

**Levels of Language:
Application to Diagnosis, Instruction, and Functional Writing Systems**

Virginia W. Berninger, Professor Emerita, University of Washington

January 21st, 2022 11:00-11:45 am Eastern Standard Time

In The Writing Brain Strand of
The 2022 International Conference on the Science of Written Expression
Organized by Kathleen S. Wright,
Executive Director The Handwriting Collaborative

Presenter's Teaching, Clinical, and Research Experience

- Virginia Wise Berninger (Ph.D., Psychology, Johns Hopkins University; APA-approved predoctoral and postdoctoral clinical psychology training, Boston's Children's Hospital) was a general education teacher in urban and suburban schools, a special educator, and a reading specialist before becoming a clinical psychologist, researcher, and university professor. She was on the Harvard Medical School Faculty, 1981-83; Tufts New England Medical School Faculty, 1983-1986; and University of Washington, Seattle Faculty, 1986-2016, Professor Emerita, December 2016 to present. *From 1989-2008, she was Principal Investigator of NICHD/NIH-funded grants on assessment and instruction for typically developing and at-risk writers and readers. From 1995-2006 and 2011-2016 she was Principal Investigator of an NICHD/NIH funded Multidisciplinary Research Center on Learning Disabilities that conducted genetics, brain imaging, assessment, and instructional studies that provided evidence for Differential Diagnosis and Differentiated Instruction for Dysgraphia, Dyslexia, and Oral and Written Language Learning Disability (OWL LD).* During retirement she has been active in translation of this programmatic research into clinical and educational practice and in professional development relevant to translation of the research into practice.
- She was the recipient of the *Samuel Torrey Orton Award*, International Dyslexia Association, 2015; the *OWL Award for Outstanding Work and Leadership*, Slingerland® Institute, 2015; the *Lifetime Achievement Award*, School Neuropsychology Society, 2013; and the *Alan S. Kaufman "Excellence in Assessment Award,"* Fordham University, 2013.

Acknowledgments

Federal Grant Support for Programmatic Research on Writing

- V. Berninger Principal Investigator, NIH P50 Center for Multidisciplinary Learning Disabilities Research, 1995 to 2006, and 2011 to 2016 no-cost extension to 2017. *Defining and Treating Specific Written Language Learning Disabilities*. National Institute of Child Health and Human Development.
- V. Berninger Principal Investigator, *Component processes in writing disabilities*, 1989-1992. National Institute of Child Health and Human Development.
- V. Berninger Principal Investigator, *Interventions for component writing disabilities*. Shannon Award, 1992-1994, ROI 1995-2000. National Institute of Child Health and Human Development.
- V. Berninger, Principal Investigator, Longitudinal Study, *Literacy Trek, typical writing and reading development*), 2001-2006, no cost extension to 6/30/08. National Institute of Child Health and Human Development.

Multidisciplinary Team of Faculty Investigators (Robert D. Abbott, Statistician; Wendy Raskind, Geneticist; Todd Richards, Neurophysicist and Brain Imager), Professional Staff, Graduate Students, and Participants (Parents, Children/Youth, Other Family Members, Teachers) contributed to the research.

Presenter:

The presenter is author or co-author of assessment and instructional resources resulting from the research, for some of which she receives royalties.

Gratitude:

Laura Dinehart, Ph.D., Dean for the School of Education and Human Development at Florida International University, for serving as moderator for the Writing Brain Strand.

Kathleen Wright at the Handwriting Collaborative for organizing the International Virtual Conference on the Science of Written Expression.

Organization of Presentation

- I Theoretical Framework of Levels (Units) of Language of Cascading Size for Language by Ears, by Mouth, by Eyes, and Hand/s
 - II Evidence-Based Diagnosis of 3 Specific Learning Disabilities Involving Writing Impairments at Different Levels of Language: Dysgraphia, Dyslexia, and Oral and Written Language Learning Disability (OWL LD)
 - III Evidence-Based Multi-Leveled Language Instruction for Students At-Risk for or Diagnosed with Dysgraphia, Dyslexia, or OWL LD
 - IV Brain Evidence for Multiple Levels of Language and Brain Response to Multi-Leveled Writing Instruction
 - V Conclusions, Resources for Assessment, Instruction, and Assessment-Instruction Links, and Research References
- Q & A Presenter Response to Questions Submitted to Q & A
Moderator for Q & A: Dr. Laura Dinehart, Ph.D.

NOTE: Presenter will not read or talk about everything on each slide. The powerpoint has been prepared to provide participants with information that can be reviewed after the presentation. At the end of the Q & A, the link will be provided in CHAT to download the powerpoint with slides + assessment and instructional resources and research references.

I Theoretical Framework of Levels of Language for Language by Ears, by Eyes, by Mouth, and by Hand/s Informed by Developmental Psycholinguistic Research



**Presenter's Developmental Psycholinguistic Research
Supporting Multi-Leveled, Multi-Modal Language Systems
(see next slide)**

- 1977-1979 Typical Aural/Oral Language Development from ages 3 to 6
- 1980-1983 Clinical Assessment/Research Atypical Aural/Oral Language Development from ages 1 to 3, 3 to 6
- 1984-1985 Research on Normal Variation in Reading, Writing, Aural/Oral Language kindergarten to first grade
- 1987-1988 Research on At-Risk Writing fourth grade
- 1989-2008 Research on Normal Variation in Writing, Reading, Aural Language, Oral Language concurrent study grades 1 to 9; longitudinal study, grades 1 to 7. Research on at risk readers and writers, screen-intervene studies, grades 1 to 4

Evidence-Based, Theoretical Framework: Language is Multi-Modal and Multi-Leveled

LANGUAGE LINKED TO SENSORY INPUT MODES

Language by Ears: Subword, Word, Syntax, Text

Language by Eyes: Subword, Word, Syntax, Text

LANGUAGE LINKED TO MOTOR OUTPUT MODES

Language by Mouth: Subword, Word, Syntax, Text

Language by Hand(s): Subword, Word, Syntax, Text

Note. Dominant Hand for writing with pencil or pen or stylus BUT Both Hands for Touch Typing (looking at screen but not looking at keys)

For brain bases of four language systems, see Berninger (2015, Exhibit 7.2, pp 187-189)

II Evidence-Based Diagnosis of 3 Specific Learning Disabilities Involving Writing Impairments at Different Levels of Language: Dysgraphia, Dyslexia, and Oral and Written Language Learning Disability (OWL LD)



**Research Findings from
Multidisciplinary Learning Disabilities Research Center 1995-2006, 2011-2016
Family Genetics (PI Wendy Raskind, M.D., Ph.D) and Brain Imaging (PI Todd Richards, Ph.D.)**

The Family Genetics Project identified probands (children in grades 1 to 6) who qualified their multi-generational family for participation.

Parents of probands and their siblings and other participating children and youth in the extended family completed parent questionnaires and interviews about their child's developmental history from birth to current school year in language, sensory motor skills, social emotional functioning, and attention/executive functions, medical history, educational history, and family history of learning problems. All participating adults completed questionnaires and interviews about their own developmental, medical, educational, and family histories.

All children and adults completed normed achievement measures for reading, writing, aural language, and oral language (referred to as the learning profile battery), and neuropsychological measures of processes related to those language skills (referred to as the phenotype profile battery because they were clinical measures of biological markers).

Research Findings from Multidisciplinary Learning Disabilities Research Center 1995-2006, 2011-2016

The wealth of information gathered by the Diagnostic Studies (Berninger, P.I.) showed that participants met research criteria for different kinds of specific learning disabilities:

- Dysgraphia (impaired handwriting—Language by Hand),
- Dyslexia (impaired word reading—Language by Eyes— **AND** impaired word spelling—Language by Hand), or
- Oral and Written Language Learning Disability (OWL LD) (impaired multi-word syntax—Language by Ears, Language by Mouth, Language by Eyes, and Language by Hand).

That is, the participants differed in level of language impairment and in language system(s) impaired.

Research Findings from Multidisciplinary Learning Disabilities Research Center 1995-2006, 2011-2016

However, Dysgraphia, Dyslexia, and OWL LD all involved impaired writing—just different writing skills at different levels of language:

Dysgraphia—impaired handwriting of letters at the *subword level*

Dyslexia—impaired spelling at the *word level*

OWL LD—impaired written expression at the *syntax level*

The genetic studies showed that Dysgraphia, Dyslexia, and OWL LD differ in genetic allele patterns (Abbott, Raskind, Matsushita, Richards, Price, & Berninger, 2017).

The brain imaging studies showed that Dysgraphia, Dyslexia, and OWL LD differ in brain variables (for example, on an fMRI spelling task, Berninger, Richards, & Abbott, 2015).

Thus, there was evidence for biological bases for the different levels of language impairment involving writing.

How to Diagnose: Steps of Differential Diagnosis

Rule out a developmental disability in one or more of the 5 domains of development (cognitive, language, sensory-motor, social-emotional, and attention-executive function) (see Chapter 8, *Interdisciplinary Frameworks*, Berninger, 2015) and a diagnosed medical condition (such as neurogenetic syndrome or injury) that could explain the learning problems rather than a specific learning disability.

Create a Learning Profile and Evaluate Whether Hallmark Skills at Specific Levels of Language Are Impaired in Language by Hand, Eyes, Ears, and/or Mouth and, If Impaired, Their Impact on Higher Level Skills, and

Create a Phenotype Profile and Identify Impaired Behavioral Markers of Biological Variables for Processes Related to Specific Writing, Reading, Aural Language, and/or Oral Language Skills.

The slides that follow list normed measures (which can be reviewed after the presentation and in some cases include multiple measures of the same construct— so it is not necessary to give all listed measures) to create the learning profiles for identifying hallmark impaired skills and their impact on higher level language skills and phenotype profiles for processes related to the hallmark impaired skills. See *Revised User Guide for PAL II RW* (Berninger, 2020) for how to integrate all the relevant assessment information (not just normed test results) for making an evidence-based diagnosis of Dysgraphia, Dyslexia, or OWL LD.

Note. Dysgraphia, Dyslexia, and OWL LD may all be impaired in supervisory attention skills—focused (*D-KEFS Color Word Form Inhibition*), switching (*Wolf & Denckla RAS* or *PAL II RW RAS*), sustaining (*PAL II RW RAN across row totals* and *Copy B across 3 time intervals*), and/or self-monitoring (*Repetitions on D-KEFS Verbal Fluency*).

Evidence-Based Diagnosis of Dysgraphia

Administer *PAL II RW* and *DASH* subtests (see Assessment Resources) to **Create Learning Profile for Writing Letters:**

Handwriting

PAL II RW Alphabet Writing legibility and automaticity at 15 seconds (Alphabet 15), total legibility (accuracy), and total time for printing each of the 26 letters in alphabetic order from memory,

PAL II RW Copy A Sentence total legibility and total time (for one sentence with all 26 alphabet letters),

PAL II RW Copy B Paragraph letter legibility at 30 seconds, 60 seconds, and 90 seconds to assess sustaining legible handwriting over time, and

DASH with *Copy Best* and *Copy Fast* instructions. Note that in UK manuscript (printing) is referred to as unjoined letters and cursive is referred to as joined letters.

Also see Berninger and Wolf (2016/2019) pages 41-45 and 52-54.

Evidence-Based Diagnosis of Dysgraphia

Also Evaluate Impact of Impaired Handwriting on Higher Level Word Spelling and Sentence/Text Composing. Administer *PAL II RW*, *WIAT IV*, *WJ IV* and *TILLS* subtests (see Assessment Resources):

Word Spelling

PAL II RW Word Choice accuracy and total time (recognizing a correct word-specific spelling among choices all pronounced the same, but only one of which is a correctly spelled real word),

WIAT IV Spelling accuracy (Spelling Dictated Real Words in Writing), and

WJ IV Spelling of Sounds and/or *TILLS Nonword Spelling* (Spelling Dictated Pseudowords in Writing) accuracy.

Sentence and Text Composing

WJ IV Writing Fluency grammatically correct sentences (composing a sentence from provided words under time limits), and

PALII RW Compositional Fluency (using provided prompts to compose text under time limits) scored for total words, total correctly spelled words, and total complete sentences.

Evidence-Based Diagnosis of Dysgraphia

Administer *PAL II RW* subtests (see Assessment Resources) to **Create Phenotype Profile** (Processes Related to **Handwriting** Skills in the Learning Profile):

Orthographic Coding:

PAL II RW Receptive Coding Tasks A, B, and C K to 6 accuracy, and

PAL II RW Expressive Coding Tasks A, B, and C grades 4 to 6 accuracy.

Sequential Grapho-Motor Planning and Execution for Finger Movements:

PAL II RW Finger Succession total time for both dominant and non-dominant hands.

Orthographic Loop of Working Memory:

PAL II RW Alphabet Writing 15 legibility of letters written from memory in correct alphabetic order at 15 seconds.

Evidence-Based Diagnosis of Dysgraphia:

Consider Findings for All Bolded Items

- **Cognitive Ability:** *WISC V* Verbal Cognitive Index is at the lower limits of normal range (standard score of 80 [-1 1/3 SD] in low average range) or higher. Research showed cognitive abilities in Dysgraphia span the lower limits of low average range to very superior range and are not necessarily discrepant from Verbal Comprehension Index (VCI) on Wechsler Scales (Berninger, Richards, & Abbott, 2015). Individuals may be Twice Exceptional (Intellectually Gifted + Dysgraphia).
- **Learning Profile:** 2 or more Handwriting measures below the lower limit of average range -2/3 SD (scaled score of 8, standard score 90, 25th %tile).
- **Phenotype Profile:** below lower limit of average range (scaled score of 8 or standard score of 90, 25th %tile) in one or more of the working memory components of the language learning mechanism related to Impaired Handwriting/Dysgraphia (receptive or expressive orthographic coding, finger succession, and orthographic loop); also, may meet same criterion for impairment in one or more executive functions for focusing attention, switching attention, sustaining attention and/or self-monitoring during letter production.
- **Developmental History:** Five domains of development show normal development during the preschool years based on parent report or during the school years based on normed measures or rating scales. However, individuals with Dysgraphia may also have attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD), see Wallis et al., 2017; if so, their handwriting may not improve until attention problems are appropriately diagnosed and treated with medication. Those with Dysgraphia may or may not have problems with fine motor grapho-motor skills. Students with only fine motor problems (not impaired subword written language skills) have Dyspraxia.
- **Medical History:** Note medical or neurological conditions that might warrant a different diagnosis than Dysgraphia. See Chapters 10, 11, Berninger (2015).
- **Family History:** There is often reported family history of handwriting problems.
- **Educational History:** shows past and current signs of handwriting problems in classroom and/or homework (on handwriting tasks alone or on handwriting in spelling and/or composing tasks, or on numeral writing in written math tasks). Handwriting problems are first noted in kindergarten and first grade after handwriting instruction is introduced.

Evidence-Based Diagnosis of Dyslexia

Administer *WJ IV*, *TOWRE 2*, *PAL II RW*, *WIAT IV* Subtests (see Assessment Resources) to **Create a Word Reading Learning Profile** and **Assess Impact of Impaired Word Reading on Higher Levels of Sentence/Text Reading Comprehension and Oral Reading:**

Word Level (administer at least one measure of each of the following—accuracy oral reading of pseudowords, rate of oral reading of pseudowords, accuracy of oral reading of real words; rate of oral reading of real words; it is also advisable to assess silent word reading)

WJ IV Letter and Word Identification and Word Attack accuracy

KTEA 3 Letter and Word Identification and Nonsense Word Decoding accuracy

TOWRE 2 Word Reading Efficiency timed

KTEA 3 Word Recognition Fluency and Decoding Fluency timed

TOSWRF-2 Test of Silent Word Reading Fluency

KTEA 3 Silent Reading Fluency timed

PAL II RW Phonological Decoding total accuracy and accuracy at 60 seconds (oral pseudoword reading on list)

PAL II RW Morphological Decoding Fluency accuracy and total time (oral reading of real words with affixes) grades 4 to 6

PAL II RW Word Choice accuracy and total time (silent word-specific reading and spelling recognition)

Sentence and Text Levels Reading Comprehension

PAL II RW Sentence Sense total accuracy and total time for choosing the one sentence in set of three sentences that makes sense; the other sentences do not make sense because one word does not fit the sentence context.

WJ IV Passage Comprehension accuracy

WIAT IV Reading Comprehension accuracy

Oral Reading of Text

Gort 5

Evidence-Based Diagnosis of Dyslexia

Administer *PAL II RW*, *WIAT IV*, *WJ IV*, *TILLS*, and *TOC* subtests (see Assessment Resources) to **Create a Word Spelling Learning Profile** and **Evaluate Impact of Impaired Spelling on Higher Levels of Sentence and Text Written Composing:**

Word Level (Assess recognition of correct spelling, spelling dictated real words and spelling dictated pseudowords, and rearranging letters in word anagrams to create a correctly spelled word)

PAL II RW Word Choice accuracy and total time (recognizing a correct word-specific spelling among choices all pronounced the same but only one of which is correctly spelled real word),
WIAT IV Spelling (Spelling Dictated Real Words in Writing) accuracy,
WJ IV Spelling of Sounds and/or TILLS Nonword Spelling (Spelling Dictated Pseudowords in Writing) accuracy, and
TOC Word Scrambles (reordering letters to create a correctly spelled real word) accuracy.

Multi-Word Level to Assess Impact of Word Spelling Problems on Multi-Word Sentence and Text Composition

WJ IV Sentence Writing Fluency (composing a sentence from provided words under time limits),
WIAT IV Written Expression (*Word Fluency*, *Sentence Combining*, and *Paragraph Writing*) accuracy,
TILLS Written Expression accuracy,
PAL II RW Compositional Fluency (using provided prompts to compose under time limits) total words, total correctly spelled words, and total complete sentences, and
PAL II RW Expository Note-Taking and Report-Writing (taking notes scored for Total Accuracy and writing reports scored for Total Quality and Total Organization).

Evidence-Based Diagnosis of Dyslexia

Administer *CTOPP 2*, *Wolf and Denckla RAN*, and *PAL II RW* subtests (see Assessment Resources) to **Create Phenotype Profile**

(Processes Related to Word-Level Reading and/or Spelling in Learning Profile):

Phonological Awareness/Coding:

CTOPP 2 Nonword Repetition accuracy for repeating whole heard pseudoword, and

PAL II RW Syllables, Phonemes, and Rime subtests to assess phonological coding of different sizes of heard and spoken word parts. accuracy

Not all three subtests are administered at each grade level.

Orthographic/Awareness Coding:

PAL II RW Receptive Coding Tasks A, B, and C K to 6 accuracy for yes/no decision

PAL II RW Expressive Coding Tasks A, B, and C grades 4 to 6 accuracy for writing whole word or letter or letter group in designated word position/s

Phonological Loop

Wolf and Denckla RAN total time for naming letters, *PAL II RW Rapid Automatic Naming (RAN)* total time, and change in time across rows for naming single letters, letter groups, and written words (for each kind of written stimuli row 4 time compared to row 1 time and to row 3 time).

Orthographic Loop

PAL II RW Alphabet 15 writing legible letters in alphabetic order from memory accuracy at 15 seconds.

Evidence-Based Diagnosis of Dyslexia: Consider Findings for All Bolded Items

Cognitive:

- **Learning Profile:** Meets these evidence-based dual criteria (at least two measures of word reading and/or spelling are below mean *and* at least 1 SD below Verbal Comprehension Index [VCI] on *WISC V*). VCI has been shown to be the best predictor of reading achievement. See Vellutino, Scanlon, & Tanzman (1991). Because VCI requires oral language for explaining word meaning, similarities, and information, and oral language skills are a relative strength of those with Dyslexia, a dissociation between VCI and measures of word reading and spelling occurs in Dyslexia (Berninger, Richards, & Abbott, 2015). This definition allows for diagnosis of Dyslexia throughout the continuum of low average to very superior verbal cognitive ability, including those who are twice exceptional (Intellectually Gifted + Dyslexia).
- **Phenotype Profile:** below lower limit of average range (scaled score of 8 or standard score of 90, 25th %tile) in one or more of the working memory components of the language learning mechanism related to Dyslexia (phonological coding, receptive or expressive orthographic coding, phonological loop, and orthographic loop); also, may meet same criterion for impairment in one or more executive functions for focusing attention, switching attention, sustaining attention and/or self-monitoring during word reading or word spelling.

Developmental History: Generally typical development across the five developmental domains (including aural and oral language development in the preschool years based on parent report and results of administered normed measures or rating scales during the school years).

Medical History: Note medical or neurological conditions that might warrant a different diagnosis than Dyslexia. See Chapters 10, 11, Berninger (2015).

Family History: Reports of others in multi-generational family having difficulty with word reading and spelling.

Educational History: Word reading and word spelling problems are first observed in school years (Kdg and above when formal reading and spelling instruction begins).

Evidence-Based Diagnosis of OWL LD

Administer *PAL II RW*, *CELF V*, *WJ IV*, *TILLS*, and *WIAT IV* subtests (see Assessment Resources) to **Create Learning Profile for**

Sentence Syntax and Text Levels of Language by Ears, by Eyes, by Mouth, and by Hand:

Sentence Syntax Level

Listening Comprehension PAL II RW Sentence Structure accuracy,

Reading Comprehension PAL II RW Sentence Sense accuracy and total time,

Oral Sentence Syntax Composing CELF V Formulated Sentences accuracy, and

Sentence Syntax Composing WJ IV Writing Fluency accuracy.

Text Level

TILLS Listening Comprehension or *KTEA 3 Listening Comprehension* accuracy,

TILLS Reading Comprehension or *KTEA 3 Reading Comprehension* accuracy,

TILLS Story Retelling (Oral Expression) or *KTEA 3 Oral Expression* accuracy, and

TILLS Written Expression or *KTEA 3 Written Expression* accuracy, and

WIAT IV Written Expression--Word Fluency, *Sentence Combining*, and *Paragraph Writing* subtests (Written Expression across word, sentence, and text levels of language).

Evidence-Based Diagnosis of OWL LD

Administer *PAL II RW* subtests (see Assessment Resources) to **Create Phenotype Profile**
(Processes Related to Language Skills in Learning Profile):

Syntax Coding (grammatical ordering of words):

PAL II RW Sentence Structure Judge which of the following could be a real sentence based on its sentence structure even though there are some made-up words.

Zaifully is zig. Yig yailful is. Yig is zaiful.

PAL II RW Does it fit? Choose word that best fits each sentence context.

parns parness parned parnly

My brother _____yesterday.

The boy smiled_____.

Morphological Coding (inflectional and derivational suffixes and prefixes):

PAL II RW Are they related? Does the second word come from the first word?

corner corn builder build

PAL II RW Find the True Fix. looks miss father smarter

Note: The same spelling pattern may or may not function as a morpheme.

Word Finding

D-KEFS *Verbal Fluency* (Name as many words as can within time limits for each category.)

Evidence-Based Diagnosis of OWL LD: Consider Findings for All Bolded Items

Cognitive: On the *WISC V*, the Perceptual Organization Index (POI) Score (Nonverbal Reasoning) tends to be higher than the Verbal Comprehension Index (VCI) score (Verbal Reasoning); both Index Scores should be obtained if OWL LD is suspected. Both should fall at the lower limit of the normal range (a standard score of 80) or higher; but sometimes VCI falls in the borderline range (standard score between 70 and 79). POI is higher than VCI. See Berninger, Richards, & Abbott (2015). Some students with OWL LD may be twice exceptional (also superior or very superior in nonverbal reasoning).

Learning Profile: 2 or more Oral Language (Listening Comprehension or Oral Expression) and/or Written Language (Reading Comprehension or Written Expression) measures below the lower limit of average range $-2/3$ SD (scaled score of 8, standard score 90, 25th %tile).

➤ **Phenotype Profile:** one or more of the following phenotype skills for working memory components below lower limit of average range (scaled score of 8 or standard score of 90, 25th %tile): morphological and/or syntactic coding; also, may meet same criterion for impairment in one or more executive functions for focusing attention, switching attention, sustaining attention and/or self-monitoring.

Developmental History: Aural language by ear (listening) and oral language by mouth (oral expression) show delays in milestones, especially for first words, word combinations, and multi-word syntax (sentences) during the preschool years. Depending on nature and timing of early intervention, the aural/oral language problems may or may not persist during the school years when reading comprehension and written expression problems emerge. However, no problems are reported by parents or identified by administering normed measures or rating scales during the school years indicating that the other four developmental domains (cognitive, sensory-motor, social-emotional, attention-executive function) are in the range for developmental disabilities (at or below -2 SD).

Medical History: Note medical or neurological conditions that might warrant a different diagnosis than OWL LD. See Chapters 10, 11, Berninger (2015).

Family History: Typically, there are reports of others in multi-generational family having had delays in aural or oral language during the preschool years and problems with listening comprehension, oral expression, reading comprehension, and/or written expression during the school years.

Educational History: Problems are often observed and reported by teachers in listening to teacher's instructional talk and oral expression in answering questions in class as well as in reading comprehension and written expression.

III Evidence-Based Multi-Levelled Language Instruction for Students At-Risk for or Diagnosed with Dysgraphia, Dyslexia, or OWL LD



Representative Examples of Multi-Levelled Writing Instruction

- **Rationale for multi-levelled writing instruction is that teaching to cascading levels of language close in time creates a functional writing system.**
- **Instructional research studies with controls* showed significant improvement in writing skills after multi-levelled language instruction.**
- **The presenter was invited to translate the published, peer reviewed research articles into lesson plans for practitioners.**
- **Representative examples of these lesson plans follow with research on which they are based cited.**

*** Identified the lowest achieving students in a specific writing skill in multiple schools and multiple school systems for multi-levelled writing instruction OR provided multi-levelled language instruction at the university for students diagnosed with dyslexia or dysgraphia. For research controls, typically compared (a) 1 treatment to alternative treatment/s, (b) group 1 after it completes the treatment to group 2 before it starts the same treatment, or (c) group with dyslexia or dysgraphia to control group without dyslexia or dysgraphia.**

**Multi-Level Instruction in Lesson Set 3 in *Revised PAL Research Based Reading and Writing Lessons*
(Berninger & Abbott, 2020) 24 lessons for 1st Graders Low in Handwriting Achievement (At Risk for Dysgraphia)
Based on Berninger, Vaughan et al. (1997)**

For the subword level, the teacher can choose to teach ball and stick or slanted D'Nealian format in Revised PAL Handwriting Lessons (Berninger, 2020b). For each level of language, children use a pencil without an eraser to discourage constant erasing. Children can cross-out and revise.

Subword Level

A Strategy for Letter Formation (study numbered arrow cues so letter is formed the same way each time) is taught. The arrows show the component strokes and the numbers show the order of the strokes. If consistent strategy is not taught, then the student tends to draw letters and not in the same way each time and letter production does not become automatic. Steps in strategy (see next slide) were shown in another research study to be the most effective of ones compared. Each letter of the alphabet is practiced just once (to avoid habituation) and in a different random order in each lesson.

Word Level

A set of three words is copied to practice applying writing alphabet letters to spelling words.

Text Level

A composition is written on a teacher-provided topic for 5 minutes, for example, “My School”, using grade-appropriate lined paper and then shared with classmates (the audience) by reading it orally.

Steps of Subword Handwriting Instruction:

Because Kosslyn's (1988) brain research showed that names of letters facilitate letter retrieval, the teacher names the letter in each step.

For each of 26 letters the teacher says the following.

1. Study the numbered arrow cues in the model letter for ____ (name letter).

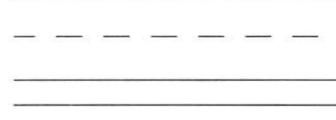
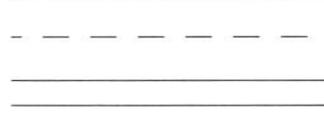
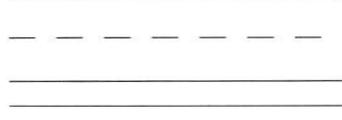
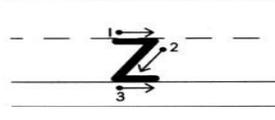
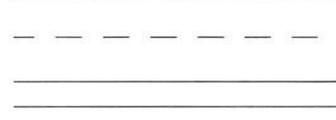
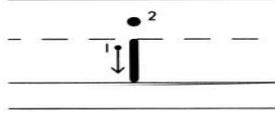
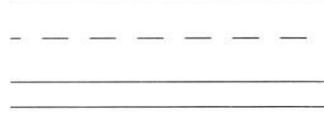
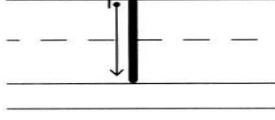
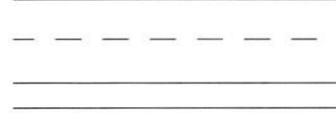
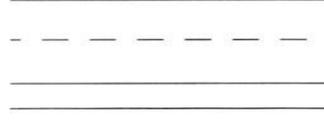
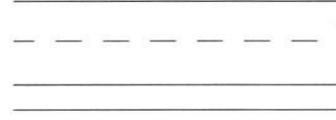
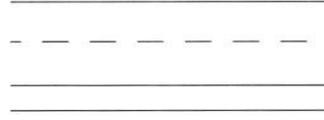
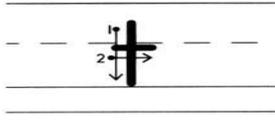
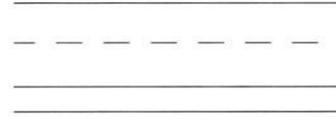
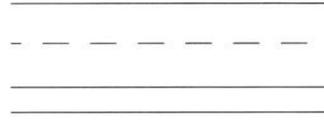
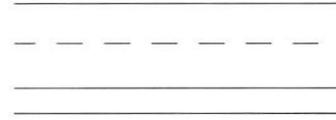
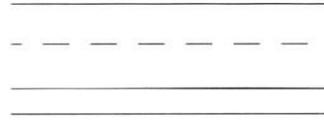
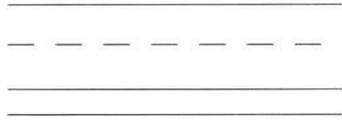
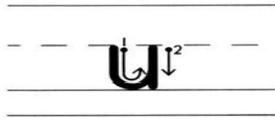
2. Take a mental photo of the letter, cover the model letter with your card, close your eyes, and see (name letter) in your mind's eye.

3. Now open your eyes and write ____ (name letter) from memory.

(Start with 1 sec delay between closing eyes and opening eyes to write the letter; increase delay over time as specified in Lessons.)

4. Take the card off the model letter and compare your ____ (name letter) to the model letter. If your ____ (name letter) looks different from the model letter, fix it so it looks the same.

Lesson 1



s

w

g

m

p

h

x

q

e

n

k

o

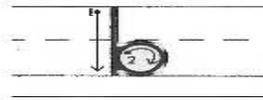
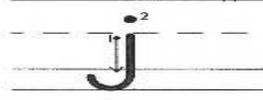
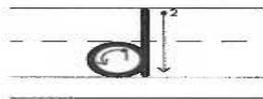
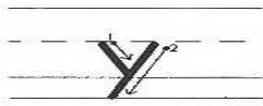
f

v

Handwriting practice lines for the letter 'q'. Each row consists of a solid top line, a dashed middle line, and a solid bottom line. There are eight rows of these lines, corresponding to the eight letters on the left.

Handwriting practice lines for the letter 'e'. Each row consists of a solid top line, a dashed middle line, and a solid bottom line. There are eight rows of these lines, corresponding to the eight letters on the left.

Handwriting practice lines for the letter 'n'. Each row consists of a solid top line, a dashed middle line, and a solid bottom line. There are eight rows of these lines, corresponding to the eight letters on the left.



Multi-Level Instruction in Lesson Set 8 in *Revised PAL Research Based Reading and Writing Lessons* (Berninger & Abbott, 2020) 14 Lessons for 3rd grade to 4th grade Transition of Low Achievers in Handwriting Based on Berninger, Abbott, Whitaker, Sylvester, & Nolen (1995)

Subword Level

“Writers’ Warm Up”: 1. *Revised PAL Handwriting Lessons* (Berninger, 2020b)—Use 4 steps to practice writing each of 26 letters, see slides 26-31) 2. ***Before and After Alphabet Retrieval Game*** (name or write letter that comes before or after designated letter) on page 192 of *Revised PAL Guides for Intervention. Reading and Writing* (Berninger, 2020a).

Word Level

Dr. Fry’s Spelling Program: Instant Words and Dictation Sentences for most frequent spelling words at a given grade level.

Text Level

Learn and apply the PWRR (plan, write, review, revise) strategy to compose using composition starters, graphic organizers, and personal dictionary in *Reproducibles for Revised PAL Research Based Reading and Writing Lessons* (Berninger & Abbott, 2020) and illustrate composition.

Importance of Spelling Instruction for Dyslexia and Providing It in Context of Multi-Level Language Instruction

- ***Students with dyslexia have not only word reading but also word spelling problems*** (Berninger, Nielsen, Abbott, Wijsman, & Raskind, 2008). If treatment is focused only on reading skills and the reading problems resolve, the spelling problems often persist beyond the reading problems and interfere with written composition.
- ***Accommodations alone, for example, using a computer with spell checks, are not sufficient for the spelling problems in dyslexia.*** Even though computers have spell checks, ***a student with dyslexia may not have sufficient spelling knowledge to recognize the correct spelling among choices offered by spell check for their detected spelling errors.*** ***Students with dyslexia benefit from a systematic spelling program.*** See Berninger & Wolf (2016/2019, pages 75-83).
- ***For systematic spelling programs to use for students with Dyslexia, see Instructional Resources at end of powerpoint*** (*Dr. Fry Spelling Program*, Marcia Henry, 2010, 2017, 2018, and Henry and Redding, 2021, on word origins, *Slingerland 3rd Edition*, *Spell-Links* [Wasowicz et al., 2004], Treiman & Kessler, 2014, and Zaner-Bloser *Spelling Connections*).
- ***Teach morphological, phonological, and orthographic coding and their interrelationships for spelling English Morphophonemic Orthography*** (see Berninger and Wolf (2016/2019)).
- ***Students with dyslexia also need explicit instruction in using spelling in composing***, see Lesson Set 14, Berninger & Abbott, 2020; Berninger & Wolf, 2009, Unit 11), ***integrating reading and writing (e.g., writing about read texts***, Ervin, 2001), and ***integrating listening and writing (e.g. note taking while listening to a teacher's instruction***, see Thompson et al., 2016).

Multi-Level Language Instruction in Lesson Set 4 in *Revised PAL Research Based Reading and Writing Lessons* (Berninger & Abbott, 2020) for 2nd Graders with Low Achievement in Spelling (At Risk for Dyslexia) 24 Lessons
Based on Berninger, Vaughan et al. (1998)

Subword Level

***Talking Letters Student Desk Guide* (card)** (Berninger, 2020c) is used to teach phoneme to 1- or 2- letter grapheme correspondences in spelling direction (substitutes on pages 43 to 44 in the *Reproducibles* for the *Revised PAL Research Based Reading and Writing Lessons*, Berninger & Abbott, 2020). **The spelling direction and the reading direction are not identical for the alphabetic principle** (Venezky, 1970, 1999); **the spelling direction should be taught in writing lessons** and the reading direction should be taught in reading lessons. **Teach using a multi-modal approach to create automatic correspondences, with the teacher modeling and the student imitating each phoneme→grapheme correspondence: say pictured word, say phoneme in it, look at, touch, and name corresponding 1 or 2- letter grapheme.** **Alternative 1- or 2- letter graphemes for the same phoneme (alternations) are taught side by side.** **No dot=phoneme is at beginning of pictured word; 1 dot=phoneme is in middle of pictured word; 2 dots=phoneme is at end of pictured word.** **Teach all the phoneme to grapheme correspondences (spelling direction) within a lesson set close in time rather than across the school year or school years for words of Anglo-Saxon origin common in grades 1 to 3 (see Henry, 2010).** The title of the next slide does not mean to teach alphabetic principle only in the reading direction (letter/s to sound).

Word Level

Practice *applying phoneme-grapheme correspondences (alphabetic principle) to spelling monosyllabic words* in a list segmented by spelling units and in a list of whole words varying in sound-spelling predictability. For lists see pages 60 to 65 in *Reproducibles*.

Text Level

Compose for 5 minutes from topic prompts and provided words (pages 86 to 109 *Reproducibles*) on grade-appropriate lined paper (page 110 in *Reproducibles*) using a pencil without an eraser, **share compositions orally with classmates**, and **enter misspelled words into personal dictionary** (pages 13 to 58 in *Reproducibles*).

Teach All Correspondences between Letter Units and Phonemes

Talking Letters Consonants

											
b	c	c	d	f	g	g	h	j	k	l	
						10					
m	n	p	r	s	s	t	v	w	y	z	
											
bl	br	cl	cr	dr	fl	fr	gl	gr	sc	sk	
			?								
sl	pl	pr	qu	x	sm	sn	sp	st	sw		
	12										
tr	tw	sh	ck	ch	ng	wh	th	th	ph		
											
dg	wr	kn	mh								



Talking Letters Vowels by Syllable Type

closed syllable



a e i o o u

open syllable



a e i o u y y

blends



ou ow oy oi aw au oo oo ew



ue ai ay ea ea ee ie oa ow

r-controlled



ar ar er ir ur or

l-controlled



al el il ul ul le

silent e



a.e i.e o.e u.e a e o

Subword Level

Teach phoneme to grapheme correspondences in the spelling direction (see slide 34, using the *Talking Letters Student Desk Guide* (card), Berninger, 2020c). To facilitate awareness of syllables, **teach Speaking Syllables** on page 46 in Berninger, 2020c. Also, **teach word families (rimes in syllables after initial phoneme or phoneme blend deleted)** on page 47 of the *Reproducibles for Revised PAL Research Based Reading and Writing Lessons*.

Word Level

Practice applying phoneme-grapheme correspondences (alphabetic principle) to spelling polysyllabic words (use lists 7 a to 7b on pages 112 to 116) and **applying inflectional suffixes (mark tense and number) to spelling words** (page 49 in *Reproducibles for Revised PAL Research Based Reading and Writing Lessons*, Berninger & Abbott, 2020).

Text Level

Complete sentence dictation in list 9 on page 117 of the *Reproducibles*. **Compose for 5 minutes from topic prompts and provided words** (pages 86 to 109 in *Reproducibles*) on grade appropriate lined paper (page 110 in *Reproducibles*) using a pencil without an eraser, **share compositions orally with classmates, and enter misspelled words into personal dictionary** (pages 13 to 58 in *Reproducibles*).

Multi-Level Instruction in Lesson Set 7 in *Revised PAL Research Based Reading and Writing Lessons* (Berninger & Abbott, 2020) 24 Lessons for 3rd graders with Low Achievement in Spelling (At risk for Dyslexia) Based on Berninger, Vaughan et al. (2002): More Effective to Teach Spelling + Composition than Either Alone

Subword Level Teaching Alphabetic Principle in Spelling Direction and Its Alternations

Teach phoneme to grapheme correspondences in the spelling direction using the *Talking Letters Student Desk Guide* (card) (Berninger, 2020c).

Word Level

Practice is provided through **word sorts** for (a) **applying alternations in phoneme-grapheme correspondences (alphabetic principle) to spelling words**; and (b) **spelling structure/function words** (*such as prepositions, conjunctions, articles, pronouns, and helping verbs, for example, is or are*), *which have no meaning of their own but glue other words together*, and **content words** (*such as nouns, verbs, adjectives, and adverbs*), *which have meaning of their own that can be pictured or conceptualized in the mind*.

Text Level

Instruction and guided learning activities are provided for ***planning, translating*** (writing a draft), and ***reviewing/revising*** on 8 different topics to learn ***to compose expository genre essays (informative/descriptive, compare and contrast, and persuasive/argumentative)***; grade-appropriate lined paper and pencils without erasers are used but students can cross out and revise.

**Multi-Level Instruction for Readers, Writers, Writing-Readers
with Hope Themes to Motivate and Re-Engage Struggling, Reluctant Readers and Writers**
Helping Students with Dyslexia and Dysgraphia Make Connections: Differentiated Instruction Lesson Plans in Reading and Writing
(Berninger & Wolf, 2009) Four Units

The Unit II Mark Twain Writers' Workshop that follows, which included subword alphabetic principle, word spelling, and text composing instruction + Hope Theme, was effective in improving spelling and composing in students in grades 4-9 diagnosed with dyslexia or dysgraphia (Berninger, Winn, Stock, Abbott, Eschen, Lin et al., 2008, Study 1) and self-efficacy of participants as writers (Berninger & Hidi, 2006).

Part I of each lesson:

Subword level Alphabetic Principle in Phoneme to Grapheme Spelling Direction (substitutes in *Reproducibles*, pages 276-277). Each lesson specifies which rows to use in *Talking Letter Card* for teacher modeling and student imitation.

Part II of each lesson:

Word level: 7 Word Sets of 16 words each (pages 279-280) and related worksheets (pages 281-288) provided for **orthographic spelling strategies (7 lessons) and morphological spelling strategies (7 lessons).**

Part I + Part 2= Subword Phonemes + Word Level Orthography and Morphology to spell English Morphophonemic Orthography

Part III of each lesson:

Text level: Composing (Informative Essays, Personal Narratives, Report Writing)

Hope Theme throughout lesson Set: Life of Mark Twain

Mark Twain struggled with word reading and spelling and dropped out of school. After spending time in boat on Mississippi River, he went west and was hired to work on a newspaper where he is reported to have said that he felt sorry for anyone who could not think of at least 10 different ways to spell the same word.

Mark Twain went on to write the first book by typewriter, but in his lifetime was also known as a famous orator.

Multi-Level Instruction for Readers, Writers, Writing-Readers
with Hope Themes to Motivate and Re-Engage Struggling, Reluctant Readers and Writers
Helping Students with Dyslexia and Dysgraphia Make Connections:
Differentiated Instruction Lesson Plans in Reading and Writing
(Berninger & Wolf, 2009) Four Units

Word-Level Spelling Strategies

Orthographic Spelling Strategies:

Photographic Leprechaun (page 277) Use 3 x 5 card to cover up word above and word below on list; look at target word in left to right direction, photographic leprechaun takes photo of word, close eyes and see word in “mind’s eye”; tell name(s) of letter(s) in word position teacher designates that does/do or does not/do not correspond to a specific phoneme and have to be learned for a specific word context, for example, 5th and 6th letter in certain or 4th letter in family.

Proofreaders’ Trick: Open eyes and take good look at word; close eyes and while holding word in memory spell it backwards quietly naming each letter; open eyes after seeing and naming first letter; check backward spelling against forward spelling in displayed word.

Morphological Spelling Strategies

The set of 16 words is practiced twice in each lesson—once with each of the following strategies:

Word Building Strategy (page 289) Use work sheets on pages 292-298.

Examples Create a word from the following parts:

dis cover ed _____

define ing _____

Word Dissecting Strategy (page 289) Use work sheets on pages 299-305.

Dissect the word into its prefix base word and suffix:

misspelling prefix base word suffix

**Multi-Level Instruction for Readers, Writers, Writing-Readers
with Hope Themes to Motivate and Re-Engage Struggling, Reluctant Readers and Writers**
*Helping Students with Dyslexia and Dysgraphia Make Connections:
Differentiated Instruction Lesson Plans in Reading and Writing*
(Berninger & Wolf, 2009) Four Units

Part III Text Level Learn to use keyboard (with spell check turned off)

Informative Essays—Descriptive, Compare and Contrast, Opinions/Argument Lessons 1 to 5

Narrative Composing Lessons 6-10 (Lesson 6-introduction to narrative composing, Lessons 7 to 9,
3-part Autobiography (My Life Before, During, and After School Years); and
Lesson 10 publish Autobiography)

Expository Report Writing Lessons 11-12 reading source material and taking notes about source material,
Lesson 13 integrating notes from multiple sources to create outline and paragraph structure, and
Lesson 14 report writing

Teach **PWRR Strategy for Informative Essays and Narrative Composing: Plan, Write, Review, and Revise**

Planning Teacher-Led Reflective Discussion, and Graphic Organizers;

Event/Plot Plan (page 311), **Character Plan** (page 312), **Setting Plan** (page 313), and

Note Taking Strategies (page 315)

Writing First Draft with Prompts

Reviewing feedback (page 307)

Revising Lesson 4 for Lesson 3

Culminating Event after Completion of 14 Lessons : Writers' Workshop Celebration Need to Celebrate Success

EVALUATING RESPONSE TO INSTRUCTION: probes (page 314)

Research Lessons (Based on Review of Research) and Teaching Tips for OWL LD

Dyslexia, Dysgraphia, OWL LD, and Dyscalculia. Lessons from Science and Teaching
(Berninger & Wolf, 2016/2019)

Representative Research Lesson and Teaching Tips for Written Expression for Students with OWL LD:

Research Lesson 5-2 (see pages 105-106)

Listening comprehension, oral expression, reading comprehension, and written expression should be taught alone so that students can learn from the teacher's instructional talk as well as comprehend read text and can express what they learn orally and in writing and also taught together so students can integrate listening-writing, oral and written expression, and reading-writing.

Teaching Tips on next slide for Written Expression.

Multi-Level Instruction for OWL LD

Teaching Tips 5-2

Teach to integrate subword affixes, words and syntax to create written sentences and texts.

Teach Subword → Word Morphological Coding: storing and processing affixes (prefixes and inflectional suffixes—mark tense and number— and derivational suffixes--mark part of speech) on base words (Nagy & Anderson, 1999; Nagy et al., 2003)

Teach Word Meaning (Semantics) (Beck McKeown, & Kucan, 2013)

Teach Word Finding: retrieving words to express specific meanings

Teach the role of word order in creating written sentences. (see page 114) **Sentence anagrams**—rearranging word order to create syntactically correct sentences.

Teach syntactic coding: creating clauses and sentences from combining content words (nouns, verbs, adjectives and adverbs) with or without inflectional or derivational suffixes AND structure/function words (conjunctions, prepositions, articles, pronouns) that glue other words together. See Berninger & O'Malley-May (2011) for creating a word pile for shuffled content words and a word pile for shuffled structure/function words from a sentence. Students choose words from each pile to create a meaningful sentence.

Model and guide written sentence construction. Explicitly teach different parts of speech (see pages 110-111) and small words that “glue” other words together in sentence syntax. (see Table 5.2 page 112)

Provide varied experiences in written expression. (see pages 124-126)

IV Brain Evidence for Multiple Levels of Language and Brain Response to Multi-Leveled Writing Instruction

Todd Richards, Ph.D., a neurophysicist, was PI of the Brain Imaging Project 1995-2006, 2011-2016.



Brain Research Confirmed that Multiple Levels of Language Exist and Matter

Richards et al. (2016)

- ✓ Brain connectivity was identified in typical readers/writers (ages 10 to 14) within and across adjacent cascading levels (units) of language on fMRI tasks *for subword grapheme-phoneme correspondence judgments (correct or incorrect) → word spelling judgments (about words that are or are not homonym foils) → syntactic judgments (sentences with and without homonym foils) (Set I) and for lexical judgments about true affixes versus affix foils → syntax judgments (sentences with and without affix foils) → multi-sentence judgments (whether last sentence makes sense based on prior sentences) (Set II)*. Adjacent levels of language from subword to word to syntax (Set I) and from word to syntax to multi-sentence (Set II) shared common and unique fMRI connectivity.
- ✓ *Typicals were compared to those diagnosed with dyslexia on the subword → word fMRI tasks in Set 1. Those with dyslexia showed additional unique functional activation (over engaged) on these tasks associated with levels of language impairment in their diagnosis.*
- ✓ *Typicals were also compared to those diagnosed with OWL LD on the word morphology and syntax judgment tasks in Set II. Those with OWL LD showed less functional activation (under engaged) on these tasks associated with levels of language impairment in their diagnosis.*
- ❖ *This pattern of results suggests that students with Dyslexia or OWL LD are inefficient, compared to typical readers and writers, in integrating specific cascading levels of language which are impaired in their diagnosis.*

Brain's Response to Writing Instruction for Multiple Levels of Language in 4th to 9th graders without and with Dysgraphia, Dyslexia, or OWL LD

Richards et al. (2017)

Multi-Levelled fMRI Writing Tasks (Before and After Instruction)

subword level handwriting: with MRI compatible stylus write the letter that follows in the alphabet after displayed letter

word level spelling: with MRI compatible stylus write the letter in the blank in displayed word to create a correctly spelled real word

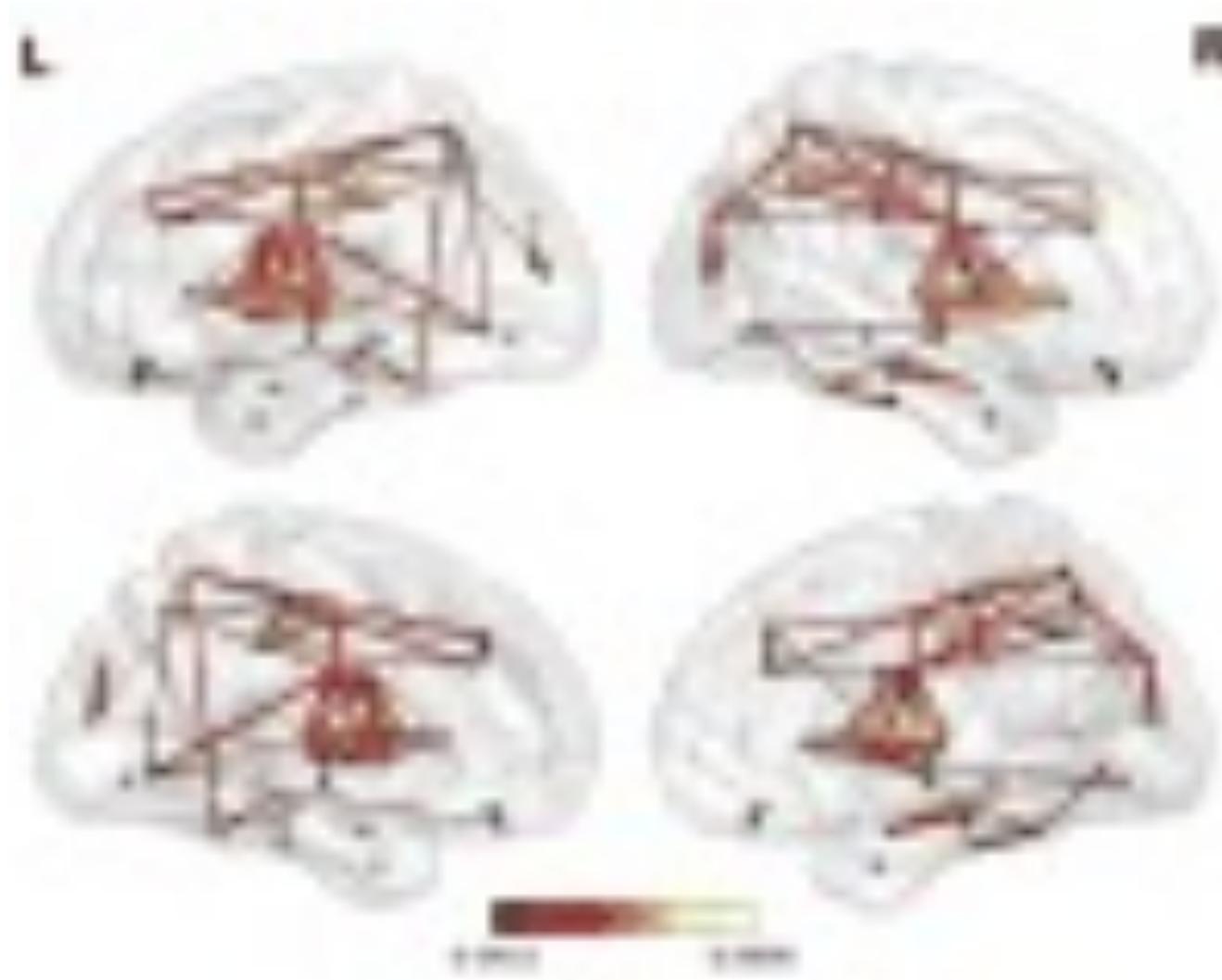
Analyses (Before and After Instruction)

- Applied network analyses based on graph theory to identify changes over time in fMRI functional connectivity in gray matter on multi -levelled fMRI tasks (see next slide)
- Analyzed changes over time in Diffusion Tensor Imaging (DTI) in white matter integrity
- Computed changes over time in correlations between fMRI graph gray matter clusters and DTI indicators of white matter integrity

Computerized Writing Instruction for Multiple Levels of Language (Tanimoto et al., 2016)

handwriting, word spelling for English morphophonemic orthography, sentence construction, and text composing

Example of Correlational Matrix Based on Graph Theory for Clustering Coefficients among Nodes to Create Functional Brain Network for a Single Participant in the Control Group of Typical Writers
Color Scale at Bottom Indicates the Magnitude of the Correlations (from Pub Med for Richards et al., 2017)



Brain's Response to Multi-Levelled Writing Instruction

Richards et al. (2017)

- Behavioral measures: significant improvement on normed measures—DASH (instructions for best handwriting), WIAT 3 spelling dictated real words, and CELF 4 constructing syntax, that is, across 3 levels of language. The interactions for time and diagnostic groups were not significant. Typical writers and those with specific learning disabilities involving impaired writing responded to the multi-levelled writing instruction.**
- Brain changes (at $p < .001$ to control for multiple comparisons) in fMRI connectivity clustering coefficient effects in Gray Matter: *On fMRI alphabet writing task*, group diagnostic x time interaction effect *in left lateral cingulate gyrus* (self-regulation and executive management of frontal system) *with largest changes in Dysgraphia and OWL LD.*
On fMRI fill in the blank spelling task, group diagnostic x time interaction effect *in right inferior frontal gyrus* (attention, response inhibition, and imagery) *with largest changes in Dyslexia and OWL LD.***
- Brain Changes (at $p < .001$ to control for multiple comparisons) in White Matter Integrity on Radial Diffusivity (RD) in anterior corona radiata* and superior frontal**; on Axial Diffusivity (AD) in superior corona radiata*, superior frontal**, middle frontal***, and superior longitudinal fasciculus****; and on Mean Diffusivity (MD) in anterior corona radiata*, superior corona radiata*, superior frontal**, middle frontal gyrus***, and superior longitudinal fasciculus****. There were no diagnostic group x time interactions at $p < .001$ indicating that all 4 groups (controls and 3 SLDs) showed brain response to the multi-levelled written language instruction.**

*neural traffic to and from cerebral cortex **on left working memory ***on left literacy development

****connects occipital, temporal, parietal, and frontal lobes in both hemispheres

Brain's Response to Multi-Levelled Writing Instruction

Richards et al. (2017)

4. Correlations for whole sample between fMRI connectivity clustering and DTI based on significant findings in prior analyses (2 and 3):

For fMRI handwriting task, the only significant correlation at both time 1 and time 2 was between this fMRI task in left lateral cingulate and DTI MD indicator in left superior frontal white matter; the correlation was of greater magnitude at time 2 (after multi-levelled writing instruction).

For fMRI spelling task, at both time 1 and time 2, the clustering coefficient on the fMRI task in the right inferior frontal gyrus was significantly correlated with DTI AD indicator in left superior frontal regions. However, at time 2 (after multi-levelled writing instruction) three significant correlations emerged for graph cluster in right inferior frontal with (a) DTI MD indicator in left anterior corona radiata (of greatest magnitude and p value), (b) DTI MD indicator in left superior corona radiata, and (c) DTI MD indicator in the left middle frontal gyrus.

Overall, Analyses of Brain RTI (Response to Instruction) Show Hope That Students with Genetic Based (Abbott et al., 2017) and Brain Based (Berninger et al., 2015) Specific Learning Disabilities Involving Writing Impairments Can, Following Multi-Levelled Writing Instruction, Learn to Write.

V Conclusions, Resources for Assessment, Instruction, and Assessment-Instruction Links, and Research References



Conclusions about Levels of Language

- Levels of Language are relevant to identifying different kinds of writing impairments.
- Levels of Language are relevant to effective instruction for different kinds of writing impairments.
- Brain imaging research has identified (a) both common and unique fMRI connectivity between cascading Levels of Language in the brain for Typical Language Learners, (b) differences between those with Dyslexia (impaired spelling) and Typical Language Learners and between those with OWL LD (impaired written expression) and Typical Language Learners, and (c) brain response (gray matter, white matter, and their correlations) to multi-leveled writing instruction.

Assessment Resources

Normed Measures

Barnett, A., Henderson, L., Scheib, B., & Schulz, C. (2007). *Detailed Assessment of Speed of Handwriting (DASH) Copy Best and Fast*. London: Pearson.

Berninger, V. (2007). *Process Assessment of the Learner for Reading and Writing, Second Edition, PAL II RW*. Pearson, Bloomington, MN. Based on federally funded assessment research, this test comes with the *Revised User Guide for PAL II RW* (Berninger, 2020d). Enter following link in Google: <https://www.pearsonassessments.com/> In search (on top right) type in PAL II Reading and Writing and hit enter. Under Our Assessments find and scroll down if necessary and click on *Process Assessment of the Learner Second Edition: Diagnostics for Reading and Writing (PAL II Reading and Writing)*. Contact Julie Godfrey at Julie.Godfrey@Pearson.com if you have difficulty accessing *PAL II RW* or *Revised User Guide for PAL II RW* or *Revised PAL Instructional Materials* on this Pearson website.

Berninger, V., & Wolf, B. (2016, 2nd printing 2019). *Dyslexia, dysgraphia, OWL LD, and dyscalculia: Lessons from teaching and science, Second Edition*. Baltimore: Paul H. Brookes. Also available as e-book.

for Handwriting and Related Skills pages 41-45 and 52-54

for Spelling and Related Skills pages 85-86

for Written Expression and Related Skills pages 103-105

Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). *Delis-Kaplan Executive Function System (DK-EFS)*. Pearson: Bloomington, MN. Color Word Form Inhibition subtest and Verbal Fluency subtest (scored for Repetitions)

Kaufman, A., & Kaufman, N. (2014). *Kaufman Test of Educational Achievement, Third Edition* (KTEA-3). Pearson.

Assessment Resources

Normed Measures Continued

Mather, N., Hammil, D., Allen, E., & Roberts, R. (2014). *Test of Silent Word Reading Fluency, 2nd Ed.* *TOSWRF-2*. Pro-Ed.

Mather, N., Roberts, R., Hammill, D., & Allen, E. (2008). *TOC: Test of Orthographic Competence*. San Antonio, TX: Pro-Ed. (Homophone Choice, Letter Choice, Word Scramble, Word Choice)

Mather, N., & Wendling, B. J. (2014). *Woodcock Johnson, Tests of Achievement, WJ IV, 4th Edition (WJ-IV)*. Rolling Meadows, IL Riverside. Sentence Writing Fluency and Spelling

Nelson, N., Plante, E., Helm-Estabrooks, N., & Hotz, G. (2016). *Test of Integrated Language and Literacy Skills (TILLS)*. Baltimore, MD: Brookes Publishing.

Torgesen, J., Wagner, R., C. , & Rashotte (1999). *Test of Word Reading Efficiency, 2nd Edition (TOWRE 2)*. Pro-Ed.

Wagner, R., Torgesen, J., Rashotte, C. , & Pearson, N.A. (1999). *Comprehensive Test of Phonological Awareness, 2nd Edition (CTOPP-2)*. Pro-Ed.

Assessment Resources

Normed Measures continued

Wechsler, D. (2020). *Wechsler Individual Achievement Test, 4th Edition. (WIAT IV)*. Pearson: Bloomington, MN.

Wechsler, D. (2014). *Wechsler Intelligence Scale for Children, 5th Edition (WISC V)*. Pearson: Bloomington, MN.

Wiederholt, J. L., & Bryant, B. (2020). *Gray Oral Reading Test, 5th Edition (Gort 5)*.

Wiig, E., Seml, E., & Secord, W. (2013). *Clinical Evaluation of Language Fundamentals—Fifth Edition (CELF 5)*. Pearson Clinical.ca Pearson: Bloomington, MN.

Wolf, M., & Denckla, M (2005). *RAN/RAS Rapid Automatized Naming and Rapid Alternating Switching Tests*. Austin, TX: Pro-Ed.

Placement Test to Identify Instructional Level for Spelling

Fry, E. (2002). *Dr. Fry's Spelling Book Levels 1-6. Words Most Needed Plus Phonics*. Teacher Created Materials, Inc. Westminster, CA. Has placement test to determine instructional level in spelling.

Instructional Resources

Beck, I., McKeown, M., & Kucan, L. (2013). *Bringing words to life: Robust vocabulary instruction (2nd Ed.)*. New York: NY: Guilford Press.

Berninger, V. (2020a). *Revised PAL Guides for intervention. Reading and Writing*. Pearson, Bloomington, MN.

Berninger, V. (2020b) *Revised PAL Handwriting Lessons*. Bloomington, MN.

Berninger, V. (2020c). *Revised Talking Letters Teacher's Guide*. Pearson, Bloomington, MN

Berninger, V., & Abbott, S. (2020). *Revised PAL Research Based Reading and Writing Lessons. also Reproducible Instructional Materials* to use with the lessons. Pearson, Bloomington, MN.

Berninger, V., & Wolf, B. (2009). *Helping students with dyslexia and dysgraphia make connections: Differentiated instruction lesson plans in reading and writing*. Baltimore: Paul H. Brookes. Spiral book with teaching plans from University of Washington Research Program.

Berninger, V., & Wolf, B. (2016, 2nd printing 2019). *Dyslexia, dysgraphia, OWL LD, and dyscalculia: Lessons from teaching and science, Second Edition*. Baltimore: Paul H. Brookes. Also available as e-book.
for Handwriting and Related Skills pages 55-59
for Spelling and Related Skills pages 88-97
for Written Expression and Related Skills page 130, and

Ervin, J. (2001). *Reading Comprehension in Varied Subject Matter*. Cambridge, MA: Educators Publishing Service.

Fry, E. (2002). *Dr. Fry's Spelling Book Levels 1-6. Words Most Needed Plus Phonics*. Teacher Created Materials, Inc. Westminster, CA. Words taught are the highest frequency ones for each grade level.

Instructional Resources

Henry, M. (2010). *Unlocking Literacy, 2nd Edition. Effective decoding and spelling instruction*. Baltimore, MD: Paul H. Brookes.

Henry, M.K. (Spring, 2017). Morphemes matter: A framework for instruction. *Perspectives on Language and Literacy*. Baltimore, MD: The International Dyslexia Association (pp. 23-26).

Henry, M.K. (2018). A short history of the English language (4rd Ed.). In J. Birsh & S. Carreker (Eds.), *Multisensory structured language instruction: Theory and practice* (pp. 540—557). Baltimore: Paul H. Brookes Publishing.

Henry, M.K. & Redding, N.C. (2021). *Patterns for success in reading and spelling* (2nd Ed.). Austin, TX: ProEd.

Slingerland, B. (2021). The Slingerland®Multisensory Approach. *A practical guide for teaching reading, writing, and spelling. 3rd Edition*. Bellevue, WA: The Slingerland Literacy Institute. <https://silshop.slingerland.org/>

Treiman, R., & Kessler, B. (2014). *How children learn to write words*. Oxford: Oxford University Press.

Wasowicz, J., Apel, K., Masterson, J., & Whitney, A. (2004). *SPELL-links to reading and writing: A word study curriculum and supplemental program for K-adult*. Evanston, IL: Learning by Design. .

Zaner-Bloser (2016) *Spelling Connections* (spelling lessons by grade, K to 8)
<https://www.zaner-bloser.com/spelling/spellingconnections/index.php>

Resources for Linking Assessment and Instruction

Berninger, V. (2020d). *Revised User Guide for the PAL II Reading and Writing Diagnostic (PAL II RW)*. Pearson, Bloomington, MN. See slides 12 and 52.

Berninger, V. (2015). *Interdisciplinary frameworks for schools: Best professional practices for serving the needs of all students*. Washington, DC: American Psychological Association. The author accepts no royalties for this book written in collaboration with an advisory panel (32 members) representing 10 disciplines which also has Companion Websites with Readings and Many Instructional and Assessment Resources and Advisory Panel papers. For developmental steppingstones in writing, writing-reading, and writing-math, see Chapters 4, 5, and 6, to design instruction aimed at instructional levels of typically developing students who exhibit normal variation in writing, reading, and math acquisition.

Berninger, V., & Wolf, B. 2nd Edition (2016, 2nd printing 2019). *Dyslexia, dysgraphia, OWL LD, and dyscalculia. Lessons from Science and Teaching*. Baltimore: Paul H. Brookes.

Assessment-Instruction Links

for Handwriting and Related Skills: pages 29-51;

for Spelling and Related Skills: pages 61-87;

for Written Expression and Related Skills: pages 91-125; and

Research References

- Abbott, R., Raskind, W., Matsushita, M., Richards, T., Price, N., & Berninger, V. (2017). Patterns of biomarkers for three phenotype profiles of persisting specific learning disabilities during middle childhood and early adolescence: A preliminary study. *Biomarkers and Genes*, 1(1), 1-10. doi:10.15761/BG.1000103 Public Access: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6407889>
- Beck, I., McKeown, M., & Kucan, L. (2013). *Bringing words to life: Robust vocabulary instruction (2nd Ed.)*. New York: NY: Guilford Press.
- Berninger, V., Abbott, R., Whitaker, D., Sylvester, L., & Nolen, S. (1995). Integrating low-level skills and high-level skills in treatment protocols for writing disabilities. *Learning Disability Quarterly*, 18, 293-309.
- Berninger, V., & Hidi, S. (2006). Mark Twain's writers' workshop: A nature-nurture perspective in motivating students with learning disabilities to compose. In S. Hidi, & P. Boscolo (Eds). *Motivation in writing* (pp. 159-179). Originally Amsterdam, Elsevier, now Emerald, Australia.
- Berninger, V., Nielsen, K., Abbott, R., Wijsman, E., & Raskind, W. (2008). Writing problems in developmental dyslexia: Under-recognized -and under-treated. *Journal of School Psychology*, 46, 1-21. Public Access: PMC 2344144
- Berninger, V., & O'Malley May, M. (2011). Evidence-based diagnosis and treatment for specific learning disabilities involving impairments in written and/or oral language. Journal of Learning Disabilities, 44, 167-183.*
- Berninger, V., Richards, T., & Abbott, R. (2015, published on line April 21, 2015). Differential diagnosis of dysgraphia, dyslexia, and OWL LD: Behavioral and neuroimaging evidence. *Reading and Writing. An Interdisciplinary Journal*, 28, 1119-1153. doi:10.1007/s11145-015-9565-0 A2 contains supplementary material available to authorized users: NIHMS683238 Publ ID 2615-04-21_0002 Public Access: Released to PMCID 4553247

Research References

- Berninger, V., Vaughan, K., Abbott, R., Abbott, S., Brooks, A., Rogan, L., Reed, E., & Graham, S. (1997). Treatment of handwriting problems in beginning writing: Transfer from handwriting to composition. *Journal of Educational Psychology, 89*, 652-666.
- Berninger, V., Vaughan, K., Abbott, R., Brooks, A., Abbott, S., Reed, E., Rogan, L., & Graham, S. (1998). Early intervention for spelling problems: Teaching spelling units of varying size within a multiple connections framework. *Journal of Educational Psychology, 90*, 587-605.
- Berninger, V., Vaughan, K., Abbott, R., Brooks, A., Begay, K., Curtin, G., Byrd, K., & Graham, S. (2000). Language-based spelling instruction: Teaching children to make multiple connections between spoken and written words. *Learning Disability Quarterly, 23*, 117-135.
- Berninger, V., Vaughan, K., Abbott, R., Begay, K., Byrd, K., Curtin, G., Minnich, J., & Graham, S. (2002). Teaching spelling and composition alone and together: Implications for the simple view of writing. *Journal of Educational Psychology, 94*, 291-304.
- Berninger, V., Winn, W., Stock, P., Abbott, R., Eschen, K., Lin, C., Garcia, N., Anderson-Youngstrom, M., Murphy, H., Lovitt, D., Trivedi, P., Jones, J., Amtmann, D., & Nagy, W. (2008). Tier 3 specialized writing instruction for students with dyslexia. *Reading and Writing. An Interdisciplinary Journal, 21*, 95-129. Printed Springer On Line. May 15, 2007.

Research References

- Henry, M. (2010). *Unlocking Literacy, 2nd Edition. Effective decoding and spelling instruction*. Baltimore, MD: Paul H. Brookes.
- Henry, M.K. (Spring, 2017). Morphemes matter: A framework for instruction. *Perspectives on Language and Literacy*. Baltimore, MD: The International Dyslexia Association (pp. 23-26).
- Henry, M.K. (2018). A short history of the English language (4rd Ed.). In J. Birsh & S. Carreker (Eds.), *Multisensory structured language instruction: Theory and practice* (pp. 540—557). Baltimore: Paul H. Brookes Publishing.
- Henry, M.K. & Redding, N.C. (2021). *Patterns for success in reading and spelling* (2nd Ed.). Austin, TX: ProEd.
- Kosslyn, S. (1988). Aspects of a cognitive neuroscience of mental imagery. *Science*, 240, 1621-1626.
- Nagy, W., & Anderson, R, (1999). Metalinguistic awareness and literacy acquisition in different languages. In D. Wagner, B. Street, & R. Venezky (Eds.), *Literacy. An International Handbook* (pp. 155-160). New York: NY: Garland Publishing.
- Nagy, W., Berninger, V., Abbott, R., Vaughan, K., & Vermeulen, K. (2003). Relationship of morphology and other language skills to literacy skills in at-risk second graders and at-risk fourth grade writers. *Journal of Educational Psychology*, 95, 730-742.
- Richards, T., Berninger, V., Yagel, K., Abbott, R., & Peterson, D. (2017). Changes in DTI Diffusivity and fMRI connectivity cluster coefficients for students with and without specific learning disabilities in written language: Brain's response to writing instruction. *Journal of Nature and Science (JNSCI)*, 3(4) e350, 1-11.
Public access: <https://www.ncbi.nlm.nih.gov/pubmed/28670621>

Research References

- Richards, T., Nagy, W., Abbott, R., & Berninger, V. (2016). Brain connectivity associated with cascading levels of language. *Journal of Systems and Integrative Neuroscience (JSIN)*, 2, 219-229. (ISSN: 2059-9781) doi: 10.15761/JSIN.1000139
Pub Med Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5261811>
- Tanimoto, S., Thompson, R., Berninger, V., Nagy W., & Abbott, R. (2015). Computerized writing and reading instruction for students in grades 4 to 9 with specific learning disabilities affecting written language. *Journal of Computer Assisted Learning*, 31, 671-689. doi: [10.1111/jcal.12110](https://doi.org/10.1111/jcal.12110)
Public Access: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4743045>
- Thompson, R., Tanimoto, S, Abbott, R., Nielsen, K., Geselowitz, K., Lyman, R., Habermann, K., Mickail, T., Raskind, M., Peveryly, S. Nagy, W., & Berninger, V. (2016, July 19, on line). Relationships between language input and letter output modes in writing notes and summaries for students in grades 4 to 9 with persisting writing disabilities. *Assistive Technology Journal*. DOI: 10.1080/10400435.2016.1199066 Link for on line published paper: <http://www.tandfonline.com/doi/full/10.1080/10400435.2016.1199066> NIHMS 846387
Public access: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5291827>
- Vellutino, F, Scanlon, D., & Tanzman, M. (1991). Bridging the gap between cognitive and neuropsychological conceptualizations of reading disabilities. *Learning and Individual Differences*, 3, 181-203.
- Venezky, R. (1970). *The structure of English orthography*. The Hague, Netherlands: Mouton.
- Venezky, R. (1999). *The American way of spelling*. New York: NY: Guilford Press.
- Wallis, P., Richards, T., Boord, P., Abbott, R. & Berninger, V. (2017). Relationships between translation and transcription processes during fMRI connectivity scanning and coded translation and transcription in writing products after scanning in children with and without transcription disabilities. *Creative Education*, 8 716-748.
<https://doi.org/10.4236/ce.2017.85055> http://file.scirp.org/pdf/CE_2017050515382839.pdf
Public Access : <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5868987>

Q & A Dr. Berninger's Response to Questions Submitted to Q & A during Presentation

Moderator: Dr. Laura Dinehart, Dean for the School of Education and Human Development at Florida International University

**At Completion of Q & A, Look for Link in Chat for Downloading the Powerpoint for This Presentation,
Which Will Also be Available in Chat To Those Who View Recording**

**Participants on January 21, 2022 or Those Who Sign Up at a Later Time for Recording of This Presentation
Can Submit Additional Question to Kathleen Wright at**

admin@handwritingcollaborative.org

Kathleen Wright will send Virginia Berninger's written responses to Registered Participants.

