

orton gillingham math

The Orton-Gillingham approach, while renowned for its efficacy in reading and spelling instruction, also offers a powerful framework for understanding and teaching mathematics. The principles of structured, multisensory, and sequential learning that underpin Orton-Gillingham can be powerfully applied to demystify mathematical concepts for students who struggle with traditional methods. This article will delve into the multifaceted ways the Orton-Gillingham methodology can be adapted for math instruction, exploring its core tenets and how they translate into practical strategies. We will examine the importance of building foundational number sense, understanding place value, mastering basic operations, and tackling more complex problem-solving through a systematic, step-by-step process. Furthermore, we will discuss how to leverage multisensory techniques to engage diverse learning styles and foster deeper comprehension in mathematics.

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Understanding the Orton-Gillingham Philosophy in Math

The Orton-Gillingham philosophy is built on a bedrock of understanding how individuals learn, particularly those who find traditional academic approaches challenging. At its heart, it's about decoding, understanding, and then applying knowledge in a systematic and deliberate way. When we talk about Orton-Gillingham math, we're essentially taking these same core principles and applying them to the realm of numbers and mathematical reasoning. This means moving beyond rote memorization and embracing a deep, conceptual understanding that is built layer by layer. The focus is on making the abstract tangible and the complex comprehensible, much like how it helps students unlock the secrets of language.

The efficacy of Orton-Gillingham in literacy stems from its diagnostic and prescriptive nature. In mathematics, this translates to identifying precisely where a student's understanding falters and then providing targeted, explicit instruction to bridge that gap. It's not about a one-size-fits-all solution; rather, it's about tailoring the approach to the individual learner's needs. This individualized path ensures that no foundational piece is missed, preventing the compounding of errors and misunderstandings that can plague

students in math.

The Foundation of Number Sense with Orton-Gillingham Principles

Building a strong foundation in number sense is paramount in mathematics, and the Orton-Gillingham approach provides an excellent framework for this. Number sense isn't just about knowing what numbers are; it's about understanding their relationships, their magnitude, and how they behave. Think of it as the intuitive grasp of quantity that allows us to estimate, compare, and manipulate numbers effectively. For students who struggle, this intuitive grasp can be elusive, making it difficult to progress.

The Orton-Gillingham principles of direct, explicit instruction are crucial here. We need to break down the concept of "number" into its constituent parts, ensuring each component is understood before moving on. This begins with concrete representations of quantity. Using manipulatives like blocks, counters, or even everyday objects allows students to physically interact with numbers, making them real and less abstract. This hands-on engagement is a hallmark of multisensory learning, a key tenet of Orton-Gillingham.

Understanding Quantity and One-to-One Correspondence

A fundamental aspect of number sense is the understanding of quantity and the concept of one-to-one correspondence. This means grasping that each distinct object can be matched with a single numeral or counting word. For many children, this connection doesn't come naturally. An Orton-Gillingham inspired approach would involve extensive practice with activities that solidify this link. This could involve counting a set of objects, pairing them with fingers, or matching them to numeral cards. The emphasis is on slow, deliberate practice, ensuring the child can reliably connect the physical items to the abstract symbol.

Developing Subitizing Skills

Subitizing is the ability to instantly recognize the number of objects in a small set without counting. This is a critical precursor to more advanced number understanding. Activities designed to foster subitizing, such as flashing cards with dots or arranging objects in familiar patterns (like dice faces), can be incorporated. The Orton-Gillingham method would encourage repetition with varied examples, gradually increasing the number of items as the student masters each stage. The goal is to build automaticity in recognizing small quantities, which frees up cognitive resources for more complex mathematical thinking later on.

Multisensory Approaches to Mathematical Concepts

The power of the Orton-Gillingham approach lies in its commitment to engaging multiple senses. Mathematics, often perceived as purely abstract and visual, can be incredibly enriched by incorporating tactile, auditory, and kinesthetic learning. When students can see, hear, touch, and even move to understand a mathematical concept, their comprehension deepens, and their retention improves significantly. This multisensory engagement is not just for fun; it's a scientifically supported method for strengthening neural pathways and creating more robust understanding.

Consider the concept of place value. For many, it's an abstract idea involving columns and digits. But with a multisensory approach, it becomes a tangible reality. Students can use base-ten blocks – units, rods, flats, and cubes – to physically represent numbers. They can feel the difference between a "one" and a "ten," a "ten" and a "hundred." This tactile experience reinforces the value of each digit based on its position, a concept that can be notoriously difficult to grasp through mere visual explanation.

Tactile and Kinesthetic Learning

Tactile and kinesthetic learning involve using physical objects and movement to explore mathematical ideas. For instance, when teaching addition, instead of just writing $2 + 3 = 5$, a student might use two red blocks and three blue blocks, combine them, and then count the total. This physical manipulation makes the abstract concept of addition concrete. Similarly, for fractions, students can cut Play-Doh into equal parts or use fraction tiles to visually and tactilely understand equivalence and operations with fractions.

Even abstract concepts like number lines can be made kinesthetic. Students can physically walk along a large number line drawn on the floor, taking steps for each number or jump for addition and subtraction. This embodied learning helps them internalize the sequence of numbers and the operations associated with them.

Auditory and Visual Reinforcement

While Orton-Gillingham emphasizes multisensory, the auditory and visual components remain vital. This involves using clear, precise language to explain concepts and providing visual aids that are consistent and logical. For example, when introducing multiplication, a teacher might use arrays of objects and visually demonstrate the grouping. Simultaneously, they would clearly articulate the process: "We have three groups, and each group has four items, so we have a total of twelve items." This dual reinforcement

helps students connect the spoken word with the visual representation and the underlying mathematical concept.

Structured and Sequential Learning in Math

The highly structured and sequential nature of Orton-Gillingham is one of its most powerful assets when applied to mathematics. Math is inherently hierarchical; understanding later concepts relies heavily on mastery of earlier ones. A student who struggles with basic addition will inevitably face significant hurdles when attempting multiplication or algebra. The Orton-Gillingham methodology provides a systematic approach to building mathematical understanding, ensuring that each step is solid before proceeding to the next. This prevents the development of "Swiss cheese" understanding, where there are many holes in a student's knowledge.

This sequential approach means starting with the most fundamental building blocks of mathematics and gradually progressing to more complex skills and concepts. It emphasizes breaking down complex tasks into smaller, manageable steps, allowing students to experience success at each stage. This not only builds competence but also fosters confidence, which is often a significant barrier for students struggling with math.

Breaking Down Concepts into Manageable Steps

The core of Orton-Gillingham is its ability to dissect complex skills into their simplest components. In math, this means deconstructing operations, algorithms, and word problems into their most basic elements. For example, when teaching multi-digit addition, the process isn't presented as a single, daunting task. Instead, it's broken down into understanding place value, mastering single-digit addition, carrying over when necessary, and then applying these skills systematically across columns. Each of these steps is taught explicitly and practiced thoroughly before combining them.

This granular approach ensures that students don't get overwhelmed. They can focus on mastering one small part of a larger problem before moving on. This methodical progression builds a sense of accomplishment and reduces the cognitive load associated with tackling complex mathematical challenges.

Progressive Skill Building

The sequential nature of Orton-Gillingham math is about building skills progressively. Students aren't expected to jump from counting to solving quadratic equations overnight. Instead, they move through carefully designed stages, each building upon the last. This might look like mastering number recognition, then moving to simple addition and subtraction with

manipulatives, then transitioning to symbolic representation of these operations, and then introducing slightly more complex problems. The pace is dictated by the student's mastery, not by a rigid curriculum timeline.

This ensures that when students encounter more advanced topics, they have the foundational understanding and skills necessary to succeed. It's like building a house; you wouldn't start framing the roof before the foundation is laid and the walls are up. Orton-Gillingham math prioritizes a strong foundation.

Applying Orton-Gillingham to Basic Operations

The core arithmetic operations – addition, subtraction, multiplication, and division – are the building blocks of most mathematical endeavors. For students who struggle, these operations can become significant stumbling blocks, leading to frustration and avoidance. Orton-Gillingham principles offer a powerful way to make these operations accessible and understandable, moving beyond rote memorization to genuine comprehension. The emphasis is on understanding why these operations work, not just how to perform them.

The diagnostic nature of Orton-Gillingham means identifying precisely which aspect of an operation is causing difficulty. Is it understanding the concept of "taking away" in subtraction? Is it grasping the idea of "equal groups" in multiplication? Once the specific deficit is identified, targeted instruction can be provided.

Addition and Subtraction Strategies

When teaching addition and subtraction with an Orton-Gillingham lens, we start with concrete representations. Using number lines, manipulatives, or even drawing pictures, students can visualize the process of combining sets (addition) or removing items from a set (subtraction). For example, to solve $7 - 3$, a student might start with 7 blocks, then physically remove 3 blocks, and finally count the remaining blocks. This kinesthetic and visual approach solidifies the meaning of the operation.

As students progress, they move to more abstract representations, but the underlying logic remains the same. The concept of "carrying over" in addition or "borrowing" in subtraction is taught explicitly, with clear procedures and ample practice, always connecting it back to the concrete understanding of regrouping quantities.

Multiplication and Division Concepts

Multiplication and division are often introduced as abstract concepts that

can be confusing. Orton-Gillingham emphasizes understanding multiplication as repeated addition and division as sharing or partitioning into equal groups. Students can use arrays, skip counting, and grouping activities to grasp these concepts. For instance, to understand 4×3 , a student might arrange objects in 4 rows of 3, or skip count by 4 three times (4, 8, 12).

Division can be taught by having students distribute a set of objects equally into a specific number of groups, or by determining how many groups of a certain size can be made from a larger set. The focus is on building a conceptual understanding before diving into algorithms, ensuring students understand the 'why' behind the 'how'.

Decoding Word Problems Using Orton-Gillingham Strategies

Word problems are notoriously challenging for many students, often due to a combination of reading comprehension difficulties and a lack of mathematical understanding. The Orton-Gillingham approach, with its emphasis on decoding language and systematic problem-solving, is exceptionally well-suited to helping students tackle these challenges. It's about breaking down the problem into understandable linguistic and mathematical components.

The process begins with ensuring the student can actually read and comprehend the words in the problem. Once the language is demystified, the focus shifts to identifying the key mathematical information, the question being asked, and the appropriate operation(s) needed to solve it. This systematic, step-by-step approach mirrors the decoding process used in reading.

Identifying Keywords and Cues

A key component of using Orton-Gillingham strategies for word problems is teaching students to identify keywords and cues that signal specific mathematical operations. Words like "altogether," "sum," and "more" often indicate addition, while "difference," "less than," and "left over" suggest subtraction. Similarly, "each," "groups of," and "times" point to multiplication, and "share equally," "divided by," and "per" signal division. Explicitly teaching these cues and practicing their identification in various word problems builds a crucial scaffold for problem-solving.

Visualizing and Representing Problems

After identifying the relevant information and operations, students are encouraged to visualize and represent the word problem. This can involve drawing pictures, using manipulatives, or creating diagrams to model the

situation. For example, a word problem about apples being added to a basket could be represented by drawing apples or using actual counters. This visual representation helps to make the abstract scenario concrete and allows students to see the mathematical relationships at play. This visualization bridges the gap between the story and the numbers, making the problem more approachable.

Addressing Math Anxiety with a Supportive Approach

Math anxiety is a real and significant barrier to learning for many students. The pressure, the fear of making mistakes, and the feeling of being "bad at math" can create a negative cycle that hinders progress. The Orton-Gillingham methodology, with its inherent patience, focus on success, and explicit, structured instruction, is ideally suited to mitigating math anxiety. It creates a safe and supportive environment where learning is approached systematically, and mistakes are seen as opportunities for growth rather than failures.

The emphasis on mastery at each stage means students experience frequent successes, which gradually builds confidence. The multisensory aspect also allows students to engage with math in ways that feel more natural and less intimidating, reducing the cognitive load associated with purely abstract thinking.

The Role of Explicit Instruction in Orton-Gillingham Math

Explicit instruction is the cornerstone of the Orton-Gillingham approach, and its application in mathematics is no different. This means that every concept, every skill, and every strategy is taught directly and clearly. There's no assumption that students will pick things up implicitly or through osmosis. Instead, teachers and tutors break down mathematical concepts into their most basic components, explain them clearly, model the process, and then provide guided practice.

This direct approach ensures that students understand the underlying logic and procedures of mathematics. It's about building a robust understanding from the ground up, ensuring that no foundational element is overlooked. For students who have struggled with traditional math instruction, this explicit, systematic, and supportive approach can be transformative, unlocking their potential and fostering a genuine appreciation for mathematics.

FAQ

Q: How does Orton-Gillingham math differ from traditional math instruction?

A: Orton-Gillingham math differs from traditional instruction by emphasizing explicit, multisensory, structured, and sequential learning. While traditional methods might rely more on rote memorization and abstract explanations, Orton-Gillingham focuses on building conceptual understanding through concrete experiences, breaking down concepts into smaller steps, and directly teaching skills.

Q: What are the key multisensory techniques used in Orton-Gillingham math?

A: Key multisensory techniques in Orton-Gillingham math include using manipulatives (like blocks or counters), drawing pictures, physical movement (like walking on a number line), tactile materials (like sand trays for writing numbers), and auditory reinforcement through clear verbal explanations and songs.

Q: Is Orton-Gillingham math only for students with learning disabilities?

A: While Orton-Gillingham is highly effective for students with learning disabilities such as dyslexia or dyscalculia, its principles of structured and multisensory learning can benefit any student who struggles with mathematics or who simply learns best through a more hands-on and explicit approach.

Q: How does Orton-Gillingham help with math anxiety?

A: Orton-Gillingham helps reduce math anxiety by fostering a sense of mastery and confidence through its structured, step-by-step approach. Each small success builds confidence, and the focus on understanding rather than just memorization can make math feel less daunting and more accessible.

Q: Can the Orton-Gillingham approach be applied to higher-level math concepts?

A: Yes, the principles of Orton-Gillingham can be adapted for higher-level math concepts by continuing to emphasize explicit instruction, breaking down complex problems into smaller steps, using visual aids and manipulatives where appropriate, and reinforcing understanding through systematic practice.

Q: What is the role of diagnostic teaching in Orton-Gillingham math?

A: Diagnostic teaching is central to Orton-Gillingham math. It involves carefully observing a student's approach and identifying specific areas of difficulty or misunderstanding. Based on this diagnosis, instruction is then tailored to address those precise needs, ensuring targeted and effective learning.

Q: How important is number sense in the Orton-Gillingham math framework?

A: Number sense is absolutely foundational in the Orton-Gillingham math framework. It focuses on developing a deep understanding of numbers, their relationships, and their properties, which is crucial for all subsequent mathematical learning. This is built through concrete experiences and explicit instruction.

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