Considerations for Educating Students With CVI:

The Learning Environment

Introduction

Students with cortical/cerebral visual impairment (CVI) have unique learning needs that differ in complexity from students with an ocular visual impairment. CVI is a neurological or brain-based visual impairment that is due to damage to the brain (Mazel, et al., 2020).

This tool facilitates team discussion and problem-solving, and offers practical ideas to implement throughout the school day, with the intent to promote a student's access to instruction in a positive learning environment. This tool does not assess or measure skills. It is meant to empower students to demonstrate self-determination skills when applicable. Before using this tool, a comprehensive educational assessment should be completed, including an evaluation of the student's visual functions and functional vision.

This tool focuses on those students with CVI who have useful vision and additional disabilities, including cerebral palsy. It offers considerations that impact student participation in school-related activities and instruction throughout the school day. Five areas are identified:

Each section provides a list of questions and relevant suggestions, which were identified and selected based on the authors' review of the literature, professional experiences, and practice in working with students who have CVI and additional disabilities.

Suggestions in this practical guide are general in scope and offered as a starting point for team discussion and problem solving. Some considerations may not apply to specific students. Suggestions should be tailored for an individual student's learning needs and require collaboration among service providers. In this document, the school environment is defined as the following:

- Physical school building locations such as classroom, bathroom, cafeteria, playground, gymnasium, library
- Community-based settings as utilized for orientation and mobility instruction

The authors anticipate this tool will assist educational teams in the following situations (including, but not limited to):

- Gathering information on a new student
- Supporting student transition to a new educational setting
- Facilitating change in the learning environments based on student needs
- Determining the possible need for additional assessment

Student Preferences

Incorporating student preferences into daily routines and instruction is essential for teaching students with a range of abilities. Preferences include interests and likes, as well as favorite objects, foods, activities, and people. Research indicates that students with visual impairments, deaf-blindness, autism, and severe and multiple disabilities are motivated to communicate and interact when activities are based on their interests (Bruce & Babinski, 2017; Graff, 2012; Tussaint et al., 2016). When offered choices, communication increases because students are motivated by preferences (Parker & Ivy, 2014; Rowland, 2009). Using preference assessments and teaching choice-making skills are well-documented in special education literature as two effective instructional tools with students who have severe and multiple disabilities (Cannella-Malone et al., 2013; Eldeniz Cetin & Safak, 2017; Tasky et al., 2008; Tullis, et al., 2011; Spevack et al., 2008). Characteristics (e.g., color, texture, reflection, sound) of preferred objects and activities may be used as reinforcers to motivate a student's participation in disliked activities or to support interactions with less preferred objects. Opportunities to make choices also promote a student's development of communication and self-determination skills.

Questions	Suggestions
Preferences and Dislikes	
Have student preferences and dislikes been identified?	Ask the student, family, and other familiar people about the student's interests and preferences. Observe the student's participation in different activities and interactions with people and things. Use a preference inventory or reinforcement inventory to determine the items, activities, and situations that motivate a student's interactions and participation. For example, see the reference list to download the Student Preference Indicators (Moss, 2006a) and Personal Preference Indicators (Moss, 2006b) that are particularly helpful for gathering information on the preferences of students with disabilities.
How does the student indicate preferences and dislikes?	Identify the student's expressive communication modes to express likes and dislikes. For example, facial expression, gaze, vocalization, gesture, speech, manual sign, or use of AAC system. See section on Communication.
In what activities, objects, and people does the student show interest, indifference, or dislike?	Keep a list of the student's likes and dislikes based on student report, feedback from others, and observations of the student.
What are the characteristics of items that the student likes and dislikes?	Identify and list characteristics that the student likes and dislikes. For example, items with lights, shiny surfaces, movements, particular colors, textures, or sounds. Select preferred characteristics that can be added to objects and activities that the student does not like.
How do student preferences relate to his/her primary and secondary learning modalities?	Refer to the student's Learning Media Assessment (LMA) to identify the student's learning modalities and whether preferences relate to the student's use of vision, hearing, or touch.

Questions	Suggestions
How can preferences be used to motivate student participation in unfamiliar, neutral, or disliked instruction/activities?	Review activities that occur during the school day. Identify activities that are challenging for the student. Select preferences that may motivate the student's participation in disliked activities. For example, five-year-old Jimmy dislikes many early literacy activities (e.g., looking at books, drawing, writing letters). He loves playing with toy cars. In a small group activity, Jimmy was motivated to draw roads, label street signs, and design parking spaces on a large piece of chart paper. His teacher created a book about different vehicles: different types, various sizes, colors, and models of cars. In this way, Jimmy was encouraged to learn early literacy skills.
How can the student learn to communicate preferences and dislikes?	Provide direct instruction (i.e., modeling, prompting, and fading) if a student needs to learn how to clearly communicate preferences and dislikes using facial expressions, gestures, speech, manual signs, or an AAC system.
Making Choices	
What opportunities does the student have to make choices during the school day?	Review the school schedule and identify appropriate opportunities when the student can make choices of materials, settings, activities, or classmates for groups.
Who offers choices to the student?	Determine who will offer choices (i.e., adult or peer). Identify appropriate opportunities for preferred peers to offer choices during small group instruction or recreational activities.
How will choices be offered?	Identify how choices will be offered so that items are perceptible (through vision, hearing, or touch) to the student. Consider the size, color, and features of visual representations (picture or object), lighting, numbers of items in a visual array, orientation of display, spacing between items, distance from student, and single words or phrases that are spoken or signed.
How can the student learn to make a choice?	Provide direct instruction to teach choice making if the student has not yet developed the skill: • Offer a preferred item for student to obtain. • Offer a disliked item for student to reject. • Offer two items (one preferred and one disliked) for student to indicate choice. When the student makes a choice, he/she should immediately receive the relevant item or participate in the selected activity.

Communication

Communication is a basic human right that involves an exchange of information (Brady et al., 2016). The ability to communicate supports participation in activities that promote social interaction, problem-solving, self-determination, autonomy, and a sense of belonging. The wide range of communication modes include facial expressions, vocalizations, body movements, gestures, speech, manual signs, and print or braille.

A student's ability to recognize faces and facial expressions, discriminate gestures, locate sounds, understand fast-rate speech, and to look and listen at the same time may be affected by CVI (Facial recognition, 2018; Language, n.d.). In turn, these challenges will influence a student's development of communication skills. Students with intellectual disabilities, cerebral palsy, and other neurological disorders are at risk for communication delays and difficulties (Choi et al., 2017; Marrus & Hall, 2017). Strategies that support listening skills and speech development in typically developing children and those with language delays or hearing loss (Language, n.d.; Martin-Prudent et al., 2016; Weitzman, 2017) may also benefit students with CVI and communication delays.

Studies indicate the need for assessment tools to identify the range of communication skills of nonverbal and nonsymbolic communicators. For example, The Communication Matrix (Rowland, 2004; 2011, Rowland, & Fried-Oken, 2010) identifies seven levels of expressive communication from preintentional behaviors (e.g., facial expressions, smiling, crying, movement) to formal language. This tool has been used with students who have severe and multiple disabilities, including those with CVI. Research has found that students with complex communication needs and significant disabilities, including CVI, may benefit from Alternative and Augmentative Communication (AAC) systems (Brady et al., 2016; Blackstone et al, 2021; Reichle et al., 2019; Roman-Lansky, 2019).

Questions	Suggestions
Receptive Communication	
What receptive communication skills does the student demonstrate?	Collaborate with the student's family, teacher, speech and language pathologist, and other team members to identify and list the student's receptive communication skills.
What types of communication seem to elicit a student's response?	Identify how the student responds to the different types of communication (e.g., facial expressions, gestures, objects, pictures, speech, manual signs) used by communication partners.
How does the student respond to speech?	Observe the student's response to slow-paced speech with short phases and emphasis on target words compared to the student's response to longer sentences spoken at a typical rate.
How much "wait time" does the student need to respond to spoken interactions?	Identify how much time the student needs to process and respond to speech. For example, count silently and slowly to 10 to estimate the number of seconds required.
What strategies are used to support the student's listening skills?	Eliminate background noise or auditory clutter so the student can easily discriminate speech. When possible, move closer to the student when speaking to him or her. Stress target words, use intonation, and lengthen initial sounds. If a student has difficulty looking and listening at the same time, help link the spoken word to its meaning by saying the word, showing the item, and saying the word.

Questions	Suggestions
What words, phrases, and directions does the student understand?	Make a list of the words, phrases, and directions to which the student responds appropriately. Identify contextual cues (e.g., location, time of day, sequence of activity, or materials) and other prompts (e.g., gestures or objects) that make the words, phrases, or directions meaningful to the student.
What strategies may be used to build the student's vocabulary?	Label specific items as the student sees, hears, or touches them to add vocabulary to experiences. Given the student's focus of attention, repeat labels using short phrases (e.g., Where's your school **bus**? There's that yellow **bus**! Line up for the **bus**.).
How is salient feature terminology used to support vocabulary instruction?	Use specific and descriptive words to identify salient features (i.e., distinguishing elements) of objects, people, activities, and events based on the individual student's interests, abilities, and experiences. For example, "This is **big green** apple. Here's a **small red** apple."
How can visual communication be used to help the student understand spoken communication?	Identify whether gestures, facial expression, objects, pictures, or images support the student's understanding of what is being said.
What visual strategies are used to enhance student receptive communication?	Identify size, color, contrast, spacing, lighting, position of objects and/or pictures (e.g., slow-paced facial expression and gestures) that support the student's understanding of receptive communication..
How are the student's communication abilities shared among people at home, school, and in other settings?	Consider developing a "communication dictionary" for the student, with lists of receptive and expressive vocabulary. Provide relevant photos of the manual signs, objects, or symbols. Share this "dictionary" across settings in which the student participates.
Expressive Communication	
What types of communication does the student use to express wants, interact socially, and make comments?	Assess the student's expressive communication skills using an appropriate tool, such as the Communication Matrix (see references). Identify and list how the student communicates expressively (e.g., facial expressions, vocalizations, gestures, objects, pictures, speech, or manual signs). Observe the student in activities that motivate expressive communication (e.g., requesting preferred items or rejecting disliked items). Identify how the student communicates his/her wants, interests, and choices.
In what contexts does the student seem the most communicative?	Identify the times of day and activities that elicit a student's communication and participation. Determine what motivates the student's interaction during these times (e.g., preferred activities, people, or items).

Questions	Suggestions
What type of Alternative and Augmentative Communication system (AAC) does the student use?	Identify the type of AAC system that has been recommended for the student and whether this system is used consistently and in what settings (e.g., home, school, and community).
How does the AAC system incorporate accommodations based on characteristics of the student's CVI?	Highlight features of objects, pictures, and symbols (i.e., color, size, spacing, and position) so the student can perceive them. Consider the number of symbols and how each are displayed (e.g., vertically, horizontally, or diagonally) so the student can easily access them. Identify how the communication display should be positioned and how lighting should be used so the student can see the system.
Literacy	
What are the student's current literacy media needs as identified on the Learning Media Assessment (LMA) (i.e., partial objects, tactile symbols, photographs, line drawings, large print, or braille)?	Refer to the student's most recent LMA and identify how the student's literacy media needs are addressed during daily activities.
How does the student access the daily schedule?	Consider providing samples of different formats (e.g., objects, photo wallet, digitalized on a tablet) of the daily schedule for the student to try and then select the preferred and most efficient format.

Peer Interaction

Social engagement is an essential aspect of every student's well-being. However, the ability to effectively interact with peers is significantly impacted for students with visual impairments, including those with CVI; and, this may result in poor self-image, low self-confidence, being bullied, and unconstructive behaviors. For example, the inability to recognize friends outside the context of the classroom may limit interactions outside the school setting (Roman-Lantzy, 2018). The inability to greet a peer out of context may communicate a lack of care and empathy and result in social isolation. Morse & Morse (2015) noted, "Students with CVI may want to participate fully in social environments and have friends, but they may not know how to accomplish this feat," (p.633). These students require ways to understand and explain their visual impairment (Bellini, 2009; Sacks, et al., 2011). In addition, they need strategies to compensate for their visual needs, to recognize faces, to discriminate between facial expressions and emotions, to deal with movement during social situations, and to manage emotions and concerns related to social situations. To do so, team members, peers, and students themselves should receive training on how to facilitate social interactions in a variety of situations (Manitsa & Doikou, 2022; Morse & Morse, 2015; Sacks et al., 2011). Therefore, collaboration among the school staff, the student's educational team, and the family are vital to ensure that everyone is aware of the student's social interaction needs and how to work together to address them. The literature (Bellini, 2009; 2019; Behaviours, n.d.; Case study 1, n.d.; How self-determined, 2016; McGahee et al., 2002; Morse & Morse, 2015; Smith & O'Donnell, 1992) identifies helpful strategies that include:

- Providing direct instruction,
- Modeling social behavior and interactions,
- Developing peer mentors,
- Providing practice sessions and role-playing specific situations,
- Encouraging students to document their strengths, concerns, and possible solutions,
- Participating in student-led IEPs; and,
- Supporting participation in social skills and community project clubs that include peers with and without disabilities.

Questions	Suggestions
Recognizing Familiar People	
How does the student recognize people in optimal environments?	In a familiar environment, assess whether the student can identify a primary family member who is sitting next to a familiar person of similar height, build, and hair color.
What clues (e.g., environment, body height/shape, hair color/length, ethnicity) help the student recognize familiar people?	In a comfortable, safe, and nonstressful place, assess whether the student can identify people (e.g., familiar vs unfamiliar) using photographs. Ask the student how he/she identified people and what clues may have been used.

Questions	Suggestions
How do crowded, cluttered, and/or unfamiliar settings affect the student's ability to locate and approach peers?	Teach the student systematic scanning techniques (e.g., vertical, horizontal, wagon-wheel approach) to use when searching for specific people/objects in cluttered environments. Make it easier for the student to locate a specific person in a complex environment (e.g., teacher on the playground, parent at end-of-day pick-up) and/or when the student may be visually fatigued, by having the person stand in an agreed-upon spot wearing a unique marker (e.g., scarf, hat, pin).
How does the student use self-advocacy skills to identify peers?	Model and practice phrases that the student can use to help identify peers. For example, "Benny, is that you?" or "What's your name?" Have the student practice soliciting this and other required assistance in specific scenarios.
Discriminating Facial Expressions/Emotions	
How does the student's vision impact his/her interactions with peers by preventing the student from recognizing peers' emotions?	Model and practice with the student the ways he/she could ask peers to express themselves in clear language that conveys their emotions.
How does the student's vision prevent him/her from picking up on social interaction cues from peers?	Teach peers, school team, and family members how to present themselves to the student through the primary sense that the student uses to get the most meaningful information. For example, identify self by name.
Explanation of Visual Impairment and Visual Needs	
What do school staff and peers understand about the student's visual condition?	Provide a student-led presentation to the educational team about the student's vision. For example, the student can share information about his/her strengths, concerns, social needs, goals, and possible solutions. The student's teacher can assist the student by ensuring that important information is included and providing further explanation when needed. Examples might include pictures of objects and people in school hallways to demonstrate what the student sometimes bumps into; quotes of practiced phrases the student is able to use to help identify people out of context; a media presentation that includes not being able to see social interaction gestures (e.g., smiles, thumbs up); ways the student asks friends to verbally express their emotions; a short video of environments with people and objects that the student may not be able to track, such as classmates moving through the cafeteria or balls being thrown in physical education class. Work with the student to determine what information about his/her vision, and its impact on social interactions, that the student wants to share; with whom it is appropriate to share; and which peers the student would like to tell. Once this information is determined, have the student practice how to share this information.

Questions	Suggestions
Concerns About Social Situations	
How does the student express concerns about interactions with peers and/or does the student exhibit any behaviors (e.g., social isolation, lack of confidence, depression) that may be related to fear of social situations?	Help the student identify when he/she may be experiencing social anxiety and understand that these feelings/behaviors may be a result of fear related to the impact of vision difficulties. Teach the student mindfulness and visualization strategies to prepare for events/activities and help manage anxiety. Build the student's confidence by modeling these strategies and providing opportunities to practice in multiple environments with various same-age peers. Once students' needs are identified through assessment and interventions, provide multiple opportunities for students to practice learned strategies. Slowly move from familiar, controlled scenarios to unfamiliar scenarios. Review and modify as needed.
Movement in Social Situations	
How does the student keep track visually of moving classmates? Is the student able to see them when movement stops? Do things seem to "appear" out of nowhere? Is it more difficult to follow moving objects the faster they move, and/or in more complex environments?	When possible, allow time for the student to experience activities through observation, modeling, role playing and/or rehearsal.
Is the student afraid of injury when engaging in a specific movement (e.g., walking across a chaotic playground) or physical activity (e.g., participating in physical education class or a team sport) due to visual needs that could lead to decreased peer interaction?	If yes, teach the student how to solicit the use of a human guide in social situations to travel through chaotic environments, and to recognize when its use might be helpful. Teach peers how to be human guides. Consider adapted physical education (A.P.E.) instruction to practice physical activities in a controlled environment, building up to the general education school environment or community sports club situation. Consider an O&M Assessment by a Certified Orientation and Mobility Specialist to address the student's ability to travel safely and independently as possible. This may result in the recommendation of a long white cane or adaptive mobility device (AMD). Guide the student toward joining nonsport-related clubs, such as ones that focus on community projects.

Task Complexity

A task is a piece of work to be done. For students, tasks may include completing a math problem using blocks, reading a story from a book, matching words to pictures, or playing a game with peers in physical education class. In psychology, task complexity is defined as the degree of complicated actions related to physical and mental aspects that are needed to complete a task (Sam, 2013). As it relates to visual functioning, identifying the complexity of a task is critical for teaching students with CVI (Roman-Lantzy, 2018). However, there is a lack of research describing its educational impact and related accommodations. According to Tietjen (2019), the amount of visual demand to complete a task may vary based on the following:

- Visual target
- Presentation of display
- Sensory input from materials
- Distance of materials
- Visual motor demands required to complete the task
- Pacing of the task
- Novelty of task materials

If any of these variables inhibit a student's learning of a particular activity, the instructional task will be inaccessible (Tietjen, 2019); and as a result, the student may demonstrate off-task behaviors (Pawletko et al, 2015; Zuidhoek et al., 2015). A "just right challenge" (Ayres, 2005) is a concept in occupational therapy that guides practice. When working with students with CVI, teachers and other team members should carefully analyze instructional materials and task requirements to determine whether visual demands present a "just right challenge" (i.e., not too easy, not too difficult, but just right) for the student to learn to complete the task. The "What's the Complexity Framework" may be useful to ensure a balance of task with visual demands, which may increase visual ability and independence (Tietjen 2019).

Questions	Suggestions
Everyday Tasks	
Are there typical tasks that cause visual fatigue and/or provoke behavioral outbursts (also known as meltdowns)?	Identify such tasks and analyze the demands these tasks have on the child. After analysis, make accommodations according to the seven aspects of task demands, as listed above.
Does the student's schedule allow participation in varying activities during the day, with a balance between visual, motor, sensory, and/or cognitive challenges?	Analyze the level of challenges (visual, motor, sensory and/or cognitive) the student can meet and review the schedule, allowing for variation between challenges. Adapt the sequence and duration of activities, as well as the time of day. A combination of more demanding tasks and less demanding tasks will allow the student to actively participate during the whole day. Given highly demanding visual activities, break the task into 5- to 10-minute parts to promote visual attentiveness, depending on the student's abilities.
Are there examples of everyday tasks (such as activities of daily living) that are "just right" for the student to complete?	Identify aspects of these tasks and apply these to other tasks, vary the different characteristics. For example, if Task 1 is visually demanding for target, distance, and novelty (e.g., students showing objects in a group), make Task 2 an activity that requires less use of vision and more use of other senses with more familiar items (e.g., sorting tactile blocks, a music lesson, or listening to an audio book).

Questions	Suggestions
Target	
What are the characteristics of objects/shapes/images/letters that the student discriminates and recognizes?	List preferred color, size, shape, contrast of objects/shapes/images/letters. Determine these aspects for both 3D and 2D visual targets. Use all the preferred aspects in a familiar task that is "just right," so the student can perform independently. When teaching new tasks, use certain aspects (e.g., bigger size, stronger contrast) that will be easier for the student; adapt over time to the "just right" targets. Adapt preferred aspects regularly as the student develops skills. Use preferred color to highlight certain visual targets or accentuate differences between salient features.
Presentation of Display	
Does the student have visual field limitations that may interfere with locating objects or persons involved in the task?	Review the student's Functional Visual Assessment. If the student has lower visual field limitations, adapt placement of materials, not too close to the near edge of the desk, and on a box to enable viewing in the upper visual field. Teach the student to systematically scan the desk for parts of the task, similar for pages with assignments. On the playground and in physical education class, be aware of visual field limitations to prevent tripping and falling. At the same time, teach the student to systematically scan the area visually. Draw attention to a visual target by using light, color, contrast, and/or movement, depending on the student's preference.
How does the student respond to visually cluttered tasks? How does the student respond to materials that are well spaced and easy to discriminate?	Identify the amount, placement, and types of objects/pictures that are challenging for the student to visually discriminate when completing a task. Identify the amount and placement of items a student can view when doing a task. This may be different for materials that have different characteristics. Adapt each task to the "just right" situation. General adaptions: • Plain background for materials, in contrasting color. • Adapt in numbers (start with few), size, contrast, 3D/2D, shape. • Use blank space and/or masking to reduce the amount of visual information on page or display. • Increase space between items. • Draw attention to a visual target using light, contrast, color and/or movement.

Questions	Suggestions
Sensory Input	
How does the student respond to activities that include competing sensory input (e.g., sound-making objects, food with strong smells, picture books being read aloud)?	Refer to Environmental Complexity section. Observe the student's responses in activities that include materials with competing sensory input. Identify whether the additional sensory information facilitates or inhibits the student's engagement in the activity. Determine whether adaptations or prompts are needed.
Distance From Materials	
Does the student have difficulty locating (the movement of) a peer, a teacher, or a parent at a distance of 15 feet or more?	Observe on the playground and in physical education class, whether the student has difficulty identifying peers, teachers, or parents. If so, provide accommodations by adding color, contrast (e.g., use a brightly colored/contrasting coat), having the person move more slowly, or having the person call the student by name.
What is the student's preferred working distance with tabletop tasks?	Observe the setup of different tasks. Make accommodations, if needed, like using a tilted desktop/slant board or using an adjustable document holder or tablet holder.
Visual Motor Demand	
How does the student complete a visual motor task that requires visual motor control like puzzles, worksheets, visual sorting games?	Observe when student performs different tasks that require high visual motor control. Identify characteristics that limit performance, such as not being able to look and act at the same time, not being able to copy actions after seeing them being performed, or not being able to plan actions without modeling. General adaptions: Give verbal prompts on how to act or where to see needed information. Use modeling, either showing or prompting the student, providing physical guidance through the movement (feeling the action). If a motor action is complex, first teach at an easy visual level, then gradually, as skills improve, make the activity more difficult (e.g., learn to ride a bicycle on an empty playground, then introduce obstacles for the student to navigate, then ride on road with adult). If needed, complete task analysis to identify needed area of instruction for student.
How does the student complete a visual motor task that can be done without use of vision? For example, stabbing food on a plate with a fork or scooping food from a bowl using a spool, or hanging a coat on a hook.	Observe when the student performs different tasks that may require low use of vision. Identify whether and when the student does use vision and if more vision use is needed. If not, instruct team members not to emphasize vision use in these tasks. For example, walking downstairs when student uses tactile information from handrail and feet feeling steps. Instruct team members to emphasize nonvisual ways of walking stairs. Another example is tying shoelaces: use a practice board with a thick lace, tie the lace together, emphasize the movements, not looking at the lace. Gradually increase difficulty to tying own shoe on lap/desk and finally shoe on foot.

Questions	Suggestions
Pacing	
How much time does the student need to process visual information?	Consider the pace or rate of instruction that is required for the student to understand and participate in activities. Identify how much time the student needs to respond in each task; allow for ample time for the student to process. In group tasks, adapt to each student's pace. For example, in a group assign tasks related to vision, hearing, and touch according to the student's strengths. Determine how much "wait time" (latency) is needed for the student to respond.
Does the student complete tasks within given time limits?	Observe when the student is not completing tasks within given time limits. Analyze aspects, such as speed of processing, internal and external distractions, and planning to do a task. Adaptations: • Provide more time to complete the task than peers may need. • Prevent external distraction and motivate the student to stay focused on the task. • Give the student parameters of beginning, middle, and end of the activity. Teach the student to apply this guide independently.
Novelty	
Is the student able to identify unfamiliar objects/ shapes/images/letters based on salient feature descriptions (e.g., color, shape, size)?	Identify which objects/shapes/images/letters are familiar or novel to the student. Observe what salient features the student uses when identifying items (color, shape, or size) in favorite activities. For example, a student enjoys identifying many different vehicles (e.g., bus, SUV, sedan, train), but does not identify fruit because of lack of interest. Use the student's preferred items to introduce and motivate identification of unfamiliar ones (e.g., license plates or trademarks on vehicles). If the task is to identify differences, use favorite objects, so novelty or disinterest does not complicate student performance.

Environmental Complexity

The literature on students with CVI emphasizes that the environment in which educational activities occur is an important influence on the visual functioning of students with CVI. A student's ability to use vision efficiently can be impacted by several environmental aspects, such as familiarity of the setting, various visual and visual processing functions, sensory complexity, and influence of movement (Dutton & Bax, 2010; Lueck, 2004; Lueck & Dutton, 2015; McDowell & Budd, 2018; Roman-Lantzy, 2018; Tietjen, 2019; van den Bosch, 2015).

In an environment that is familiar (or known), a student can focus visual attention on doing a task, socializing, walking a route, or any other activity. In a novel environment, unknown features of this setting will compete for visual attention with the activity. This means the student is distracted from fully participating in a task or social interaction.

Visual functions such as acuity, contrast sensitivity, visual field restrictions, sensitivity/need for light all impact a student's access to the environment. In addition, difficulties with visual processing, such as selective visual attention/crowding, eye-hand-motor coordination, and working memory, can also further complicate how a student sees and moves about in an environment.

Sensory complexity in the environments can also make it difficult for a student to use vision efficiently. Visual overload in a classroom, hallway, or playground may prevent the student from focusing on looking at what is important. Similarly, auditory overload can also influence a student's feeling of safety (van den Bosch, 2015; van den Bosch et al., 2016). For example, the quiet chatting of classmates may be reassuring, while the stern voice of the teacher suddenly correcting a peer may cause anxiety in the same environment. The influence of tactile and olfactory (smell-taste) input, as well as positioning is often not so obvious to others, but may affect the performances of the student. A clothing label tickling your neck, the smell from the food being prepared next door in the kitchen, or not feeling stable or secure in the new school chair, all add to environmental distractions.

Although movement can be beneficial in attracting visual attention (Cohen-Maitre, 2005), environmental movement can distract a student from a learning activity. For example, peers moving about or paper fluttering in the breeze from a fan or window can be distracting.

The literature (Cockburn & Dutton, n.d.a; n.d.b; Dutton, 2019; Philip & Dutton, 2014; Zuidhoek, 2020) identifies helpful strategies that include:

- Use of lighting and contrast
- Decluttering the environment
- Assigning specific storage (e.g., first or last coat hook)
- Influence of sensory input like sound, touch, and smell
- Positioning with least distraction

Questions	Suggestions
Familiarity/Novelty	
How does a stable and familiar environment influence the student's use of vision?	Do not change the familiar environment unnecessarily. Maintain a stable layout of areas and its contents. When in unfamiliar areas, give the student more guidance and ample time to familiarize him/herself with the new environment. Using the same routes helps the student focus his/her visual attention on the landmarks and on dealing with unpredictable factors like people moving.

Questions	Suggestions
Visual Function/Processing	
What lighting does the student need?	Ensure overhead or task lighting is used within learning environments as appropriate for student's use of functional vision, including but not limited to classroom, hallways, bathroom, cafeteria. When possible (e.g., going from inside to outside), allow for adaptation time and/or use dark glasses. Avoid glare from windows and lamps. Identify the best position for the student's visual abilities.
Does the student need contrast in walls, doors, windows, and floors to see better?	Provide contrast between walls and doors/window frames, and between floors and walls. For example, contrasting colored tape or paint may be used.
Does the student have visual field restrictions in the left or right, upper, or lower visual field?	Adapt the seating position of the student so he/she can see people in his/her best visual field. Approach the student so your face can be seen in his/her best visual field. Organize materials (storage) and signs at the student's eye level or just below/above, depending on the student's visual field restrictions. Keep floors uncluttered to avoid stumbling over objects.
Does the student have problems with simultanagnosia*/ selective visual attention/crowding when looking for items needed? *Simultanagnosia is the inability to see more than one or two objects at the same time, due to neurological damage (Lueck & Dutton, 2015).	Add well-spaced visual cues to surfaces of plain doors and drawers of cabinets. Teach the student to recognize these cues to identify where items are stored. Avoid busy surfaces and patterns on bulletin boards, curtains, walls, and ceilings, and many decorations in rooms.
Does the student have difficulty recognizing routes and landmarks?	Assign student the first or last coat hook, locker, drawer, etc., in a row marked by a visual cue that the student has learned to recognize. Explore routes with the student when not crowded. Encourage the student to use the same route between destinations. Consult with an O&M specialist as needed. Use landmarks to indicate routes and doors. Enhance landmarks or add new landmarks to each student's preferences.
Is the student able to visually track moving targets (e.g., people, vehicles, physical education/sports equipment, pets)?	Determine the speed at which the student loses visual tracking (e.g., people, vehicles, and physical education/ sports equipment). Make adaptations when possible (e.g., use orange cones to mark boundary borders during physical education activities, use auditory cues when crossing the street).
Does the student have difficulty with visual guided movements when walking up or down stairs? (Not related to a motor difficulty).	Use the stairs when they are not crowded, along with using handrail. Use the same stairs whenever possible, provide physical guidance when the student must go up or down unfamiliar stairs.

Questions	Suggestions
Sensory Complexity	
Is the student hyper/hypo sensitive to certain sensory stimuli?	Gather information from the family and practitioners who know the child well. If necessary, collaborate with appropriate professionals (e.g., occupational therapist) to complete a sensory assessment.
Is the student able to recognize location based on sounds in the environment?	Draw the student's attention to sounds that are relevant in recognizing the area, such as the sound of a pump of the fish tank in the hallway, the echo of footsteps in an empty sports hall/gym.
How do sounds impact the student's behavior and sense of security? Are modifications required?	Observe the student's behaviors in different auditory environments. Determine whether adding or decreasing sounds in the environment will improve the student's feeling of security (e.g., offer student headphones/ earbuds).
Does smell help the student orient and recognize a location?	Draw the student's attention to smells that are associated with the area (e.g., cafeteria, library, art room). Add different scents to help with recognition of certain rooms, such as adding air freshener in bathroom or changing room.
Are there settings that cause visual fatigue for the student?	Identify potential settings which cause visual fatigue. Collaborate with team to discuss ways to make adaptations and/or modify expectations as needed.
Are there situations that provoke or trigger behavioral outbursts (e.g., meltdown)?	Review situations to identify sensory components that may trigger outbursts. Collaborate with team to discuss ways to make adaptations and/or modify expectations as needed.
Movement	
Is the student distracted by people moving around in the environment?	Consider the student's positioning. For example, position student with his/her back to movement or surround the student's work area with room dividers. Allow student to transition earlier or later in order to avoid distraction or anxiety due to increased movement and activity.
How does movement of visual targets/people/objects guide students with orientation and mobility?	Observe student to determine whether movement impacts his/her ability to orient and locate destinations. For example, is the student able to locate a familiar adult/peer waving or motioning and then move toward the person?

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