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# FIND THE GAP

## How to Locate Exactly Where a Student's Learning Stopped and What to Teach Next

*A guide for Student Success Teams at independent schools*

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# The Student You Cannot Figure Out

Marco has been evaluated twice.

The first evaluation found a math difficulty. The second found processing speed deficits, working memory weaknesses, and what the report called a complex learning profile. Marco has an accommodation plan. He has been working with a math tutor for six months.

His teachers describe him as bright, engaged, verbally sophisticated — if easily distracted.

But he has hit a wall. Fractions. Decimals. Multi-step word problems. The curriculum is getting more complex, and Marco cannot keep up. The accommodation plan gives him extra time, a calculator, and modified assignments.

He is not moving.

> **The evaluation gave us a label for Marco's difficulty. It did not give us a location.**

There is a difference. That difference is the methodology in this document.


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# Part 1: The Mechanism

## Why the learning challenge looks complex when the problem is specific

In the early grades, Marco was quick with everything. ELA. Math. Counting. Number bonds. Word problems. None of it slowed him down.

But Marco was doing something in math class that nobody noticed. He was using the same strategy that made him fast in reading. He was treating numbers like letters. He memorized the counting sequence the same way he memorized the alphabet — quickly, confidently, completely. He knew which numbers came before and after each other. He could go forward and backward. He could retrieve number facts the way he retrieved sight words.

What he did not do was see numbers as quantities.

He did not see 9 as more than 5. He knew that 9 came after 5 in the sequence. That is a different kind of knowledge entirely.

For the early grades, the difference was invisible. The counting sequence produced correct answers. Marco looked proficient. Nobody had a reason to look deeper.

By third grade, the strategy started showing its holes. Errors appeared in places that did not make sense. Word problem responses that contradicted his strong verbal reasoning. Bizarre answers that did not match what a bright kid should be able to do. The adults around Marco attributed it to attention, to anxiety, to a bad testing day.

What had happened was structural. Marco had never developed number sense. He had never built the foundational understanding that numbers represent quantities and that quantities have magnitude. His verbal strength had allowed him to race past that learning entirely. The counting sequence got him far enough that nobody saw what was missing underneath it.

Then the curriculum asked him something the counting sequence could not answer.

What is larger: one third or one half?

Marco did not know. The sequence gave him no foothold. And without a concept of quantity, everything built on it became a fog. Parts and wholes. Repeated addition. Equal groupings. Fractions on a number line. Every concept that required

him to understand what numbers actually mean was inaccessible, because he had never built that understanding..

By the time Marco reached middle school he had a math disability label. Entrenched. Complex. Hard to decipher. He was capable in geometry and graphing, where visual-spatial reasoning could carry him. He was lost in algebra and word problems, where quantity and magnitude were inescapable.

The difficulty was real. The cause was a single unfound gap at the foundation of the entire sequence.

He did not learn that numbers represent quantities. Every year of math instruction since then had been built on that missing concept. The structure above it was not defective. It was unsupported.

**ENCAPSULATION**

A student has a gap in a developmental sequence. She compensates around it. Because she is routing around the gap instead of developing through it, the underlying skill never receives the developmental attention it needs to grow. The curriculum advances. The workaround holds. The gap calcifies. Months become years. The gap compounds. By the time of a formal evaluation, the profile is so complex it looks inherent. The evaluation captures the compounded endpoint and mistakes it for the cause. The diagnosis names what the process produced. It does not recognize the underlying gap.

**Encapsulation can develop in any academic domain.**

| | |
|---|---|
| **READING** | A first grader with weak phonemic awareness compensates by memorizing words as visual wholes. Works for high-frequency words. By fourth grade: deficits in decoding, fluency, spelling, vocabulary, and comprehension — five domains of difficulty, every one of them traceable to one foundational skill that was not built. |
| **MATH** | A kindergartner who does not integrate counting and quantity into a single mental number line compensates by memorizing arithmetic procedures without understanding what numbers represent. By fifth grade: can execute algorithms but treats them as arbitrary rules. Flip-and-multiply without knowing what a fraction means. Carrying the one without understanding place value. Procedures learned without understanding. |

| | |
|---|---|
| **WRITING** | A first grader with delayed fine motor coordination and visual perception compensates by overgripping the pencil and pressing hard into the page. Works for single letters. By middle school: five competing labels — dysgraphia, processing speed, working memory, executive dysfunction, anxiety. Each one a description of the same compounded endpoint. Transcription was never automated. When forming letters requires conscious attention, there are fewer resources left for composition. The student who cannot write is not just a student with complex learning needs. She is a student who never stopped thinking about how to hold a pencil. |

## The Impact of Encapsulation Expands

A student who has spent four years routing around a number sense gap does not look like a math problem by third grade. He looks like an avoidant, anxious, disengaged student. He stops raising his hand. He asks to go to the bathroom when math starts. He tells you he hates school.

By the time the cascade reaches identity, it has generated its own maintenance system. The student stops trying because he has accumulated years of evidence that effort does not lead anywhere. That belief produces more behavior that confirms the belief.

> **Sometimes the behavior we are managing is the downstream consequence of a learning gap.**

Address the gap, and the behavior often resolves without a behavior plan. The student who believes he cannot learn mathematics has not been taught mathematics at his actual developmental coordinate. He has been asked to execute procedures he has no foundation for, year after year. Over time the complexity of the learning challenge expands.

**What if the “Learning Disability” is an unaddressed gap with years of identity protection built on top of it?**

## The Evidence

Vellutino's 1996 study asked a simple question: what happens when you stop accommodating around a reading difficulty and start addressing it directly?

He provided targeted, daily 1:1 reading instruction to first graders who had been identified as “reading impaired.” After one semester, reading achievement in most of these children was within or above the average range. The students who remained difficult to remediate had an identifiable profile — severe phonological deficits. The rest had been misread. Their difficulty was experiential, not constitutional. The label described where the cascade had landed. It did not describe what the child was capable of.

Torgesen's review of that evidence and the studies that followed it produced a number that should change how every team looks at a struggling student: high-quality, well-timed intervention reduces the rate of persistent reading failure from roughly 20% to as low as 1–5%. The students who remain genuinely difficult to help are a small, identifiable group. They are not the majority of students currently carrying a learning disability label.

The same pattern appears in mathematics. Griffin, Case, and Siegler's RightStart studies found that low-income kindergartners entering school nearly two years behind their middle-income peers on number knowledge tests reached the same level as their peers by the end of kindergarten, after one year of targeted instruction aimed at the foundational conceptual structure. The control groups, who received other math programs, still showed the same developmental gap at the end of first grade.

The gap was experiential. The coordinate was findable. The properly focused intervention worked.

These are not isolated findings. They are a pattern across domains, populations, and decades of research. The student who has not yet made progress is not evidence that the student cannot break through. **It is evidence that the right coordinate has not yet been found, or that the intervention aimed at the right coordinate has not been delivered with enough power to move it.**

That is what this document is for.

## The Distinction That Changes Everything

| THE CLINICAL MODEL | THE EDUCATIONAL MODEL |
| --- | --- |
| *Asks: What is wrong with this student?* | *Asks: Where is this student in the learning sequence?* |
| Produces: A category. A diagnosis. A set of accommodations and compensations designed to work around the difficulty. | Produces: A coordinate. A specific skill, in a known sequence, where development froze. |
| **A diagnosis does not include the path forward.** | **A coordinate includes a path forward.** |

**The student who has been managed for two years with an accommodation plan is not unteachable. The specific coordinates of what she needs have not yet been found. The three tools in this document are how you find them.**

## A Coordinate

Not "reading weakness." Not "math disability." "Concept of number at the single digit level." That is a coordinate. It tells you exactly where development froze. It tells you exactly what to teach next. Coordinates have paths forward. Labels do not.

The evaluation gave Marco a label. What he needed was a location: the specific point in a known developmental sequence where his understanding stopped and where intervention needs to begin.


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# Part 2: The Tool

*The Developmental Trace — A Five-Step Protocol for Finding Where Learning Stopped*

You have a student whose intervention data has been flat. The evaluation says learning disability. The accommodation plan says extended time and modified assignments. We have tried everything.

## Have we tried this?

**01**

### SCREEN

Universal screening identifies students who are not at the level the curriculum expects. A second grader reads at 35 words per minute when the benchmark is 89. A first grader cannot reliably tell you which of two numbers is larger. A third grader produces 8 words per minute when her peers produce 18. Screenings are simple tools that surface students for the team to explore further and discuss. Screening does not explain.

⚠ **Do not skip straight from screening to intervention. Screening earns the student a closer look. Nothing more.**

**02**

### IDENTIFY THE DOMAIN

A student struggling in reading might have a phonological deficit, a fluency bottleneck, a vocabulary gap, or a comprehension challenge. A student struggling in math might lack number sense, place value, or number fluency. A student struggling in writing might have a transcription challenge, a spelling difficulty, or overwhelmed by composition. Step 2 narrows the field. You cannot trace until you know which map to trace through. Gough and Tunmer's Simple View of Reading tells you whether to trace through the word reading sequence or the comprehension sequence. If a student can decode but cannot comprehend, trace through the language strand. If a student comprehends everything she hears but cannot read the page, trace through the decoding strand. Berninger's model for writing tells you whether the bottleneck is transcription, text generation, or executive

function.

**⚠ Do not focus on the symptom. Find the primitive gap. A student whose comprehension is weak because of decoding will not benefit from comprehension intervention.**

## 03 TRACE BACKWARD THROUGH THE SEQUENCE

Once you know which developmental sequence you are in, follow the map backward until you find the last place where the skill is genuinely solid, where the student demonstrates real proficiency. Start with what the student cannot do. Ask what skill that depends on. Check whether the student has that skill. If yes, move forward one step — you have found the gap. If no, keep tracing backward. Repeat until you hit solid ground. An electrician troubleshooting a broken outlet does not rewire the house. She traces the circuit backward from the outlet until she finds the break. Fix the break. The current flows again. For younger students (K–2): start at the beginning of the sequence and work forward. For older students (grade 3+): trace backward from the identified area of difficulty.

## 04 VERIFY THE COORDINATE

The trace generates a hypothesis. Before you build an intervention plan on the hypothesis, verify it. Administer a brief, targeted assessment at the hypothesized level. If the student performs as predicted — solid below the coordinate, inconsistent at the coordinate and above, then you know the location. If the student performs differently than the hypothesized gap predicted, the trace found the wrong spot. Revise the hypothesis. Trace again.

## 05 INTERVENE

Begin intervention at the verified coordinate. Build forward through the sequence. Monitor weekly with the intervention content whether the student is moving. If the student is making measurable progress after six weeks on the curriculum materials and a separate progress measure, continue. If the student is not making progress after six

weeks, one of three things is true: the trace identified the wrong coordinate / the instruction focuses at the right coordinate but lacks sufficient power / conditions outside the instruction are preventing the student from accessing it. Start with power. Is the intervention frequent enough, long enough, specific enough, delivered by someone with sufficient expertise?

**⚠ Do not persist with an intervention that does not produce progress. An intervention that is continued indefinitely without progress creates its own form of harm.**

**What the Developmental Trace Produces**

Not a new label. A coordinate. A starting point. A path forward. Once you find it, you know what to teach. Not what to accommodate.

## The Trace in Action: Math

The evaluation says: specific learning disability in mathematics. Strong verbal reasoning. Strong oral language. Learns rote procedures. Cannot handle fractions, decimals, or multi-step word problems. Struggles in algebra. Produces nonsensical errors. Capable in geometry and graphing.

| | |
|---|---|
| **DETECT** | Winter screener places Marco at the 34th percentile in math. Teacher referral notes increasing difficulty as the class moves into fractions and multi-step problems. |
| **DOMAIN** | Ask him to solve a word problem aloud without writing anything down. He reasons through it clearly. The language is not the bottleneck. Ask him which is larger: one third or one half. He cannot answer. The breakdown is not in computation or language. It is in the understanding of quantity. You are in the number sense sequence. |
| **TRACE** | Give him two numbers — 1,020 and 989. Ask which is larger. He chooses 989. Ask him to place 6 on a number line between 1 and 10. He places it by counting from the left. Ask him to estimate 29 + 35. He cannot. He needs to calculate the exact answer, on |

| | |
|---|---|
| | paper. The counting sequence is solid and fluent. The concept of magnitude is not there. Solid below: counting sequence, arithmetic facts by rote. Gap appearing at: magnitude comparison, number as quantity. |
| **VERIFY** | Brief number sense assessment confirms: fluent with counting sequence, weak on magnitude tasks, cannot place fractions on a number line, cannot estimate. Coordinate confirmed: number sense — the understanding that numbers represent quantities with magnitude. |
| **INTERVENE** | Instruction begins at number sense: quantity, magnitude, the mental number line. Not fraction procedures, not algorithm review which are the symptoms. As the concept of number consolidates, the procedures built on top of it become learnable. Fractions become quantities rather than arbitrary rules. Multi-step problems become solvable because the numbers in them mean something. |


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# Part 3: The Maps

## Learning Hierarchies

The Developmental Trace follows a map.

Each level shows three things: the skill, what mastery looks like, and, most importantly, what being stuck at that level looks like.

> **To Run the Trace**
>
> Identify the domain (Step 2), then move backward through the relevant hierarchy until you find the level where the student's understanding is solid. The next level up — where learning is inconsistent — is the encapsulated skill. That is where intervention begins.

*Primary research: Case & Griffin (1990, 1994, 1997); Griffin (2004, 2005); Clements & Sarama (2014)*

The sample below covers mathematics — the domain where developmental maps are underused and where the gap between what the evaluation says and what is actually happening is widest.

# Level 1: Number Sense

The understanding that numbers represent quantities, that quantities have magnitude, and that the counting sequence maps onto that magnitude. This is a common site of encapsulation in mathematics. A student who has not consolidated this structure compensates by memorizing procedures — executing algorithms correctly without understanding what the numbers mean. The surface accuracy masks the conceptual gap until the procedures become too complex to memorize. Then more complex learning collapses at once.

| Sub-skill | Mastery looks like | Stuck here looks like |
|---|---|---|
| **Subitizing** | Recognizes small quantities (1–5) without counting | Must count every group, even two or three objects |
| **Stable counting sequence** | Recites numbers in correct order to 20+ | Skips numbers, reverses order, or stalls after certain numbers |
| **One-to-one correspondence** | Touches each object once while saying one number per object | Double-counts, skips objects, or loses track |
| **Cardinality** | Understands that the last number counted tells "how many" | Recounts from the beginning when asked "how many did you count?" |
| **Magnitude comparison** | Knows 7 is greater than 5 and can demonstrate why | Cannot compare quantity of two numbers without counting out objects |
| **Mental number line** | Places numbers on a line and understands their relative position | Numbers have no spatial or quantitative relationship to each other |

**THE DIAGNOSTIC MOVE**

Give the student two numbers — 89 and 101. Ask which is larger. A student with consolidated number sense answers immediately and can explain why. A student without it hesitates. He may count. He may guess. Use greater numbers for older students, lesser numbers for younger students.

# Level 2: Addition and Subtraction Concepts

Counting on is the critical transition. It requires understanding that the first addend represents a fixed quantity — not just a starting point. This distinction is visible in thirty seconds.

| Sub-skill | Mastery looks like | Stuck here looks like |
|---|---|---|
| **Counting all** | Combines two groups by counting all objects from 1 | Cannot combine groups; treats each set separately |
| **Counting on** | Starts from the larger addend: 5+3 becomes "five... six, seven, eight" | Always restarts from 1 regardless of group size |
| **Part-whole understanding** | Understands that 7 can be 3+4, 5+2, 6+1 | Sees each number fact as isolated; cannot decompose flexibly |
| **Derived facts** | Uses known facts to derive unknown: "5+5=10, so 5+6=11" | Every fact must be memorized or counted out independently |
| **Fact fluency** | Retrieves basic facts within 20 automatically | Must calculate or count for harder facts |


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## Level 3: Place Value

Where procedural-only students become visible. They execute the standard algorithm correctly but cannot estimate, solve the same problem presented differently, or demonstrate how the procedure works.

| Sub-skill | Mastery looks like | Stuck here looks like |
|---|---|---|
| **Grouping by tens** | Understands that 10 ones = 1 ten | Counts 23 objects as 23 ones; does not see groups of ten |
| **Decomposition** | Knows that 47 = 40+7 = 4 tens and 7 ones | Can label "4 is in the tens place" but cannot explain what it means |
| **Flexible computation** | Adds 28+35 by decomposing: 20+30=50, 8+5=13, total=63 | Can only compute using the standard algorithm |
| **Estimation** | Approximates 29+35 as "about 65" | Cannot estimate; must calculate exact answer or guesses |
| **Regrouping with understanding** | Can demonstrate why regrouping works | Follows the "carry the 1" rule without knowing why |

**WHAT THE EVALUATION MISSED**

The student who gets 29+35=64 correct using the standard algorithm looks proficient. He might not be. Ask him to estimate. Ask him to solve it a different way. Ask him why carrying the 1 works. The surface accuracy might be masking a Level 3 gap. That gap will collapse learning the moment the procedures become too complex to solve with memory alone.


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# Level 4: Multiplication And Division Concepts

Multiplication marks the point where memorization strategies typically collapse. Without the connected network that informs new mental models, the list becomes too long to hold.

| Sub-skill | Mastery looks like | Stuck here looks like |
|---|---|---|
| **Equal groups** | Understands 3×4 as "3 groups of 4" | Does not connect multiplication to grouping |
| **Repeated addition bridge** | Sees that 3×4 = 4+4+4 = 12 | Cannot link multiplication to addition |
| **Commutative property** | Knows 3×4 = 4×3 and demonstrates how | Treats them as separate facts to memorize |
| **Derived facts** | Uses 7×7=49 to get 7×8=56 | Every fact is isolated; forgetting one means it is gone |
| **Fact fluency** | Retrieves multiplication facts automatically | Slow, effortful retrieval; confuses similar facts (6×7 vs. 6×8) |
| **Division as inverse** | Understands 12÷3 asks "how many groups of 3 in 12?" | Can only solve division by trial-and-error or memorized pairs |


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# Level 5: Fractions

The National Mathematics Advisory Panel identified fraction proficiency as the single most important predictor of success in algebra. The challenge of fractions is where the cascade from number sense becomes more visible.

| Sub-skill | Mastery looks like | Stuck here looks like |
|---|---|---|
| **Equal partitioning** | Divides a whole into equal parts and understands each part's relative size | Cannot create or recognize equal parts |
| **Fraction as number** | Understands 3/4 is a single number with a location on the number line | Sees 3/4 as "three out of four" only |
| **Unit fraction understanding** | Knows 1/3 > 1/5 because thirds are larger pieces than fifths | Thinks 1/5 > 1/3 because "5 comes after 3" |
| **Equivalent fractions** | Understands 2/4 = 1/2 because they represent the same quantity | Can only find equivalents using a rule; cannot demonstrate why |
| **Fraction operations** | Adds, subtracts, multiplies, divides fractions with understanding | Memorizes "flip and multiply" without understanding |
| **Decimal-fraction connection** | Converts fluently between fractions and decimals | Treats fractions and decimals as unrelated |

**THE CASCADE — MADE VISIBLE**

Number sense understanding not developed → computation understanding not developed → place value understanding not developed → multiplication and division understanding not developed → fractions understanding not developed → algebra is a fog. Every level depends on the understanding of the level before it. The trace finds where the cascade started. The hierarchy tells you what you are looking for at each level. The intervention begins at the origin of the gap, not the grade level symptom.


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# Part 4: Developmental Trace

## A One-Page Protocol for Locating the Coordinate and Building Forward

Complete one Trace Sheet per student. Use in student success meetings, individual consultations, or as a record of your investigation.

**STUDENT:** _____ **GRAGE:** _____ **DATE:** _____

**Concern:** _____

### STEP 1 — DETECTION

What data helped you idendify this student? (screener score, classroom work, teacher observation)

**Current level of learning:** _____

**Grade-level expectation:** _____

### STEP 2 — DOMAIN DECISION

Circle the sorting question that applies, then name the sequence to trace.

**Reading - Simple View:** ☐ Decoding strand ☐ Language comprehension strand

**Writing - Berninger:** ☐ Transcription ☐ Text generation / Executive function

**Math:** ☐ Conceptual understanding ☐ Procedural fluency

**Domain identified:** _____

### STEP 3 — THE TRACE

Start with what the student cannot do. Trace backward through the hierarchy until you hit solid ground.


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| Hierarchy Level | Status | | | Evidence |
|---|---|---|---|---|
| | ☐ Solid | ☐ Gap | ☐ Not Assessed | |
| | ☐ Solid | ☐ Gap | ☐ Not Assessed | |
| | ☐ Solid | ☐ Gap | ☐ Not Assessed | |
| | ☐ Solid | ☐ Gap | ☐ Not Assessed | |
| | ☐ Solid | ☐ Gap | ☐ Not Assessed | |

**Last solid level:** _____ **First level of gap:** _____

## STEP 4 — HYPOTHESIZED COORDINATE

Be specific. Not "reading weakness." Not "math difficulty."

**The coordinate:** _____

_____

_____

***Example:*** *"Phonemic segmentation at the four-phoneme level" / "Magnitude comparison — number sense not consolidated" / "Transcription automaticity — handwriting effortful, spelling two stages below grade level"*

## STEP 5 — VERIFICATION

**Assessment used:** _____

☐ Confirmed — begin instruction ☐ Revised — new coordinate: _____


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## 6-WEEK INTERVENTION PLAN

| Intervention | Frequency | Duration (min) | Group size | Person responsible | Progress metric |
|---|---|---|---|---|---|
| | | | | | |

**6-week check-in date:** _____

## SITUATION AFTER 6 WEEKS

| Situation | What it means | Next step |
|---|---|---|
| Data rising / intervention delivered / student engaged | **Working** | **Continue** |
| Data flat / intervention NOT delivered as designed | **Untested** | **Fix delivery first** |
| Data flat / delivered as designed / student engaged | **Wrong target** | **Trace again** |
| Data flat / delivered as designed / student disengaged or depleted | **Trace too narrow** | **Widen the lens** |

## NOTES / REVISIONS / NEXT STEPS

_____

_____

_____

_____

_____


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# The System

**01** **ENCAPSULATION**

Gives you the mindset: the student who looks complex has a traceable need. What appears to be a fixed deficit is a developmental position, a coordinate in a known sequence with a path forward.

**02** **THE DEVELOPMENTAL TRACE**

Gives you the method: five steps, any domain, any age. Detect, identify, trace backward, verify the coordinate, aim and build and monitor.

**03** **THE DEVELOPMENTAL HIERARCHIES**

Give you the maps: what mastery looks like at each level, and what being stuck at that coordinate looks like.

> What if the students who have been stuck the longest are not stuck because they are not capable? What if they are stuck because we have not found the exact point where their learning stopped? We can build from there.

**A WARNING**

**The trace is powerful. It is also dangerous without a safety system. A hypothesis that is never tested can confine a student. An intervention that is never monitored becomes a limitation. We must be mindful of the risk of assigning students to low level remedial classes where they do not progress and are denied access to the on-grade level work their peers experience. The process described in this document is a focused and efficient method to help students catch up to their peers, not to isolate them.**


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# Additional Resources

## The Developmental Framework

**Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*(4), 360–407.**

The foundational paper explaining why early unaddressed skill gaps compound over time. Stanovich demonstrated that students who struggle early read less, encounter fewer words, build less vocabulary, and fall progressively further behind — not because their capacity is limited, but because the gap was left to widen. This is the research behind why finding the coordinate early matters: the longer the gap runs unaddressed, the more consequences it accumulates.

https://doi.org/10.1598/RRQ.21.4.1

## Reading: The Foundational Skills Hierarchy

**Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and Special Education, 7,* 6–10.**

The original Simple View of Reading: reading comprehension equals the product of decoding and language comprehension. Either component can be the failure point — and they require different interventions. This framework is the structural logic behind the reading developmental hierarchy in this guide. A student who cannot decode requires a different trace than a student who decodes fluently but does not comprehend.

https://doi.org/10.1177/074193258600700104

**Vellutino, F. R., Scanlon, D. M., Sipay, E. R., Small, S. G., Pratt, A., Chen, R., & Denckla, M. B. (1996). Cognitive profiles of difficult-to-remediate and readily remediated poor readers: Early intervention as a vehicle for distinguishing between cognitive and experiential deficits as basic causes of specific reading disability. *Journal of Educational Psychology, 88*(4), 601–638.**

The study that showed most students identified as reading disabled are experientially impaired, not constitutionally limited. First-grade students given daily 1:1 targeted reading instruction showed reading achievement within or above the average range after one semester. Students who remained difficult to

remediate had an identifiable phonological profile. Reading disability is not a category — it is a question that requires a trace to answer.

https://doi.org/10.1037/0022-0663.88.4.601

**Torgesen, J. K. (2000). Individual differences in response to early interventions in reading: The lingering problem of treatment resisters. *Learning Disabilities Research & Practice, 15*(1), 55–64.**

The paper that produced the number that should change how every team thinks about a struggling reader. High-quality, well-timed early intervention reduces the rate of persistent reading failure from roughly 20% to 1–5%. The students who remain genuinely difficult to remediate are a small, identifiable group. The majority of students currently carrying a reading disability label are in the experiential 15–19%.

https://doi.org/10.1207/SLDRP1501_6

## Mathematics: The Number Sense Hierarchy

**Griffin, S., Case, R., & Siegler, R. S. (1994). RightStart: Providing the central conceptual prerequisites for first formal learning of arithmetic to students at risk for school failure. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 25–49). MIT Press.**

The chapter that established the developmental hierarchy in mathematics underlying the number sense trace in this guide. Griffin, Case, and Siegler mapped the conceptual structures children need to build numerical understanding — and showed that students who arrive without them are not mathematically limited. They are experientially behind.

**Griffin, S., & Case, R. (1996). Evaluating the breadth and depth of training effects when central conceptual structures are taught. *Monographs of the Society for Research in Child Development, 59*(1–2), 90–113.**

https://pubmed.ncbi.nlm.nih.gov/8657170/

The outcome study for the RightStart/Number Worlds curriculum. Low-income kindergartners entering school nearly two years behind their middle-income peers on number knowledge tests reached the same level as their peers by end of kindergarten — after one year of targeted instruction aimed at the foundational conceptual structure. Control groups receiving standard math programs still showed the same developmental lag at the end of first grade.



**Griffin, S. (2004). Teaching number sense. *Educational Leadership, 61*(5), 39–42.**

https://files.ascd.org/staticfiles/ascd/pdf/journals/ed_lead/el200402_griffin.pdf

The practitioner-accessible version of the number sense research. Griffin explains how children develop number knowledge in a predictable sequence and what it looks like when a critical conceptual structure is missing. This is the most direct reading for understanding why the diagnostic move in Level 1 of the trace — asking a student which of two numbers is larger — reveals so much in so little time.

## Writing: Transcription and Composition

**Berninger, V. W. (1999). Coordinating transcription and text generation in working memory during composing: Automatic and constructive processes. *Learning Disability Quarterly, 22*(2), 99–112.**

https://doi.org/10.2307/1511269

The research base for the writing developmental hierarchy in this guide. Berninger demonstrated that transcription — handwriting and spelling — and text generation compete for the same working memory resources. When transcription is not automatic, working memory is consumed by letter formation and orthographic retrieval, leaving nothing available for generating and organizing ideas. A student who cannot write is not a student with complex learning needs. She is a student whose transcription was never automated.

**Berninger, V. W., Vaughan, K. B., Abbott, R. D., Abbott, S. P., Rogan, L. W., Brooks, A., Reed, E., & Graham, S. (1997). Treatment of handwriting problems in beginning writers: Transfer from handwriting to composition. *Journal of Educational Psychology, 89*(4), 652–666.**

https://doi.org/10.1037/0022-0663.89.4.652

A randomized controlled study showing that targeted handwriting instruction in first grade transfers directly to gains in compositional fluency. Instruction aimed at the transcription coordinate produced improvements in text generation — the higher-order skill. This is the writing equivalent of the Griffin and Case number sense finding: address the foundational skill directly, and the cascade resolves.

Applying the Trace: Assessment and Decision-Making

**Torgesen, J. K., Alexander, A. W., Wagner, R. K., Rashotte, C. A., Voeller, K. K. S., & Conway, T. (2001). Intensive remedial instruction for children with severe reading disabilities: Immediate and long-term outcomes from two instructional approaches. *Journal of Learning Disabilities, 34*(1), 33–58.**

https://doi.org/10.1177/002221940103400104

The strongest single study for the proposition that students carrying formal disability labels can make dramatic gains when the right coordinate is targeted with sufficient intensity. Students with severe reading disabilities who received intensive, phonologically explicit instruction showed normalized scores in word attack and word identification. Within-subject effect size: 4.4. The disability label described where the cascade had landed. It did not describe what the students were capable of.



# True Progress

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