognized.

Ms. ESTY. Thank you, Mr. Chairman, and thank you, Ranking Member Johnson, for holding today's hearing.

As the mother of three who's been in those first-grade classrooms and seen very bright kids who are struggling, as somebody who comes from a state where our Governor, Dan Malloy, by his own admission is profoundly dyslexic, was the first person in the State of New York to have an oral bar exam as a level of his dyslexia, had his wife read his law books to him, is an example of the kind of stellar people we have who happen to also be dyslexic.

And to your category, Dr. Robillard, I would add every tradesperson I know who is supercreative is terrible at reading, and they put their creativity into working with their hands and that spatial ability. So we have enormous innovators who are hampered and oftentimes beaten down, discouraged, told they're stupid, made to feel unsuccessful. So I see an enormous opportunity for this country, and I'm so delighted that, as you can tell here, there's a lot of enthusiasm on the part of this Committee and elsewhere in Congress to do a better job. So let's figure out how we do that.

I was encouraged, Dr. Tallal, by your discussion about neuroplasticity, and particularly when we look at prison populations, we look at people looking for retraining. Can you talk a little bit about the research we might need to do on that? In addition for children, how do we get this neuroplasticity training at work for adults who need this help as well?

Dr. TALLAL. Well, the good news is that neuroplasticity lasts a lifetime, and the same variables that drive neuroplasticity, which are repetition, repetition, repetition, individually adapting from easier to harder items, sustained attention, and timely rewards to release neurochemical feedback saying that was a good one, save it, are the same throughout life.

Yes, it may be harder because people have—older people have developed more alternate strategies but we have developed versions of Fast ForWord for all ages. It's been shown to work in colleges, it's been shown to work in prisons. The big problem that we have getting our methods into prisons is the fact that we require the computer and the internet to give feedback on a mouse-click-by-mouse-click basis so we can individually adapt. These are highly technological methods, and many prisons don't allow the internet. But you can get around that by having servers.

Nonetheless, the results are very encouraging that neuroplasticity lasts a lifetime. You just have to know how to drive

it, and it needs to be driven by computers first and then backed up by what teachers do best. Let computers do what computers do best, which are also much more scalable at a more economical level so that teachers can do what teachers do best.

Ms. ESTY. That makes a great deal of sense. The Chairman and I have worked a lot on STEM education and support for teachers, and I hear a lot of the same issues that we face in the STEM field. We have great programs that work. We need to scale them and we need to get that information out in a way.

So one thing I would ask you, because we've seen this on the STEM field with the Noyce master teacher program, is whether we need something like that to help show—I think part of it is to show teachers how effective this is, to get them into classrooms and see what the teacher who's trained with these skills to see what a difference they can make so that they embrace it—not as a requirement, but rather as an opportunity to help students who are otherwise struggling.

Dr. TALLAL. If you don't understand neuroplasticity or how the brain actually learns, which is what these Science of Learning Centers are all about. If you don't understand that children who are struggling, or adults who are struggling, to read have not built the foundational first and second floor and you keep hammering away at trying to give them more time to build the third floor and you have never been taught that in your educational programs, you're not going to understand why these programs when you look at them could possibly work. So you need the professional development or changes within the teachers' colleges themselves, which is much harder to come by in order for people to even understand why something might need to be done, what the science shows and then why these tools might be effective.

Ms. ESTY. A final question. As we try to figure out how to scale up, and we all are talking about the scale-up issue, do you think that in this legislation or perhaps in other legislation we need to be having research that demonstrates the effective teaching skills that would lead to faster dissemination and acceptance?

Dr. TALLAL. What I mean by scaling up is that if we say that our goal for getting funding from NSF is translation to education, I think the bill could ask for explicit criteria for evaluation and priority to those methods and approaches that have more potential to actually be scaled up for use in a wide variety of classrooms, and many of them do not. I mean, I see—as scientists and as NSF starts to evaluate, they're always looking at the theory, the science, the double-blind control study. I think we also need to really re-evaluate whether a double-blind control study is ecologically or morally sound for an educational environment as the only gold standard for determining efficacy. I think cumulative data over a lot of different approaches is what really will help move this bar for education rather than demanding that there's only one kind of evidence that works.

Ms. ESTY. Thank you, and that's a provocative one we can follow up on later. Thank you.

Chairman SMITH. Thank you, Ms. Esty.

The gentleman from Alabama, Mr. Palmer, is recognized for his questions.

Mr. PALMER. Thank you, Mr. Chairman, and I want to thank all the witnesses for being here. My daughter is finishing her graduate degree at Auburn University in speech pathology——

Ms. WILSON. Fabulous.

Mr. PALMER. And she had to have speech therapy when she was little, so I know how important this work is.

Dr. Tallal, we have a school, Spring Valley School in Birmingham, that specializes in teaching children with learning disabilities, and according to information from that school individuals affected by dyslexia are often affected by other disabilities as well. Can you discuss the interaction of dyslexia and other disabilities and the challenges that this presents for students and the teachers?

Dr. TALLAL. That's an excellent point. Our brain is not divided easily into compartments. When you have a problem in one area, it often will cascade into other areas. When you have a problem with how the brain can efficiently process incoming sensory information, that is going to cascade in a number of ways into other functions, cognitive functions, linguistic functions that subsequently impact reading. So I think that is—basically the finding is that there's a tremendous overlap when you get right down to it and great heterogeneity in children whose final common denominator is they cannot learn to read. But there are many subskills that could have led them there.

Many of these children are diagnosed with attention deficit disorder, and at a scientific level did you fail to pay attention because you couldn't process fast and efficiently, or are you failing to process fast and efficiently because you can't pay attention? So we do need to still understand that.

Many children are diagnosed with autism spectrum disorder. That is a language-based learning disability.

Mr. PALMER. So when we talk about increasing funding for research on dyslexia, I think we need to also be talking about some overlap with—in the research in this area, how these other disabilities interact and follow that out.

Dr. TALLAL. The diagnosis you get often depends on just who you got sent to see.

Mr. PALMER. Right.

Dr. TALLAL. Okay. If you got sent to see a psychiatrist, you're going to get one diagnosis. If you got sent to see a speech pathologist, you could get a different diagnosis. If you got sent to see a reading specialist—and it also depends on the age at which your disability is finally diagnosed. But that doesn't mean they're all mutually exclusive from each other.

Mr. PALMER. It really sounds like we need to be able to have a one-stop-shop when we're dealing in these areas because you could get misdiagnosed. It's kind of like firing a rifle at a target. If you're off a little bit at the front end, you're off a lot at the back end.

Dr. Robillard, in your testimony, you highlighted the approach you're taking in Austin to better serve students with dyslexia. What are you doing in Austin that's different than approaches taken in other schools?

Dr. ROBILLARD. I think what we did in Austin was, we took that science to practice seriously the last two years. I left the ivory

tower to come back and do this because I would diagnose them as a neuropsychologist and I would send a lovely report to the school district, and nothing would happen, and so I got a little frustrated and finally decided to put my money where my mouth was and went back to try to see what I could do with it and had wonderful backing of our board of trustees. That's where our process started was getting their support and then getting our superintendent on board, and teaching. I actually would go teach our board of trustees. They invited me to come teach them about dyslexia, teach our superintendent about dyslexia, and from there we were able to— we now have in every school in Austin, 129 of them, 85,000 kids in our school district, we have what's called a dyslexia designee on every campus, and that person has been taught what these ladies have been talking about all afternoon and they have—they understand now on that level. We've also brought in evidence-based multisensory Orton-Gillingham-based programs for all grade levels. We have changed the diagnostic process. We used to have classroom teachers doing this diagnosis. Many kids went misdiagnosed. So sadly, I'm diagnosing students that are in high school now that never got diagnosed early, but we're diagnosing them now and we're intervening now because the neuroplasticity is there, and if you have the right tools, you can make a huge difference in their lives by getting the right diagnosis and getting those intervention materials.

So we've made a concerted effort to not only get those highly trained CALTs but to get training for all of our teachers K–12 in at least the understanding of dyslexia and then at every grade level have teachers trained who are both special education, and we address a lot of dyslexia in Texas by 504 under the ADA. So we do it in the regular education setting with teachers that are trained on the materials to deliver them in the gen-ed classroom.

Mr. PALMER. Mr. Chairman, would you allow me to ask a question of Ms. Wilson?

Chairman SMITH. Yes. The gentleman continues to be recognized.

Mr. PALMER. Thank you, Mr. Chairman.

Ms. Wilson, you were talking about your reading program. One of the things that I wanted to ask you is, is there a distance learning component for this when children are out of school so that parents can continue to be involved with their kids and continue to help them learn.

Ms. WILSON. Yes, there is distance learning actually for teachers and so the teachers can learn.

In terms of teachers who are trained, they will often do distance learning because of technology. That's one of the things that technology has brought with the fast internet and the ability to do work in observations online. So there are some teachers who are actually providing instruction to students distantly.

Mr. PALMER. So they're providing the instruction to the students when the students are out of school, and is it programs where parents can participate in this program with their kids?

Ms. WILSON. That is—it's not something that we organize because we focus on teacher training, and so that would be something that the school or the teacher themselves would organize. But if that were the case and they were working, yes, the parents could

be involved with that at home, parents work at home is just in a support role as opposed to an instructional role.

Mr. PALMER. Thank you. Thank you, Mr. Chairman.

Chairman SMITH. Thank you, Mr. Palmer.

The gentlewoman from Maryland, Ms. Edwards, is recognized for her questions.

Ms. EDWARDS. Thank you very much, Mr. Chairman, and thank you to the witnesses today.

I have to tell you, I was sitting here a little bit earlier, I think it was the Chairman who asked, you know, what the positives are for young people, for people who have dyslexia, and it made me tear up because you were describing my son, and it was a reminder as a parent and as educators how important it is to value all of the person that these young people are and how that can contribute to their eventual learning success.

And I was really curious, Dr. Tallal. In your testimony, you talked about a description that wasn't—didn't say dyslexia but a language-based learning problem, a more inclusive way of thinking about the way that some of our children are learning differently, and I think that that's really helpful because I think it's important for us to say what it is and for people, especially our young people, to feel like we're talking about them and that we're trying to work on strategies that help them to learn the best way that they can.

It was also a reminder that in the READ Act, of which I'm a co-sponsor, that we may have some tweaking to do to try to make sure that we're capturing the elements of research and of teacher training and other aspects that you've identified and the knowledge gap from the action gap. And so I thank you for that.

I just came from a celebration of 50 years of Head Start. I love Head Start. But it was also another reminder that for children not of means, and Dr. Tallal, you talked about this 30-million-word deficit, that being able to identify learning-based conditions is really important in that early period, especially among young people not of means. And so I wonder if you can describe for me what we might begin to think about programs like Head Start where we know when people get a good head start that they really can succeed but what we can do in teacher training, in working with educators to give them the tools and something like Head Start that will enable us to identify these conditions earlier and to deal with ways that we can make sure that young people have the tools that they need. And I'll just give you the rest of the time and all of you the time to talk about that.

Dr. TALLAL. Well, I love what Head Start has done. I completely agree with you on that. And I would just say that if we now could also add some of these new technologies, they will even further boost the advantage of Head Start. We need to get more words and more consistently pronounced words.

There's a reason that a child, a young child, when asked to have a storybook read to them, despite the fact that they may have several books, they always want to pick the same book. Have you ever experienced that? The parent's going, oh, not again, but why does a child want the same book? Because the brain is reinforced by being able to predict what is about to come next and then have it happen, and books are great for that, and repetition is great for

that. So there are also some wonderful technologies that can allow children to receive more consistent reading patterns through books, either through a human giving them to them, if they're available, or just by being able to have some books that are being read to them.

Our second product is Reading Assistant, which I haven't talked much about, but what Reading Assistant is, is it is a scientifically based state-of-the-art voice recognition software that allows a child to read out loud to the computer and get real-time one-on-one feedback like a virtual tutor. There's a tremendous amount of research that shows that if you want to build reading fluency, the only way to do that is to allow a child to read more out loud with corrective feedback. but who has the time to give each child that individual attention? Again, we can use some of these technological advances to add to what teachers are able to do, and it's a partnership, I think, at this point between technology—let technology do what technology can do so that teachers can do what they can do.

So I would say adding some of these new technologies—iPads, you know, what are you going to put on your iPad. Let's get some programs that are very well identified and researched and evidence-based to provide to some of these younger children.

Ms. EDWARDS. Thank you very much.

Thank you, Mr. Chairman.

Chairman SMITH. Thank you, Ms. Edwards.

The gentlewoman from Virginia, Mrs. Comstock, is recognized.

Mrs. COMSTOCK. Thank you, Mr. Chairman, and thank you. I join the enthusiastic response of the other Members of the Committee.

I'm from a family of educators. My husband was in school. He was an assistant principal, certainly saw this issue quite a bit oftentimes with the children who might be, since he was the assistant principal, some of the kids who would get in trouble, right because acting out in some ways. My sister's a guidance counselor. My mom was a librarian. So I've seen a lot.

I was interested in following up on the technology now that I have three grandchildren also. How can we make parents sort of be partners and what are some of the good things that are already online? Are there things on iPads? Are there things that you can start doing with young children that help you identify if there are early problems and help the parents be partners with you and with others, you know, and their contemporaries?

Dr. TALLAL. Well, we have actually come out with a distance learning component, as you might call it, speaking to Mr. Palmer's question earlier, that is a direct—it's Fast ForWord that is run by parents in their own home with children across the many ages in collaboration with a trained therapist who talks to—or teacher that talks to the parents once a week. So there's a lot that parents can do to use these technologies.

But the beauty is that they don't have to have the educational level of a trained professional to be able to implement. What parents can do is implement something when it's really running individually and individually adapted for a child and just keep them motivated to do it and help with reinforcement that way. So there's a lot that parents can do with these technologies.

We also have kind of forayed a little bit into early math learning and developed a program called Eddie's Number Party, which is just a little app, and it teaches the number line. So research is coming out with all this information as is education, and the question is, how do you work together with the people who know how to motivate kids now through developing computer games to do something with their time which is more valuable, and I think that's a great way also to focus in the future of how do we make what kids are going to be doing and wanting to do anyway—playing with these computers—something that could actually teach them the fundamental skills that are going to set them up early in life for success in math, in oral language, in written language, et cetera.

Mrs. COMSTOCK. And with the online and then also maybe in— you talked about the language exposure and having kids exposed to more words, things like that, I hear from my kids now when they're dealing—having their children, they won't put them in front of television. I was a big Sesame Street lover. I did park them in front of that at the arsenic hour at four o'clock and let them watch, and they were all very early readers. I thought that Sesame Street did a very nice job on the alphabet and having them understand that. But now they're oh, we can't let them in front of the TV before they're 2 years old. Is that true? Did I totally mess up my early reading children?

Dr. TALLAL. Well, there's a difference, I think. I think the question is interactivity between adults and children. In the best of situations, the very best thing you can do is have parents who are talking to children and reading with children in a clear, consistent way, but that's not going to happen in most environments.

So then what else can you do? Passive observation does not work to drive neuroplasticity. That's one of the factors that we do know. You have to actively pay attention. So if a child is actively paying attention to what's going on on an educational program like Sesame Street, it's going to be helpful, but if they're just passively listening, it probably isn't.

Where computers again can be better than that is that they can provide similar information but give one-on-one individually real-time feedback so it's much more interactive. It much more closely simulates the parent-child or teacher-child interactions in real time, and that's the clue, in real time and personally individually adapted to your brain so you're moving at the speed that your brain is getting about 80 percent correct.

Mrs. COMSTOCK. Any other comments from the others?

Dr. ROBILLARD. I think the assistance technology pace is key, and we have an assistive technology person that's on our staff that goes out and works with our students as they get explicit instruction to start, and then as they're getting better at reading, we use more and more assistive technology, not only for their reading but for their writing, which is dysgraphia is really connected to this reading, this issue of dyslexia, and so we find that man of our students who are dyslexic or dysgraphic as well, and there's wonderful apps for that and wonderful assistive technology applications for that.

The University of Edinboro actually has some great apps that we put on our kids' iPads that help them out in schools with dyslexia

and dysgraphia and decoding and incoding and immediate feedback
sorts of things and helps them with their writing as well.

So I think assistive technology, the explicit multisensory system-
atic sequential teaching, the Orton-Gillingham method, I think is
always going to be inherent in helping our dyslexic kids get to that
place where they can read but the technology of the repetition that
they need in order to build those new neural pathways that are
more successful for reading than the ones that they came to us
with I think is really key.

Mrs. COMSTOCK. And I wanted to ask the Chairman if for our
record we can maybe include a lot of those apps and Web sites and
anything that you think might be good just sort of as a demonstra-
tion so we can sort of put them on our Web sites, let people know
about them and any way we can be promoting this information and
help them, and thank you a lot and look forward to working with
you.

Chairman SMITH. Good idea. Thank you, Mrs. Comstock.

And the gentleman from Virginia, Mr. Beyer, is recognized for
his questions.

Mr. BEYER. Thank you, Mr. Chairman.

I'd like to begin by thanking the Chairman and the Ranking
Member for having this hearing this morning, and Chairman,
thank you for your leadership on this issue. It's very important.
And I'd like to thank you for showing up. I want to pile on assistive
technology too.

My oldest has this wide variety of learning disabilities, and in
fourth grade he could still not read at all until I brought a PC
home with Sierra Games, which were text-based, and you could
only get through the adventure if you could type and spell the
words correctly, and in six months, he went from barely being able
to read to reading on grade level, and now he's got a townhouse
full of books. So it's really terrific stuff to do that.

Dr. Robillard, in your written testimony, you said—and probably
you've spoken to—that "Dyslexia is not a disorder that can be com-
partmentalized; it is not just a deficit, but carries with it inherent
strengths that have been recognized for decades."

In his school, the Oakwood School out in Fairfax, they had big
pictures of Albert Einstein, Thomas Edison, Winston Churchill, and
the most fiery political speaker I've ever known who was Majority
Leader of the Virginia House who never had a note because he
couldn't read them because his learning disabilities were so bad.
But he was an incredible orator.

How do we make sure that these strengths, these inherent
strengths, are not suppressed? How do we recognize them and cele-
brate them?

Dr. ROBILLARD. Well, I think we have to really do that piece, that
part that we're teaching our teachers to recognize this. Our univer-
sities—and I have to say, I've been a part of our universities that
have not taught our pre-service teachers about dyslexia as well we
should have. We fortunately in Texas now have since House Bill
5 a little piece in there that says all higher-education entities that
are training teachers will teach about dyslexia now, and we're
starting to do that. I think that getting at that basic level of mak-
ing sure all educators, all administrators recognize that just be-

cause a student has dyslexia, that they are still able to do so many other things and they are so capable in so many other areas that contribute to their non-dyslexic counterparts that may not be able to see the world or understand the world as well as they can in other ways I think is really key in making that happen.

And I think it's an education from the ground up. It's not just our teachers but our principals, our assistant principals who are often disciplining these kids because they often have creative ways of thinking about doing things. I think that our administrators really need to understand it as well, and that's been a grassroots effort in our district to help our administrators understand that.

Mr. BEYER. Thank you very much.

Dr. Tallal, the READ Act provides a definition for dyslexia that captures everyone who has difficulty reading despite normal intelligence, and again, I think of my son, who never had the reverse letters dyslexia. It was soft vowel differentiation, sequencing difficulties, specific word recall. It was always that red stuff in the refrigerator rather than ketchup, you know.

How broadly or narrowly should we define dyslexia, and does it matter in terms of intervention?

Dr. TALLAL. That's an excellent question. The research I think primarily by Martha Denckla and many other well-established and well-respected dyslexia researchers have shown despite tremendous research and study that there seems to be no difference between children who have a frank diagnosis of dyslexia and those who for research purposes are called garden-variety poor readers. So there's no difference in their symptomatology and, importantly, there does not seem to be a great difference or any difference that we can discern about what works to improve their outcomes.

One of the things that is often used in definitions of dyslexia is that children have failed to learn to read despite normal intelligence and opportunity to learn to read, and that's an important statement as well, but there usually is a word that says unexpected reading problems, and what concerns me about that is that if a child comes from a high socioeconomic family of successful people and they are failing to learn to read, that's quite unexpected. But if a child is coming from poverty or from family that doesn't have English as their primary language and that child fails to learn to read, people aren't that surprised. Well, the truth is that even though they got to their reading problem in very different ways along different avenues, they all seem to need the same kind of intensive repetition at the auditory-process and spoken-language level to break the code for reading.

So if we want to use a definition of dyslexia, I think there is value to bringing attention to the fact that there's so many children failing to learn to read. But it also can have the effect of limiting the school's sense of responsibility for children who don't have a frank diagnosis, and you may want to speak to that.

Dr. ROBILLARD. And we run a camp in the summer for high school kids who are still struggling readers. We have now also interjected all of our English-language learners who have some capacity for English, and we're finding that our dyslexic students have the opportunity to help these kids learn to read as well and that they are benefiting from the same methodology—the same rep-

etition, the same assistive technology—and are moving ahead and reading much quicker than their counterparts who are English-language learners who don't come to the summer program. Furthermore, in six weeks, we have statistically measurable differences in their fluency and their comprehension scores.

Mr. BEYER. Thank you.

Thank you, Mr. Chair.

Chairman SMITH. Thank you, Mr. Beyer.

Let me recognize myself for a final quick question to Dr. Robillard.

One area we haven't covered today is the possibility and connection between adults with dyslexia and adults that had behavioral problems, and I know you've been aware of some research at the University of Texas about that. Can you comment real quickly on anything we need to address or anything we need to know? And then we'll finish up.

Dr. ROBILLARD. Well, I think it's significant that we have this school-to-prison pipeline that is full of dyslexic students who are either undiagnosed or misdiagnosed or just struggling readers even who are misdiagnosed or undiagnosed, and the research about ten years ago, in 2004, I believe, Dr. Falbo at UT did quite a bit of research on this population and found about 80 percent of our prisons in Texas had prisoners who had dyslexia or some form of reading disorder.

Recently this summer, in July of this year, current year, new research came out, similar research, says 85 percent of our prisoners have dyslexia or related disorder. That is a huge, huge number of people.

Chairman SMITH. And the logical conclusion is, if we could have helped them earlier, we may not have had the kind of problems that they've exemplified later in life.

Dr. ROBILLARD. I think there is a correlation. I don't know that we can say it's a cause and effect but I think there's a very high correlation.

Chairman SMITH. Thanks for that answer.

Also, let me thank you all for your testimony today. This has been very, very informative.

I have to end with a little bit of a plug for the State of Texas because I think we're a little bit ahead of the curve or we're certainly ahead of a number of other states because of legislation that has been passed, and we mandate the recognition of dyslexia in our school districts and mandate that the school districts have a program of early detection, and I only wish all school districts across the country had that as well.

So again, thank you. Just a reminder, the reception is down the hall this way to my left at the very end of the hall. I look forward to seeing you all there.

And we stand adjourned.

[Whereupon, at 11:36 a.m., the Committee was adjourned.]

Appendix I

ADDITIONAL MATERIAL FOR THE RECORD

Yale University

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September 28, 2015

Chairman Lamar Smith and Rep. Julia Brownley,

Thank you again for the privilege to address the Science, Space, and Technology Committee last year in your hearing about Science of Dyslexia. As a physician, I have all too many memories of sitting by an ailing child's bedside, wishing so desperately that we had the knowledge to help that child. As a physician I know the power of science and how once new knowledge becomes available we act quickly, indeed, race to put that knowledge to good use. We want to close that knowledge gap and improve the lives of the affected children.

As I testified, dyslexic children can learn to read and must be taught to read. It is imperative that teachers and parents learn about the powerful science of dyslexia, know how to identify dyslexia early on and to provide evidence-based methods to teach dyslexic children to read. We must not give up on teaching reading and limit a child's future options.

Dyslexia differs markedly from all other learning disabilities. Dyslexia is very specific and scientifically validated: we know its prevalence, cognitive and neurobiological origins, symptoms, and effective, evidence-based interventions. Learning disabilities is a general term referring to a range of difficulties which have not yet been delineated or scientifically validated. Learning disabilities are comparable to what in medicine are referred to as 'infectious' diseases, while dyslexia is akin to being diagnosed with a strep throat – a highly specific disorder in which the causative agent and evidence-based treatment are both known and validated.

Education must, and can be, aligned with science. We must ensure that scientific knowledge is translated into policy and practice and that ignorance and injustice do not prevail. We know better, we must act better. I cannot look into the face of one more child who has lost faith in himself and the world, I cannot look into the face of a child's father who is desperately trying to hold back tears; I cannot hear once again about how a school told a mother, 'we do not believe in dyslexia.'

With my testimony before your committee in mind, I have reviewed and wholeheartedly support and endorse H.R. 3033, the Research Excellence and Advancements for Dyslexia Act. The bipartisan READ Act puts rightful focus on the specific need to address the problem with the large population of Americans who have dyslexia (an estimated 1 in 5 people) and takes much-needed action to provide scientifically-proven and practical applications to identify and

overcome dyslexia. The READ Act will help to put knowledge (the science of dyslexia) into action more quickly than it would otherwise.

Everyone who is a parent, teacher, or researcher working with a dyslexic child should support H.R. 3033, the READ Act. If I may be of assistance to the Congressional Dyslexia Caucus or the Science Committee in any way to help this legislation become law, please let me know how I may help.

Sincerely,

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SUPPLEMENTAL TESTIMONY SUBMITTED BY MS. BARBARA WILSON

SUPPLEMENTAL TESTIMONY for the

U.S. House of Representatives

Committee on Science, Space, and Technology

Statement of:

Barbara A. Wilson, M.Ed.

Co-founder and President, Wilson Language Training

Oxford, MA

October 30, 2015

WHY EARLY IDENTIFICATION AND INTERVENTION?

For individuals with dyslexia, early identification and instruction from a well-trained teacher using an effective program can be life changing. They can alter the course of one's educational attainment, self-esteem, and future career and personal goals, since the struggles for students with dyslexia affect not just their English/language arts class, but all aspects of life inside and outside of school.

Research has shown us that students who are identified early and receive appropriate multisensory structured language instruction will make gains in the early years of their education (Ritchey & Goeke, 2006). Furthermore, we have learned that early intervention can produce increased activation in key brain areas for reading (Shaywitz et al., 2004). Therefore, prevention and early intervention programming in a multi-tiered system is critical.

Students with dyslexia who go undiagnosed or do not receive the appropriate intervention, may be able to use their intelligence to figure out how to "work around" their disability and mask their challenges for a while. But, eventually, the inability to read catches up with them. As the student progresses through school, text that they encounter every day grows increasingly difficult, requiring a very high level of reading, and as we have seen time and again, without the ability to read, a student's self-confidence plummets.

In addition to reading difficulties, dyslexia may also present itself with weaknesses in the way information is processed, stored, and retrieved. Individuals may have issues with memory, processing speed, time perception, organization, and sequencing. As demands in high school, college, and career increase, late identification of dyslexia only compounds the challenges these individuals face.

Inability to read well past third grade requires the use of accommodations in order for students to keep up with their classmates. These children require an adult advocate, and are at the mercy of the system for providing the necessary accommodations. But while accommodations help a child access content presented in class, the inability to read the material independently still limits the range of interaction that the child can have with the content.

When students are diagnosed in adolescence, finding the time to squeeze the necessary intensive instruction into a school schedule can be logistically very challenging. This challenge is compounded by the increasing period of time it takes overall to teach these students to read. Research has shown that it takes four times longer to improve a student's skills in fourth grade than it does in kindergarten (Hall, 2011). Shaywitz noted that, "A child with a reading disability who is not identified early may require as many as 150-300 hours of *intensive instruction* (at least ninety minutes a day for most school days over a one-to-three-year period) if he is going to close the reading gap between himself and his peers. And of course, the longer identification and effective reading instruction are delayed, the longer the child will require to catch up" (2003, p.259). Guthrie also noted that, "Although (reading) fluency may be learned in 100 hours, it requires more like 50 months to gain sufficient knowledge to bring students to grade level in reading" (Torgesen et al., 2007, p.130). Early screening and intervention to limit the number of years that students are falling behind in reading and accessing grade-level content, and in feeling unsuccessful, would help reduce the time consuming intensive instruction that must be scheduled during the school day.

The specific, intensive instruction these students need requires the specialized skills of a highly trained teacher. Middle and high schools are often reluctant to or unable to find the resources

and time to make it happen. Also, this kind of instruction limits the time the student could be spending on other academic or non-academic endeavors (e.g., learning content, developing relationships with peers). While we know that we can teach older students to read and write in middle and high school or as adults, we also know it will take longer and be more challenging than it would have been had the student been identified in primary school and received the appropriate instruction then.

Older students and adults who should have but were not given the opportunity to benefit from an intensive intervention may face serious challenges in their lives. For one, low literacy levels affect a person's educational, personal, and career opportunities because poor literacy skills increase the odds that the person will drop out of high school, and research points to a connection between high dropout rates and high incarceration rates, high unemployment rates, and low income (NYS Center for School Safety, 2009 and Sum, Khatiwada, & McLaughlin, 2009).
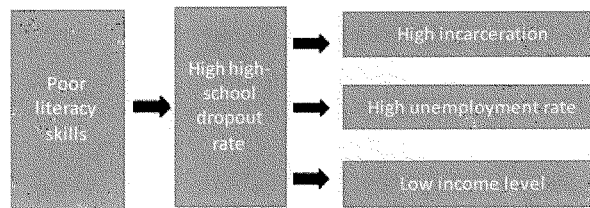
People who have poor literacy skills may be adversely affected in the following ways:

- Career options are limited if you cannot read; it is challenging to get a job that does not require some level of reading and writing.
- Accessing information in daily life is also difficult if you cannot read (emergency information, general life information about opportunities in your community, etc.)
- Options for traveling are limited if you cannot read street signs.
- Low literacy's effects cost the U.S. $225 billion or more each year in non-productivity in the workforce and loss of tax revenue due to unemployment (ProLiteracy.org).
- Students who do not read proficiently by the third grade are 4 times likelier to drop out of school (Hernandez, 2011).
- Among those with the lowest literacy rates, 43% live in poverty (ProLiteracy.org).
- 2/3 of students who cannot read proficiently by the end of 4th grade will end up in jail or on welfare (Teach for America, 2012).
- Over 70% of America's inmates cannot read above a 4th grade level (Teach for America, 2012).
- Approximately 75-90% of juvenile offenders are estimated to have a learning disability (Mentor & Wilkinson, 2005); and approximate 80% of those with a learning disability have dyslexia (America Academy of Pediatrics, 2009).

These statistics are sobering on their own, but we also know that there is a social and emotional toll that is not represented in these statistics. Social and emotional problems can develop when a person is consistently faced with an inability to meet expectations at school, at work, and at

home, and these problems affect not only the child or adult with a low literacy rate, but also their teachers, their co-workers, and their family.

Working closely with public schools and districts across the country for almost thirty years, I have learned that there are two keys to successfully teaching students with dyslexia to read:

(1) intensive MSL instruction, and

(2) effective implementation practices.

WHAT IS INTENSIVE MSL INSTRUCTION?

Individuals with dyslexia need specific, intensive instruction utilizing an Orton-Gillingham based approach, also referred to as Multisensory Structured Language (MSL) instruction. This instruction can be enhanced through other curriculum and technology tools.

MULTISENSORY STRUCTURED LANGUAGE (MSL) INSTRUCTION

The Orton-Gillingham based approach to literacy instruction refers to the structured, sequential, multisensory techniques established by Dr. Samuel T. Orton, Ms. Anna Gillingham, and their colleagues (Orton, 1937; Gillingham & Stillman, 1977). This approach is now referred to more globally as Multisensory Structured Language (MSL) instruction. The body of instructional practices that comprise MSL instruction is very important for individuals with dyslexia.

In MSL instruction, learning incorporates visual, auditory and kinesthetic-tactile pathways simultaneously to enhance mastery of the language structure involved with reading and writing. In addition, instruction is intensive, direct, systematic and cumulative, diagnostic, and both synthetic and analytic (i.e., students learn how to take parts of language structure and put them together, or given the whole, break it into its parts).

The MSL approach to instruction helps students understand the structure of the language in a very systematic way. Students learn the sound system of the language and build up from there to include syllable, word, sentence, and paragraph structure gradually and with mastery. Mastery is a key to MSL instruction—at each step along the way, students need to internalize the knowledge and skills that have been taught and be able to apply those automatically and fluently so that they no longer labor over individual words, freeing up cognitive capacity for comprehension. Another key is diagnostic instruction. A teacher who has been well trained in MSL instruction understands how to shape a lesson based on a student's abilities and needs, focusing on those areas where a student needs particular help. The reading program I authored, the Wilson Reading System® (WRS), is an example of an MSL program.

Brain scans have demonstrated that effective intervention can rewire the brain. Wilson Reading System was used in one study that demonstrated that use of the program with a qualified instructor led to improved reading ability and changed students' brain activity. Researchers found improvement in brain function as well as rewiring of the brain to function similarly to that of a good reader (Keller & Just, 2009, and Meyler, Keller, Cherkassky, Gabrieli, & Just, 2008).

INTENSIVE INSTRUCTION

Intensive instruction is a component of MSL instruction, but its importance for students with dyslexia merits further discussion. Intensive instruction can be characterized by a reduced group size along with or separately from an increase in the amount of instructional time (Wanzek & Vaughn, 2007 and Vaughn, Wanzek, Murray, & Roberts, 2012). Other characteristics of intensive instruction would also include diagnostic instruction (Wanzek & Vaughn, 2007), more explicit and systematic instruction, increased opportunities for feedback, and integration of strategies to support cognitive processes (Vaughn et al., 2012).

First, intensity of instruction can be increased by reducing group size or boosting the amount of instructional time, or both. A student with a mild form of dyslexia might benefit from being in a group of 4 or 5 other students, meeting 3 times per week, for 45 minutes. However, students with greater needs will need smaller group or one-on-one instruction, and may require daily instruction for 60-90 minutes. A study by Torgesen et al. (2001) showed students who had daily, intensive instruction for one school year made significant gains. Furthermore, 3 years later, 40% of these students no longer needed an IEP.

Intensive instruction is a big commitment for teachers and schools. The schedule must accommodate enough time to deliver each lesson as designed, and must provide enough lessons per week and over time to be effective. This is not a quick fix. Students may need 100 lessons or more in a one-on-one or small-group setting. They may need to work with a well-trained teacher for 2-3 years to address all the skills needed to become a proficient reader.

Intensity of instruction can also be increased by amplifying the focus on giving students the tools they need to support their own cognitive processing (Vaughn et al., 2012), and by including three components common to the most effective interventions: explicit instruction, systematic instruction and opportunities for feedback and student response (Swanson, Hoskyn & Lee, 1999). It is also crucial that intensive reading instruction involve a diagnostic approach–lessons designed and delivered to meet the specific needs of the student(s) (Wanzek & Vaughn, 2007). In order to accomplish this, Vaughn et al. (2012) recommends that teachers:

- assist their students in cognitive processing by taking care to "think-aloud" in order to show students the process used when approaching a new text

- provide explicit instructions and explain in detail their expectations to students

- scaffold learning of complex tasks

- progress from smaller to larger units, or from easier to more difficult sounds and word types

- give students many opportunities to respond (which also aids the teacher in monitoring student learning and understanding)

- give students frequent feedback and practice in order to implement the feedback so that errors do not have time to take root.

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SUPPLEMENTAL TOOLS

Students' individual needs can be met through a combination of core MSL instruction along with supplemental tools. For example, we know that students with dyslexia vary widely in their cognitive profiles. Some have strong oral comprehension and will benefit from audiobooks while they learn to read, whereas those with poor oral comprehension likely will not. Those with poor orthographic memory have difficulty learning words that are irregular and do not follow the English language system, and will need tools that help them with that. Some students easily master these words. An array of tools to support these various areas of need would be useful.

Technological innovations in recent years have been helpful in the delivery of instruction. Leveraging the reach of a mobile device, the computing power and connectivity of the cloud, and advanced data analytics, apps can be developed that are adaptive, customizing the learning experience to students' specific needs by adjusting to the user's strengths and weaknesses. This provides for rich and interactive learning experiences that can go more in depth than traditional methods, while giving teachers the control and support they need. Adaptive technologies/ software offer the prospect of allowing students to continue to learn and reinforce skills that they need before moving on to more complex skills.

These tools, however, do not eliminate the need for a highly trained dyslexia specialist to work with an individual with dyslexia. These specialists are still necessary in order to understand the type of instruction a student requires, identify an appropriate intervention program, understand whether that program is working, think diagnostically about what to do when it is not working, and know how to provide the motivational support and educational guidance that technology tools cannot provide.

WHAT ARE EFFECTIVE IMPLEMENTATION PRACTICES?

Despite the many national, state, and local policies to improve the reading performance of students across the country, we have not seen significant improvement. But our failure is not with a lack of understanding of how students acquire reading skills, even for students with dyslexia. It is with the implementation of what we know works. Implementation science practices will help us to be successful in teaching students with dyslexia.

In a recent white paper I co-authored with Dr. Michelle Duda for Literate Nation (*Using Implementation Science to Close the Policy to Practice Gap*), we discuss the importance of policymakers attending to research from implementation science in order to increase the odds that policies will affect classroom or school practice in the expected way (Duda & Wilson, 2015). The point we share from implementation science is that selecting an **effective intervention** to improve a condition is not sufficient to reliably achieve one's intended outcome. We must also utilize **effective implementation methods** and provide **enabling contexts** in order to achieve the desired and expected outcomes (Fixsen, Blase, Duda, Naoom, & Van Dyke, 2010). This is what the National Implementation Research Network (NIRN, 2013) refers to as the Formula for Success:

Effective Interventions	X	Effective Implementation Methods	X	Enabling Contexts	=	Intended Outcomes

(Fixsen, Blase, Duda, Naoom, & Van Dyke, 2010)

When selecting an intervention for students with dyslexia, we must choose one that has research studies behind it to show that it is effective. However, we can reliably achieve the same successful results with our students only if the intervention is implemented the way it was designed and tested. That means it is necessary to have knowledgeable, well-trained teachers and the necessary support from school and district leaders.

TEACHER KNOWLEDGE AND SKILLS

Both teacher knowledge and the practical ability to apply this knowledge in a real-life setting are crucial (Hattie, 2012). To successfully teach students with dyslexia, teachers much have an in-depth knowledge about reading instruction, including the structure of the English language—meaning its phonology, morphology, and orthography. But, they must also be able to take this knowledge and successfully instruct a student who does not easily learn it. The second part is critical. Without that, teachers have knowledge but not the skill to succeed. Imagine conducting surgery only from book-knowledge about the body rather than from actual clinical experience operating on a patient.

Knowledgeable, skilled teachers are able to:

- anticipate and plan for difficulties that students are likely to encounter with new concepts;
- identify when an individual student needs assistance;
- understand at a deeper level the reasons for individual student success and failure on a given task;
- understand what assistance a student requires in order to learn to improve their reading skills;
- adapt their teaching to make their instruction more successful for the individual student;
- diagnose individual learning problems; and
- set new achievable goals (Hattie, 2012).

Important for students with dyslexia, expert teachers believe these students can learn, are able to perceive their knowledge gaps, and then apply the right instruction to improve students' outcomes. In 2015, Wilson surveyed teachers who had just completed Level I Certification in the Wilson Reading System® while teaching a student with a significant reading disability. We found that:

- Teachers reported that the training substantially *increased their knowledge* of each of the five components of reading (phonemic awareness, phonics, vocabulary, fluency, and comprehension). Before the training, 49-64% of teachers reported that their knowledge of each was good or excellent (percentage varied by reading component). After training, nearly all teachers (97-99%) felt that their knowledge in each of these five areas was good or excellent.
- Teachers also reported a substantial increase in their *ability to teach* each of the five critical components of reading. Prior to training, 51-63% reported that their ability in each of the five components of reading was good or excellent. After training, this percentage soared to 97-98%.
- When asked about the impact of training, 94% of teachers reported that our intensive training offered a big or enormous impact on their teaching of reading and spelling.

Recognizing the importance of teacher knowledge and skills, the International Dyslexia Association (IDA) created the *Knowledge and Practice Standards for Teachers of Reading* to identify what all teachers of reading should know and be able to do in teaching their children to read (IDA, 2010). Teachers working with students with dyslexia must have even greater knowledge than average classroom teachers, so the IDA has one version for regular classroom teachers and a separate version specifically for dyslexia specialists. These teachers must understand the neuroscience behind dyslexia, how dyslexia presents with any particular student, and knowledge of the instructional methods necessary for success (i.e., structured literacy approach, background in structure of English, reading components, scaffolding instruction, release of responsibility).

EDUCATOR TRAINING

While we have identified the knowledge teachers must have and the skills they must be able to apply when working with students, how do we support teachers in acquiring these? One aspect of effective implementation is training. But, we have much to learn about how to implement effective professional development. For example:

- Quick day-long or even week-long workshops are convenient, but do they truly have an impact without further follow-up, training and support?
- Online courses can provide the knowledge base, but is that sufficient?
- Are blended learning solutions utilizing both online and in-person training effective?
- When teachers work over a period of time with a student under supervision, what are the results?
- Can the practical experience be done in a short amount of time, or is it needed over a longer period of time?
- How can we ensure that professional development is purposeful and disciplined?

From my experience over 30 years, I have learned that teachers working with individuals with dyslexia need a clinical teaching experience (practicum) to be able to take book-learning and knowledge and translate that into practical application in the classroom. The practicum should be under the supervision of an experienced individual who has taught people with dyslexia how to read, and has attained a deep level of knowledge and experience. The Academy of Orton-Gillingham Practitioners and Educators (AOGPE), Wilson Language Training (WLT) and training programs accredited by the International Multisensory Structured Language Education Council (IMSLEC), each provide a training that incorporates both the knowledge and supervised practical experience to prepare them for working with students with dyslexia. Hiring teachers with a certification from one of these organizations, or from the Academic Language Therapy Association (ALTA), provides a level of assurance that these teachers have received the right preparation for working with students with dyslexia.

Wilson Language Training has been recognized by Learning Forward (formerly the National Staff Development Council) as one of the programs for inclusion in their 2005 research-based initiative, *What Works in K-12 Literacy Staff Development*. What makes professional learning from WLT different from most professional learning experiences is that we are committed to incorporating the principles of implementation science (Fixsen, et al., 2005) and research by Joyce and Showers (2002) into our professional learning plans. Through my extensive work in the public school setting, I have learned about the challenges of operating within it. To best support these educators and ensure that the students receive the necessary instruction, Wilson integrates the principles of implementation science as we work closely with schools and districts to provide a systematic implementation of the program and associated professional learning that

builds capacity at multiple levels of the system and promotes deep implementation and sustainability over time.

ORGANIZATIONAL SUPPORT

Another aspect of effective implementation is organizational support. In this context, it includes the allocation of sufficient time for instruction, appropriate grouping of students for instruction, sufficient duration of the intervention, and access to the necessary materials. Students with dyslexia need an effective intervention program that is implemented as it was designed to be, since it is that implementation that has demonstrated evidence of effectiveness.

Scheduling of time. One of the most challenging aspects for schools and teachers is the scheduling of instruction. Too often, students do not have sufficient instructional time. For example, they might get 30 or 40 minutes, 3 days per week when they need much more. As a result, progress is slow. Having teachers and administrators who truly understand the needs of students with dyslexia can help with the scheduling issue.

Appropriate grouping. Another challenge is scheduling the student in an appropriate group or, if needed, in one-on-one instruction. Too often, students are scheduled in their special education classes with other students who might be at different levels of instruction or be receiving help in math or other areas at the same time. As with appropriate scheduling, having teachers and administrators who truly understand the needs of students with dyslexia can help with the grouping issue.

Duration of Intervention. As mentioned earlier, if students are not identified early, it becomes more time consuming to teach these students to read. The time it takes also depends on several factors previously discussed such as teacher proficiency, fidelity of implementation, the student profile as determined by an evaluation, and intensity of instruction. For struggling adolescent readers, Guthrie noted that may take as long as 50 months to bring them up to grade level in reading (Torgesen et al., 2007, p.130). This requires a school to make a long-term commitment to the child and the allocation of necessary resources.

Access to necessary materials. Students must have full access to the full intervention program. If they are not able to utilize the full set of materials as they were designed to be used, then they are not benefiting from the full power of the program.

Even if teachers are well trained, if these organizational factors are not put in place, students will not benefit. Ensuring that our teachers have the proper knowledge and skills, undergo training to become highly skilled teachers, and have the organizational support necessary to implement a program as designed requires the support and commitment of leadership at each level of the system—school, district, state, and federal.

CONCLUSION

While identification and early intervention are effective ways to combat dyslexia and its potentially devastating effects, intensive, MSL instruction that is effectively implemented can remedy reading problems from our youngest to our oldest students. This is critical, since the incidence of dyslexia in the general population is very high, affecting up to 20% of the population (The Yale Center for Dyslexia & Creativity).

In public schools, 80-90%[1] of children receiving support through special education programs have difficulties with reading. Of students diagnosed with a learning disability, approximately 80%[2] to 90%[3] have reading difficulties. In fact, reading is the subject most likely to be the cause of special education referral for both elementary and secondary school students[4]. And the disturbing reality is that students identified with a reading disability in third grade do not appear to outgrow this problem; more than 70% continue to have this status throughout their school years[5].

With statistics like these, it is clear that something needs to be done to improve reading outcomes. However, despite the prevalence of dyslexia in the U.S., funding for research in this area is low, especially in comparison to autism spectrum disorder and ADHD. Affecting approximately 10 times the population of autism, and slightly more individuals than ADHD, dyslexia receives only about $27 million in research funding, compared with $851 million for Autism spectrum disorder and $532 million for ADHD (Bishop, 2010).

Low literacy rates negatively affect the school, work and personal lives of both children and adults, resulting in low self-esteem and income levels, and high unemployment and incarceration rates. The good news, however, is that it is never too late to learn to read. Research has shown that the plasticity of the human brain (children and adults) makes it possible to learn to read at any age.

In order to ensure that we have even more success stories, additional research to demonstrate that it is not too late for older students and adults, as well as to identify the instructional and implementation factors necessary to reach these older individuals, is important. It would also be useful to further demonstrate the benefits of early identification and instruction, and its impact on the brain and learning.

It is also true that while we know a great deal about how to teach individuals with dyslexia, it is worthwhile to continue to investigate new ways to do this.

- Are there more efficient and effective ways than what we are doing now? For example, is there a blended solution with technology tools and teacher proficiency that will allow us to scale up successful instruction?
- What types of differentiated instruction are most beneficial to students with dyslexia, given that their cognitive profiles vary?
- What tools are effective in addressing students' individual differences?

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[1] Lerner, 1989, cited in Fletcher, Lyon, Fuchs, & Barnes, 2007, p.105.
[2] Gersten, et al., 2001; and Lerner, 1993.
[3] Kavale and Reese, 1992, cited in Fletcher, et al., 2007, p.105.
[4] Kavale and Reese, 1992
[5] Fletcher, et al., 2007.

Also, given my experience, it seems that much more can be learned about implementation science in regards to individuals with dyslexia. Further research must be done into the best kinds of professional development for teachers and the enabling context that will allow them to effectively implement their practices. We must continue to ask these questions:

- What kind of professional development do teachers and administrators need to help children with reading struggles?
- How do we support ongoing teacher training?
- What specific components of professional learning are necessary for impact?
- What are the specific conditions needed to further improve the effectiveness of professional learning and for scaling up and sustaining effective professional learning?
- What organizational structures need to be in place in order to help students with dyslexia succeed?

There are often gaps in the in-depth training that is necessary for teachers to succeed, which must be addressed through our policies and practices. We will only be able to effectively reduce the negative statistics associated with low literacy levels when we have created effective policies which promote best practices as supported by research. Both children and adults with reading challenges deserve targeted instruction that allows them the opportunity to experience the world through the eyes of a reader, and teachers and administrators deserve to have access to the tools and research necessary to deliver on the promises of education in the United States.

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A LITERATE NATION
WHITE PAPER

LITERATE NATION SCIENCE CORE GROUP—Beyond Literacy Legislation
Spring 2015
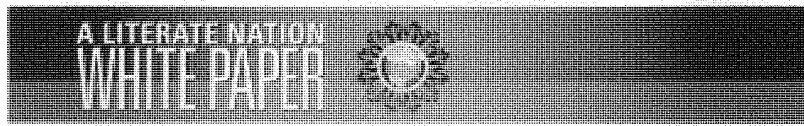
Using Implementation Science to Close the Policy to Practice Gap
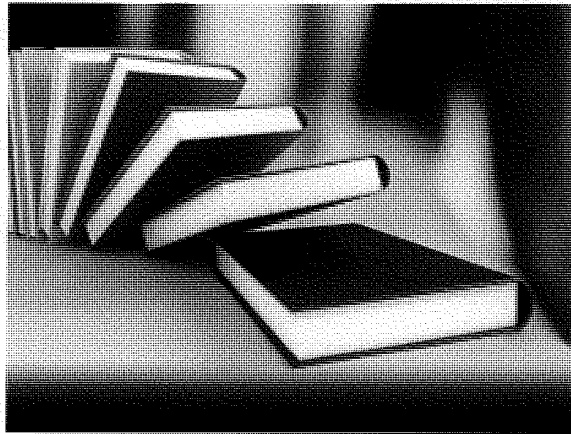
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"Reading is a basic tool in the living of a good life."

Introduction and Background

Current context/challenge

The importance of literacy and its long-term effects on individuals and society has been acknowledged for many decades. From as early as the 1950s, federal funding has been allocated to support specific educational priorities (www.ed.gov). Past presidents have led the adoption of national policies and mandates meant to support student academic success, such as the Elementary and Secondary Education Act (ESEA) of 1965 as part of the "War on Poverty" initiative, and the more recent No Child Left Behind Act of 2001 (NCLB). These and other policies and initiatives afforded educators and researchers many leverage points to drive change in districts, schools, and classrooms. They also created a cultural shift in the understanding of the power of a high-quality education for all students, drove the public's expectations for the use of evidence-based practices in schools, and inspired future generations of technical assistance providers and program developers.

Despite the best intentions of policymakers and their extensive contributions to the improvement of education in America, the statistics on current literacy rates of students continue to be grim, and projections point to the possibility that 1 in 4 American children will grow up not being able to read. Furthermore, it is estimated that students who do not achieve proficiency in reading by third grade are four times likelier than their peers to drop out of school (www.dosomething.org). This "national crisis" of low literacy rates and its effect on high school graduation rates has the attention of students, families, educators, administrators, policymakers, and The White House.

Now over a decade since NCLB was authorized, many of the same struggles persist: how to improve reading outcomes for students, prevent school dropout, and build the 21st century skills needed for college or a career. Moving from policy to practice is hard work. Though policymakers and decision makers are well intentioned, creating new polices and initiatives is only one piece of the puzzle. Whether it be a state law to improve literacy outcomes for individuals with dyslexia or the formalization of an RTI (Response to Intervention) model, a policy or initiative does not cause change at the local level simply

by making it a mandate. Many decisions, actions, resources, and reorganizations need to happen in order to create the conditions that allow educators to apply new policies and initiatives as intended. While the continued policy-to-practice gap is due to the complexity and ambiguity of the education system along with the localized needs of communities, science can offer practical strategies to close that gap—this emerging discipline is known as Implementation Science.

Purpose

The purpose of this paper is to offer a high-level overview of Implementation Science frameworks, their application, and considerations that policymakers and other stakeholders can use to support educators striving to improve literacy outcomes for all students. To highlight key variables that lead to predictable academic outcomes for students, this paper will be organized around a Formula for Success. Each of the variables of the formula and the embedded Active Implementation Frameworks (AIFs) (Fixsen, Naoom, Blase, Friedman and Wallace, 2005; Fixsen, Blase, Duda, Naoom & Van Dyke, 2010) will be introduced.

Closing the Gap between Policy and Practice

The emerging field of Implementation Science provides insight into the elements of effective implementation processes that lead to the adoption of new policies, programs, or practices in a manner that results in the intended outcomes. This research indicates that if policymakers are to successfully affect student outcomes, they should attend to and build strategies that support the following Formula for Success:

$$\text{Effective Interventions} \times \text{Effective Implementation Methods} \times \text{Enabling Contexts} = \text{Intended Outcomes}$$
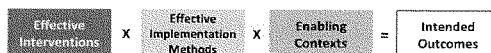
While the specific application of this formula is unique at each level of the education system, the formula itself provides a framework for understanding how effective interventions alone will not solve the challenges that schools and districts face (Fixsen, Blase, Duda, Naoom, & Van Dyke, 2010). Instead, each of the three components is critical, and leaders at all levels of the education system should attend to the factors influencing the selection and adoption of effective interventions, the local use of effective implementation methods to appropriately install the interventions, and the contexts within which the interventions will be applied.

Overview of Active Implementation Frameworks

To better meet all students' needs, decision makers may establish new policies or mandates that influence the local adoption of evidence-based programs, practices, or system-wide initiatives (e.g., Multi-Tiered System of Supports). Some of these, such as the adoption of the Common Core State Standards, are extremely complex. No matter the size of an initiative, the adoption process will cause some shift in the culture of the school, district, or state, and it is important to recognize that the management of the shift affects the outcome. Thus, stakeholders need to understand the science of implementation and consider how to incorporate this science into the introduction and rollout of the initiative.

At the local level, implementation science provides a structure to successfully manage the use of new programs or practices. In general terms, it is a platform that can help schools and districts apply and sustain programs with fidelity (as intended) so that students can experience the expected benefits. Using this model, policymakers should keep in mind that those at the local level implementing new programs or initiatives to abide by a new policy will need to answer the following questions:

- **What** is the usable intervention (in this context, the system intervention/innovation) being implemented?
- **Who** is accountable for ensuring that it is being delivered as intended?
- **When** is the organization ready to make the needed shifts until it is fully embedded and has become "education as usual?"
- **How** do you create a system that will support and sustain these programs and practices?

These questions are integral to the Active Implementation Frameworks. In 2005, the National Implementation Research Network (NIRN) released a monograph synthesizing implementation research findings across a range of fields (Fixsen, et al., 2005). Based on these findings, the NIRN team developed and organized five overarching frameworks called the Active Implementation Frameworks. These are depicted in Figure 1. In order to achieve sustainable and scalable programs/practices to improve outcomes for all students, the frameworks need to be fully integrated and applied across all levels of the education system.

Figure 1: Active Implementation Frameworks
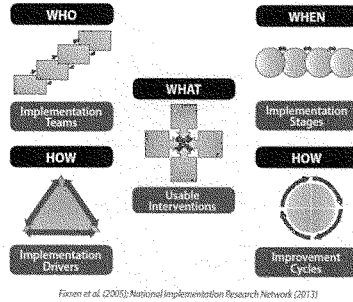
As the research and experience in Applied Implementation Science evolved, the AIFs also evolved (Fixsen, et al., 2010; Duda, et al., 2013; NIRN, 2013). Based on further study, NIRN linked the AIFs to an overarching Formula for Success. Figure 2 illustrates how these frameworks fit within the Formula for Success.

In the figure, the "What" or "Usable Interventions" framework corresponds to the Effective Interventions variable in the formula. The other four frameworks (Who/Intervention Teams, When/Implementation Cycles, How/Implementation Drivers, and How/Improvement Cycles) correspond to the Effective Implementation Methods variable in the formula. The final variable, Enabling Contexts, is represented by the grey circle encompassing all five frameworks.

Figure 2: Linking the Formula for Success with the Active Implementation Frameworks

Duda, Penfold, Wernikoff, & Wilson, 2014
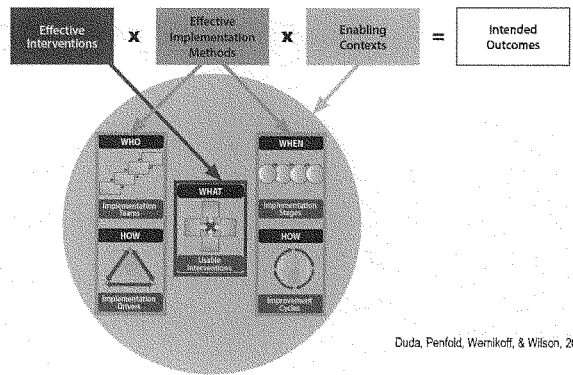
To inform the introduction and rollout of policies and initiatives that are intended to improve student outcomes, the following sections explain the factors that a school or district must address to create an effective implementation process (system). It offers a brief description of the application of AIFs within the Formula for Success, starting with Effective Interventions, moving to the Effective Implementation Processes, and finally, addressing Enabling Contexts.

The What: Effective Interventions (Innovations)

The first variable in the formula to improve and sustain positive student outcomes is the "What." In the context of the formula and this paper, the "What" relates to the system intervention that will impact literacy, is based on rigorous research, and has documented evidence of success in school settings. For policymakers, this could be a new policy, mandate, or system-change initiative. Collectively, these interventions can be called "innovations." The innovation in turn may affect local decisions about programs, practices,

and other local initiatives. As of 2015, many promising practices and initiatives have been credited with improving student achievement. However, only some students are benefiting and positive results are not always sustained. To improve the successful adoption of an innovation, policymakers and stakeholders need to carefully consider and articulate the "What" that they are asking educators to implement. Some key questions to ask include:

- ☑ *What are the core components of the innovation (reading intervention, RTI model, etc.) that make it successful?*
- ☑ *What is the evidence that it will improve student outcomes?*
- ☑ *How do we assure that the selected or mandated innovation will meet the needs of local students?*
- ☑ *How do we assure the capacity to implement as intended?*

To answer these questions systematically, one may apply the Usable Interventions Framework, the first of five frameworks articulated by Fixsen et al. (2005; 2010) and the NIRN (2013). In order for the intervention, or innovation, to be considered usable (i.e., translatable from the highly controlled conditions in practice, to highly complex and frequently changing environments in schools), four features must be assessed (Blase & Fixsen, 2013). Blase and Fixsen (2013) identified these as: 1) a clear description of the "What"; 2) information about essential functions; 3) operational definitions; and 4) performance assessments or fidelity measures.

This rigorous and often time-consuming process is imperative if the state, district, or school is to meet and sustain the intended outcomes. Without it, those implementing the innovation are left to independently identify core components and make decisions on ways to integrate the new innovation into the current system.

Policy and decision-makers can support leaders and district/school implementation teams by including or making recommendations for protocols that can be used to guide processes and decisions. They can also set expectations for reporting student outcome data and

implementation fidelity data. These strategies apply to any initiative and will help to create an enabling context for more purposeful, functional, and sustained use of the innovation.

Effective Implementation Methods (The WHO, WHEN and HOW)

Once the interventions (programs or practices) are selected or adopted, the next critical step is to build local implementation capacity to engage in and sustain the work. The following section will define the AIFs that can be used at any level of the system to support the people engaging in this important work and create an aligned system to help achieve results.

The Who: Invest in People

In order to create an effective implementation system, it is essential to identify "Who" will have the time and talent to engage in system transformation. This leads to the second AIF: Implementation Teams. Implementation Teams are action-oriented groups that come together around a common goal and purpose: to create a transparent, efficient, and aligned system that supports the use of important and effective programs or practices. Having the right people on the Implementation Team is critical. These individuals should have the skills, knowledge, commitment, and authority to make and enforce decisions.

The main role of the Implementation Team is to ensure that all of the components of the innovation can be used as intended and yield the intended student outcomes. They may need to consider ways to adjust the system in a manner that will improve the adoption of the innovation. For example, they may focus on current strengths and build implementation capacity in the areas that are weaker or need additional support. If the implementation of a new program is person-dependent, meaning that work is tied to an individual currently in the system, the Implementation Team may seek ways to develop or identify others who can support this work in the future.

An Implementation Team consists of a core group of at least three to five members who have dedicated time (e.g., part of their job description) to address the system changes needed to support the new program or practice and have the knowledge and skills to implement it. Implementation Teams build on current strengths within the system (e.g.,

effective coaches and coaching supports in place, accessible data collection system). They are critical at the start of a new initiative, applying a new policy or mandate, and throughout the process to continuously improve the system in a manner that will support and sustain the use of the selected programs and practices over time. As a result, Implementation Teams at the local level typically include members of the school and district Leadership Team or other staff who have the ability to make key decisions. The team will need to attend to the alignment of all components of the system so that the programs and practices are implemented with fidelity, which will allow all students involved to experience the full benefits.

This may mean aligning professional development activities and supporting organizational shifts (such as scheduling). Implementation Teams are also responsible for creating pathways of communication with stakeholders, such as families, community members, policymakers, and other Implementation Teams that may reside in the school or district. Implementation Team functions should align with leadership activities and other strategic or improvement plans at the school and district level (Duda, Penfold, Wernikoff & Wilson, 2014).

Government and private funders can contribute to the successful adoption and use of evidence-based or evidence-informed literacy innovations by expecting their applicants to include a plan for formulating and operating an Implementation Team. Team members should have the authority to make system-change decisions and have allocated time (FTE) to do the work. Based on recent findings by Fixsen, Duda, Blase & Horner (2009), state-level Implementation Teams are most effective and sustainable when they are led by at least two individuals who are dedicated to this work on a full-time basis.

Linking Implementation Teams across the education system (school with district, district with regional, regional with state) can serve to close the policy to practice gap. Implementation Teams should be expected to function and share information in a linked manner following a cascading logic model shown in Figure 3. One way to successfully scale up an initiative is to use linked teams that begin as a vertical slice of the education system and eventually spread to support all students. For example, a district-level Implementation Team would be accountable for supporting (or creating in some cases) an Implementation Team (that includes leadership) at the school level. These school-based Implementation Teams would have clear communication pathways to their District Leadership and Implementation Team (DLIT), to report successes and barriers related to policies and mandates in their respective classrooms. When challenges are identified, the

DLIT would be responsible for resolving any district-level barriers if possible. If not, they would be responsible for using clear communication pathways to Regional Implementation Teams, or to State level Teams. Regional/State teams would then work towards resolving the challenges that originated at the classroom level. The "successful" functioning and impact of the DLIT can be evaluated by the effect on the work of the other Implementation Teams one level "below" at the school or building level and one level "above" at the Regional or State level.

Figure 3: Linked Implementation Teams
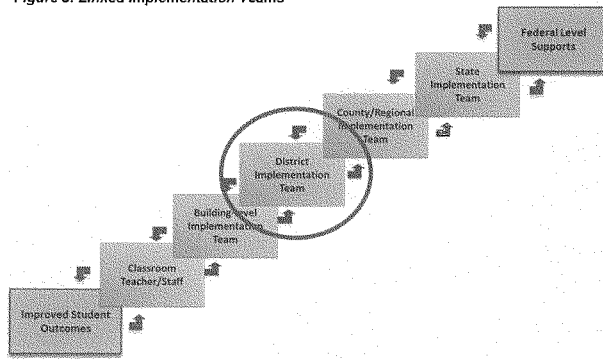
The When: Implementation Takes Time

To sustain an innovation in a manner that aligns to current policies and mandates, it is essential to understand its stage of implementation in the classroom, school, district, or region. Typically, there are many initiatives going on simultaneously. Furthermore, each initiative is usually at a different stage of adoption, use, accuracy or fidelity, and ability to sustain. If leaders and policymakers understand the current stage of implementation of the targeted initiative, they can better manage the pace of the rollout, and identify and use formative data for decision-making purposes.

To facilitate change at the classroom, school, district, or state level, a plan that helps staff negotiate the journey through the stages of implementation must be established. This plan should engage and support teachers and administrators so that they are able to make full, effective use of the new interventions in their educational settings. Understanding the stages of implementation facilitates intentional planning for change, which results in:

☑ *Alignment of activities to the applicable stage, increasing the likelihood of moving successfully through the stage and on to the next one.*
☑ *Preparation for activities and challenges that will be encountered in the next stage.*
☑ *Reduction in wasted time and resources.*
☑ *Increased likelihood of sustained and improved use of educational practices.*

Research suggests it can take from two to four years to fully and successfully make an evidence-based program, practice, or effective educational innovation operational (Fixsen, Blase, Timbers, & Wolf, 2001; Panzano & Roth, 2006; Prochaska & DiClemente, 1982). The implementation process begins when a gap to improving outcomes for students is identified, and a process for selecting possible interventions to address that need is determined. Decisions are made at that point for what to adopt, how to support the new intervention, and how to sustain high-fidelity use of the practices so that all students can benefit. The process includes four stages comprising key components and processes that can lead to the long-term survival (sustainability) and continued effectiveness of any intervention in the context of a changing world. The four stages are named: Exploration, Installation, Initial Installation, and Full Implementation.

Exploration	Installation	Initial Implementation	Full Implementation
Identification of the need for change, learning about possible interventions that may provide solutions, learning about what it takes to implement the intervention effectively, developing stakeholders and champions, assessing and creating readiness for change, and deciding to proceed (or not).	Establishment of the resources needed to use an intervention and the resources required to implement it as intended.	The first use of an intervention by teachers and others who have just learned how to use it and who are working in school and district environments that are just learning how to support the new ways of work.	The skillful use of an intervention that is well integrated into the repertoire of teachers, and routinely and effectively supported by successive building and district administrators.

The stages are not linear and each one does not have a crisp beginning or end. For example, there are times when an organization will move among stages due to changes in staff, funding, leadership, or unsuccessful attempts at employing the intervention with high fidelity.

Identifying the stage of implementation where the intervention is at that particular point in time allows for opportunities to provide targeted and developmentally appropriate support for staff, helps to manage expectations, and allows for more efficient use of resources. This is particularly true for districts, who must support schools and adjust support, helping to fill in gaps when changes in funding and staff turnover occur.

Policymakers and leaders can maximize supports and align expectations of project or program deliverables by understanding the current stage of implementation in which the targeted interventions are mostly residing. The understanding creates an opportunity to provide more streamlined supports and resources and to encourage educators to stay the course in order to benefit from the investment to date. Research has demonstrated that the adoption of new interventions will go through an "implementation trajectory" that oftentimes results in organizations falling back to earlier stages of implementation. Moving to earlier stages of implementation allows teams to further solidify the elements that work and make adjustments to plans that are not leading to the intended outcomes.

The How: Implementation Drivers

The "How" is defined by the Implementation Drivers Framework, which defines a set of three factors necessary for successful implementation. This set of best practices improves the likelihood of creating an efficient and aligned system so that the intended outcome of a policy can be achieved. Implementation Drivers can be organized into three categories:

1) *Staff Competency Drivers*: Support personnel in their use of the new program.
2) *Organization Drivers*: Help align programs, policies, procedures, and opportunities to ensure that new interventions have the supports and buy-in to be used as intended.
3) *Leadership Drivers*: Acknowledge the importance of leaders and leadership styles, and support current and future leaders in an organization.

Due to the integrated and compensatory nature of these drivers (meaning that they work together), they are depicted as three sides of a triangle as illustrated below.
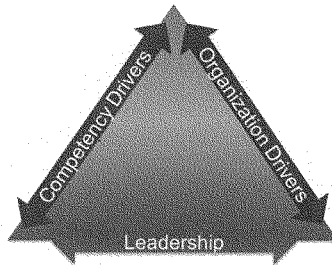
2008, Fixsen, Blase, Duda, Naoom & Van Dyke (adapted)

1. Staff Competency Drivers

Staff Competency Drivers (pictured on the left side of the triangle) are designed to build staff confidence and competence in the use of the new intervention (e.g., new literacy program or new set of instructional practices). Legislation must take into account the importance of identifying what teachers and other staff should be doing in order to attain fidelity of implementation. Schools or districts may need to hire or recruit existing personnel who have the skills needed to implement the initiative with fidelity, and then provide targeted and efficient training to develop and encourage the use of those skills. Finally, as documented by the meta-analysis by Joyce and Showers (2002), training

should be accompanied by coaching in order to lead to behavior change or use of the new skills in the classroom. Dyslexia laws (or other legislation intended to improve literacy outcomes) must take into account the essential factor of highly trained staff. Workshops alone will not provide staff with the necessary skills. Ongoing professional learning, coaching, and the demonstration of teacher proficiency are critical to achieve intended results.

2. Organization Drivers

Organization-support Drivers, pictured on the right side of the triangle, provide the structure for ensuring that the selected intervention (e.g., evidence-based programs) are used as intended, sustained over time, and positioned to better "weather" external factors such as changes in funding, mandates, and staff. In a school or district setting, these include policies, resources and materials, procedures, and other structures that play a role in supporting the success of implementation. When challenges to supporting the implementation of the new innovation and the resulting shifts arise, additional financial, organizational, or other types of support might be needed from external sources outside the immediate school or district. In the case of a school or group of schools, this may mean assistance from the district. In the case of a district or group of districts, this may mean assistance from the state. Also part of the organization drivers, a robust data system should be used to advise the Implementation Team on how well the implementation processes are functioning. Fidelity matters. There must be built-in measures to assess the effectiveness of the innovation and implementation process during each stage of implementation. Without sufficient data, beneficial educational practices that are not adequately adopted and supported may risk being perceived as not being effective and ultimately discontinued.

3. Leadership Drivers

Leadership Drivers are at the base of the triangle since they are the foundation of selecting, supporting, sustaining, and scaling up any new evidence-based program or practice. The purpose of these drivers is to support existing leaders at all levels of the system as well as future leaders in a school or district. Building a system to implement a new program is difficult work. The two biggest challenges are that current systems are being disturbed and new, more transparent systems are being created. Heifetz and Laurie (1997) recognized that two levels of leadership styles are required to address these challenges: technical and adaptive. Technical leadership is required when there is a straightforward problem that has a straightforward solution (e.g., a need to change the school schedule to incorporate an intervention period, or buying more materials for classrooms). Adaptive leadership is required when the problem or the solution is not

entirely clear, or the solution requires a nuanced response (e.g., too many students are not reading on grade level despite a school-wide effort to improve performance, or staff are reluctant to use a new intervention). Both types of leadership are necessary to move a new program forward in the implementation process.

The How: Improvement Cycles

Leadership and Implementation Teams must make many decisions when adopting new evidence-based practices. There is much learning, and often un-learning, that takes place. This cannot occur in one short cycle of change. The educational system, at all levels, must create a process that allows for continuous improvement (Senge, 2006; Aarons, 2005). This process assists with the scaling up of a new policy with success.

Deming (1982) taught the field of manufacturing that engaging in intentional cycles that focus on improvement can help teams adopt innovations and create efficiencies. A key process articulated by Deming, and earlier by Shewhart (1931), is the Plan-Do-Study-Act (PDSA) Cycle. From an Implementation Science lens, Implementation Teams rely on PDSA processes to help them document decisions that evolve out of rapid problem-solving protocols. When changing systems and disturbing the status quo, many unanticipated barriers or challenges emerge. For schools, districts, or states, the use of improvement cycles provides a helpful process for making decisions systematically while engaging in continuous improvement. Repeating the cycle continues the process of usability testing. With each cycle, implementation should be refined and communicated. Documenting these cycles creates an institutional memory of decisions made and lessons learned that can be passed on to future stakeholders. It also informs stakeholders of the activities occurring and provides opportunities to solicit and incorporate their feedback. As a result, this process creates a supportive environment in which evidence-based programs and practices can thrive, builds a culture of trial and learning, and ensures that the supports in place are designed to improve student outcomes.

The Need for Enabling Contexts

The final variable in the Formula for Success is the importance of an enabling context. Attending to the What, Who, When, and How's of the Active Implementation Frameworks affects the predictability and achievability of the intended outcomes. This means having the right members on the Implementation Team; knowing where the school or district is in the cycle of implementing the intervention program and acting accordingly; understanding

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what the implementation drivers are and supporting them in a manner that promotes the outcome; and, finally, understanding and engaging in improvement cycles. Together, these comprise effective implementation methods that will help a school or district achieve its intended outcomes. However, as the formula depicts, attending to all of the above can only yield positive change when it occurs within an enabling context. That is, the school, district or state must leverage or create a supportive context in order to achieve the intended outcome.

Prior to implementing a new policy within a school district, it is important to learn more about the context within which it will be implemented. This requires attention to the culture of the school and district; support for all staff involved in the implementation; and policies, procedures, and practices that can facilitate the implementation of the intervention as intended. A new policy must fit into an existing myriad of competing priorities. School leaders must navigate a multitude of initiatives, limited budgets and time, and other new (sometimes competing) policies and mandates. An enabling context is critical so that the new policy or change is supported and results in the intended outcomes that are sustained over time.
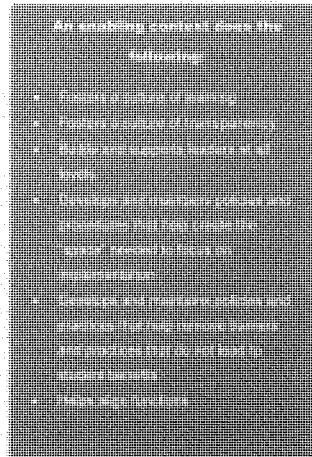
Learning how to foster an enabling context in school, district, and state settings is critical in order to achieve the intended outcomes. Because of the unique combination of variables, operationalizing these principles will look different in each educational setting. Therefore, the conditions for successful implementation of the selected intervention should be articulated at the school, district, and state levels so that they can be clearly shared. These conditions can then guide the development of a plan that results in a more enabling context in each setting.

Summary

All educators ultimately share a common goal: to improve outcomes for today's students and prepare them with the skills to succeed in careers that may not yet have been imagined. A core skill needed to succeed in the 21st century is the ability to read. In order to improve literacy rates and, ultimately, academic outcomes for students, careful consideration needs to be paid to the science of implementation.

As laws and policies are constructed and passed, it is essential to know that "good" policy is not enough. At the policy or decision-making level, it is critical to allocate time, flexibility, and resources for the application of implementation science principles. Implementation Teams may need to be developed and teams will need both time and flexibility to carefully plan how to integrate and sustain best practices in their unique setting. Leaders at all levels need to have enough information to select innovations that align with policies and to ensure that the core intervention components are clearly defined so that they can be translated into specific actions and outcomes. Education agencies at all levels will need to build supports and set expectations for gathering student outcome data as well as fidelity data. Together, these can better inform whether the selected interventions are in fact making a difference.

Legislators as well as all educators play a key role in helping well-meaning goals, at the heart of laws and policies, translate to expected outcomes. By bringing all the pieces of the Formula for Success together—choosing and using effective innovations, building and sustaining effective implementation processes, and leveraging an enabling context that includes practice informed policies and aligned functions—it is possible to achieve tangible results and improve the literacy rates of today's students and tomorrow's innovators.

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Related Resources

The following resources have been selected to offer examples of how Active Implementation Frameworks have been applied in local settings and links to resources to learn more about Applied Implementation Science.

All levels of the Education System

Make "It" Happen: Using Implementation Science with Wilson® Programs.
Duda, M.A., Penfold, A., Wernikoff, L., & Wilson, B. (2014). Wilson Language Training, Oxford, MA.
http://www.wilsonlanguage.com/PDF/Make%20it%20Happen%20Using%20Implementation%20Science%20with%20Wilson%20Programs.pdf

Active Implementation Hub.
National Implementation Research Network (2013), Frank Porter Graham Child Development Institute, University of North Carolina, Chapel Hill.
http://implementation.fpg.unc.edu/

Making It Happen vs. Hoping It Happens: Do It with the Science of Implementation.
Wilson, B.A., Coffey, J., Duda, M.A., Wernikoff, L., Regacho-Anaclerio, R., Hicks, J., & Logie, D. (2014). Symposium presented at the 65th International Dyslexia Association Annual Conference, San Diego, CA.
https://app.box.com/s/63h1n1q2thcaabk4fophix6ro4ads01f

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District Level

From Islands of Excellence to a Sea of Change: School District of Indian River County.
Wilson Language Training (2015), Oxford, MA.
http://www.wilsonlanguage.com/PDF/Indian_River_Profile.pdf .

Moving Your Numbers: Tigard-Tualatin School District: Achievement Profile
National Center on Educational Outcomes (2012), University of Minnesota-Minneapolis, MN.
http://movingyournumbers.org/images/digital/ttsd-achievement/index.html

School Level

Wilson Implementation Network: Combining Evidence-Based Wilson® Programs with Evidence-Based Implementation Practices: School Profile: Salisbury Elementary School, MA. Wilson Language Training (2014), Oxford, MA.
http://www.wilsonlanguage.com/PDF/Wilson_Implementation_Network_Site_Profile.pdf
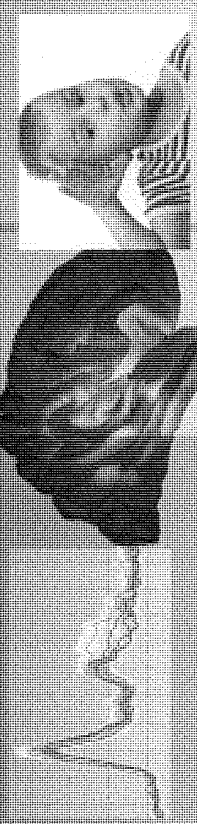
LITERATE NATION
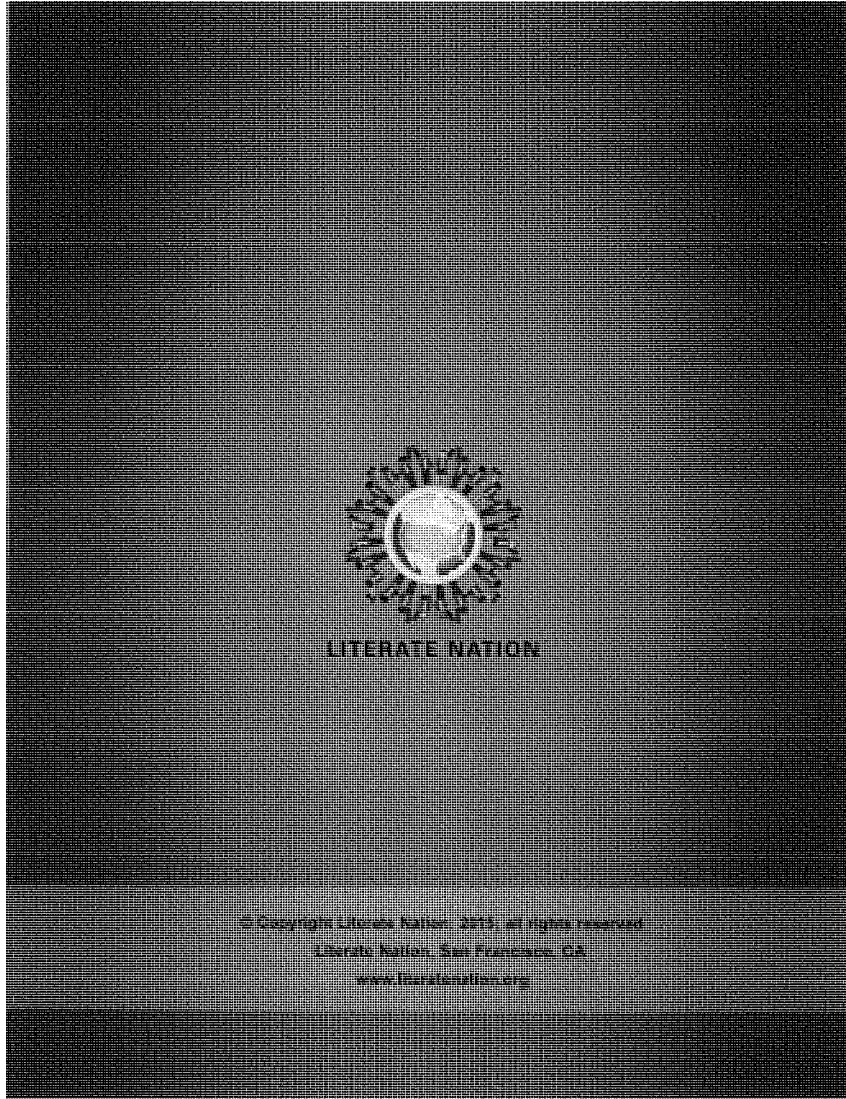
20

LITERATE NATION

We Have a Problem

- More than 60 percent of fourth and eighth graders struggle with reading and require targeted instructional support. (National Assessment of Educational Progress —NAEP)

Almost half of students of color, from low-income families and/or from urban areas enter fifth grade with reading skills below the basic level.

These outcomes mean that millions of young people lack rudimentary reading skills essential for academic or occupational success.

2

Oral language communication is the foundation upon which reading other academic skills depend.

For a variety of biological, social and cultural reasons, increasing numbers of children in the US are entering school without sufficiently strong spoken English language skills on which to build adequate literacy and other academic skills.

The most effective route to improving reading, academic and social competency is to strengthen the basic perceptual, cognitive and linguistic skills that build *oral* language proficiency.

Factors Leading to Weak Oral Language Skills

1) Poverty - Low SES

2) English Language Learners (ELL)

3) Language-learning Disabilities (LLD)

Language Exposure and SES

Cumulative Effects of Language Experience
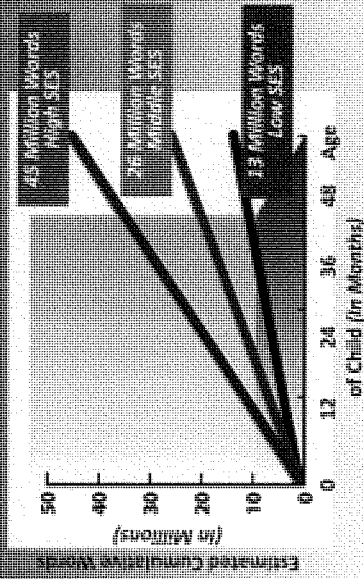
Effects of Low Language Development on Reading
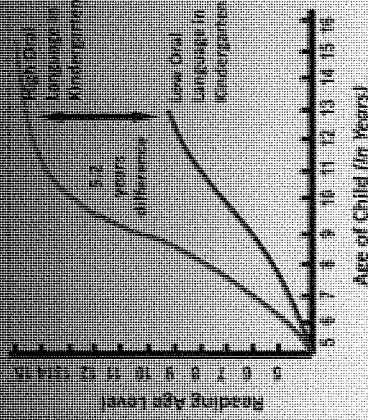
Meaningful Differences in the Everyday Experience of Young American Children, Hart & Risley. (1995).

(Loban, 1967; Hirsch, 1996)
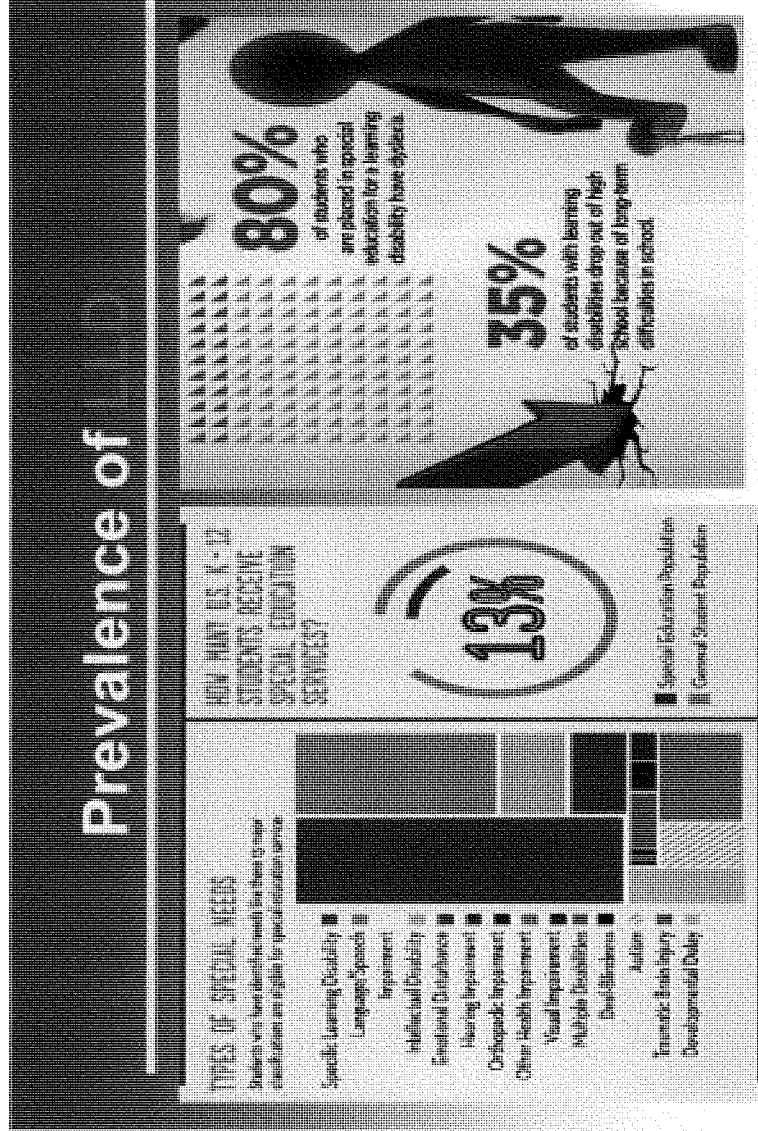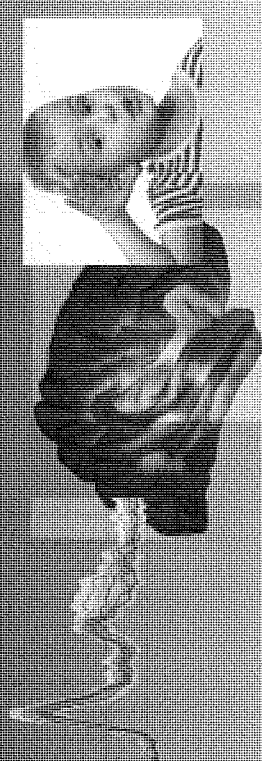
Insights from Research

- Our research has focused on understanding the neurobiological and environmental bases of individual differences in language development and disorders.

- We began our research program with the observation that many children with specific developmental language learning disabilities (LLD) leading to reading deficits have particular difficulty at the phonological (speech) level of language.
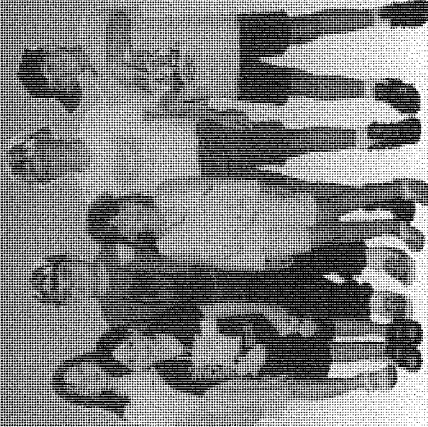
The Language to Literacy Continuum

Processing speech is the fastest thing our brain has to do. Our earliest studies led to the discovery that language impaired children have particular difficulty in both perceiving and producing brief, rapidly successive signals, specifically in the tens of millisecond time range.

Children with weak language development can't sequence 2 tones at rapid presentation rates

Tallal & Piercy (1973) Nature.

For speech, 10's of milliseconds can change the meaning of a word

"say"

"stay"

100 ms

Amplitude

Time (milliseconds)
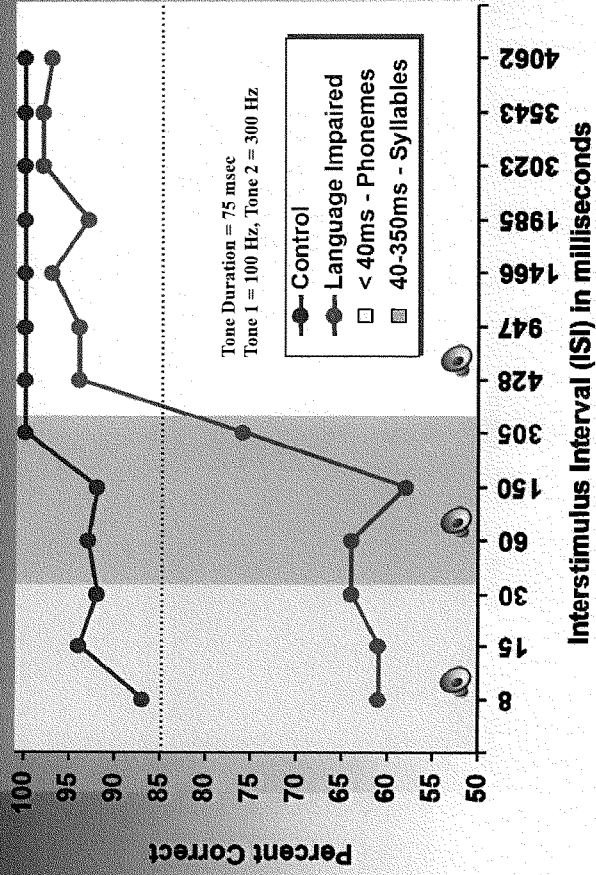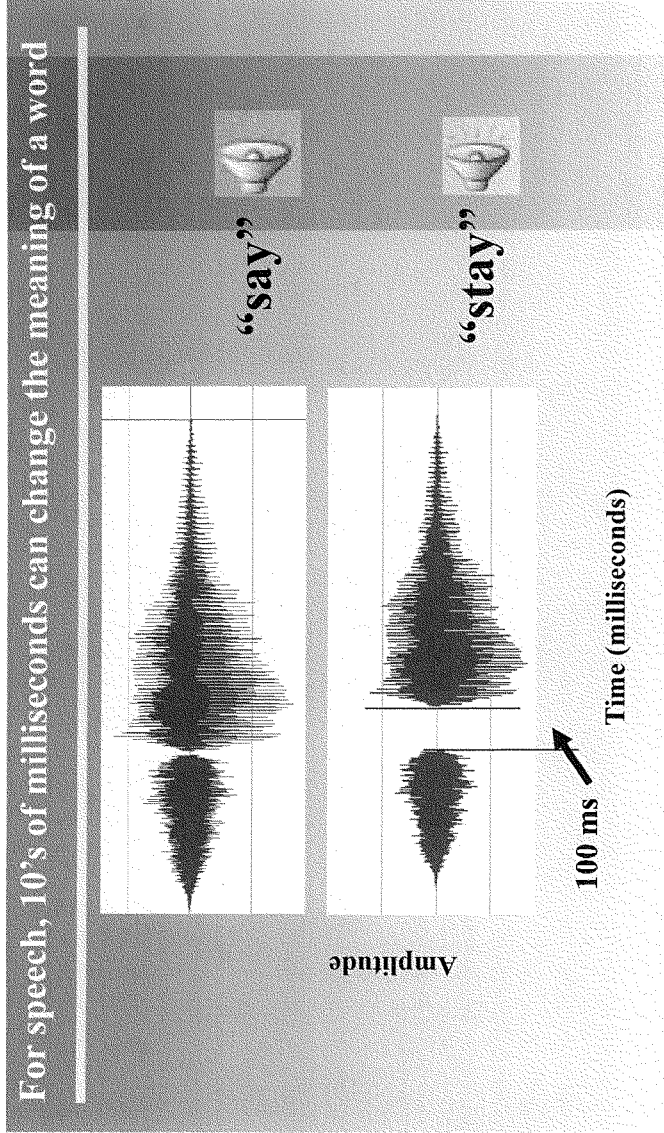
These waveforms are identical except for an inserted 100ms silent gap, yet we hear two different words. In order to be able to learn to read and spell we need to hear these small acoustic differences in words and become aware that it is these acoustic differences that the letters represent.

10's of milliseconds can determine which syllable we hear
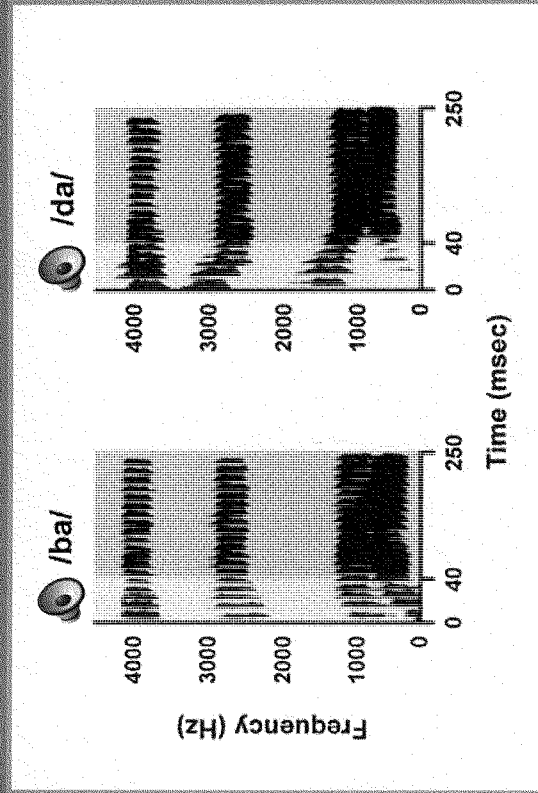
Many speech sounds (phonemes) differ only by brief spectral and/or temporal changes, specifically within 10's of milliseconds

Language enhances the brain's capacity for processing the fast acoustic changes in speech that are critical for distinguishing between each phoneme in a language

ga

ba

da

12

Lack of...
With English, due to low SES,
ELL, or LLD leads to blurree phonemic cortical
representations for English sounds
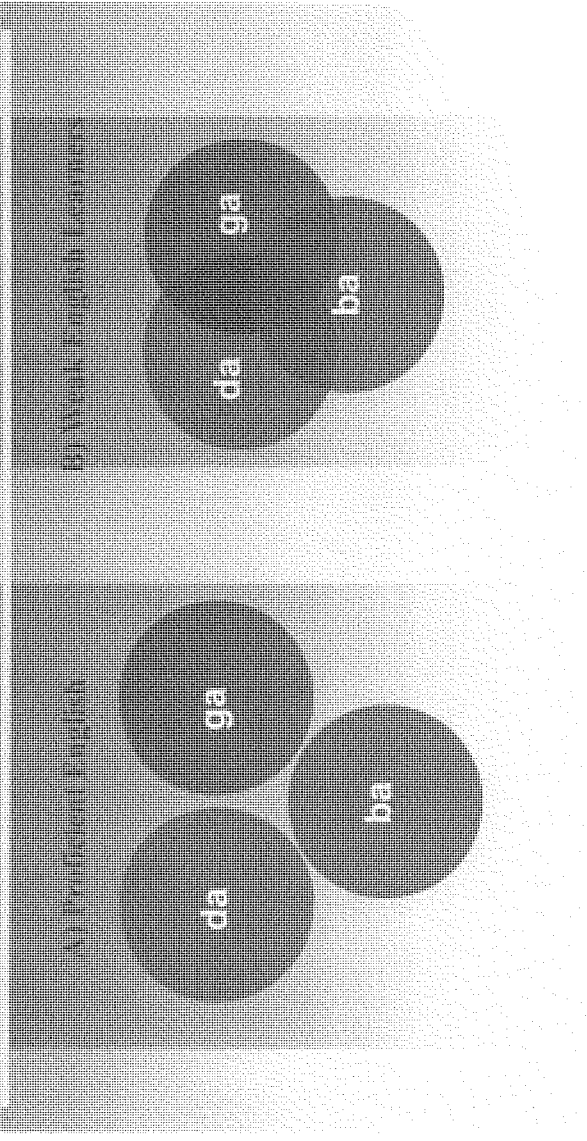
In order to learn to read proficiently a student needs to become aware that it is these distinct that the letters represent

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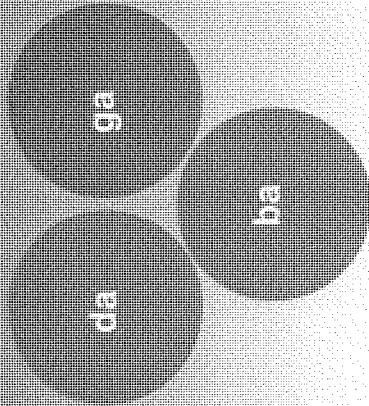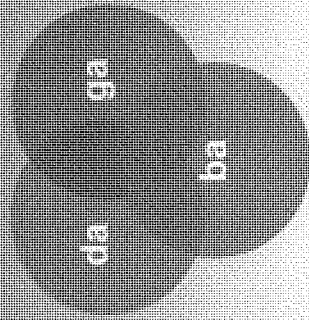
We discovered that speech can be computer modified to slow down the fast acoustic changes in ongoing speech
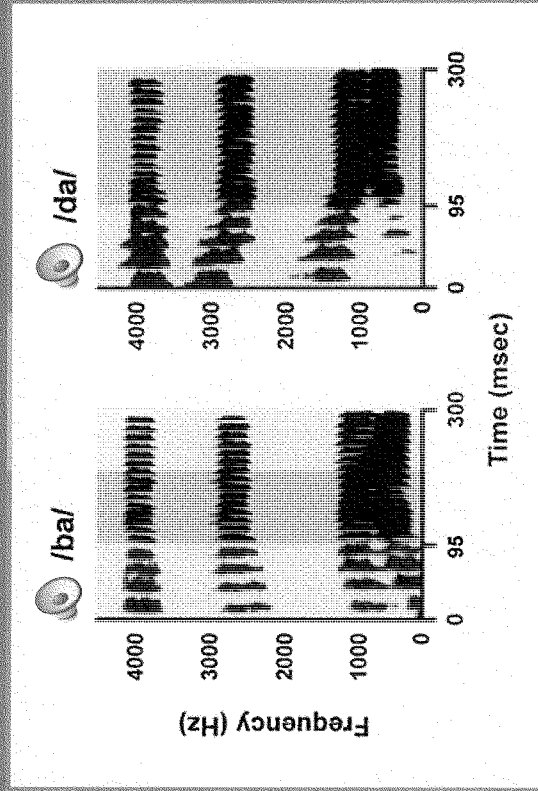
This research demonstrated that significant improvement in syllable discrimination can be achieved when the fast acoustic changes are extended in time

Tallal & Piercy (1975) Neuropsychologia, 13.

Subjects Reaching Criterion

■ Control
■ Language Impaired

CV Syllables
40 ms transition
(ba/da)

Steady-State
Vowels (a/ae)

CV Syllables
95 ms transition
(ba/da)
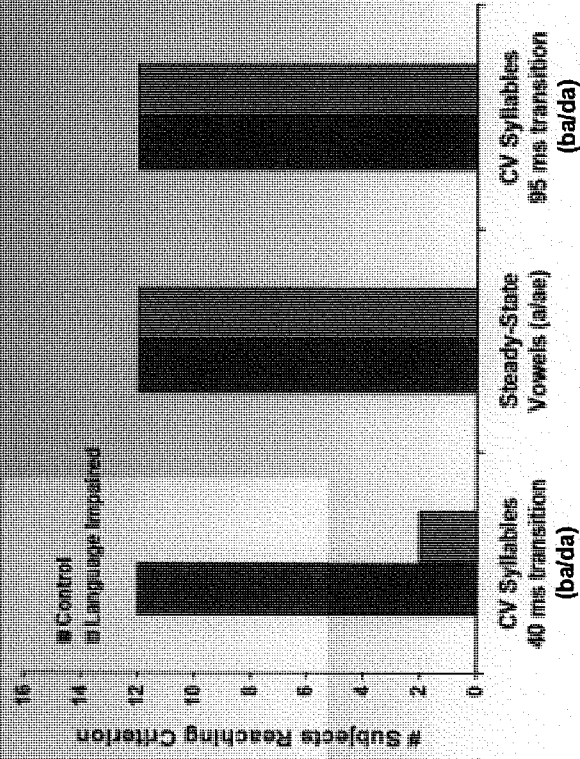
Research-based goals for building the language
Literacy Continuum -
Moving beyond traditional reading instruction

Our model suggests that intervention for improving language and literacy skills should include *both*:

Strengthening underlying neural capacity for learning, ie the *perceptual and cognitive building blocks* for learning (memory, attention, processing speed and sequencing)

Strengthening fundamental *linguistic building blocks* (phonology, semantics, morphology and syntax) essential for spoken and written language.

The Language Literacy Continuum
Goals for Intervention

Strengthen Perceptual/Cognitive Skills

Sharpen phonological representations

Enhance oral language abilities

Strengthen reading, writing, spelling

Reduce learning and academic problems

Successful students

Why have schools failed to focus on improving fundamental neural and linguistic capacities?

It is commonly believed that children enter school with differing genetically and/or environmentally endowed brain capacities and that teachers must just make-do with these individual differences in neural capacity. Recent breakthroughs in the neuroscience of learning, specifically in neuroplasticity, have demonstrated that this view is fundamentally wrong. (Merzenich and Jenkins, 1993).

What is Neural Plasticity?
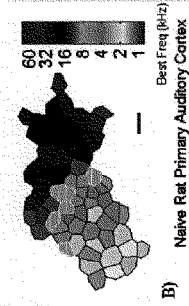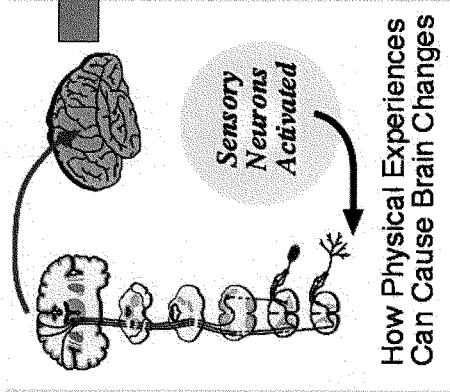
the brain's capacity to physically change the size and capacity of cells based on experience.

Neuroplasticity is regulated by age, experience and neurochemical signals
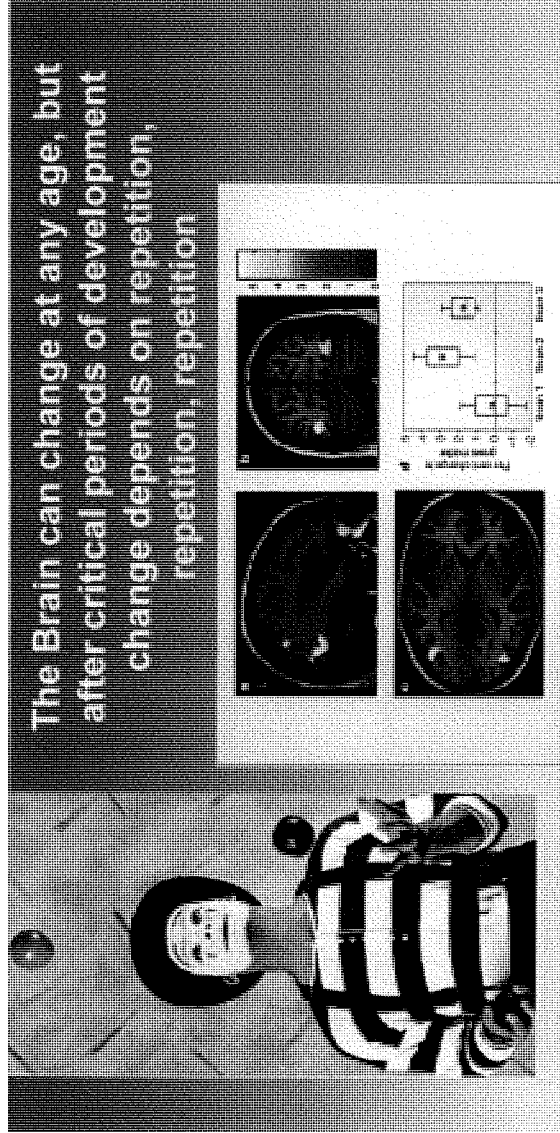
The Brain can change at any age, but after critical periods of development, change depends on repetition, repetition, repetition

Subjects were taught a simple juggling task to criterion and re-scanned after 3 months. Controls were scanned twice, 3 months apart, but not taught to juggle (Draganski et al.).

Focal increases in gray matter and white matter were observed in motor sequencing areas of the brain only in the subjects who were trained to juggle.

Variables Driving Neuroplasticity

Frequent / intense input (repetition, repetition…)

Adaptive trials (easy to hard)

Sustained attention

Timely rewards (releasing neurochemical signals that indicate, "that was a good one, save it")

Implications for literacy intervention

Children from poverty, ELL or LLD do not experience sufficient repetitive English language stimulation needed to set up the distinct phoneme categories for English phonemes, which are critical for learning both spoken and written language. Neuroplasticity training methods create the automaticity in the neural firing patterns that sharpen phonological representations in the brain - which is the foundation needed to develop proficiency in English.

Language (Literacy) Continuum
Goals for Intervention

Strengthen perceptual/cognitive
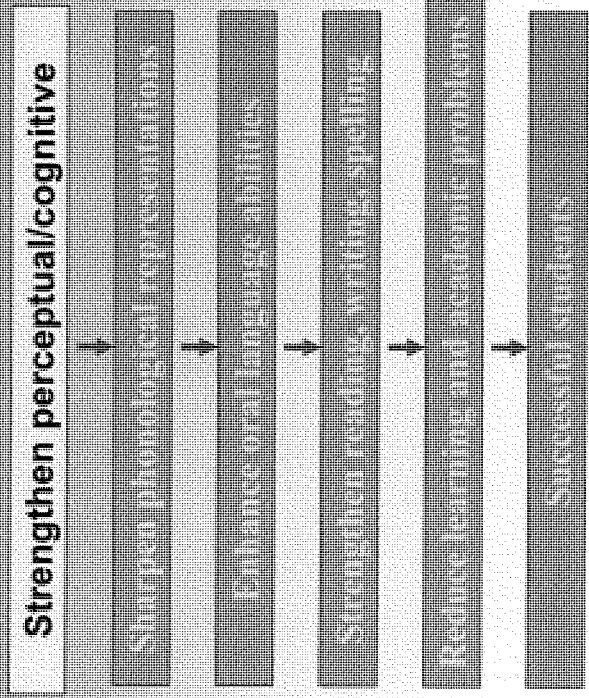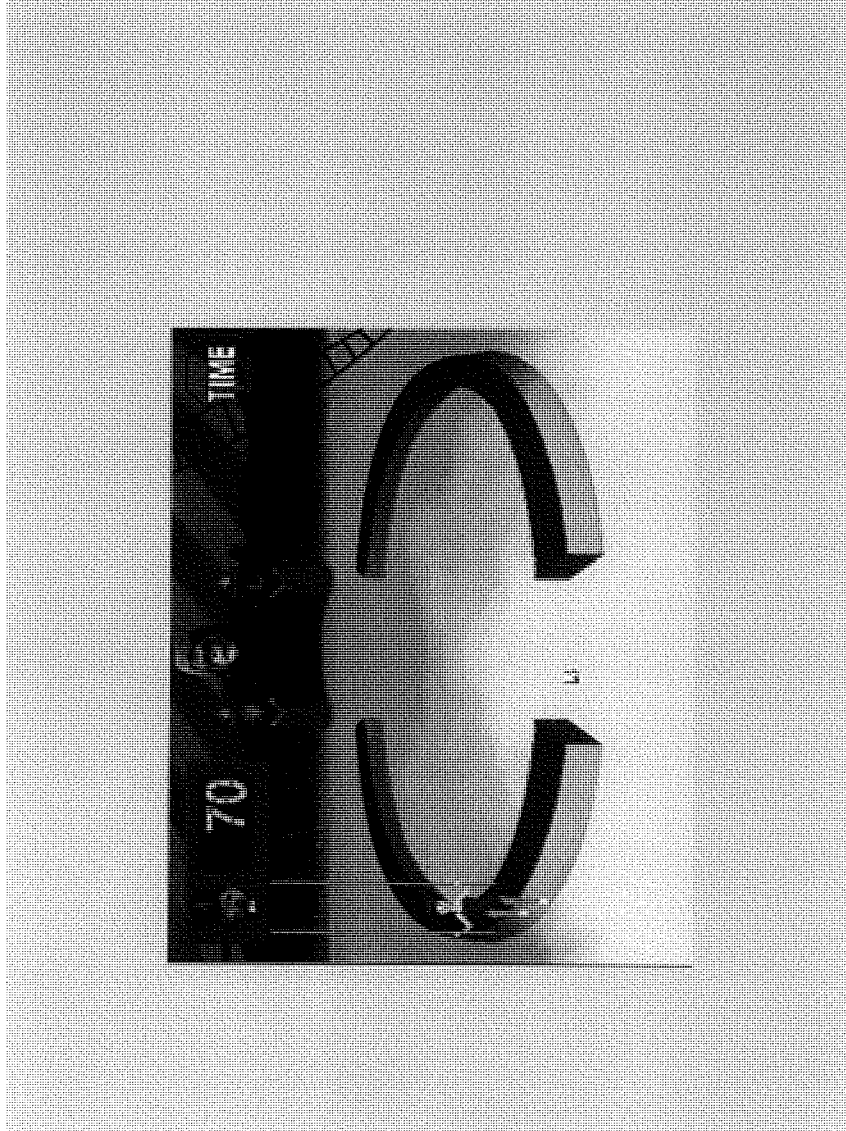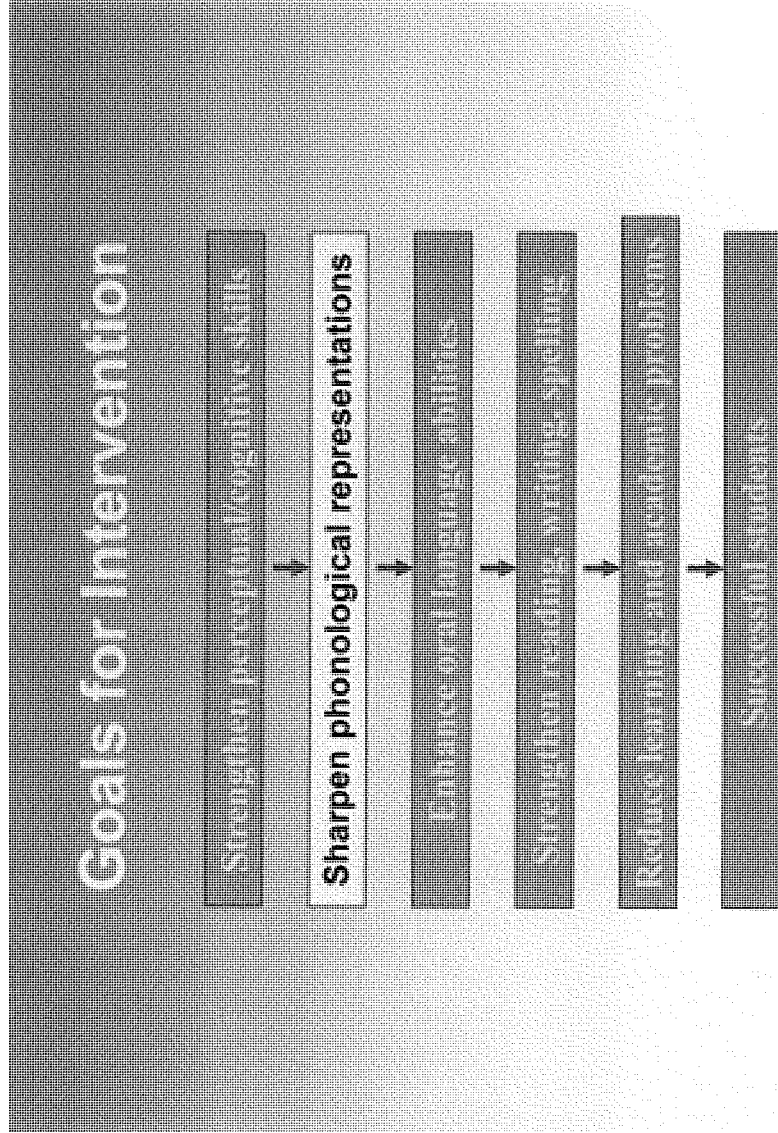
Computer Enhanced Speech

the fast acoustic changes in ongoing speech
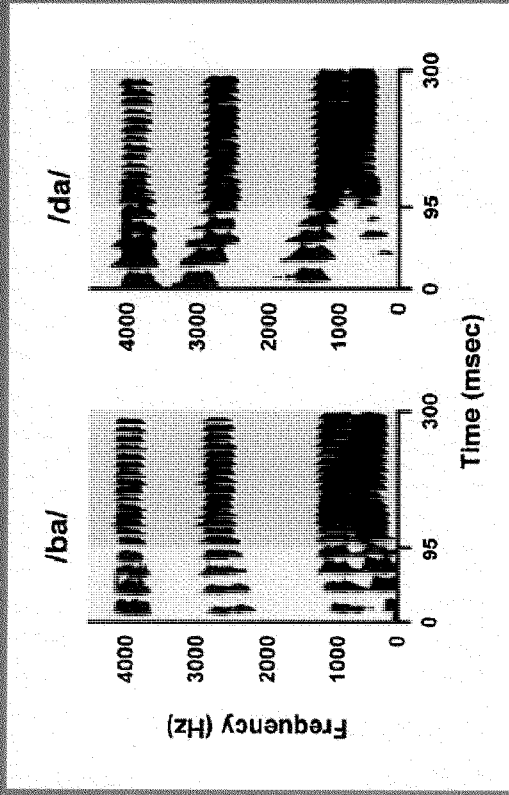
Sharpen Phonological Representations
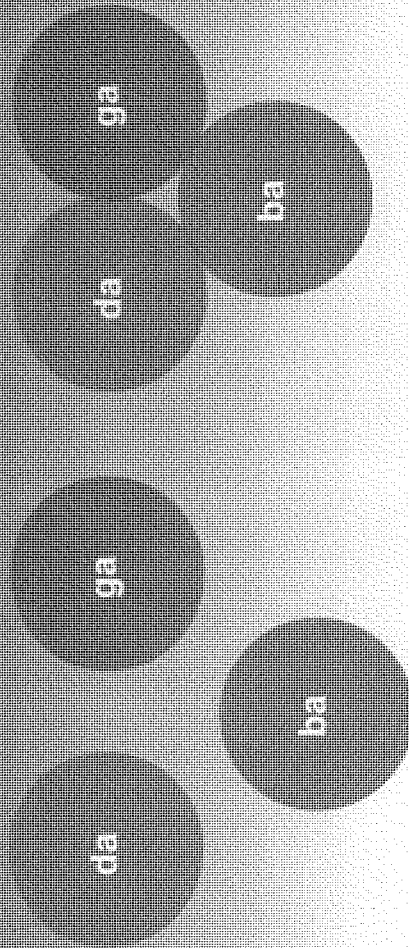
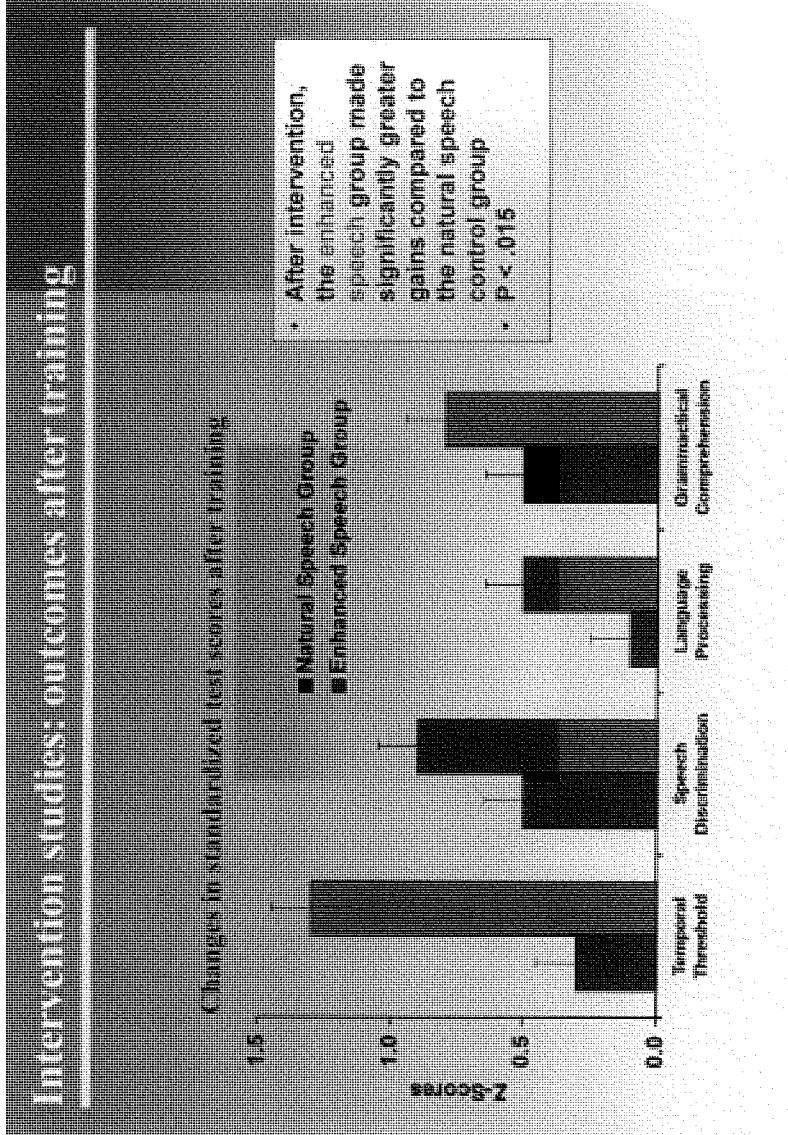Explicitly Train Each Rule of English Grammar

The baby who is hugging his Mom is not crying.

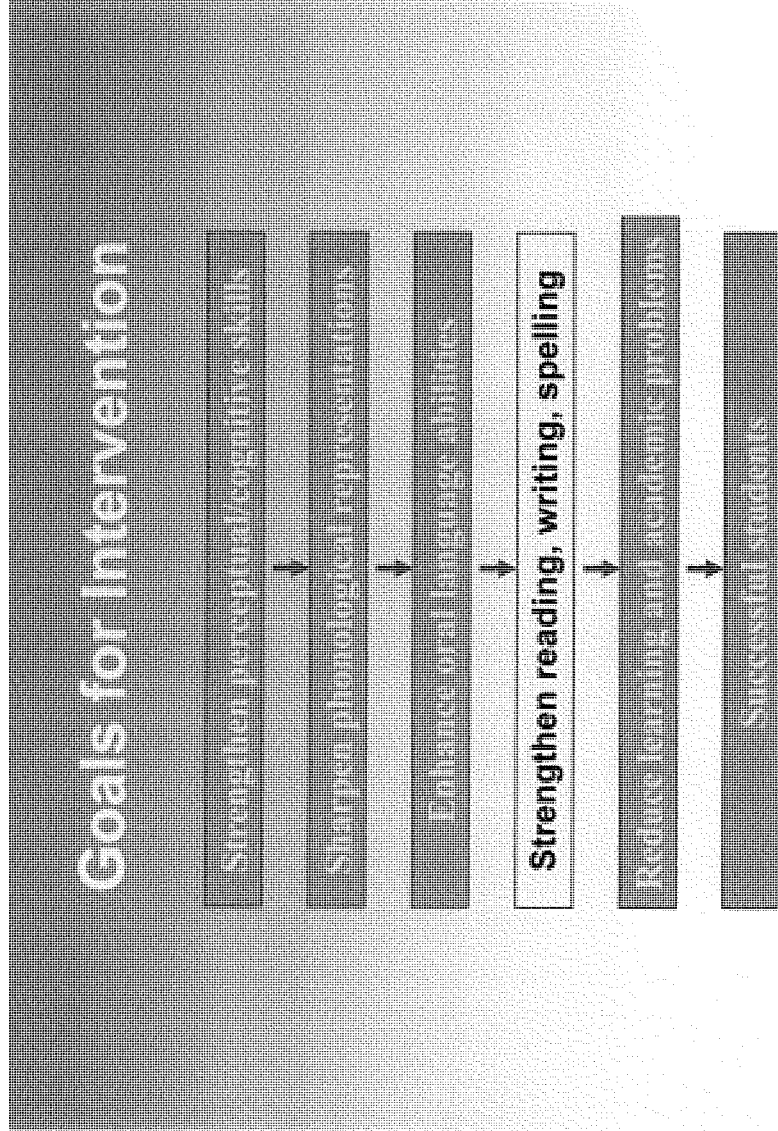Tallal et al. (1996) Science, 271.

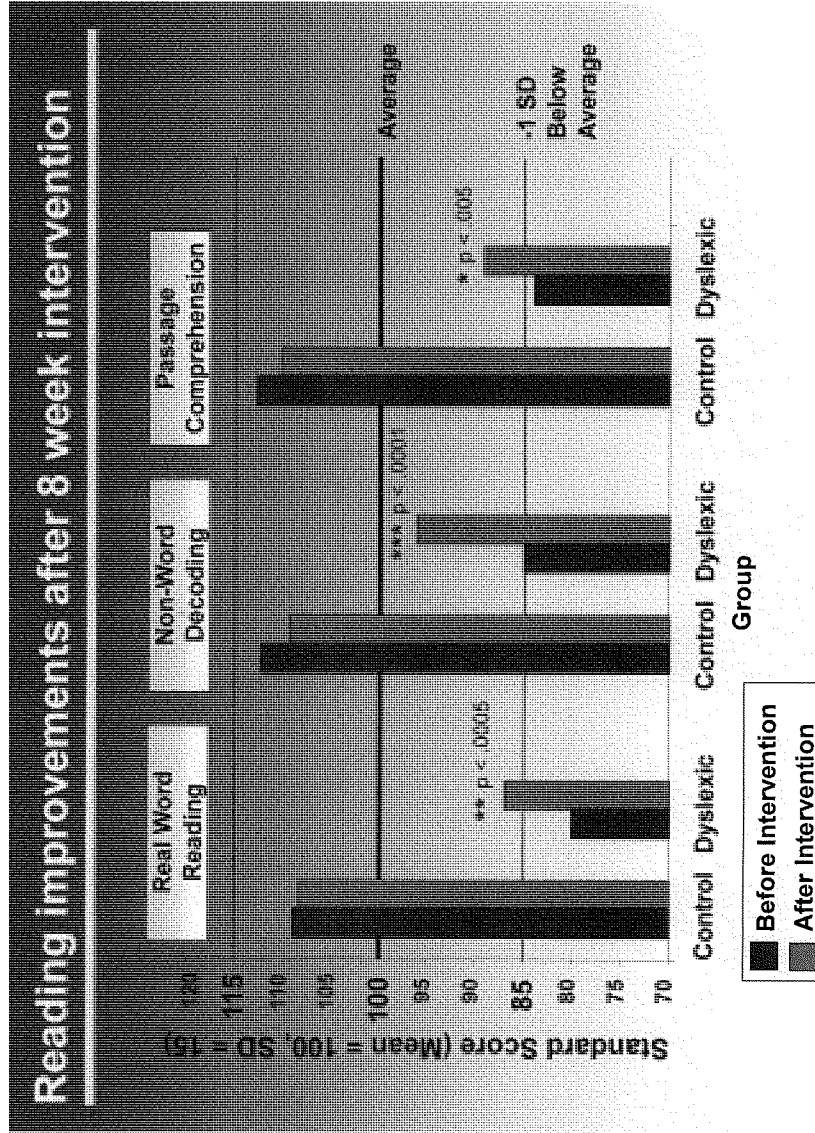Teacher selected "academically at risk" group
Large urban school district

Score Distribution on a Standardized Language Assessment

(n = 288)

Number of Cases

Pre-training z-score

Post-training z-score

Goals for Intervention

Strengthen reading, writing, spelling

Reading improvements after 8 week intervention

Temple et al. (2003) PNAS 100.

fMRI activation while viewing two letters and determining whether their names rhyme

Control

Frontal AND Temporo-parietal

Dyslexic

Frontal but NOT Temporo-parietal

Example:
B D = Rhyme
B K = Do Not Rhyme

Temple et al. (2003) PNAS, 100.

fMRI Activation While Rhyming Letters

Controls

Dyslexics
Pre
Intervention

Dyslexics
Post-Intervention

Frontal
& Temporo-
parietal

Frontal
but NO
Temporo-
parietal

Increased
activity in
Frontal &
Temporo-
parietal

Brain activity differs between controls and dyslexics.
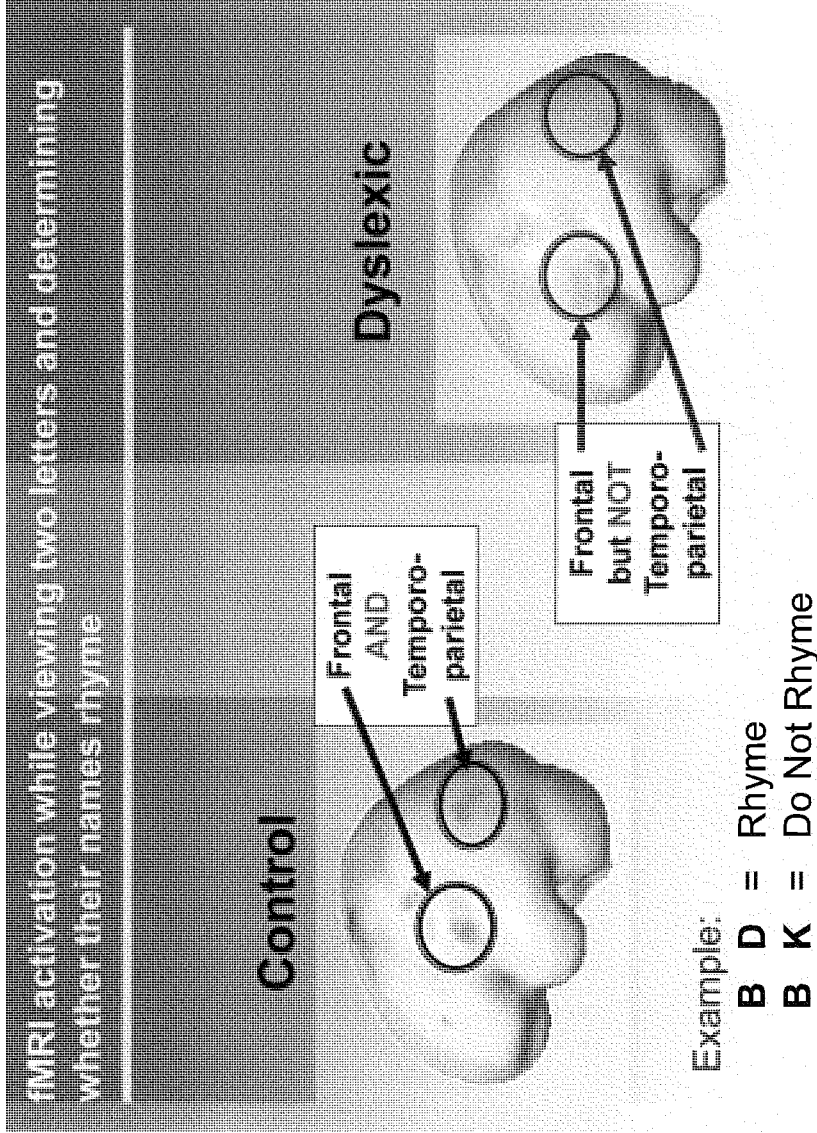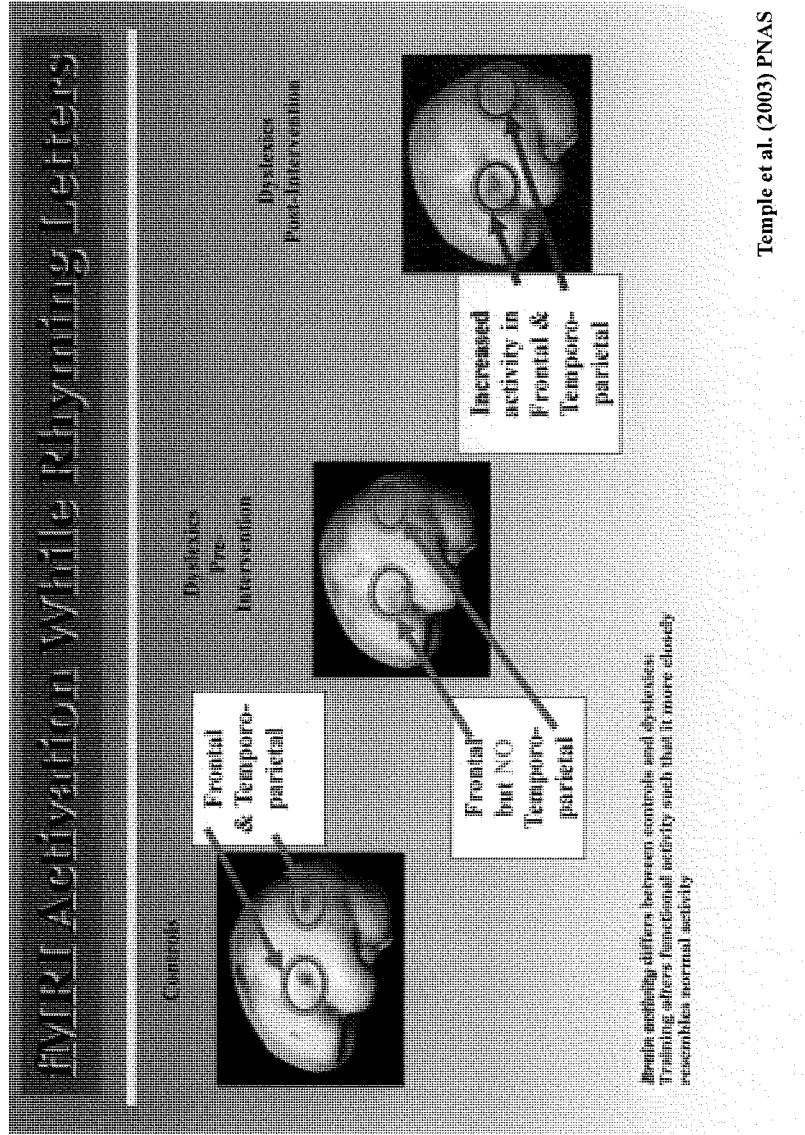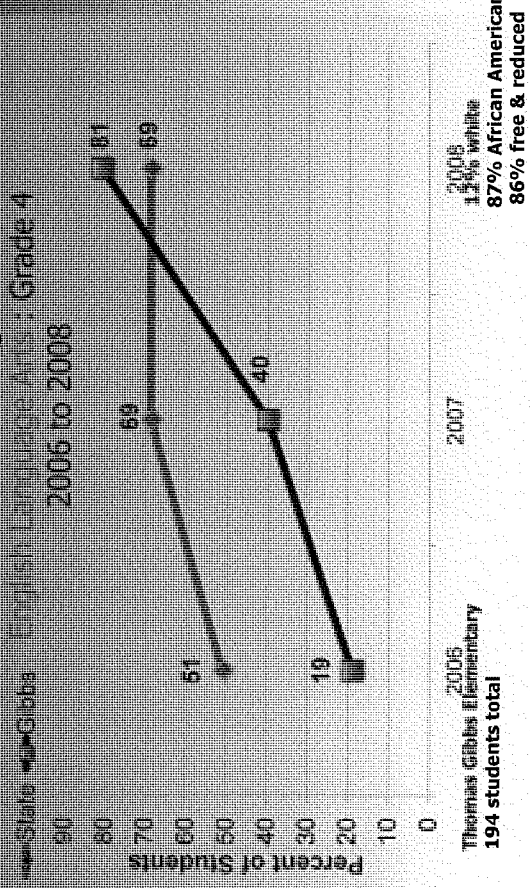Training alters functional activity such that it more closely
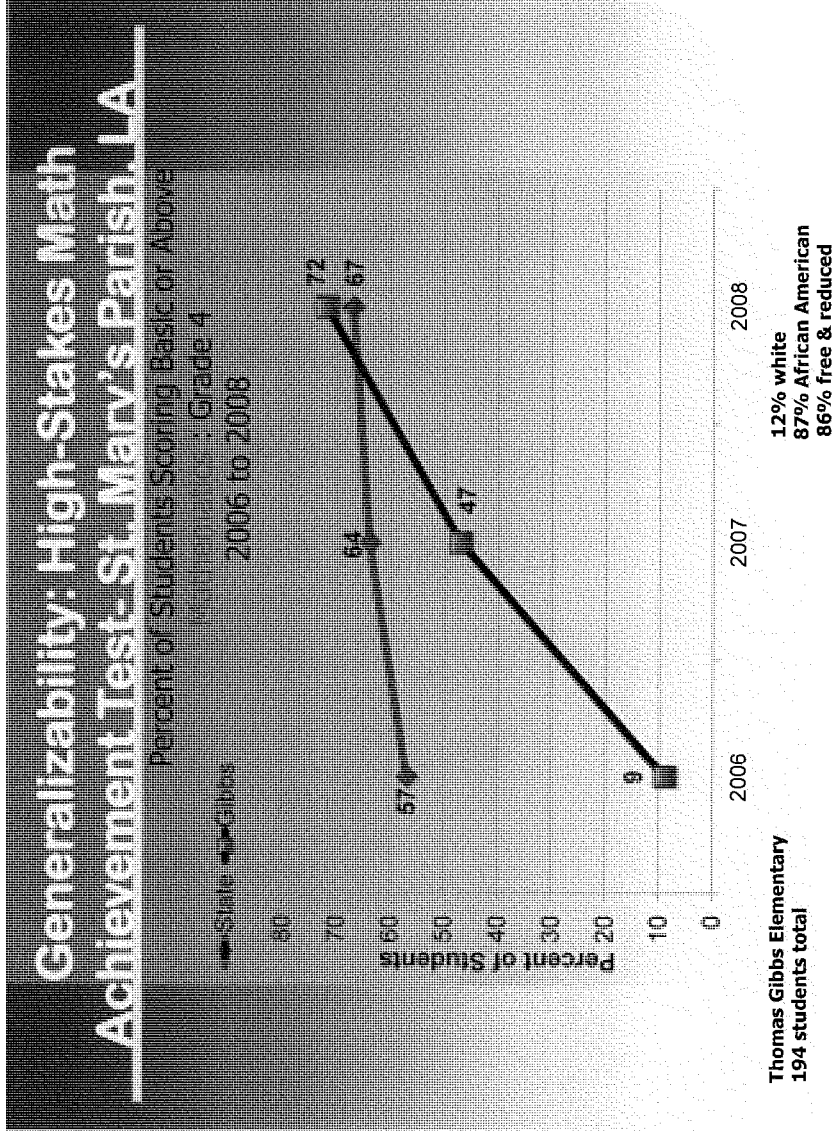resembles normal activity

Temple et al. (2003) PNAS

State-wide language achievement results : St. Mary's Parish, LA

Percent of Students Scoring Basic or Above : Grade 4 2006 to 2008

Generalizability: High-Stakes Math
Achievement Test St. Mary's Parish LA

Percent of Students Scoring Basic or Above
Grade 4
2006 to 2008

State — Gibbs

72
67
64
47
57
9

2006   2007   2008

12% white
87% African American
86% free & reduced

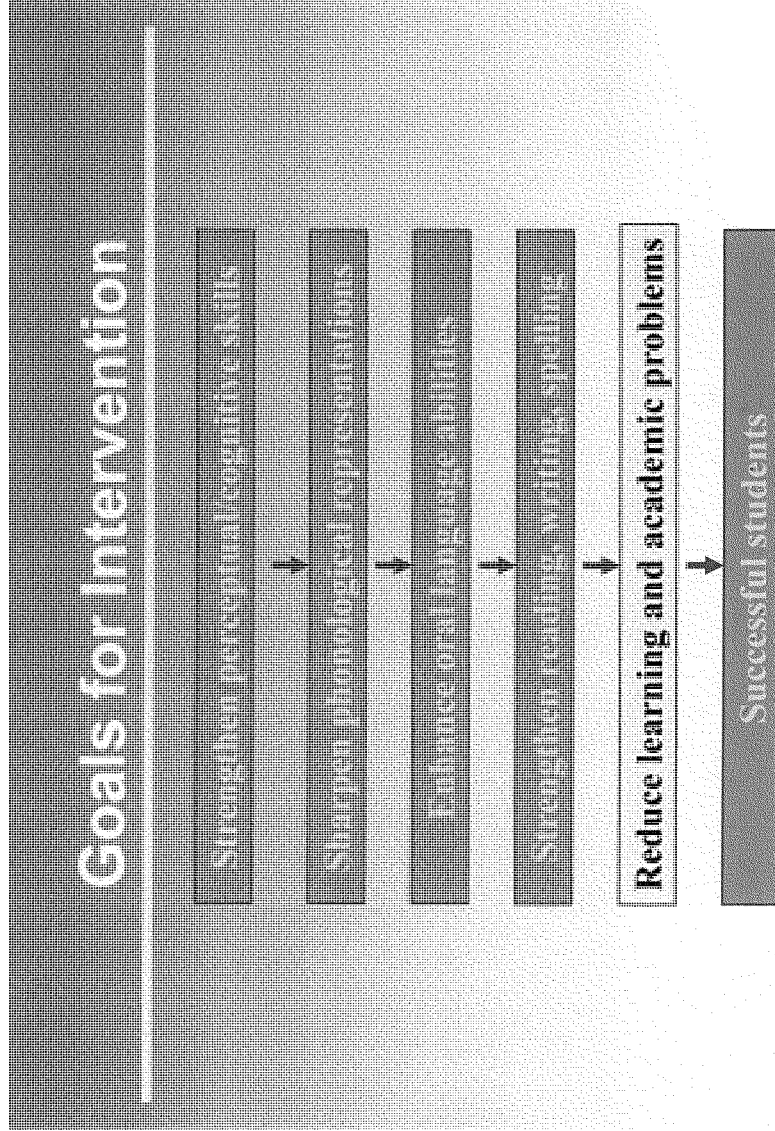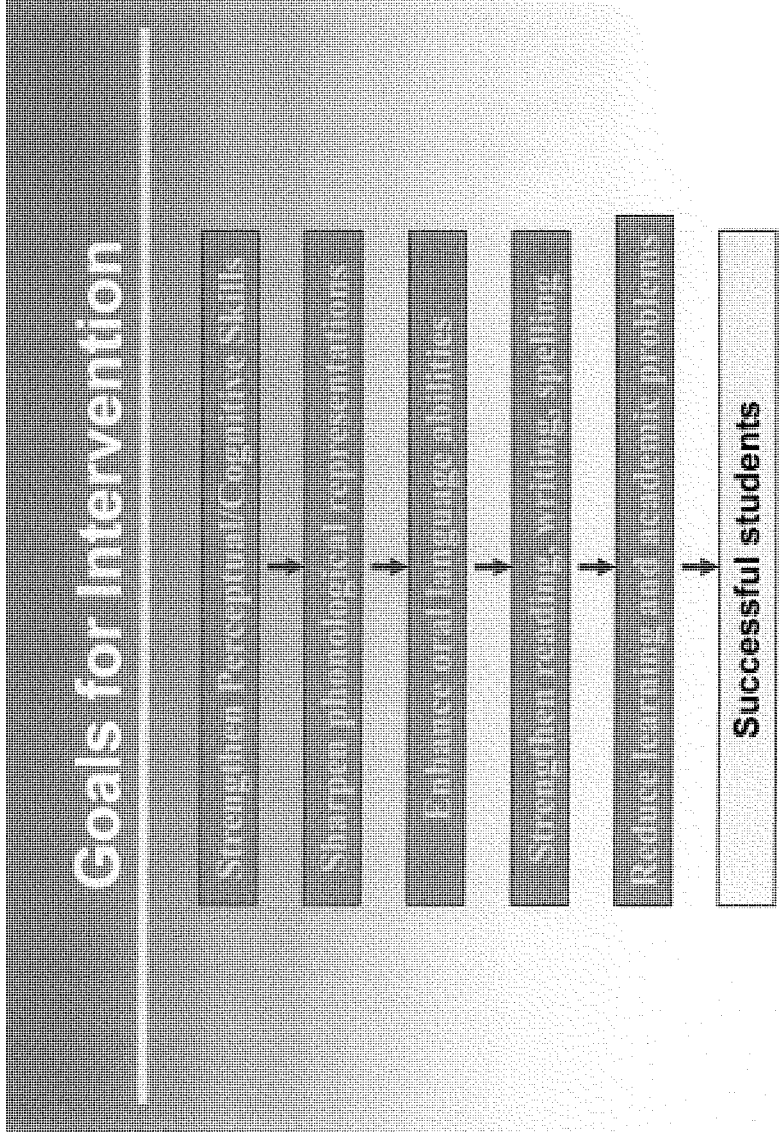Thomas Gibbs Elementary
194 students total

Percent of Students

What Works Clearinghouse

#1 Rated Intervention for improvement in English Language

Intervention	Improvement Index	Effectiveness Rating
Fast ForWord® Language	31	+
Instructional Conversations and Literature Logs	23	+
Read Well®	21	+
Peer Tutoring and Response Groups	17	+++
Vocabulary Improvement Program for English Language Learners and Their Classmates (VIP)	17	+
Bilingual Cooperative Integrated Reading and Composition (BCIRC)	11	+
Arthur	11	+
Read Naturally®	9	0
Enhanced Proactive Reading	-1	0

Source: http://ies.ed.gov/ncee/wwc/findwhatworks.asp The table has been reformatted to fit this slide.

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Goals for Intervention

Reduce learning and academic problems

Successful students

Goals for Intervention

Successful students

Integrating basic science, technology, and education: Moving Research from the Lab to the Classroom. Scaling up.
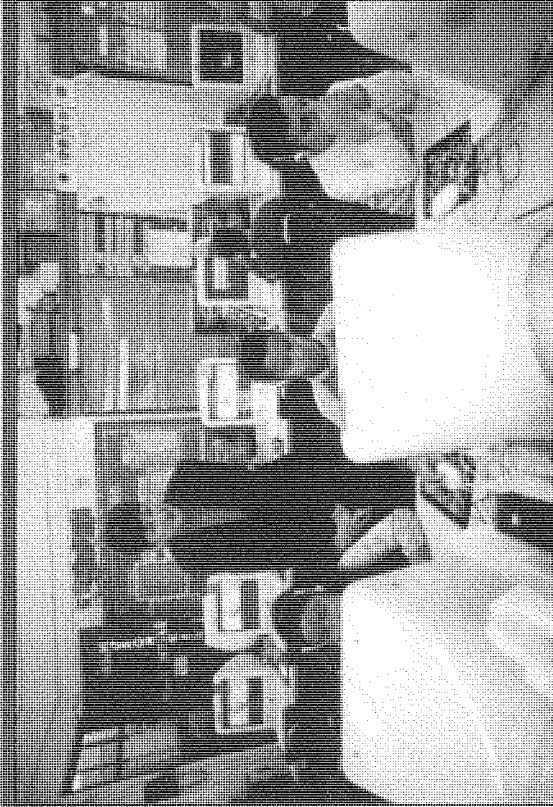
To date, over 2.5 million children in over 12,000 schools nationwide, as well as in 55 countries internationally, have received Fast ForWord® Language and Reading intervention programs.

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"For more information about Fast ForWord please go to the Scientific Learning Corporation website at www.scientificlearning.com"

THE STORY

of the

TEXAS

DYSLEXIA

LAWS

Tincy Miller

MY STORY BEGINS...

In 1956 when my eldest son was born (the eldest of four).
Thirteen years later in 1971, he rebelled... thus begins my journey,
A journey that Robert Frost referred to in his famous poem
The Road Not Taken (last paragraph...):
"I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in the wood, and I...
I took the one less traveled by,
And that has made all the difference".

Or as the famous baseball player Yogi Berra said:
"When you arrive at a fork in the road, take it".

In seeking the answers to my son's problems, I found myself going back to academia for the answers... by age 19, we discovered he had an IQ of 145 with a form of dyslexia called dysgraphia. By then, my journey had taken me to Texas Scottish Rite Hospital for Children where I became an Academic Language Therapist earning my Masters in Reading from Texas A&M Commerce. During the eight years I taught in the Reading Laboratory at TSRHC, Highland Park Presbyterian Meditative School, as well as one-on-one teaching with children with dyslexia and related disorders. I became passionate about these precious children who traditionally fall through the cracks... just like my son.

In 1983, Texas passed the most comprehensive reform in public Education requiring higher expectations of students and teachers. It became known as the famous "No Pass, No Play" law. The 1200 school districts were mandated to have students study and pass before they had the privilege of playing a sport, such as football. Needless to say, the schools were pretty upset. There was a glaring omission... no safety net for the children I knew and taught... the very

1

ones who were traditionally forgotten in the public school system. Therefore, I made up my mind to try to find a way to help them.

As Joyce Pickering, chairman Emeritus of the Shelton School in Dallas states: "These children are very gifted... they are the students who think out of the box, our future entrepreneurs."

In 1984, the Governor of Texas appointed me to serve on the new appointed State Education of Board (SBOE) for a 4 year term then revert to an elected board in 1989. **In January of 1985,** three bills on Dyslexia came to my desk. I sent them over to Dr. Lucius Waites at TSRHC for his advice. He sent them back and said "Go for it!" The Texas Legislature meets every odd year from January to May... I only had 5 months to work on these bills. Thanks to my husband Vance, who loaned me his lobbyist to teach me how to work the legislature, **we were able to facilitate the passage of two of the three bills. The original bill (HB 157 69th Legislature) defined dyslexia and related disorders mandating the screening and treatment by the local school districts.**

The second bill (later repealed) mandated continuing education for teachers on dyslexia and related disorders. The third bill that failed related to college courses on dyslexia being required. The bills were authored by Senator Ted Lyon and Representative Bill Hammond.

An unhappy teacher called to tell me that when I leave the SBOE, the law will be repealed. Whereupon, I told him I wasn't leaving... 26 years later I served as an elected member of the SBOE and made sure that the Dyslexia Law was implemented. **The following is the chronological order of its implementation:**

December 1986: Texas Education Agency sent a letter to all school districts explaining that the law needed to be implemented at all grade levels (K-12).

January 1987: The State Board of Education approved the first

procedures and guidelines.

1987: 70th Legislature repealed the professional development law because it was connected to the career ladder and the teachers did not want to be evaluated to earn extra money.

March 1990: Special Education teachers (who did not want the law) called for a public hearing on the law. Over 800 people (parents, students, teachers and administrators) attended from 8:30 a.m. to 9:30 p.m. testifying two to one "yes" the dyslexia law was needed, and rules were needed to implement the law because school districts were not implementing the law. (By the way, this was when there were no cell phones, computers, faxes to get the word out... we did it the old fashioned way: writing letters and making phone calls to our friends.) This was truly democracy in action... the grassroots can make a difference.

In 1991: 72nd Legislature passed HB 1314, accommodations for the students with dyslexia was allowed.

In 1992: First Dyslexia Handbook was approved by the SBOE and published by the TEA with an overview of state and federal requirements including a question and answer section.

1993-1994: First State Coordination position was created in Region Service Center X with the approval of then Commissioner Skip Meno. The first state coordinator was Jo Polk followed by Cindy Hipes, Helen Macik and Brenda Taylor. SB 7 was passed requiring accommodations for testing dyslexic students.

1995-1997: Important years for Texas. George W. Bush was elected as Governor of Texas and took on reading by inaugurating his reading initiative with $80 million. This law became known as "No Child Left Behind" stating that all children will read by 3rd grade. During this time, because it has been ten years since the education

code had been written, the legislature mandated the entire education code be rewritten for public schools again. Realizing our Dyslexia Law could be lost I made a very important call to the author, former Senator Ted Lyon, asking for his help in getting the Dyslexia Law rolled over into the new education law.

Thanks to his friendship and support, former Senator Ted Lyons was able to get this done.

During these two years (1995-1997), our SBOE was in charge of updating all state curriculum (K-12). Thanks to my good Reading-Teacher friends, they helped me find the best qualified teachers to serve on the committee to rewrite and update the Reading Curriculum (K-12)... resulting (historically) in the passage of the first phonics-based Reading Curriculum for Texas... (ten years later in 2009, we were again able to update the 1997 Reading Curriculum with a stronger explicit scientific-research phonics-based curriculum... the reading textbooks 2010-2011 are now adopted). Part of the $80 million covered Summer Reading Academies and Dyslexia Academies for teachers K-3rd grade (until the money ran out). Proving phonics works, in 2003, 98% of all third graders passed the State TAKS Reading Test. Since our Dyslexia Students need phonics, the new updated research-based phonics curriculum in Texas reinforces their learning to read, write and spell.

1997: The Legislature passed the Students Success (Funding) Initiative and Reading Diagnosis for early identification of reading difficulties, such as: Dyslexia and related disorders (TEC 28.006). Informal screening was developed for the early identification.
Also, Commissioner Mike Moses approved $300,000 for Dyslexia Coordinators in all 20 Region Service Centers.

1998: The Dyslexia Handbook was updated.

2001: Another update to the Dyslexia Procedures and Handbook

2003: TEC 7.028 (b) Limitation on Compliance Monitoring was passed.

2004: As a result of a longitudinal study by TEA, **Bundling Accommodations for Assessments were implemented.** The purpose: to be able to test our students with Dyslexia with three bundling accommodations without invalidating the state test. (1) Oral reading proper nouns, (2) Oral reading of questions and answers on multiple choice, (3) extended time over two days. Results went from 9% to 41%success for elementary through middle school students (longitudinal study continues with High School students).
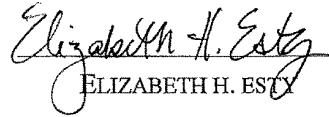
2007 and 2010: Our Dyslexia Handbook was revised to include the current research of the experts in the field of Dyslexia with page numbers to support early intervention and quality training of teachers with the ability to prevent reading failure by 95%. And the new Licensure Law passed (on the third try after attempts in '05 and '07) in **2009 81st Legislature (effective September 1, 2010).**

In closing, I am reminded of the words of Emerson:
"Do not go where the path may lead. Go where there is no path and leave a trail." This has been an incredible journey of how one very important law to keep our students with dyslexia from falling through the cracks of public education was implemented... and I am so glad I took that path or fork in the read... for it truly has made all the difference.

PREPARED STATEMENT SUBMITTED BY ELIZABETH H. ESTY

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Statement and Questions for the Record
Hearing of the House Committee on Science, Space, and Technology
"Dyslexia and the Need to READ: H.R. 3033, the Research Excellence
and Advancements for Dyslexia Act."

September 30, 2015

Thank you, Chairmen Smith and Ranking Members Johnson for holding today's
hearing to review Chairman Smith's bill, H.R. 3033, the Research Excellence and
Advancements for Dyslexia Act.

Early identification of children and students with dyslexia is critical. Parents in
Connecticut understand that early detection is possible when teachers have the
resources necessary to detect and address dyslexia. Their advocacy helped drive
the Connecticut legislature to enact legislation that identifies dyslexia as a primary
disability for special education services. This legislation was signed into public law
14-39 by longtime advocate Connecticut Governor Dannel Malloy, who as a young
boy was diagnosed with severe dyslexia. Starting this year, Connecticut is now
required to train its teachers in dyslexia recognition and intervention.

Connecticut has played a leading role in helping teachers develop evidence-based
practices for instructing dyslexic students. However, we can and must do more on
the federal level. Passage of the Research Excellence and Advancements for
Dyslexia Act or the READ Act would echo what the Connecticut state legislature
has already enacted. This bipartisan legislation would devote $5 million within the
National Science Foundation (NSF) to advance research in the early detection of
dyslexia, helping teachers develop curricula and evidence-based tools for teaching
children with dyslexia across the nation.

As a mother of three children, I know how important it is to provide our children
with a quality education, particularly to those living with disabilities. That is why I
offered an Amendment to the Elementary and Secondary Education Act (ESEA) to
increase funding for students with disabilities and to set national standards that
prevent abuse through seclusion and restraint practices. We have an obligation to
prioritize education and disability issues, and I join others on this committee who
are eager to work together to advance our shared goal of delivering a quality
education to all students.

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