Revised | Art Intervention in One-on-One Math Classes for 7-12th Grade Students with ADHD

In one-on-one Maths classes, students in Grades 7-12 with ADHD (*Attention Deficit Hyperactivity Disorder*) are often struggling with abstract concepts. This intervention draws on literature, including not only Laura Aldridge's *Make Space* (sensory art for marginalized learners), but also Andrea English's *educative listening* (attending to students' cognitive cues or interruptions). It is also inspired by Farinati & Firth's *rhythmic listening* (collective relational building through sound) and the concept of transforming aporia (the disorientation of doubt) into a learning passage, consistent with Dewey's emphasis on embracing confusion as an integral part of reflective inquiry. It focuses on a creative case study adapted from Aldridge's sensory workshops, providing art interventions to Middle School (7-9th) and High School (10-12th) respectively.

Context:

One-on-one Maths classes for students with ADHD in Grades 7-12.

Impacted Groups:

- ADHD students with strengths in sensory engagement and dynamic thinking
- Maths tutors who are seeking strategies to reduce distraction and deepen conceptual understanding.

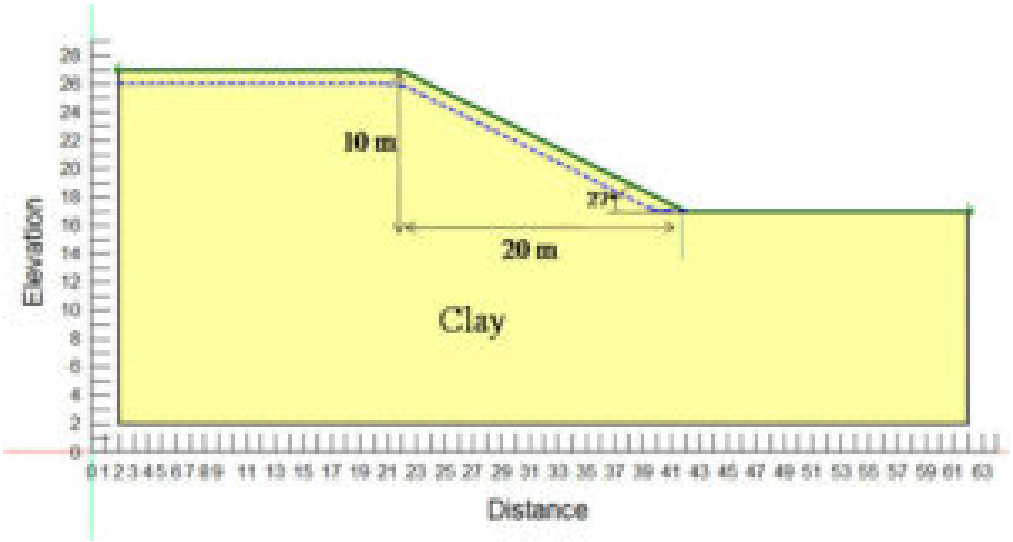
Middle School (7–9th Grade)

Informed by the emphasis of sensory inclusion (Aldridge, 2000), students use clay to model linear slopes, sandpaper to represent inequality shading, and foam spheres to build geometric proofs. This aligns with the work of Burbules, where sensory materials are used to transform the student's aporia (the feeling of confusion or being lost in abstraction) into a tactile passage for exploration

- **Activities**

Pre-Algebra Terrain: Manipulate clay landscapes to solve equations

e.g., by changing and touching the slope of clay, students can feel the difference between gradients. Moreover, students can be instructed to adjust the slope to make the clay pass through one specific point.



Geometry Sculpture: Construct 3D models of theorems

e.g., when learning Pythagorean Theorem, tutors can use three pipe cleaners with different lengths a, b, c to form a right triangle. Foams are used to construct three rectangles with side lengths a, b and c. By comparing the areas of

rectangles, students can investigate the relationship between a^2, b^2 and c^2.

- **Effect Measurement**
  - *Observation*: Track student-initiated problem-solving and engagement duration (aim: ≥15 minutes/activity).
  - *Tutor Reflection*: How did sensory materials change the student's approach to pre-algebra or geometry?

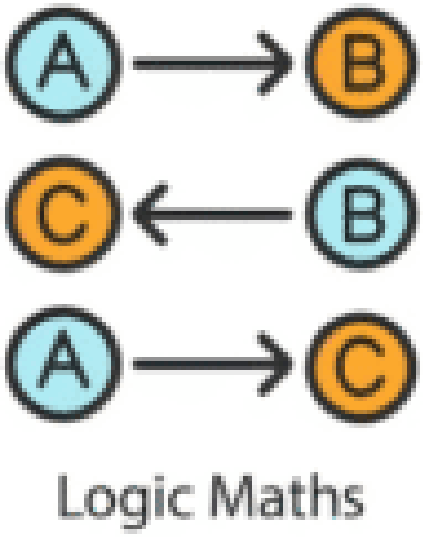
High School (10–12th Grade)

Inspired by Farinati & Firth's emphasis on collective listening, these activities integrate the learner's behavior (rhythm/movement) into the construction of mathematical systems, ensuring ADHD learners' sensory strengths become integral to meaning-making.

- **Activities**

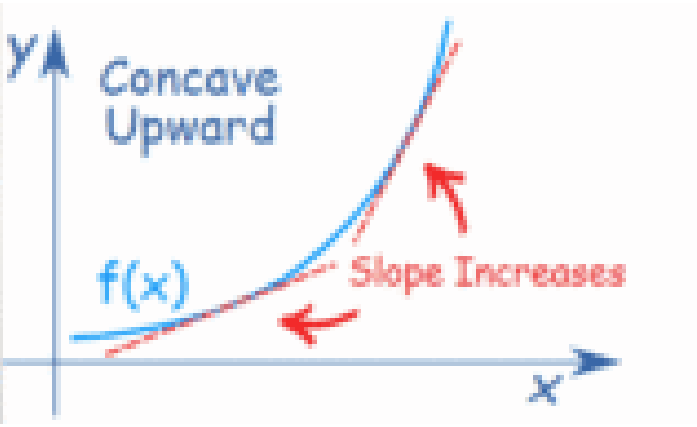
Algebraic *Beats*: Assign rhythms to algebraic operations

e.g., Factoring = 2-beat staccato and explain logic .



Kinetic Calculus: Map concepts to physical movement

e.g., Upward curve = arm rising and reflect on connections.



- **<u>Effect Measurement</u>**
  - *Media Analysis*: Count unique rhythms/movements and their alignment with mathematical logic.
  - *Student Survey*: Did rhythm/movement deepen your understanding of algebra/calculus? (Likert scale, 1–5).

Interdisciplinary Alignment & Relationality

- *Middle School*: Sensory landscapes foster tutor-student relationality – tutors 'listen' to material choices.
- *High School*: Rhythmic/kinetic activities build student-math relationality – ADHD learners' sensory strengths become integral to mathematical meaning-making (Aldridge's argument for PMLD learners).

In conclusion, instead of treating ADHD students' sensory-cognitive traits, like liking hands-on work or being sensitive to rhythms, as learning barriers, these interventions can help students grasp Maths and make student-tutor interactions smoother. Furthmore, these designs aren't random but rooted in interdisciplinary research and creative practices.

Reference

1. Farinati, L., and Firth, C. (2017). *The Force of Listening*. Berlin: Errant Bodies Press.
2. Aldridge, Laura. "Make Space for Everybody, Make Time for Difference". Artlink, 2022.
3. English, A. (2009). Listening as a teacher: Educative listening, interruptions and reflective practice. Philosophical Inquiry in Education.
4. Dewey, J. (1933/1989). How We Think. The Later Works. Vol. 8 (pp. 105-352). Carbondale: SUP.
5. Nicholas C. Burbules (2015). Aporias, Webs, and Passages: Doubt as an Opportunity to Learn

Art Intervention in One-on-One Math Classes for 7–12th Grade Students with ADHD

Backgrounds:

In one-on-one math classrooms for 7–12th grade students with ADHD, sustaining focus on abstract concepts like algebra and geometry is a common challenge. This intervention draws on key ideas from course readings:

- Laura Aldridge's ***Make Space*** (sensory art as an engagement tool for marginalized learners)
- Andrea English's ***Educative Listening*** (prioritizing students' sensory-cognitive cues).

This case study is adapted from Aldridge's sensory workshops, reimagined for secondary math's complex topics.

Context:

One-on-one math lessons for 7–12th grade students with ADHD.

Impacted groups:

ADHD students (needing sensory-rich, interactive ways to grasp advanced math) and their tutors (seeking strategies to minimize distraction and deepen conceptual understanding).

Initial Intervention Proposals:

1. Sensory Algebra Sculpting:

Students use materials like wire (stand for linear equations),

foam blocks (stand for quadratic curves), and fabric (stand for inequality shading) to build 3D representations of algebraic concepts. This leverages ADHD learners' sensory strengths, as highlighted in Aldridge's work on ***non-elitist art engagement***.

2. Rhythmic Geometry Proofs:

Tutors introduce hand drums or metronomes to set a rhythm for breaking down geometric proofs (e.g., one beat for state the theorem, three beats for cite congruent triangles).

Tutors practice English's ***educative listening*** by adjusting rhythms based on students' engagement signals (e.g., faster tempo if a student leans forward, slower if they fidget).