# Philips Color Kinetics LightAide Prototype Test

# Evaluation Report

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**TERC**
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# Overview of the LightAide

**Background**. Philips Color Kinetics (PCK), located in Burlington, MA, is the industry's premier LED lighting provider. They have developed innovative, state-of-the-art dynamic lighting systems that are currently in use in over 34,000 high profile installations around the world. The LightAide (LA) that is the focus of this evaluation report is being developed by PCK. It takes advantage of their LED technology.

Knowing that many children with visual impairments have the ability to detect and respond to light, Catherine Rose, a Philips employee, wondered if it might be possible to use PCK's LED technology to engage her visually impaired daughter and other children who are blind or have low vision in new ways of learning. Exploration of this initial idea in collaboration with teachers and therapists at Perkins School for the Blind in Watertown, MA led to development of a prototype LightAide. It includes a working version of the device and a selection of activities. Its development represents a first step in eventually providing blind and visually-impaired learners with a unique assistive tool that offers new opportunities for learning standards-based English Language Arts and mathematics content and for mastering skills that are components of the Expanded Core Curriculum (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a; National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010b; American Federation for the Blind, 2013).

**LightAide Features.** The LightAide is a portable device that includes 224 multicolored LED lights. Based on the needs of the learner who is using the LA, it offers a range of viewing options that are accomplished through the use of different lenses as shown in the figures below.
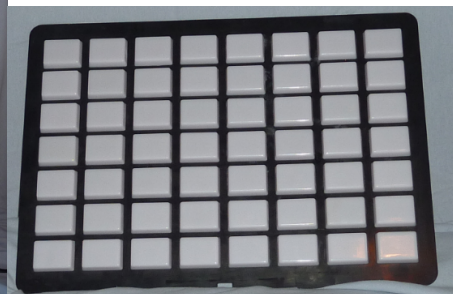


**Figure 1. Lens for Viewing 224 Lights**



**Figure 2. Lens for Viewing 56 Lights**



**Figure 3. Flat Lens**



**Figure 4. Dome Lens**

Switches are used to operate the LA. They enable interaction between an adult leader and up to four learners. Said differently, there are five switch connections – 1 for the leader and 4 for the learners. Leaders can select from the series of activities programmed into the device. They can also use an LCD control panel on the side of the LA to scroll through the activities and adjust their brightness.

**LightAide Activities.** The set of activities included in the prototype LA were designed to offer: 1) New opportunities for members of the intended audience to learn English language arts and mathematics content and skills associated with the ECC. 2) New ways for therapists, clinicians, and educators to assess vision capabilities. 3) New ways to motivate members of the intended audience to participate in therapies. Table 1 lists the activity topics and the content or skill area that each addresses.

**Table 1. LightAide Activities**

| Mathematics | English Language Arts | Expanded Core Curriculum |
|---|---|---|
| Identifying Shapes | Identifying Letters | Chasing a Rainbow |
| Matching Shapes | Matching Letters | Taking Turns |
| Identifying Numbers | Tracking Columns (left to right) | Matching Colors |
| Matching Numbers | Tracking Reading (left to right) | Tracking Rows (top to bottom) |
| Building Patterns with Blocks | | Color Wash (color recognition, calming effects of color, visual stimulation) |
| | | White with Red Checks; Red Stripe (introduction of colors) |
| | | Bulls-eye (visual field assessment) |

Taken together, the LA incorporates the principles of the Universal Design for Learning (UDL) framework to maximize its potential to remove barriers, individualize instruction, and increase access to information for visually impaired learners (Rose & Meyer, 2002). Based on the neuroscience of learning, the UDL framework includes principles that emphasize three key aspects of pedagogy: 1) The means for the representation of information. 2) The means for the expression of knowledge. 3) The means for engagement in learning. The LA incorporates these principles as follows.

Principle 1 – By offering a broad range and variety of activities that present light in different ways, and providing opportunities to assess visual ability and/or teach concepts and skills, it gives learners various ways of acquiring knowledge.

Principle 2 – By allowing learners or the leader to operate the device via a switch and providing opportunities to use other educational materials (such as manipulatives) to supplement the activity, the LA provides learners with alternatives for demonstrating what they know.

Principle 3 – By offering learners opportunities to work in ways that make sense and are interesting to them (such as choosing activities according to preference,

ability, or need), The LA taps into learners' interests, offers challenges, and increases motivation.

## Purpose and Goals of the Evaluation

TERC, Inc., an educational research and development organization located in Cambridge, MA, worked with PCK to conduct initial testing of the LightAide prototype for usability and feasibility in classroom, clinical/therapy, and home settings. An additional intent of the evaluation was to identify components to include in a first beta version and in subsequent iterations of the product. With this at the forefront, the partners sought to accomplish the following goals:

1) Introduce the LA to teachers, instructors, therapists, clinicians, and parents of visually impaired children (ages 0-18) before use.
2) Collect observation data and feedback from individuals who had used the device.
3) Elicit suggestions for improving the LA and for creating additional activities and support materials.
4) Prepare the composite data for analysis, analyze the data, and write a report of findings.

## Methods

The research design used for the evaluation builds on the methodology TERC has established for similar studies. Testing was coordinated by TERC and PCK and conducted primarily in classrooms at Perkins School for the Blind in Watertown, MA. It took place in: 1) classrooms within visually impaired and Deaf blind programs; 2) the technology room; 3) therapy rooms (orientation and mobility and occupational therapy). An itinerant teacher affiliated with Perkins School for the Blind also tested the LA in one home. To examine use of the LA with children outside of Perkins, The Professional Center for Child Development in Andover, MA served as a test site.

### Infant and Toddler Program Testing

Testing at Perkins began in the on-campus Infant and Toddler Program in October of 2012. This program is for children ages 0-3. It is held once a week and is designed to address issues relevant to the child and to the family. For the child, the weekly visit involves participation in sensory, language, play and movement activities under the guidance of a teacher trained to work with the visually impaired. The intent of the testing was twofold: 1) To begin to find out about usability of the device with very young students; 2) To implement an initial set of testing protocols that would then be refined for subsequent testing with older students. PCK and TERC staff worked with the administrators of the program to initiate and coordinate testing as described below.

TERC researcher, Tara Robillard, observed several of the Infant and Toddler group sessions prior to introduction of the LA to gain a better understanding of the program, its participants, and their needs and behaviors. After observing the sessions, she met briefly with parents to describe the LA and the purpose of the evaluation. The following week, she set up several devices for use during the portion of the session where volunteers work one-on-one with individual children and observed their use. Catherine Rose was present at some of these sessions. An Observation Guide was used to record observations, feedback and suggestions from

instructors, and comments and reactions from children. A copy of the guide is included in the Appendix.

This first round of testing provided insight into the usability and feasibility of the LA, as described in the findings section on the next page. It also resulted in a protocol that included allowing teachers, therapists, and clinicians to use the LA with their students in their particular setting for a two to three week period. They then provided feedback and suggestions via a targeted feedback form or interview based on the form. A copy of the Feedback Form is included as the third element in the Appendix.

## Participant Recruitment

To recruit participants from a range of settings within Perkins and from its outreach programs, several informational sessions were held on the Perkins campus in November of 2012. The sessions were announced to all staff via an email from Perkins' administrators. Interested participants were asked to sign up to attend one of the sessions. Led by Catherine Rose, these sessions consisted of an introduction and demonstration of the device and an explanation of the testing protocol and testing requirements. Attendees then had the opportunity to complete a form to indicate their interest in participating in the test. A copy of this form is included as the second element in the Appendix. Subsequent testing was coordinated based on availability of devices and participants' schedules.

## Classroom, Technology Room, Therapy Room, and Home Testing

Subsequent testing in two to three week phases took place between late November 2012 and April 2013 as follows. TERC researcher, Tara Robillard, and/or PCK developer, Catherine Rose, met with participants to deliver the LA, to go over its set up and use, and to review the testing requirements. Participants were also given an informational Set Up Guide and a hard copy of a Feedback Form. Participants then used the device as often as they liked during a two to three week period with members of the target audience. At the end of the period, they used the form to provide information in hard or soft copy about their experiences and suggestions for improvement. Multiple copies or Word versions of the form were provided for situations in which more than one adult used the LA. Participants were asked to submit the completed form to Tara Robillard or, if they preferred, to request a follow up phone or in person interview to provide feedback.

## Results

**Demographics:** The test sample included 13 groups as described in Table 2. In support of TERC's policies for working with human subjects, identifiers such as names have been removed to ensure the confidentiality of participants.

**Table 2. Demographic Information of the Test Sample (N=+/-48)**

| Test Group | School | Group | Characteristics of LightAide Users | N |
|---|---|---|---|---|
| 1 | Perkins | Early Learning Center - Infant and Toddler Program | Children ages 0-3 with a wide range of visual impairments including CVI*. Several children have additional disabilities and medical conditions and are also hard of hearing or deaf. | ~15 |

| | | | | |
|---|---|---|---|---|
| 2 | Perkins | Early Learning Center - Preschool Classroom | One 5 year old male and one 3 year old female with CVI, CP** , and seizure disorder. They use wheelchairs. | 2 |
| 3 | Perkins | Early Learning Center - Itinerant Teacher (0-3 years) | One female under 1.5 years old with light perception and a diagnosis of optic nerve hypoplasma and Joubert Syndrome. She will look at light. It is unclear what she sees and is still in process of evaluation.<br>One child with exotropia and high functioning CVI. | 2 |
| 4 | Perkins | Lower School - Occupational Therapy (OT) Room | Two students with CVI and good functional vision. They use 2x2 Mayer Johnson pictures for schedules. | 2 |
| 5 | Perkins | Lower School - Technology Room | Lower School students who have different levels of ability. | ~5 |
| 6 | Perkins | Lower School - Classroom | One 12 year-old boy with CVI, alternating exotropia, and acuity at 20/63 with preferential looking test. One 11 year-old girl with high myopia, exotropia, and acuity measured at 20/94. She has optic nerve hypoplasia and oculomotor apraxia. Tracking is difficult for her. | 2 |
| 7 | Perkins | Lower School - Classroom | Four students ages 6-8. All have some vision. Two have CVI. One has ROP (use of one eye upper field). The other has upper and lower field restrictions upper and lower. Both have some cognitive delays. | 4 |
| 8 | Perkins | Lower School - Orientation & Mobility | Students with CVI. | ~5 |
| 9 | Perkins | Pre-K/Kindergarten – C Deafblind Program | Two students ages 6 and 7. Both have developmental delay, sensory overload, and difficulty focusing.  They use total communication. | 2 |
| 10 | Perkins | Occupational Therapy - Deafblind Program | One 6 year- old with chromosomal anomaly, developmental delay, microcephaly, craniostenosis, conductive and sensory-neuro hearing loss and seizure disorder. He has significant physical needs, wears a BAHA and glasses, and has restricted visual field superiorly, hyperopia, and CVI. One 8 year old with bilateral hearing loss, history of cataract surgery, and developmental delay, ocular impairment, optic nerve impairment, and CVI. | 2 |
| 11 | Perkins | Preschool Classroom - Deafblind Program | One blind/visually impaired student who wears glasses and has a coloboma. | 1 |
| 12 | Perkins | Secondary Program - Computer Classroom | One student with hypoxic ischemic encephalopathy secondary to perinatal asphyxia, spastic quadriparetic cerebral palsy, developmental delays, and CVI. The focus is on trying to increase visual attention and sustain attention to a task. | 1 |
| 13 | Professional Center for Child Development | Classroom (5-8 year olds) | Several students ages 5 through 8 who are significantly physically and cognitively impaired and require adaptive equipment for seating and mobility. They all have a diagnosis of CVI with different levels of functional vision use. All receive individual services from a teacher of the visually impaired. | ~5 |

\* Cortical visual impairment
\*\* Cerebral palsy

**Summary of Findings:** Qualitative and quantitative data collected from each of the participants and recorded on the Observation Guide (Test Group 1) and Feedback Form (Test Groups 2-13) were cleaned and analyzed. A detailed summary of the findings, grouped according to categories, is included in the pages that follow.

***Set-up and Operation -*** Participants were asked whether they were able to set up and operate the device easily and to list challenges and obstacles they encountered. They were also asked if they found the Set Up Guide helpful and to suggest additional information or instructions to help first time users.

- 8 of 12 participants (67%) indicated that the device was easy to set up and operate.
- Participants who used the Set Up Guide found it helpful.

Challenges Encountered
- LCD control was confusing, difficult to see and access, inaccessible to visually impaired adults, took too long/too slow to operate, not described in the Set-Up Guide.
- Not clear how to plug-in switches (which port operates teacher switch).
- Teacher switch occasionally is not working (reported by one user).
- Set up is upside-down.
- Need for an outlet to plug in the device limits classroom location options.
- Excessive power is required; seems to be a power drain.

Suggestions for Improvement
- Label or color code the switch ports on the device and/or provide an easy graphic with clear instructions on where to plug in the switches.
- Explore options or possibilities for having the switches either closer to or mounted on the device (natural progression from external control to touch screen).
- Add a label or indicator to show which end should be up/on top when setting up.
- Reduce the amount of power the device requires.
- Provide a cordless option (battery operation) or longer cord.

***Look and Feel*** - Participants were asked to give their overall impression of the look and feel of the device and suggest changes or modifications that would improve the look and feel of the device.

- 8 of 12 (67%) participants indicated that the size and weight of the device were acceptable (especially when placed in a stationary location such as a tabletop, desk, floor or mat).

- 3 participants said that the device was heavy. 2 of the 3 said that it was too heavy for transport, but acceptable for stationary use.
- 3 participants said that it was too large, preventing it from being safely placed on a wheelchair tray.

Problems with Look and Feel
• Device did not seem to stay in position if pushed on by a student (it collapsed down to the table from a slanted position).
• Size and shape of the device makes it too difficult to put it on the average size wheelchair tray.
• Weight of the device makes it difficult to transport and situate effectively for use.
• Locking mechanism that holds the screens in place was easy to open (students wanted to play with it).
• Power Cord can be distracting or in the way and is too cumbersome. Move it so that the device can lay flat.
• Lights can get too hot and may be too bright.

Suggestions for Improvement
• Reduce size.
• Reduce the weight.
•Add clips to the handle/stand that would make it possible to be clipped to the front of a wheelchair tray.
• Add hooks or other components so the device can hang on a wall and be adjusted for height.
• Add the ability to be hooked up to an iPad/iPod.
• Add sound as blind students cannot use the device since it needs an additional piece of equipment for sound).
• Allow for flexibility to use switches with timed and latch functions.
• Make or include a "quieter" switch.

**Bag/Portability:** Participants were asked to choose features that would be important for a bag used to carry the device. The features and number of responses for each were as follows.

2- Shoulder strap
3 - Back-pack straps
1 - Messenger bag strap
2 - Handles
3 - Several small pockets
2 - 1 big pocket
1 - Extra pockets for other items

Suggestions for Improvement
• I personally have back pain. It would be much more helpful to have a backpack with two Straps! I cannot carry that weight with only one strap.
• I would like for it to have a lot of girth and padding such as a foam inlay so you do not have to support the bag while putting the device in it.
• Slots to put all of the lenses in easily. Hand held/handles is fine – back pack is nice but for classroom as long as it can be put next to desk on the floor and be "protected" by the case, it's ok.
• Made out of material that can easily be cleaned with a wet cloth, and a dark color so it will not look dirty too easily.
• Perhaps a rolling backpack or case since it is already heavy.

*Activities:* Participants were asked to describe how they selected an activity and to identify those they found useful and those that were not useful. They were also asked to provide suggestions for modifications or additions that would make the activities more useful and to suggest additional activities.  Table 3 summarizes participants' responses.

**Table 3. The Activities**

| Test Group | Selection Method and Usability | Suggested Changes | Additions |
|---|---|---|---|
| 1 | • Much time spent figuring out which programs each child would like, find interesting, or be capable of seeing.<br>• Volunteers (or sometimes children) would click through the lesson options using the teacher switch, looking for reaction, ability to track, focus or reaction to a particular lesson, or specific shape, color, etc.<br>• Experimented with the different screens with different displays to find the ideal, best fit. | • Variability of control and lesson options based on a particular need. For example, once a favorite or responsive color is determined, the user could run all of the lessons with that color. | • An activity where the board is entirely lit, and then either horizontal or vertical rows, or portions of the lights turn off, one by one or in sequence. |
| 2 | • Tried the columns and rows lessons - did not work with the student pushing the switch to move the columns or rows.<br>• The students both liked the color wash and chasing rainbows as a vision stimulating activity. | | |
| 3 | • Students used LA as a reward so they tended to cycle through all of the lessons.<br>• The joystick and turn taking did not work for us. | • I would like to be able to write on the big white screen with white board markers, but am not sure that this is an option. | |
| 4 | • The students really liked the blocks and the where the bars came down and sideways. This is where the colors could be associated with sounds.<br>• The matching game with shapes was nice for a few of the students. Matching the letters was much more difficult. | • Change/simplify font on letters and numbers. It is so different from regular print. | • Some random light display might be fun for some students, where the lights are different colors and jump to different areas. |
| 5 | • The Cause/Effect and tracking exercises were the best for my students.<br>• Higher functioning (color matching, letters) weren't as functional. But for cause/effect they could be useful. | | |
| 6 | • All lessons for lower level students were great.<br>• Older kids (K/1 early academic) | • Increase skill level - more options for letters and numbers. | • Positional Concepts – top, bottom, left, right.<br>• Variations to tracking lessons – |

| | | | |
|---|---|---|---|
| | would require more complex and challenging lessons. | • Matching program was cool – wish they were a little longer with more options (go thru what is there too quickly).<br>• Having the shape options spread apart would be nice. They seemed close. More shapes (basic, mid and upper level program). Diamond, rectangle, etc. | light that starts goes left to right to middle to right – ask students: where is it going? Could be random – best because otherwise they learn or memorize pattern.<br>• Lesson on big and little – using shapes: one side big, one side small – choose which one is bigger.<br>• Graphing – see something get bigger.<br>• Working on short/long letters; if they were random…what letter is this? doing 3-letter words to be able to introduce K sight words, early reading – switch cat to bat or even nonsense words. Switching ending – trying all possibilities. |
| 7 | • We liked when a light or small group of lights can be gradually moved across the screen. This would be useful in assessing tracking ability of students. | | |
| 8 | • Found the rainbow moving along lesson good to see how a child is tracking.<br>• Used the tray to place objects in that were translucent to encourage tactile skills. | • Option to change background and color of letters.<br>• Change the font to sans serif. | • Lower case letters<br>• Counting dots to match up to numerals. |
| 9 | • Letters - student liked this program (traced letters using fingers).<br>• Turn-taking lesson - particularly like that the student's switch only activates when it is their turn.<br>• All lessons that involved building of rows, columns, and patterns are great for my students to use independently. | | |
| 10 | • Chasing rainbow with dome lens, columns and rows with high-resolution lens. | | |
| 11 | • The lessons that had rapid noticeable change (columns and rows changing) were of most interest. | | |
| 12 | • High Resolution (224 lights).<br>• Most success with: columns, white with red check/red stripe), and color matching. | • Option of sound<br>• Large Alphabet letters are hard to read.<br>• Option to change colors (for example on the letters and shapes) | |

| 13 | • We like the concepts available: shapes, numbers, letters, matching, and directionality. However, most of our students who would use the device don't achieve the cognitive level to learn those concepts even at the most basic level (although we incorporate these concepts in all activities). | • Have lessons coded and some kind of menu, so that you can easily find what you want and go right to it, rather than having to scroll through everything (that takes too long and by then we may have lost them).<br>• Letter/numbers/shapes need to be larger and more defined. | |

Participants suggested the following changes to the naming, categorization and description of the activities to make their content or purpose clear and to help them select and sequence their use. They also suggested support materials to enhance use.

- It would have been helpful to have a short description of what every activity did instead of just using trial and error.
- It may be helpful to re-arrange the order of some of the lessons and rename them so that they follow a more clear sequence that is based on a progression of content or skills.
- Having names was helpful as a list on the setup guide. Having a write up for each one would help – this is what it does…would help initially especially if more lessons are introduced.
- Include a guide with teaching purposes – mini lessons you could do with the device that relate the skills and goals.
- Having as much potential information as possible to outline possible uses – what goals are met, standards, skills would be very helpful. We get so many materials and it is sometimes not possible to have the time to know how to use them in the classroom. Support materials, guides, lesson plans to go along with the device/lessons would help.
- I would benefit from a written description of each lesson and suggestions for what each lesson could be used to accomplish. I had difficulty thinking about how to use the lessons as more than a highly motivating cause/effect toy.
- Have a manual with actual photographs of each activity or a DVD or YouTube video.

*Value Added*: Participants were asked to describe their view of the potential the LA has for teaching, learning, or diagnosis. They were asked to specifically identify what the device could be used to accomplish or do better than existing devices. Their comments follow.

**1** - *One child said the word "light" for the first time following use. For several children volunteers said that they "paid attention to" or "stayed focused" on using the LightAide for longer than they normally would with any other "toy" or device. Some children were able to track light (left to right or top to bottom). Children were motivated to move their bodies or sign showing their interest or reaction to the lights or specific programs. For example, signing "more" until each horizontal row was lit up; or they reacted with sounds or became "calm" when a particular light, color or program appeared (boy that relaxed with red). Positive interaction occurred with use with siblings (boy with two older brothers). Device used to "calm" children if they were excited or upset.*

**2** - *For my students it would be good for visual stimulation. I would use it when I wanted to have a student shift their visual attention from one item (a switch) to another item (LA). It is a good visual cause and effect toy; I could use it as part of a CVI or functional vision assessment.*

**3** - *I don't know how I could use the LightAide as a teaching tool in a therapy setting. I think it may be more useful as a reward.*

**4** - *I have really enjoyed the LightAide in the classroom with students who have some sight. Many students have enjoyed the device for an extended period of time. However, with students who are blind, it is very limited when it does not have sound.*

**5** - *Tracking is difficult for one of my students. The device was wonderful because I could set the lights both horizontally and vertically to work on tracking skills.*

**6** - *Both students really enjoy it. It will be more of a motivational tool. I can't use the "lightbox" for some things because having to use additional materials with it (overlays) is difficult – with the Lightbox, the teacher is in control not the kids. This device enables the child to be in control.*

**7** - A*ssessing tracking ability of students.*

**8** - *Light helps child to be interested in using her vision. Bumpy texture encourages hand use. Also, it provides a good for step switch counting, letter and number matching. Observe if the child tracks moving light or can they find a dot at various segments.*

**9** - *The LA has enough activities so that it can be appropriate for a wide range of levels and needs. It also keeps the student engaged when they can use a variety of programs. The high-resolution face with smaller lights was best, but I like that there is an option. The dome lens may be best for a student that needs a calm activity or mood induction.*

**10** - *The LA was effective at drawing the attention of my 6 year-old student with CVI during positioning activities. By attending to the LA she was able to maintain optimal trunk/head position. The 8 year-old student was highly motivated to use his non-preferred left hand when the switch was positioned to his left for the columns/rows program. He demonstrated increased motivation/comfort for sitting on an unstable therapy ball when interacting with the LA. I would use the LA with other students as a motivating cause/effect switch toy during positioning activities. For example, a student could work on reaching across midline to access a switch or release one hand to play during propped sitting.*

**11** - *I think that the high-resolution lens that I used would be great for turn taking, sensory breaks, and learning about colors, numbers, and letters.*

**12** - *Teaching cause and effect, taking turns, tracking, same/different, identifying colors, and increasing attention span.*

**13** – *Although most students would not use this device for learning concepts, they could use it for tracking, focus, increased attention, exposure to concepts, and encouraging switch use. We love the switch access. We do a lot with switches with our students.*

***Frequency of Use:*** Participants were asked to indicate approximately how often they would use the LightAide.

> 5-Every day (possibly several times a day)
> 5-Once or twice a week
> 1-Occasionally, to evaluate progress, introduce or practice a topic or skill
> 1-Very rarely
> 0-Never

***Additional Comments***
- A concern is that it is a large item. We have so much equipment that we often are reluctant to add another piece of equipment unless we really can't live without it.
- I find it useful. However, there are other ways of doing the same lessons and skills with other items or equipment. Most of these things I can do on a computer, which we already have in the classroom. And often the software is free or very inexpensive.
- I am so excited to have a product that is so very switch accessible. We use switches for so many blind students these days and there aren't that many great products readily available.
- It is possible that lights may induce seizures.
- To avoid drastic glare, recommend placing new lens in front of other one before removing it.
- We like the black lens.
- For my students the LA is a great way to provide motivation during lessons, expand on concepts, and teach a student to play independently or take turns with a peer.
- I was pleasantly surprised at how well my students attended to the LA. I can envision the LA being used as a method to prevent students who frequently gaze at ceiling lights from doing so in the form of a more functional leisure activity.
- Our students have very involved and complex educational/therapeutic/learning needs. This device seems like it would be good for vision stimulation and certain activities. It is difficult for us to assess and comment on the usefulness with higher-level curriculum or academic goals. We do like it better than the traditional light box for vision stimulation.

**Reflections**

Overall, our findings indicate that the LightAide has the potential to be a useful and valuable assistive tool for use with visually impaired learners in a range of settings. It is important to note that while all of the settings where testing occurred included learners with visual impairments, more than half of the participants indicated that at least one individual in their group had additional disabilities or medical conditions that included developmental, physical, and cognitive delays. Therefore, this report provides general information about the use of the LA with visually impaired students, who may or may not have one or more additional disabilities.

With regard to the physical look and feel, physical features, and set-up of the LA, the majority of participants found it to be acceptable for its intended use. For some, the size and shape of the device made it difficult for them to transport, and to place in a location that was ideal for use – either within the classroom or in proximity to the student. Suggestions were made to reduce both the size and weight of the device to make it easier to use, and to add the capability for it to be attached to either a wall or wheelchair tray for accessibility. Additionally, users had several safety concerns that should be considered such as the amount of radiant heat that is emitted by the LED lights and the brightness of the lights. Occasionally, features such as the teacher switch and the LCD control panel did not function.

The feedback about the activities indicates that they are useful for teachers/therapists to accomplish a broad range of goals and add value to the experience of the learner. These included: functional vision assessment (ability to track the field of vision), visual stimulation and attention (shifting visual attention from one item to another, focusing gaze), teaching a skill or concept (colors, matching, shapes, letters, numbers, cause and effect), motivation or reward (clicking through lessons and being able to choose a preferred lesson), mobility (move in relation to the device or in response to light, crossing a midline to hit the switch), and increasing independence. Suggestions for altering the existing activities to make them more applicable or accessible included changing the font for letters and numbers and adding additional shapes and colors. They also provided helpful suggestions for additional activities that would expand the potential clinical, educational and therapeutic value of using the LA with a wide range of learners with varying needs.

With regard to materials that would contribute to usability of the LA, the majority of participants mentioned the need for a Users Guide or Reference Manual. These should systematically list the activities, include goals and objectives, and provide concise descriptions of what the leader and learner are to do. Participants emphasized that this would help them select and sequence the activities for optimal use with individual learners, classes, or groups.

**Next Steps**

This report provides encouraging information about use of the LA with learners who are visually impaired. It also includes information that may have implications for subsequent development and testing that includes.

1) A Guide that lists the activities, outlines their focus, and includes suggestions for extensions.
2) A short video or Flash movie that introduces the LA and its features.
3) Testing with a larger sample of users.

# References Cited

American Federation for the Blind. (2013).  The Expanded Core Curriculum for Blind and Visually Impaired Children and Youths. http://www.afb.org/section.aspx?FolderID=3&SectionID=44&TopicID=189&SubTopicID=4&DocumentID=2117

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010a). *Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects*. Washington D.C.: National Governors Association Center for Best Practices, Council of Chief State School Officers.

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010b). *Common Core State Standards for Mathematics*. Washington D.C.: National Governors Association Center for Best Practices, Council of Chief State School Officers.

Rose, D.H., & Meyer, A. (2002). *Teaching every student in the digital age. Universal design for learning.* Alexandria, VA: Association for Supervision and Curriculum Development.

# Appendix

## Observation Guide
### (Infant/Toddler Program)

**Teacher/Instructors/Therapists:**                  **Date**:

**School**:                      **City**:          **State**:

**Age**:                      **Study Focus/Activity:**

**Observer**:                      **Length of Observation**:

1. How are activities introduced?

2. Describe the discussion that takes place. Include examples of questions, responses and statements.

3. Describe the activities the students/teachers are carrying on.

4. Record any teacher comments/student interactions.

5. Record any student comments/examples from their work – what devices, manipulatives are students using.

# LightAide Usability Test Sign-Up Sheet

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_____

*First Name*                                      *Last Name*

_____

*Role (teacher, administrator, or other)*

_____

*Organization/District/School*                    *City, State, ZIP*

_____

*Email Address*                            *Phone Number*

✎ **I'd like to use the LightAide with my students to:**
_____.

✎ **I'd like to use the LightAide from:** _____ **To:** _____.

---

_____

*First Name*                                      *Last Name*

_____

*Role (teacher, administrator, or other)*

_____

*Organization/District/School*                    *City, State, ZIP*

_____

*Email Address*                            *Phone Number*

✎ **I'd like to use the LightAide with my students to:**
_____.

✎ **I'd like to use the LightAide from:** _____ **To:** _____.

# Feedback Form

1. **Teacher/Therapist Information**.
Your name: _____
Name of your class or group: _____

2. **Student Information**. Please describe the students with whom you are using the LightAide. [Please include your best assessment of their visual impairment, its cause, and the student's specific needs]:

3. **Set-up and Operation**. Were you able to set up and operate the device easily?  If not, what were the challenges and obstacles you encountered?  Did you use the Set Up Guide?  Was it helpful? What type of information or instructions would be helpful (if you had not been introduced to the device previously)?

4. **Look and Feel**. What is your overall impression of the look and feel of the device?  Is it the appropriate size and weight? Where you able to place it, or situate it, easily in the best location for use with students.  What changes or modifications would you make to improve the look and feel of the device?

5. **Bag/Portability.**  Which of the following features would you consider most important for a bag to carry the LightAide (check all that apply):

___Shoulder strap
___Back-pack straps
___Messenger bag strap
___Handles
___Several small pockets
___1 big pocket
___Extra pockets for other items
___Other (Please explain):

6. **Lessons**. Which LightAide Lessons did you find particularly helpful and for which students?  Which LightAide Lessons were not useful? Which lenses did you find useful (with which lessons)? How might the Lessons be adjusted to make them more useful? What new lessons would you suggest?

7. **Value added**. Please describe your view of the potential the LightAide has for teaching, learning, or diagnosis when used with members of the intended audience.  Specifically, what do you imagine you could use the device to better accomplish or do?

8. **Frequency of use**.  Please indicate approximately how often you would use the LightAide with your student(s):

☐ Every day (possibly several times a day)
☐ Once or twice a week
☐ Occasionally, to evaluate progress, introduce or practice a topic or skill
☐ Very rarely
☐ Never

Comments:

9. **Additional Comments**:

10. **Next Steps**. Might we contact you for a brief interview to discuss your feedback/experiences? ☐YES ☐No

If yes, what is the best way to reach you?

If yes, please provide a phone number or email address that is best for contacting you:

What date(s)/time(s) would be best for you to arrange a meeting or phone conversation?