

Leveraging Learning Through Sensory Modification



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Foundational information

Learning occurs in the context of social relationships. The speaker communicates information that is converted into soundwaves which students receive through sensory input before it is perceived by higher regions to create context and meaning.

When sound is detected, the middle ear muscles contract, attending to the higher frequency tones of human speech while synchronously processing relational information like facial expression and emotional affect so language can be better understood and integrated.

By contrast, in times of stress, the sympathetic nervous system redirects resources in the body in effort to keep it safe (eg; adrenaline is produced, heart rate and respirations increase to move blood and oxygen throughout the body for mobilization, pupil dilate for visual cues, and middle ear muscles loosen so we can better attend to loud low frequency sounds that may signal danger.) This relay of events ultimately leaves the cortex inaccessible, limiting learning, problem solving, creativity and social reciprocity.

Decreasing unnecessary sensory information can mitigate the likelihood of activating a stress response in students, increasing perceptual safety and lending to better access and equity in educational settings.

Benefits of stimulus reduction on behavior and the brain

In an average classroom, 22% of students will be more adversely impacted by sensitivity to stress at baseline on account of lived neurodevelopmental experience or a history of trauma exposure. Utilizing evidence-based and developmentally appropriate approaches, benefits the well-being for all students.

64% of children with learning differences are taught in general education classrooms. Difficulties linked to academic underachievement for some neurodivergent students is associated with challenges in auditory filtering, including the ability to detect, discriminate, and respond to auditory information in the presence of noise (Ashburner et al., 2008).

Other forms of sensory information, including temperature and lighting, can be similarly overwhelming and which can interfere with executive function; motivation, concentration and problem-solving, and can result in difficulties managing impulses and emotional regulation.

Additionally, the auditory system does not fully mature until around age 15. On account of this, greater consideration for managing sensory information is relevant for K-9th grade.

Benefits of 20-30% reduction in noise

Elevated exposure to noise negatively impacts academic performance, problem solving, concentration, and memory. A 10-decibel difference in background sound has been shown to negatively impact exam scores (Journal of Urban Health 2013). Mild hearing loss can also be a contributing factor in students missing 50% of classroom instruction (HLAA).

A teacher must speak at 75-88 decibels, the equivalent of heavy traffic, to be heard over environmental school sounds of 65-78 decibels (Kakofonien, 2010). This contributes to educator vocal strain and compromises speech with competing sounds.

20-30% reduction in noise improves speech intelligibility by addressing signal to noise ratios which reduce cognitive demands and improves the middle ear mechanics to better attune to higher frequencies associated with speech.

It is well documented that speech recognition improves when auditory information is conveyed in conjunction with visual input of facial expression.

Creating environmental safety by means of enclaves such as “burrows, nests”, etc., is an important tool to help with engagement and self-regulation by reducing sensory overload (Porges, 2011). Utilization of the Think Nook provides a variety of opportunities for student directed skill development and self-monitoring. Predictable physical spaces lend to environmental and emotional security to enhance learning, graded tolerance, creativity and social reciprocity. Students may remain present in the classroom for group learning, while still visible and supervised. This reduces the likelihood of student isolation or removal from the classroom which can be interpreted as punitive and further dysregulate students.

Applications of the Think Nook in Noise Reduction at a glance

- Evidence-based and developmentally appropriate approaches benefit the well-being for all students.
- Auditory system does not fully mature until around age 15. On account of this, greater consideration for managing sensory information is relevant for K-middle school.
- Addresses sensory needs of 64% of Students with learning differences taught in general education classrooms.
- Offsets the impact of mild hearing loss that can result in 50% of missed classroom instruction.
- Supports language processing by improving auditory filtering and sound differentiation to enhance concentration, memory and problem solving.
- Reduces unnecessary sound and provides sensory input for movement and touch to benefit learning through activation of alternative neural pathways.
- Provides a relational foundation and safety needed for learning to occur.
- Design elements can facilitate structure of routine, transitions, social interactions to foster skill development and self-esteem.
- Enhances security and opportunities for respite relevant for K-9th grade.

Citations:

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