The LightAide: Using Interactive Light to Engage, Do, and Learn!
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TERC

Beneath the imposing Gothic spires and towering pines of its 33-acre campus, Perkins School for the Blind, located in Watertown, MA, is an institution brimming with innovations in assistive tool development and integrated technology use. Despite—or perhaps because of—being steeped in nearly 200 years of history, today's Perkins is ever evolving to meet the needs of a changing world and an increasingly diverse student population. In recent years, Perkins has become an experiential design and development lab for the newest cutting-edge assistive technologies.

In partnership with the Perkins community and with Philips Color Kinetics, one of the nation's premier LED lighting-system providers, TERC researchers are evaluating and developing instructional support materials for a new device called the *LightAide*. Together, these three Boston-area organizations are exploring the potential usability of the LightAide as an assistive tool for students with visual impairments to use in classroom, home, and therapy settings.

The inspiration for the LightAide came from an experience Catherine Rose, Philips employee and Perkins parent, had with her deafblind daughter, Alexis. While visiting the Philips Color Kinetics office, Alexis moved toward the color-wash of lights displayed in the lobby—something she had never done before. Having observed this, and knowing that many children with visual impairments have the ability to detect and respond to light, Rose collaborated with her employer and Perkins staff to develop the hardware and software for the device that eventually became the LightAide.

This unique assistive tool, a prototype version of which is shown in Figure 1, includes a display of 224 LED lights on one-inch spacing. The LightAide is portable and lightweight, connects to an external power supply, and comes with two different overlay lenses. Five switch connections offer opportunities for interactivity between a leader, such as a teacher, parent, or therapist, and up to four children. A control panel on the side of the LightAide allows the leader working with the children to adjust the brightness of the lights, select the color of the lights, and choose from a set of core-based activities. Some activities focus on English Language Arts content; others on mathematics; still others on skills included in the Expanded Core Curriculum (ECC).

**Figure 1. A Prototype Version of the LightAide**

During the past year, Judy Vesel, Principal Investigator and leader of a TERC team that focuses on research and development of materials for individuals with low-incidence disabilities, and Tara Robillard, member of the team and Lead Researcher, have been studying the usability of the prototype version of the LightAide in classroom settings. Says Robillard, "In our initial evaluation of the prototype, we intended to examine the degree to which LightAide activities are accessible to a wide range of learners with varying degrees of visual impairment. We also wanted to begin to explore the degree to which this assistive tool offers members of this audience multiple ways to express and interact with information." She went on to say, "From our evaluation, we found that teachers, therapists, and clinicians are using the LightAide as a tool to assess vision capabilities and as a device to further pre-elementary and elementary students' understanding of essential math and English Language Arts concepts."

A recent TERC visit to Infant/Toddler Program classrooms at Perkins saw the LightAide prototype in action.
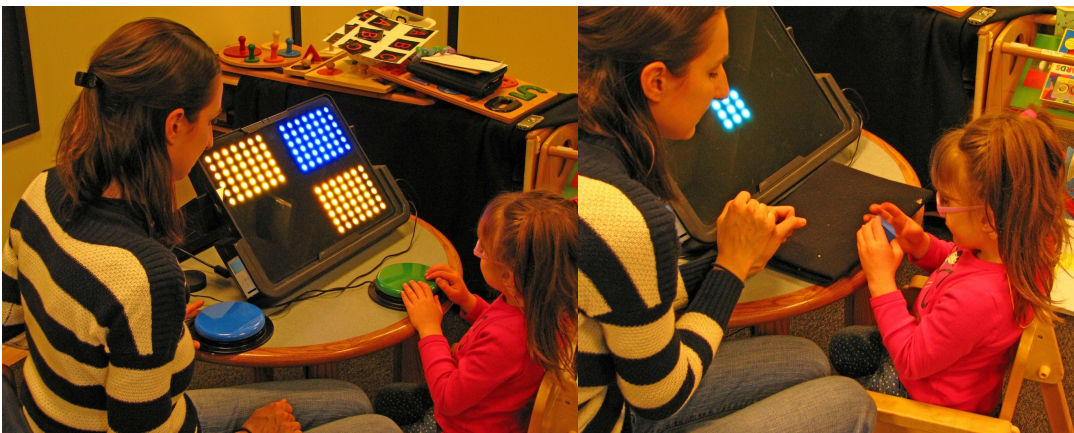
Figure 2. Learning to Take Turns   **Figure 3. Learning to Identify Shapes**
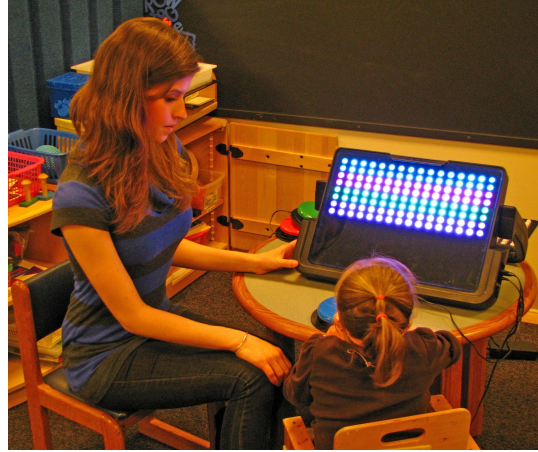
Figure 4. Assessing Top to Bottom Tracking

During the visit, teachers Mary Wasserback and Christina Berger explained that they have been using the LightAide as a diagnostic tool for assessing visual tracking, which is important in determining if low-vision learners can sense light and movement. They also reported that monitoring their students' attention, physical movements, and switch-use in conjunction with the LightAide activities has allowed them to better determine their students' visual fields, radiant light sensing, and particular blind spots or color aversions.

Berger noted that her students show varying degrees of aptitude in their use of the LightAide. "Many of the matching programs are too extensive for our pre-kindergartners in that they require lots of scrolling and a long attention span to complete. But even for our kids with shorter attention spans, the LightAide is helpful for the kids who *can* sense light because it promotes multiple means of engagement with colors and objects. It's more interactive than something like a Lightbox that is static and only allows objects or transparencies to be illuminated." Berger demonstrated how she could simultaneously show a student a colored shape on the LightAide screen while allowing the student to handle a physical object of the same color and shape. "For low-vision students, kinesthetic engagement with shapes and numbers of objects is very useful in cementing early math understanding," says Berger.

"I think the LightAide is great for left-to-right sequencing for our low-vision kids, which is a hugely important pre-literacy skill," says Wasserback. She goes on to say that "the LightAide—far from needing a lot of scaffolding or curricular supports—is a curricular support in itself. It's great for introducing shapes and color sense as well as facilitating communication. With greater customization capabilities embedded into subsequent versions, it could be a learning tool for a wide range of learners with different visual-cognitive impairments for pre-K, elementary, and beyond."

A beta version of the LightAide is complete. It incorporates design feedback from teachers involved in the prototype testing. An Activity Guide, developed by TERC, includes implementation guidelines and provides alignment of each activity with the Common Core. For more information about the LightAide and contact information, visit: http://lightaide.terc.edu/