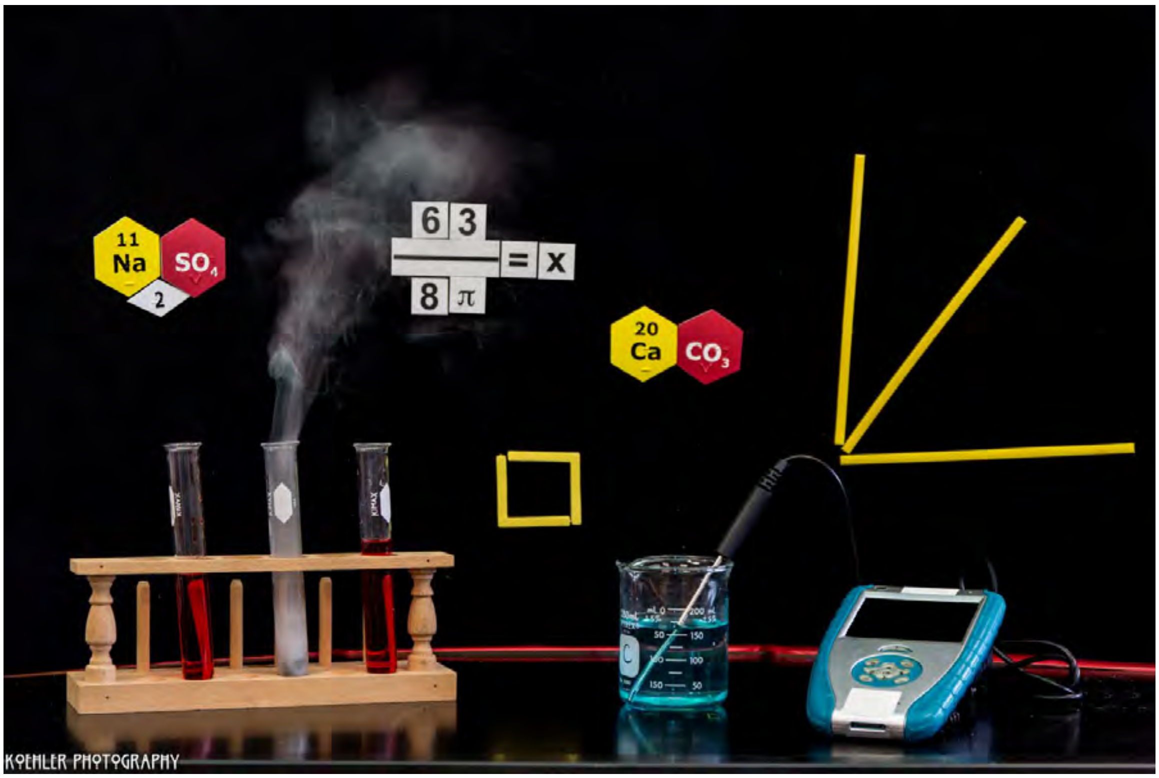
Visual Impairment and Deafblind Education Quarterly

Division on Visual Impairments and Deafblindness



Full STEM Ahead! Issue

Volume 61 • Number 4 • 2016

The Voice and Vision of Special Education

Council for Exceptional Children
The voice and vision of special education

Contents

This is a publication of the Council for Exceptional Children's Division on Visual Impairments and DeafBlindness (CEC-DVIDB). Advertisements included in this issue are not endorsements of products or services, and individual views of authors are not necessarily the official position of CEC and/or DVIDB.

Cover photo shows tactile objects and adaptive equipment for lab experiments.

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Message from the Guest Editor

Karen E. Koehler
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I was so thrilled when our editor Dr. Kathleen Farrand asked me to be the guest editor for a special issue of the *Visual Impairments and Deafblind Education Quarterly* journal devoted to STEM (Science, Technology, Engineering & Math). As a veteran science educator for students with visual impairments, this topic is a passion of mine and also a major focus of my doctoral research at The Ohio State University.

The number of jobs in the STEM disciplines are projected to continue to grow and students with visual impairments are currently underrepresented in these STEM fields. This issue will focus a spotlight on some of the programs and activities that attempt to make STEM concepts more accessible to students with visual impairments; thereby, creating more STEM success for them.

The issue begins with an article by another veteran science educator and TVI who had the amazing opportunity to work with NASA to open up the world of astronomy to students with visual impairments. Also in this issue are articles about adapting materials and programming to increase accessibility of math and science. Additionally, articles related to technology include improving computer science access, a new certification program for assistive technology specialists and a book review about teaching iOS to students with visual impairments.

I would like to thank all the contributors for their excellent articles and their excitement about sharing their work with our readers. Together we can open up the STEM fields for our students and prepare them for new and exciting future careers. I hope that you enjoy reading this issue as much as I enjoyed putting it together!

President's Message

Tiffany Wild, Ph.D.
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Dear DVIDB Members,

I hope everyone has a great start to the new school year.

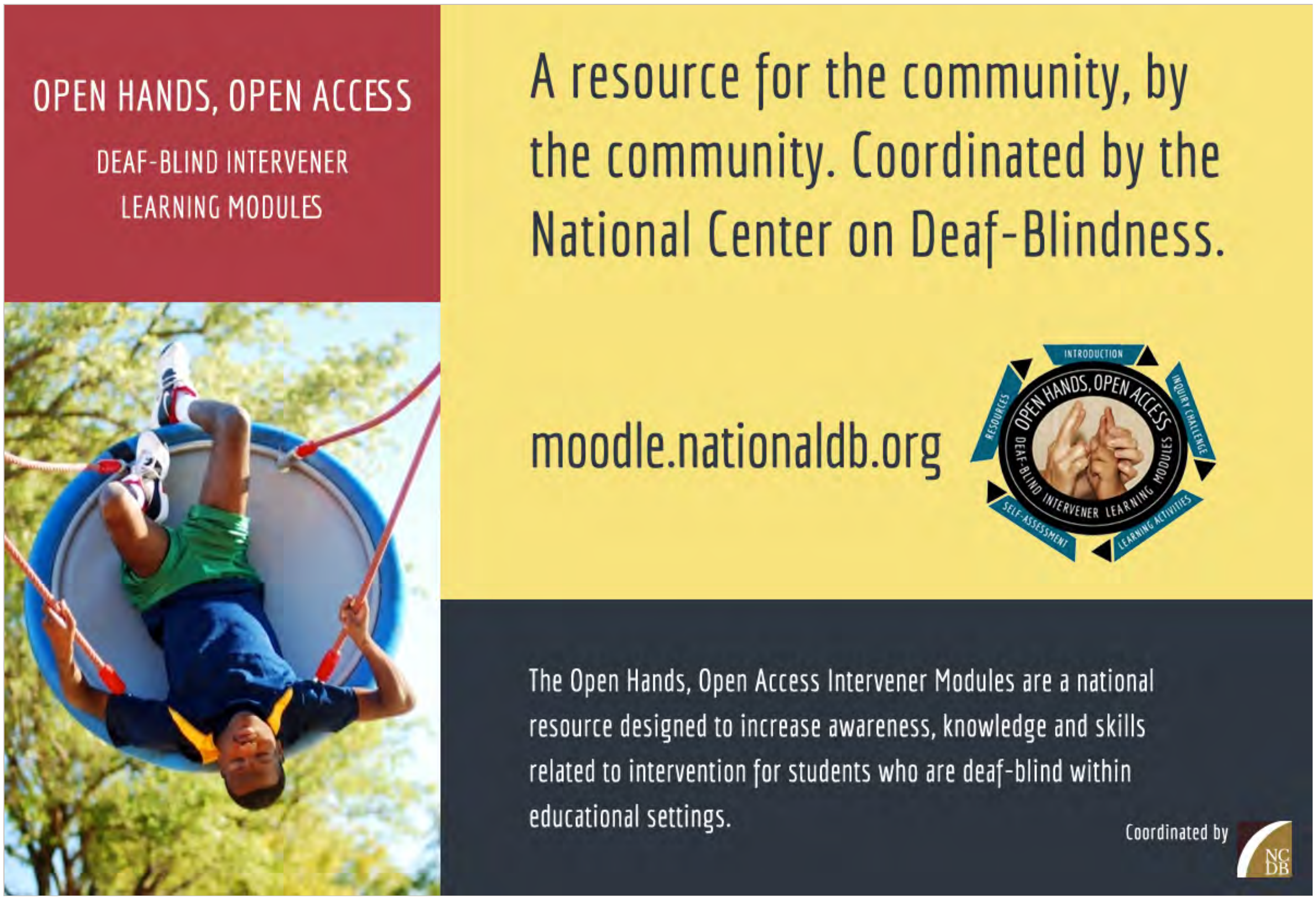
I am very excited to share this new installment of our journal with you. Thank you to Karen Koehler and Kathleen Farrand for putting together this special issue. I also want to thank all that submitted articles. Science, Technology, Engineering, and Mathematics (STEM) is an area that I am very passionate about and to my knowledge this is the first issue we have dedicated to this topic. Each year I get many questions about accommodations and modifications for teaching STEM to students with visual impairments. I hope that the articles presented in this edition will serve as a helpful reference for our TVIs, interveners, and service providers. Please feel free to contact the authors for more information on topics presented.

Please be sure to read the updates on several projects in which our division is currently involved including updates on the professional standards for teachers of students with visual impairments. This committee continues to work very hard to meet all requirements and deadlines from CEC.

We also have added news from our field in this edition that includes efforts to increase our low vision service provider directory.

The Program Advisory Committee has been working all summer to put together an excellent program for our convention in Boston. This committee is also working to put together additional learning opportunities beyond those sessions being presented. Please look for additional information about the convention in our journal, the website, and on Facebook.

I want to thank all of our committee members and board members on all that they are doing this year on behalf of DVIDB. We have a field full of amazing people that are dedicated to ensuring that our students with visual impairments receive the best education possible.



We work hard to respond to the needs of the field. If you have ideas for additional special editions, topics that need to be addressed, or ideas for Webinars please let us know. We work hard to meet your needs.

Happy Reading!

Tiffany Wild

Making Astronomy Accessible for Students with Visual Impairments Through NASA's Airborne Astronomy Ambassador Program

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For countless generations, humans have looked skyward to explore and explain the tiny dots of light seemingly suspended above us. From early visages of mythological creatures to modern day cosmology we have sought to find our place in the universe and understand "what's out there." We have learned to build increasingly powerful telescopes for both ground and space-based observatories which have given astronomers powerful tools that peer deep into the cosmos, revealing mysteries that were unthought-of just a generation ago. Yet there are limitations for these platforms.

Enter the Stratospheric Observatory for Infrared Astronomy, or SOFIA. The result of an 80/20 partnership between NASA and the German Aerospace Center (DLR), SOFIA is the world's largest flying observatory. This extensively modified Boeing 747SP aircraft carries a 2.5-meter telescope 43,000 feet above earth's surface to explore the heavens in infrared light, which is invisible to the human eye. This unseen universe cannot be observed from the ground because infrared radiation is blocked from reaching the ground by water vapor in the Earth's atmosphere. Infrared light from space can only be observed from a plane, balloon borne instruments, or with satellites. SOFIA's job is to track the part of the night sky that is invisible to us on Earth, and cruising at an altitude of 13 km, she is in prime position to do so.

Picture 1 – NASA SOFIA aircraft in flight

Flying up to five 10 hour flights each week in both the northern and southern hemispheres, astronomers use SOFIA to study a wide variety of astronomical objects and phenomena including:

- Star birth and death
- Astrochemistry
- Probing distance nebula and intergalactic dust
- Black holes

As part of the SOFIA mission, education is greatly emphasized. Through the Airborne Astronomy Ambassador (AAA) program, select educators from around the country engage in professional development designed to improve teaching methods and to inspire students. As part of the preparation, the Airborne Astronomy Ambassadors complete a graduate credit astronomy course and are partnered with professional astronomers to participate as the scientists conduct research on board SOFIA. As the science instructor for the New Mexico School for the Blind and Visually Impaired, I was honored to be the first teacher from New Mexico, and the only Teacher for the Visually Impaired in the nation to be selected to the AAA program. In September 2015 my partner, Michael Shinabery, who is an educational specialist for the New Mexico Museum of Space History, and I, traveled to NASA's Armstrong Flight Research Center in Palmdale, CA for an indescribable week of exploration and observing.

Picture 2 – Jeff Killebrew standing next to the NASA SOFIA

In order to include my students in the adventure, we set up a daily blog, “Countdown With Mr. K,” in which I posted educational information and updates of our flight week. Not only were my students engaged in following it, but over 1,800 visitors from 10 countries also joined in the blog by posting questions and encouraging messages.

We were provided with two overnight flights aboard SOFIA, with each flight taking us on 5,000-mile journeys north from Palmdale deep into Canada and back again. On our first flight we were even blessed to have aboard with us none other than Nichelle Nichols, the original Lt. Uhura from Star Trek. She has long been a supporter of NASA's efforts to include women and minorities into the STEM fields, and flew with us to further promote NASA's educational mission by taking live questions from students during the first half of the flight. I was able to spend a bit of time with her, giving her a brief lesson in braille at 43,000 feet (believed to be the world's highest braille lesson), and together we made a short 30 second "hello" video for the students of my school. Another highlight of both flights came when we flew under the Northern Lights as we passed over Canada. They were truly spectacular, and I will fondly remember watching the brilliant green and pink aurora dance across the sky as I sat in one of the forward seats eating a sandwich while my nose was pressed against the window, just as a child does at a department store display at Christmas.

Picture 3 – Jeff Killebrew on board NASA SOFIA with Nichelle Nicols (Lt. Uhura from Star Trek)

Yet, while these and other experiences that week made for some incredible memories, my main mission was focused on how SOFIA and the type of astronomy it conducts can impact students with visual impairments. My students either cannot see well, or even see altogether. So the question that arose was, “how can I help my students who can’t see, see what we who have sight, cannot see?” It seemed like a reasonable endeavor. For students who are blind, everything is invisible to start with, so translating the invisible universe of SOFIA was what was needed to be done. But we soon discovered that’s not such an easy proposition.

We began by making use of our school’s Tiger embosser by first making a tactile image of SOFIA out of one of the photographs found on the SOFIA website. This allowed my students to orient themselves with the outline of the plane and the location of the telescope. I brought a stack of them with me and gave them to the SOFIA team – they were a big hit and helped to open up many conversations regarding students with visual impairments and how to help them access infrared astronomy. One promising idea involved developing vibrating feedback within the images that relates the intensities of the energies being represented.

After returning to school, we again used the Tiger embosser and translated additional SOFIA infrared images of the Orion constellation and the black hole at our galactic center into tactile graphics that allowed our students to explore star formation and the acceleration of stellar matter as it is swallowed by a black hole.

We were able to share and explore these tactile images with over 300 students from around the country and Canada as we hosted a live online learning event on March 23 in which students from 11 schools for the blind were able to interact with one another, ask questions and talk with NASA astronomers about SOFIA and infrared astronomy. Though it was challenging gathering everyone from all of the time zones at once, we were able to provide a unique and informative learning experience specifically for our students with visual impairments. Not only did the students appreciate it, but they clearly expressed a desire to do more of this type of learning.

There are many challenges that must be met to further increase access to astronomy and infrared astronomy for our students. As we continue to work towards this accessibility, our students will ultimately benefit as opportunities to study the universe will be at their fingertips.

For more information about SOFIA and the Airborne Astronomy Ambassador Program, visit:

https://www.nasa.gov/mission_pages/SOFIA/index.html

https://www.sofia.usra.edu/

http://www.seti.org/AAA

Determining the Effectiveness of an Adaptive Science Curriculum for Students who are Visually Impaired

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When working in the education field, the chief concern of any educator is to ensure the unlimited access to the world of learning. This becomes a delicate task when working with students who are blind or visually impaired, as vision is one of the primary channels of learning. In the classroom, especially elementary education, the use of visual skills is heavily relied on to learn basic concepts. Thinking back to the beginning of our educational careers, we will think of the alphabet borders, anchor charts, lessons on the board, and many other learning techniques. Well, it can be said that these elements of a classroom have not changed over the years. Even with the introduction of technology in classrooms, we still see a heavy reliance on visual skills. Along with visual skills needed to learn, we have also seen a push for continuous growth of kinesthetic learning. Though what does that mean for students who are blind or visually impaired in the general education classrooms? Does this mean that they should just take a back seat with little participation in the classroom? What are they able to do in group projects?

What materials should be provided in the classroom? These are questions that have become a normalcy in inclusive classrooms.

With these questions in mind, it has become the goal of many to find answers, driving so many educators for students with visual impairments to find the best ways for their students to access the world of learning. It is because of their efforts and dedication that education in this field has grown throughout the years. Many adaptions and accommodations have been made to the core curriculum. Included in the core curriculum are mathematics and English language arts standards. These have become a huge focal point in education. It is understandable why this focal point would transfer over to adapting and accommodating the general education curriculum for students with visual impairments. Great efforts have been made to adapting mathematics, reading, and writing for students with visual impairments (Holbrook & Koenig, 2000). A teacher of the visually impaired can easily access resources and adaptations that can be used in these core subjects. These adaptations are incredible for the field of education for students with visual impairments. However, this huge focus on these core subjects has cast a shadow over other important academic subjects.

The one subject that has been largely overlooked is science. Science along with math is usually the most difficult topic for students with visual impairments to understand, because of the complex concepts that are involved in the field because science heavily involves visual skills (Dion, Hoffman, & Matter, 2000). Once again, thinking back to our educational careers, think about sitting in a science class. Think about all those experiments and observation skills you used. Think about how much you learned from just observing the world and diagrams around you. You learned about the human body, the environment, the weather, animals, and plants. It is important for any student to be exposed to these concepts of learning. It is especially important for students of the elementary age to be exposed to science concepts, because they further their knowledge about the world around them. They are taught basic problem solving skills in science. They truly get to see the way the world works, because of this subject (Maguvhe, 2015). Sadly, students with visual impairments have not been given the opportunity to learn science. Not many harmonious leaps have been made to accommodate students with visual impairments in the field of science. Yes, many educators of these students have taken their time and dedication to make sure their students are given a decent science education, however, there are not numerous resources that these special educators can use to help them accommodate for their students. There are many hands-on strategies that have been used to accommodate for those with visual impairments, but there has not been a distinct method of guidelines that has been provided to teachers. There is a clear need to identify these effective hands-on strategies for children with visual impairments, which I have begun to unravel.

In a few shorts months, I will be a certified teacher of the visually impaired. In the past three years, I have been studying the field of special education: visual impairments at Kutztown University in Kutztown, Pennsylvania. It is in my classes and research that I realize the lack of resources there are for adapting science in the general education curriculum for students who are blind or visually impaired. With being able to understand the importance of science, I wanted to change this deficiency of resources. For the past year, I have been conducting research to find the best methods of teaching science to elementary students with visual impairments. I have done this through observations, interviews, and readings. Once I felt like I had a substantial amount of information, I began to look at the Pennsylvanian Academic Standards for Science and Technology and Engineering

Education. It was my goal to really pinpoint which skills involved vision. This allowed me to see where accommodations and adaptations are needed for students who are blind or visually impaired. After this, I began to look at a Pennsylvanian elementary school science curriculum. This is where I saw a huge problem in accommodations. The expectations and activities in no way accommodated students with visual impairments. I began to adapt the curriculum activities so that students with visual impairments could complete them. For example, a first grade objective is to identify and describe types of fresh and salt-water and the suggested activity is to classify pictures of bodies of water, e.g., fresh and salt. My initial adaptation was to have the student classify tactile images of the different bodies of water. As I continued adapting these activities, I began to realize that there are so many activities that need adaption, because of the visual skills they require.

As my research continues and I begin to work in the field of visual impairments, I hope to compile numerous resources that could be used by any teacher of the visually impaired. This will include resources for adaptation, instructions to create materials, and ideas about how to teach a certain topic. I feel that my research, among other research in the STEM area, is just the beginning of finding the best methods of adapting science for students with visual impairments.

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Introducing the New Assistive Technology Credential and Project VITALL University Training Program

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There is a well-established demand for experts who are highly trained in assistive technology (AT) and working in the field of visual impairments (Edwards & Lewis, 1998; Kapperman, Sticken, & Heinze, 2002; Kelly, 2008, 2009, 2011; Zhou, Parker, Smith, & Griffin-Shirley, 2011b; Zhou, Smith, Parker, & Griffin-Shirley, 2011a; Zhou et al., 2012). There is now an official specialty area in assistive technology for professionals who work with individuals who are blind or visually impaired. On May 1, 2016 the Academy for Certification of Vision Rehabilitation and Education Professionals (ACVREP) launched this new assistive technology credential. The Certified Assistive Technology Instructional Specialist for People with Visual Impairments (CATIS) credential is now available after more than two and half decades of discussions about such an essential certification (ACVREP, 2016). The CATIS certification has created a much needed national standard in the area of assistive technology instruction for people who are visually impaired.

To further support this longstanding shortage of expertise in the area of AT for people who are visually impaired and the launch of the CATIS, there is a new university specialization in this area. Northern Illinois University (NIU) is the first university that is offering a course of study toward this new credential as part of Project Visually Impaired and Assistive Technology for ALL (VITALL). NIU's Project VITALL includes programs of study in AT for both existing vision professionals (i.e., "Camp VITALL") and those who are entirely new to the field. Thus, NIU offers a standards-based program of courses in AT for existing vision professionals (i.e., teachers of students with visual impairments [TVIs], Certified Orientation and Mobility Specialists [COMS], and/or Certified Vision Rehabilitation Therapists [CVRTs]) leading toward a Certificate of Graduate Study in assistive technology instruction. "Camp VITALL" is an abbreviated program of courses that presumes and requires extensive knowledge pertaining to instruction of individuals who are visually impaired. The "Camp VITALL" program is comprised of a series of four courses in assistive technology instruction for people with visual impairments and an assistive technology internship that results in eligibility for the CATIS certification exam.

Those who are new to the vision profession are not eligible for this abbreviated Certificate of Graduate Study. Instead, those who are new to the vision profession can acquire the required CATIS coursework and internship experience at NIU through the full-length vision master's degree program leading to initial licensure/certification in any combination of the following: TVI, COMS, CVRT, or CATIS. For example, NIU students enrolled in this aspect of Project VITALL coursework are pursuing full-length master's degree programs that lead to dual certification in TVI/CATIS, COMS/CATIS, or CVRT/CATIS. This method of acquiring eligibility for the CATIS certification exam includes traditional and comprehensive year-round coursework and the required clinical experiences for new professionals earning a master's degree in visual disabilities.

To learn more about the ACVREP CATIS certification, go to www.acvrep.org/certifications/catis. The ACVREP CATIS Certification Handbook is available on this website and outlines the CATIS eligibility criteria. Northern Illinois University has generous financial support available for those interested in earning their CATIS certification. For more information about NIU's Project VITALL and the financial aid that is currently available, go to www.vision.niu.edu. Those interested are encouraged to start their application today by contacting the Project Director, Stacy Kelly, at skelly@niu.edu or by calling 815-753-4103.

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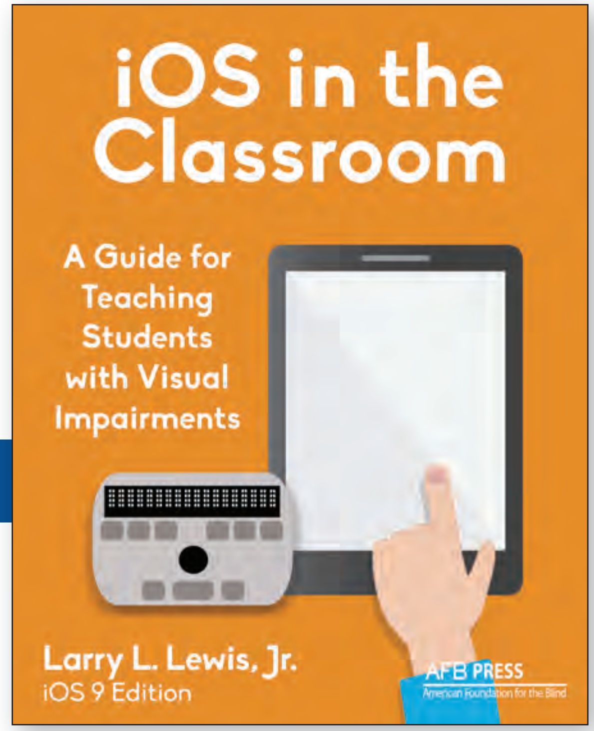
iOS in the Classroom

A Guide for Teaching Students with Visual Impairments

iOS 9 Edition

By Larry L. Lewis, Jr.



iOS in the Classroom: A Guide for Teaching Students with Visual Impairments is a fully illustrated, step-by-step guide to teaching the use of the iPad running iOS 9. The book explores the extensive accessibility options available, where to find them, and how to configure them.

iOS in the Classroom is geared to allowing students with visual impairments to use the iPad to complete the same classroom tasks as their peers. It covers a variety of tasks and features including:

» Getting acquainted with VoiceOver and Zoom

» Using external keyboards and refreshable braille displays

» Understanding touch screen gestures and braille chord commands

» Finding and managing content in iTunes, the App Store, iCloud, and other file sharing apps

» Using the iPad for online activities including internet browsing, e-mail, and instant messaging

» Utilizing specific apps

This resource provides teachers with helpful, easy-to-understand iOS technology instructions, allowing them to support their students in learning, and ensuring success in the classroom.

Available in print, e-book, and online subscription.

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iOS in the Classroom: A Guide for Teaching Students with Visual Impairments Book Review

Kim Picard, Technology Instructor, The Ohio State School for the Blind
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Lewis, L. L. (2016). *IOS in the classroom: A guide for teaching students with visual impairments*. New York, NY: AFB Press.

Apple and iOS devices are ubiquitous in today's technology-driven communications world. With built-in accessibility options, the visually impaired (VI)/blind population has embraced these devices. Additionally, the iPad has become an integral part of the educational process in many schools. This makes it paramount the devices are accessible for the VI population and provide useful apps to access the curriculum. iOS devices are easy enough to use on the most basic level and many of the students I work with, who have difficulty navigating a computer interface with a screen reader, can readily learn to use these devices effectively.

I was given the opportunity to review the how-to book, *iOS in the Classroom: A Guide for Teaching Students with Visual Impairments* by Larry L. Lewis. The following are my thoughts.

Overview

In the educational setting, iPads have been a boon for educators and students alike. While these devices are easy for sighted students to use, they may pose some obstacles for students with visual impairments. This book ~~provides~~ an introduction and step-by-step instructions for using the iPad with the accessibility options, external braille devices and keyboards. Descriptions and steps are clearly written and easy to understand and follow. There are screen shots provided in many cases, but the images are quite small and I found using a hand-held magnifier to enlarge the images increased accessibility. Additionally, it is useful to have an iPad at hand when reading the text.

The book is designed for the iPad novice but has many tips for more advanced users. I used the print version of the book, but it is available in audio and daisy formats from various sites. Each chapter begins with a bulleted list of what will be covered in that chapter, making it easy to locate the chapter/information the reader seeks; and a brief summary of what was covered, and in some cases, offering additional resources.

The book's introduction provides an overview of the accessibility options available; that the book is intended for devices running iOS9; and that some features are not available on iPad2. The author also states, which is so important, that technology moves so quickly, that some features may not appear in this text.

Chapter Reviews

Chapter 1. *Getting Started*, offers initial set-up instructions, a description of the device's basic functions, and how to set up connectivity options for a user with visual impairments. The directions are very easy to follow and understand. Each step is numbered and provides 'how-to' instructions. The chapter includes a bulleted list of apps that are pre-installed with an explanation of their use. For the seasoned user this chapter was a good review, but for the novice it is essential.

Chapter 2. *Getting Acquainted with VoiceOver and Zoom* introduces VoiceOver, Apple's screen reader, and Zoom, their magnifier. VoiceOver gestures are introduced with 'how-to' descriptions. It describes the basics of opening, closing and switching between apps. There are practice exercises using pre-installed apps such as Notes, Calendar and Contacts. Peppered throughout the text are handy tips associated with using VoiceOver and Zoom.

Chapter 3. *Setting Accessibility Options* further explores accessibility options and settings, such as switch controls, hearing, media and learning options, including Siri, which is introduced for third or fourth generation iPads.

Chapter 4. *External Keyboards and Refreshable Braille Display* provides a discussion and steps for connecting Bluetooth wireless external braille displays and keyboards. Lewis states that once commands associated with using these devices are learned, users increase efficiency and speed tremendously. “When watching proficient iPad users who are blind at work, notice how much more efficiently and accurately they move around an iPad.”

He describes the differences between an Apple keyboard layout and Windows-style layout, which may initially be a bit disconcerting for some users. It is this type of tip I found useful. This chapter also provides 4 ½ pages of keyboard commands presented in table format for using the Apple wireless keyboard and portable braille displays - a great resource.

Chapter 5. *Finding and Managing Content* describes how to create an Apple account and download and install apps from the App Store. This chapter explores more advanced utilities and requires the user to be familiar with employing accessibility options. It also outlines how to bypass entering a payment method when ordering free apps. There is a practice exercise using VoiceOver in the App Store. The exercise is downloading the ViA app from Braille Institute of America which is a database of up-to-date apps for users with visual impairments, which is a great resource for educators. This chapter offers a section addressing how to find the right app for your student; outlines involving the student in the process; and creating a chart of tasks and apps for that particular task. An important point to remember is that all apps in the App Store may or may not work with accessibility options enabled on the iPad. There is a useful discussion on using iCloud versus Dropbox for sharing documents.

Chapter 6. *The iPad Online* offers exercises for using the browser, email, messaging and the rotor. It also has step-by-step instructions for downloading and using apps for reading books, specifically iBooks, a free app available in the App Store; Read2Go from Bookshare; and BARD that is available from National Library Service.

Chapter 7. *Strategies for Completing Tasks in the Classroom* describes different keyboard layout and entry options, and word processing apps, iaWriter and AccessNote, the latter created by American Foundation for the

Blind. Another word processing tool, Pages, part of the Apple iWork suite is compatible with Word documents. There is a brief discussion on using math on the iPad specifically referring to the Talking Scientific Calculator app, which doesn't interfere with VoiceOver.

Appendix. *Beyond the Classroom* outlines everyday uses for the iPad such as utilizing the camera, and with available apps, social media, using GPS and identifying money and colors. The book offers several pages of resources and an index to quickly locate topics of interest.

Conclusion

I found *iOS in the Classroom: A Guide for Teaching Students with Visual Impairments* by Larry L. Lewis to be very useful. Information is presented in a logical progression, from basic to more complex skills; the text is easy to follow and straightforward; the author avoids expressing his opinion, but rather relying on experience interacting with the device. The exercises offer practice of skills, and descriptions provide useful information to help guide educators. This is an excellent quick read (a mere 125 pages), go-to guide and resource for educators and parents interested in teaching and using the iPad with their students with visual impairments, thus providing

equal access to those students. Despite the fact that technology moves so quickly, I feel many aspects of the text will remain relevant. With more schools putting iPads in students' hands, this book provides a bridge for students with visual impairments in the classroom and beyond.

Creating access to computer science: Enhancing engagement and learning for students with visual impairments

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Recent trends in STEM education emphasize technology—the T in STEM—a recognition of the educational benefits and career opportunities computing offers for *all* students (Israel et al., 2015a). Creating access and supporting students with disabilities is essential, particularly given their lower achievement levels in STEM (U.S. Department of Education, 2011) and lack of representation in computer science fields (Burgstahler & Ladner, 2007). Furthermore, being able to solve problems with technology is no longer optional. Recent research by Change the Equation [CTEq2015] indicates that 80% of jobs ***not*** requiring a bachelor's degree will still require tech skills.

Students with visual impairments (VI) reflect their sighted peers in terms of cognitive ability. Yet their participation in STEM activities can be limited by insufficient resources and instruction and a lack of teacher preparation in computing and non-visual teaching methods (King, 2011; Israel et al., 2015b; Snodgrass et. al., 2016). The negative consequences can be substantial.

The National Center for Science and Engineering Statistics (NSF, 2013) revealed that the number of scientists and engineers with disabilities since birth or identified at a young age (which would include many students with visual impairments) are few.

The Exploring Computer Science (ECS) curriculum (http://www.exploringcs.org)[1] can provide opportunities for students with VI, as the project has already made notable progress in broadening participation in computer science. However, substantial barriers remain for students with VI who cannot fully access the software and curricular activities. In response, our NSF-funded Inclusive-ECS (I-ECS) project has enhanced several of the curriculum units to increase accessibility.

Enhancements

The ECS units include written text, pictures/icons, visual simulations and activities, and block-based programs to support learning. Our enhancements replaced or modified these supports. In some cases, we developed new technologies. Below, we provide examples of physical, tactile, auditory, and technological enhancements designed to eliminate

[1] ECS curriculum development is funded by the National Science Foundation.

barriers and increase student engagement and learning.

Physical Enhancement Examples

1. Tower of Hanoi Activity

- **Goal:** Computers function by executing clearly defined steps.
- **Curricular Barrier:** Using a computer animation, requiring sight, students move a tower of blocks to a new post in as few steps as possible.
- **Enhancement:** A simple stacking toy allows students to feel the disks and work in an iterative fashion.

Picture 1 – Student completing Tower of Hanoi activity by stacking rings on wooden posts

2. Steiner Tree Activity

- **Goal:** Computers use algorithms to find the shortest paths through networks.
- **Curricular Barrier:** Students were asked to connect printed dots to form networks and to use other visual representations to determine distances and routes.
- **Enhancement:** LEGO bricks and a base plate are provided. Constructing the physical model and measuring distance tactilely help students form a mental picture of their network.

Picture 2 – Students using legos to create shortest path through a circuit

3. Sorting Algorithms: Heaviest to Lightest Activity

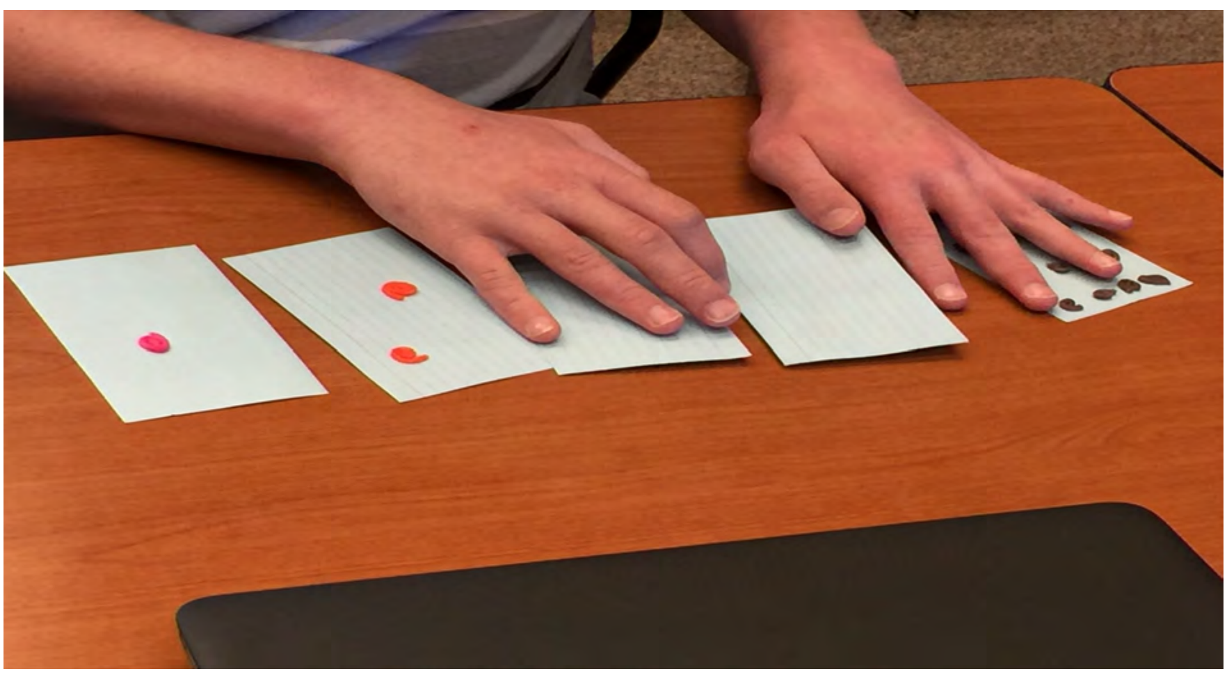
- **Goal:** Computers must sort information efficiently and in different ways, for instance, through a bubble sort (iteratively comparing two things at a time) or a quick sort (recursively dividing a set of things into two groups and then sorting each smaller group).
- **Curricular Barrier:** Typical classroom scales can be difficult to manipulate, and objects' weights must be read via printed or digital numbers. Also, keeping track of the objects being weighed to make successive comparisons is difficult.
- **Enhancement:** We replaced the scale with a larger plastic one to allow students to feel the arrow indicating the weight. Canisters being compared have braille labels for easy identification, and circles made with Wikki Stix are placed on tables so students can group objects after each round of testing.

Picture 3 – Students using accessible scale to weigh canisters

Tactile Enhancement Examples:

1. Binary Number Counting

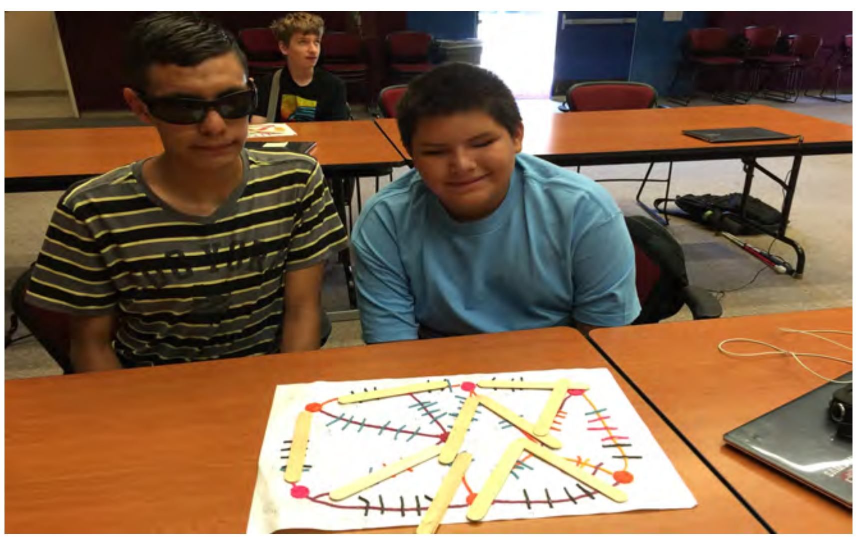
- **Goal**: Computers process information using binary numbers and arithmetic.
- **Curricular Barrier:** Cards with printed dots are held up by groups of students at the front of class, demonstrating how they cracked the code.
- **Enhancement**: Complete sets of cards, with raised Wikki Stix dots, are provided, allowing each student to crack the code.



Picture 4 – Student sorting cards with raised circles

2. **Minimal Spanning Trees: Muddy City Activity**

- **Goal:** Computers must efficiently link components of a network.
- **Curricular Barrier:** Students used a visual map to identify the shortest route that should be paved, connecting all of the houses in a muddy city.
- **Enhancement:** A tactile map was created with Wikki Stix, so that students can feel the routes. In addition, information about the length of each route is provided in braille and in Wikki Stix markers. Lastly, large popsicle sticks are provided so that students can lay them on top of each section of their shortest route—this enables them to remember prior decisions and to continuously assess the length of their path.



Picture 5 – Students posing with their completed tactile Muddy City map

Auditory-Technological Enhancement Examples:

1. Data Analysis: All Activities

- **Goal:** Computing allows researchers to analyze, visualize and draw conclusions from large data sets.
- **Curricular Barrier:** Graphical representations were visual, and screen reader software did not reliably make menus navigable. Often, graph output could not be understood.
- **Enhancement:** Glance, a web-based tool, is designed so that students can listen to data representations for bar, line, and scatterplot charts. Students can collect and enter their own data or upload a comma delimited file (like Excel).

To experience Glance, click here: https://youtu.be/0SkomvXaqb0

2. Robotics: Building Supports

- **Goal:** Robots must be carefully designed and crafted for them to work as intended.
- **Curricular Barrier:** The LEGO kit has over 600 pieces. It was challenging to locate specific ones quickly, which made iterative robot design and building slow and challenging.

- **Enhancement:** Sorting trays enable students to identify categories of pieces, and structured activities allow students to explore and practice building with LEGO pieces prior to robot construction.

Picture 6 – Sorting tray for robotics activity

3. Robotics: Programming Supports

- **Goal:** Learning to write code so a LEGO Robot works as intended.
- **Curricular Barrier:** ECS uses NXT-G, a visual programming software that requires students to see and move blocks on the screen.
- **Enhancement:** JBrick programming software supports student writing of text-based code, scaffolded by auditory prompts. Lines of code are highlighted for students with low vision.

To experience J-Brick click here: https://www.youtube.com/watch?v=yAZcRLOLbJk

Student Use of Enhancements: Initial Findings

I-ECS research is ongoing; final evaluation results will be available in the summer of 2017. Below we present initial findings that show the promise of enhancements in creating access. We also identify areas for further development or refinement.

Physical and tactile enhancements: Overall, students were able to manipulate physical objects and use tactile markers/information to work through the steps of the activities. In most cases they remained engaged, revising their problem-solving approach multiple times when needed. Observation data suggest that students understood: the requirements for completing the physical/tactile tasks (e.g., the Muddy City would be fully paved when all districts were connected); the specific objective of the activity (e.g., the inter-connected paved road should be the short distance possible); and the associated computer science learning goal (e.g., that the paved road represented a computer network that was efficient and fast). As one student commented, “after I got to do the hands on activities, I thought that I really knew the material.”

The biggest challenge involved physical and tactile activities that taxed student memory and organization. For instance, while students were able to more fully engage in a binary code activity, some had difficulty remembering what they had learned at each stage of the multi-step task. This caused them to work very slowly and lose interest. As a result, we created (and continue to create) additional enhancements to support memory and organization to accompany these tasks.

Auditory and Technological Enhancements: With practice, many students increased their comfort in discerning differences among sonified data. One student commented that he liked hearing the data because it "…gave him a feel for the graph." However, it was clear that some students needed more scaffolded listening experiences to sufficiently strengthen their auditory skills in order to compare and contrast data points within a set.

Through JBrick, many students developed basic programming skills. While writing code is more challenging than using the 'drag and drop' blocks in a visual programmer, several software features provided support. In particular, many students felt that hearing where they made an error helped them to find and correct it more easily. One student found that programming was "like [learning] a language; as you practice it gets easier." But he and other students also noted that such practice requires persistence, which is not always easy when you are getting many error messages. Still, the final result—dancing robots—excited almost everyone. Click here to see a dancing robot: https://www.youtube.com/watch?v=iO83ZsU2WTU!

Overall, student ratings of the Computer Science Academy were positive, indicating greater confidence and skill in their technology use. And like good computer scientists, they diagnosed problems with the enhancements, enabling us to further improve them for future use.

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Integrating Math and Science into Camp Activities at The Ohio State School for the Blind

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In order to address the STEM needs of the elementary students with visual impairments in Ohio, the staff at the Ohio State School for the Blind in collaboration with the Ohio Department of Education, The Ohio State University and ORCLISH developed two summer enrichment camps. The Math and Movement Camp and Braille Camp were designed to incorporate the academic content standards of math, science, English language arts and adaptive physical education for students in grades 2 through grade 6.

Our Math and Movement Camp focused on learning math concepts through movement activities, along with a lot of fun! Instruction and activities were aligned with the Ohio Mathematic Content Standards, with the purpose of increasing student competence in mathematics. The camp stressed problem solving, math skills, listening skills, teamwork, movement, orientation and mobility skills, daily living skills and social skills. The five-day residential camp included pre and post-tests to allow for differentiation of instruction and to measure student growth. Each day, the students were introduced to math concepts through classroom activities and movement activities.

In the early years of the program, teachers of students with sensory disabilities could attend with their students. Teachers could receive graduate level credit for the instruction they received in serving the needs of their students with visual impairments and for curriculum development. The teachers and their students would participate in some activities separately and others as a group. The camp has now evolved to focus only on the student's educational opportunities.

Each math concept was taught through about an hour of classroom activities and an hour of movement activities. Some examples of activities include: pairing measurement and graphing skills with track and field events. The students would measure their resting heart rates before doing running and throwing events and then again after the fitness activities. All of the measurement data would be recorded and used in the classroom. They would use their personal data to create a graph of their own running times and use their resting and active heart rates to create a giant wall sized graph of the whole group's results. See picture below.

Picture 1 – Student reading information on giant wall sized graph

When students were learning about parallel and perpendicular lines along with acute, obtuse and straight angles, pool noodles were used while cooling off during an afternoon swim. The students positioned their noodles to show their understanding of different lines and angles after having spent classroom time reading about them, using protractors to measure angles, and abstract art activities to display their knowledge about lines and angles. The lane lines were also used to reinforce parallel lines and the students positioned their bodies or the noodles to be perpendicular to them. See picture.

Picture 2 – Students in swimming pool using pool noodles to demonstrate parallel lines

Some other pairings were learning about coordinate graphing while using our climbing cargo net, place value with relay races, problem solving techniques with gym scenarios, decimals with stopwatch times on running events, and teamwork on buddy boards. All of math concepts would be taught with two or three activities in the classroom and several in the gym, track or pool to complement the classroom work.

Our Summer Braille Immersion Camp is designed for students who currently use braille as a means for written communication and for accessing information. Students work to improve and enhance existing braille skills through educational and fun science activities that are based on Ohio's New

Learning Standards in English language arts and science. It is also a five-day residential camp for students in grades 2 through grade 6.

Activities include instruction in braille reading and writing, including UEB, letter writing, storytelling, and journal writing, all based upon different science themes. Students are given braille assessments in both reading and writing at both the beginning and end of camp to identify levels of proficiency and pinpoint areas of need for the week. The students have hands-on experiences conducting experiments, exploring topics, and investigating science concepts to add a fun factor to their braille learning.

A variety of science topics students have explored include: animals such as penguins, whales, wolves and bear; weather topics like clouds, hurricanes, and tornados; and ocean topics including sharks, starfish, and tide pools. See picture below. The students have also created planets and made fossils.

Picture 3 – Students exploring items in a simulated tide pool

Our camps have benefitted greatly from collaboration with The Ohio State University and the personnel preparation program for teachers of students with visual impairments. OSU's student teachers assist throughout the week and take part in the planning and preparation of materials. This allows them to learn about the most current technology and methods to adapt materials and equipment. The student teachers are also extra hands to assist with direct individual instruction for the students.

Assessments play an important role in both camps. At the end of each camp, we take time to reevaluate student growth during the week. After the math pretest, the questions of the different topics are scored separately to find areas of strength and those needing more work. The braille reading and writing pretests evaluate each student's use of signs and strengths and weaknesses of their braille. Throughout the week, we focus on needs of individual students as much as possible. Results of the week's assessments show growth in student knowledge from the pretest to posttest as well as enthusiasm for learning in each of the content areas.

An additional benefit for the students are the new, and sometimes life-long friendships that form during camp. In many cases, the students have

2017 Submission Deadlines

Issue	Submission Date
Winter	February 3, 2017
Spring: Convention	April 14, 2017
Summer: Back to School	June 30, 2017

Email Dr. Kathleen Farrand, Farrand.9@buckeyemail.osu.edu to submit an article and/or advertisement for 2017!

never met another student with a visual impairment and being able to share experiences with another person is an important step in helping them understand that they are not alone. Activities in the evenings include swimming, roller skating and watching audio described movies. There is so much learning going on, and so much fun too, that camp seems to fly by for both students and staff!

Using Adapted Materials in Mathematics for Students with Visual Impairments and Additional Disabilities

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Kutztown University

There is minimal research on teaching mathematics to students with moderate and severe disabilities and an even smaller amount of research involving mathematical practices for serving students with visual impairments and additional disabilities (Cortade, Test, & Cook, 2015). This is unfortunate because mathematics is crucial for this population of students in order to perform daily tasks and to be contributing members of society (Jitendra, George, Sheetal, & Price, 2010). Students with multiple disabilities typically exhibit slower rates of communication and cognitive development, which makes it difficult for them to reach grade-level standards in mathematics. Additionally, teachers of students with multiple disabilities, including visual impairments, often may not know how to provide quality instruction in mathematics in order to address the required standards.

Evidence-based interventions that have been effective in the area of mathematics for students with multiple disabilities, including visual impairments, are conceptual models, simultaneous prompting, and hands-on interventions (Browder et al., 2012; Creech-Galloway, Collins, Knight, & Bausch, 2013). Students with multiple disabilities, including visual impairments, frequently require adaptations to the mathematics curriculum in order to achieve proficiency. In the area of problem-solving, Browder and colleagues (2012) found that performance improved for students with significant disabilities using a task analysis of steps in a graphic organizer to solve problem stories.

There are many other ways teachers of the visually impaired can adapt instructional materials in mathematics for students with multiple disabilities, including visual impairments. Simplifying the language in math stories and the use of repetitive operation words are methods to improve problem understanding for this population of students. Using pictures in the story problems give students with low vision access to solving problems as well. Teachers of the visually impaired can also create adapted materials to reinforce accuracy of solving addition and subtraction problems (refer to Table 1).

Skill	Material	Description	Visual	Source
Addition	Addition Machine	This allows students to use concrete materials in order to learn how addition works. Students look at each problem of the addition problem then add the proper number on each side of the PVC pipe then count how many total objects fell into the jar. The activity helps build the concept of addition for both students with and without visual impairments.		http://theprimarypack.blogspot.com/2014/11/addition-machine-diy.html?m=1
	Apple Tree Addition	This is another example of making math fun for students with VI and involves putting apples on the tree to add numbers presented in the problem. Students can also use dice on the tree trunk to represent problems presented then count the total apples. This can easily be adapted in Braille or done in high contrast for students with low vision.		http://mamapapabubba.com/2014/09/23/simple-apple-tree-addition-game/
Subtractio n	Subtraction Lego Game	This interactive game can be used to build beginning subtraction skills. The teacher starts with 10 or more legos built in a tower and has the student roll the dice. The student will subtract the legos off of the tower to see how many they have left. This can also be made into a race so students would start with the same amount of legos and see who gets to zero first.		http://thekindergartenconnection.com/subtraction-lego-game/
	Play Dough Subtraction Smash	Students begin with small balls of play dough. They count out the number of play dough balls given in the first number of the problem then "smash" play dough balls they are taking away. The play dough balls left un-smashed is the difference. This is a fun hands-on activity to learn the concepts of subtraction.		http://www.123homeschool4me.com/2015/08/playdough-subtraction-activity-for-kids.html?m=1#more

Table 1 Adapted Materials for Basic Mathematics Skills

In conclusion, it is important to build math concepts early for students who are blind and visually impaired, as well as those students with additional disabilities. This population of students requires a thorough understanding of basic concepts so higher mathematics skills can be achieved throughout the years as the concepts become more challenging. The games and activities described in Table 1 can help motivate these students to master basic concepts in mathematics and develop social skills within their general education classroom by learning with their peers.

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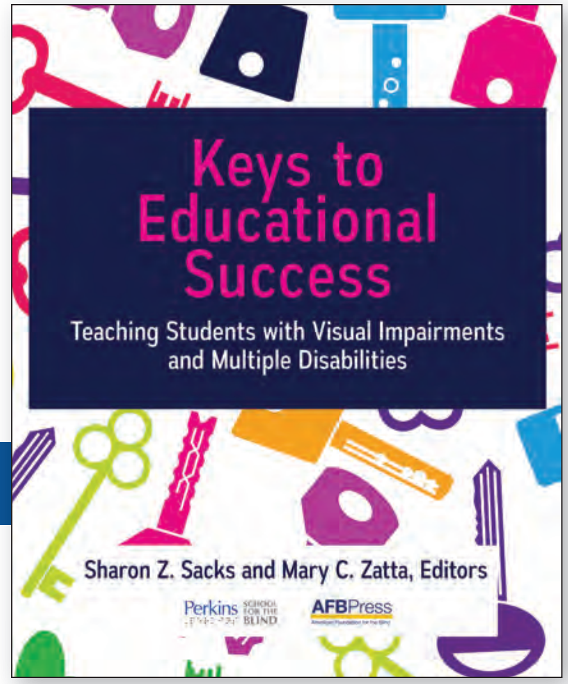
Keys to Educational Success

Teaching Students with Visual Impairments and Multiple Disabilities

Sharon Z. Sacks and Mary C. Zatta, Editors



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Input from Field on Initial Licensure Standards for Teachers of Students with Visual Impairments

Dear Colleagues,

Many of you participated in meetings regarding the revision of CEC initial licensure standards for TVIs either by phone or in person at AER or NLCSD/OSEP in July. A committee appointed by DVIDB President Tiffany Wild is leading the revision. On behalf of that committee, I am attaching the latest version of draft standards based on our meetings and suggestions from colleagues in the field.

We are currently soliciting input from the field for content through Nov. 30th. Remember that we have a number of constraints based on CEC guidelines and procedures. Therefore, at the end of the draft standards, I have included a concise list of CEC guidelines. ***Please provide suggestions/edits using track changes and send to Deborah Hatton at Deborah.Hatton@vanderbilt.edu before November 30, 2016.*** The revision committee will review all suggestions. We plan to share an updated version by December, 2016.

We cannot add standards after our validation survey is submitted. For that reason, it is critical that we identify all the standards now and that we secure input from as many colleagues as possible. We will document the responses that we receive from you as evidence to support the proposed standards.

Thank you for sharing your time and expertise in the standards revision. These standards will impact accreditation for university personnel preparation programs that prepare TVIs and for the job responsibilities of TVIs for years to come.

Warmest Wishes,

Deborah Hatton

Draft Specialty Set Standards for Initial Licensure: DVIDB

September 19, 2016

Overarching Definitions and Issues

- Ages: Birth to 22 years
- Settings: Home, school, community
- Visual impairment (VI): Uncorrectable visual impairment that impacts access to information
- Individualized characteristics/full range of learners: age; sensory function; diagnoses and prognoses; co-occurring disabilities; ability, including giftedness; grade level; family values and cultural background (diverse background); motivation; acquired or congenital onset; English language learner; communication skills
- Roles of TVIs: Eligibility determination; assessment/evaluation/progress monitoring; identifying priorities and goals; strategy selection for optimizing development and learning; identifying/implementing accommodations/modifications, including assistive and information/communication technologies for assessment/evaluation, access to the general curriculum, and the expanded core curriculum; implementing instruction/intervention, including the expanded core curriculum; transition planning; development of individualized education programs/individualized family service plans; liaison for medical issues; collaboration; advocacy
- Development and learning include access to learning experiences and opportunities that occur incidentally through vision
- Development includes sensory, cognitive, communication, motor, social, and adaptive domains
- Assistive technology (AT): As defined by IDEIA (P.L. 108-446), assistive technology is "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (1997, Sec. 602, 20 USC 1401, 300.5).
- Information and communications technologies (ICT) and educational technologies used in educational settings are the diverse set of technological tools and resources used to communicate and to create,

disseminate, store, and manage information in a classroom environment

- Protective techniques for orientation and mobility: upper hand and forearm, lower hand and forearm, trailing, squaring off, direction taking, systematic search techniques, seating, room familiarization, and methods of orientation to indoor unfamiliar areas

Standard 1
Learner Development and Individual Learning Differences

KNOWLEDGE

a. Development, including structure and function, of the human visual system: the eyes, optic nerve, other visual pathways, and areas of the brain involved in processing visual images
b. Most prevalent causes of severe, uncorrectable visual impairment in children and youth ages birth to 22
c. Terminology related to diseases and disorders of the human visual system, including cerebral/cortical visual impairment, current treatments, effects of medications, and implications for individualizing assessment/evaluation and instruction
d. Implications of prevalent visual conditions, including prognosis, common medical treatments and medications, congenital versus acquired visual impairment, and co-occurring disabilities for concept development, development and learning, and for assessment/evaluation systems and instruction
e. Sensory development and its impact on development and learning when vision is impaired
f. Psychosocial and psychoeducational impact of visual impairment, cultural identity, family systems, and family values on independence; development and learning; accommodations and modifications, including appropriate assistive technology; assessment/evaluation; strategy selection and implementation; progress monitoring; orientation and

mobility; vocational skills and career education; self-determination; and leisure/recreation

g. Impact and implications of visual impairment on attachment, early social and communication development, early literacy, early orientation and mobility, and nonvisual strategies for facilitating attachment, early communication, and social development
h. Impact and implications of sociocultural/psychosocial factors, such as motivation, fear, anxiety, self-concept, self-efficacy, and attitudes unique to blindness, across ages and settings, on acquisition of orientation and mobility skills, and social interactions that impact education and rehabilitation

SKILLS

a. Accurately read, interpret, and summarize eye reports and serve as liaison to families and other members of the educational team to individualize services
b. Select and develop assessment/evaluation and teaching strategies, accommodations and modifications that address age, visual impairment, family values and priorities, visual prognosis, and other individual characteristics
c. Use nonvisual/alternate strategies to promote attachment, early communication, and independence to address the effects of visual impairment on families and the reciprocal impact on individuals' self-esteem
d. Select, adapt, and use nonvisual/alternate instructional strategies to address co-occurring disabilities and other individual characteristics
e. Adapt human guide techniques including basic guide position and grip, transferring sides, narrow passageways, reversing directions, doorways, stairways, and seating based on individual characteristics

Standard 2
Learning Environments

KNOWLEDGE

a. Physical and virtual environmental factors that impact optimal sensory use and promote access to and meaningful engagement in the general and expanded core curriculum, including multimodal instructional media
b. Physical and virtual environmental factors that impact the acquisition of spatial and positional concepts, access to and synthesis of data visualizations, and other concepts typically acquired through vision
c. Environmental analysis to inform appropriate design accommodations and modifications for a full range of individual learners with visual impairment

SKILLS

a. Identify and implement environmental accommodations and modifications to facilitate optimal sensory use and multisensory access to, and active participation in, individual and group activities in general and expanded core curriculum environments
b. Collaborate with team members including other vision specialists, resource and alternate media specialists, and technology personnel to design and implement environments that promote optimal sensory use, foundational orientation and mobility skills, independence, social engagement, and efficient storage of specialized materials
c. Access digital multimedia and virtual built environments such as software programs, websites, and virtual classrooms.
d. Use ergonomics and appropriate technology settings aligned with students' preferred learning media, such as illumination and size control, color and contrast (visual) settings, speech output (auditory) settings, braille input/output and other tactual displays, mouseless computing (tactile) settings, and low tech strategies to support ubiquitous computing to promote access to the general and expanded core curriculum
e. Facilitate incidental learning experiences to address nonvisual access across physical and virtual environments for a full range of learners

f. Evaluate social interaction skills and design behavior management strategies appropriate for learners with visual impairments to maximize positive social engagement and interaction across all environments
g. Teach students with visual impairment human guide as well as protective and alignment techniques for independent travel to promote safety across environments
h. Teach students with visual impairment to develop orientation skills using environmental features, identify and advocate for optimal environmental accommodations and modifications, and to request and refuse assistance as needed
i. Teach students with visual impairment nonvisual and alternate strategies for promoting digital citizenship and secure online practices

Standard 3
Curricular Content Knowledge

KNOWLEDGE

a. Relationship of assessment/evaluation, intervention planning and implementation, development of individualized education programs or individualized family service plans, progress monitoring, and placement across ages, settings, and ability levels, specific to unique needs of visual impairment
b. Specialized curricula and resources to optimize sensory use, development, and learning; provide access to the general curriculum; implement instruction in the expanded core curriculum
c. Low to high tech instructional and assistive technology, specific to visual impairment, including mainstream devices and software with built-in accessibility features, specialized devices and software, and other information/communication technologies for accessing print and digital information in the general and expanded core curriculum
d. Advantages and disadvantages of a wide range of instructional and assistive technologies for providing access to, and creation of, printed text and images, digital text, graphical information, data and data visualizations, digital multimedia such as images and video, and production of alternate media for nonvisual or low vision access
e. Importance of role models with visual impairment for a full range of

individual learners across settings

f. Use of mobility devices, such as long cane, adaptive devices, dog guides, and electronic travel devices used to meet the needs of the full range of learners

SKILLS

a. Demonstrate proficiency in reading, writing, proofreading, and interlining alphabetic and fully contracted Unified English Braille
b. Demonstrate basic proficiency in reading and writing braille for mathematic and scientific notation
c. Produce braille with brailler, slate and stylus, computer (including use of braille translation software), and braille production methods
d. Demonstrate basic proficiency in human guide, protective, alignment, and search techniques in orientation and mobility with modifications for a full range of learners
e. Identify specialized resources unique to visual impairment to address the specific communication needs of students with varied communication abilities, reading levels, and language proficiency
f. Develop, collaboratively implement, and continuously monitor communication goals, objectives, and systems for students with visual impairments and co-occurring disabilities
g. Collaborate with team members such as speech/language pathologists, occupational therapists, and classroom staff to modify the presentation of augmentative/alternative communication devices such as switches, tangible symbols, and visual displays for nonvisual or low vision access
h. Design, obtain, and organize specialized materials, resources, assistive technology, and curricular programs to optimize sensory efficiency and to implement instructional and individualized education program goals and objectives
i. Identify the individual needs of the full range of learners and adapt materials and curricula as appropriate to provide access to the general education and expanded core curriculum
j. Develop, implement, and continuously monitor learning objectives and goals for optimizing sensory use, developing concepts, and accessing the general and expanded core curriculum across settings
k. Identify general education and visual impairment specific curricula for

instruction of literacy, other academic areas, and the expanded core curriculum

Standard 4

Assessment

KNOWLEDGE

a. Challenges of assessing students with visual impairments and co-occurring disabilities, including validity, reliability, and appropriateness of measures based on sensory impairment(s)
b. Options for specialized assessment/evaluation materials and equipment to meet individualized needs unique to visual impairments
c. Accommodations and modifications of assessment/evaluation measures and procedures unique to visual impairments
d. Uses and limitations of alternative assessment/evaluation techniques for individuals with visual impairments
e. Implications of specific visual conditions and other individual characteristics for assessment/evaluation, instructional planning and implementation, accommodations/ modifications, progress monitoring
f. Methods for conducting specialized assessments/evaluations of students with visual impairments, including the selection, procurement, and use of nonbiased tools
g. Knowledge of the role of specialized, individualized assessment/evaluation data unique to visual impairment in pre-referral, referral, annual, and tri-annual processes

SKILLS

a. Interpret medical reports and multiple sources of data, including background information and family history, to plan and implement nondiscriminatory assessments/evaluations to meet individualized needs unique to visual impairment
b. Use multiple sources of information to evaluate the effectiveness of intervention, instruction, specialized media, materials, equipment, and the physical environment for learners with visual impairments

c. Use assessment/evaluation results and medical reports to determine eligibility for vision specific services, with and without specific visual diagnoses
d. Use functional vision, learning media, assistive technology, and other assessment/evaluation data related to individual characteristics to select appropriate assessment/evaluation measures, procedures, and supports
e. Use assessment data and knowledge of the potential impact of visual impairment on psychosocial functioning to identify when referral for psychosocial and psychoeducational assessment/evaluations are necessary
f. Adapt assessments/evaluations when tests are not validated on individuals with visual impairments and interpret results with caution
g. Identify assessment/evaluation items and measures that are biased and make recommendations for non-visual accommodations and modifications
h. Collaborate with team members and families to plan and implement assessments/evaluations and interpret assessment/evaluation results on issues specific to visual impairment
i. Conduct functional vision, learning media, assistive technology (AT), and other expanded core curriculum-related assessments/evaluations matched to individual needs
j. Assess cognitive, motor, social, and language concepts unique to individuals with visual impairments
k. Use multiple sources of data, including functional vision, learning media, assistive technology assessment/evaluation data, clinical low vision evaluation data, and formal and informal literacy assessment/evaluation, to determine appropriate learning and literacy media (braille, print, or combination of both) and needed assistive technology, such as auditory and video magnification tools, recorded/digital books, and synthesized speech software settings, across a full range of learners
l. Interpret assessment/evaluation results to determine individual needs to support acquisition of skills in both the general and expanded core curriculum
m. Identify and advocate for accommodations and modifications for standardized assessments/evaluations

n. Communicate visual impairment specific assessment/evaluation data accurately to the educational team, including families, in comprehensive assessment/evaluation reports that address limitations of standard scores and non-standard data
o. Assess unique educational needs of individuals who are visually impaired who are English language learners and/or who are from culturally or linguistically diverse backgrounds
p. Use results of clinical low vision evaluation, functional vision, learning media, and assistive technology assessments/evaluations to identify optimal assistive technology devices, software, text adaptations, and settings, such as font size, color and contrast, audio speed

Standard 5
Instructional Strategies

KNOWLEDGE

a. Proper use and care of braille and braille production devices and technology equipment, including maintenance of devices and software updates
b. A range of methods and instructional strategies to prepare individuals with progressive visual conditions to transition to alternative skills
c. Importance of creating positive, productive learning environments that foster independence and student achievement and that reduce the tendency of others to engender learned helplessness in learners with visual impairments
d. Techniques for creating and adapting instructional materials for all learners with visual impairments

SKILLS

a. Develop, coordinate, and implement appropriate programs for infants and young children with visual impairment, including those with co-occurring disabilities, and their families
b. Obtain resources for braille codes currently in use
c. Use digital resources, hardware, and software to produce and access materials in accessible media including the conversion of print materials

into braille, tactile, and/or digital formats

d. Use and teach device/software navigation features for efficient and equitable navigation of information
e. Use visual, nonvisual, and adaptive methods to teach technologies to students with visual impairments to access information stored online
f. Select and use visual, nonvisual, and adaptive methods to teach technologies to achieve individual goals and needs based on sensory skills, learning media, constraints of different types of content, individual keyboarding skills, ability to read and write, listening skills, and ability to access visual information
g. Plan and implement explicit instruction in assistive technology that permits students to meet, and advocate for, their own access needs
h. Teach students to install and maintain assistive technology, use troubleshooting techniques, and appropriately use connectivity
i. Teach students to use visual, nonvisual, and/or adaptive methods to organize their own work space, manage materials, and gain access to needed resources
j. Adapt and format documents, including text, images, and video to improve accessibility based on individual needs
k. Use basic methods to adapt and format inaccessible media, text, images, and video to improve usability for students with visual impairments
l. Provide systematic, explicit braille literacy instruction using embossed materials and digital technologies to meet individual needs
m. Teach the use of the abacus, accessible calculator, tactile graphics, adapted equipment, and appropriate technology for mathematics and science instruction to meet individual needs
n. Teach students to access, interpret, and create increasingly complex printed and digital graphics in visual and/or tactile forms, including maps, charts, diagrams, and tables, based on individual needs
o. Teach students with low vision to use optical, electronic, and non-optical devices to optimize visual efficiency and independently use dual learning media such as visual and auditory information, or auditory and tactile information
p. Promote and reinforce sensorimotor and physical skills, including gross and fine motor, posture, balance, purposeful movement, and strength to meet individual needs unique to visual impairment

q. Teach basic orientation, body image, and spatial, temporal, positional, directional, and environmental concepts based on individual needs to promote motor skill development, orientation and mobility, and academic and social inclusion
r. Teach and reinforce human guide techniques to students with visual impairment, their peers, and others who interact with them
s. Teach and reinforce protective and alignment techniques for independent travel
t. Orient students to unfamiliar school and home environments
u. Reinforce skills taught by orientation and mobility specialists to support the use of mobility devices, including long cane, adaptive mobility devices, dog guides, electronic travel devices, and other technology for orientation and mobility
v. Teach independent living skills using alternate strategies based on individual needs, including skills related to organization, personal hygiene, grooming, clothing care, dressing, time management, eating, cooking, cleaning, other household tasks, telephone use, and money management
w. Teach social interaction skills based on individual needs, including skills related to appropriate body language and non-verbal communication, social communication and cooperation, effective conversation patterns, social etiquette, digital citizenship, development and monitoring of relationships and friendships, and knowledge of self, including human sexuality
x. Teach skills usually acquired visually to develop and enhance participation in fitness/leisure/recreation activities, hobbies, and team and spectator sports to facilitate inclusion across settings
y. Teach career education skills usually acquired visually to facilitate transition of students with visual impairments based on individual needs, including facilitating positive work habits and skills, concepts related to work, exploration of vocational interests, opportunities to work, use of technology to complete tasks in the workplace, and for planning for post-school engagement across settings
z. Teach self-determination skills usually acquired visually based on individual needs related to self-knowledge, self-advocacy and empowerment, assertiveness, informed decision making, problem solving, goal setting, and self-directed and self-regulated behavior to

facilitate inclusion across settings

aa. Teach students to recognize and report behaviors that they may not perceive visually that may threaten their personal safety and well being

bb. Teach students their legal rights and responsibilities related to being a citizen with a visual impairment

Standard 6
Professional Learning and Ethical Practice

KNOWLEDGE

a. Roles and responsibilities of teachers and support personnel in providing services for students with visual impairments in a range of settings, including referral and eligibility determination, assessment/evaluation, development of IEPs/IFSPs, intervention planning and implementation, progress monitoring, data collection, and transition
b. Current knowledge of incidence and prevalence of severe, uncorrectable visual impairment in children and youth ages birth to 22
c. Current knowledge of specialized services, including the ECC, assistive and instructional technologies, and other resources, including but not limited to, funding and materials sources specific to visual impairment
d. Eligibility for specialized services, including the ECC, assistive technology, and other resources for students with visual impairments
e. Historical, political, and sociocultural forces unique to the education of students with visual impairments
f. Specific ethical practices related to interactions with students who are visually impaired, including inappropriate use of gestures and behaviors that are not accessible to students with visual impairments
g. Identification of online and other resources for ongoing formal and informal professional development specific to visual impairment
h. Identification of online communities of practice that provide information and resources specific to students with visual impairments
i. Role of teachers of students with visual impairments in determining and recommending appropriate type and amount of services based on evaluation of needs in all areas of the expanded core curriculum

SKILLS

a. Develop and maintain professional learning and practice by actively participating in professional organizations and professional development activities within the field of visual impairments
b. Articulate instructional and professional philosophies and ethical practices to address the specific needs of students with visual impairment across settings
c. Articulate and advocate for individual needs regarding placement, service delivery models, type and amount of service, and key components of services unique to visual impairment across ages and settings
d. Articulate an instructional philosophy that incorporates the expanded core curriculum to respond to the specific implications of visual impairment across settings
e. Advocate for evidence-based educational policy related to visual impairment and low incidence disabilities
f. Articulate a plan for continuous professional development to remain current on all areas of the expanded core curriculum, with particular attention to assistive and instructional technology, most prevalent causes of and medical treatments for severe visual impairment, and co-occurring disabilities
g. Conduct online searches to locate information specific to visual impairment
h. Use tools for online engagement in communities of practice
i. Evaluate and discern credible and scholarly sources of information about visual impairments

Standard 7
Collaboration

KNOWLEDGE

a. Role of teachers of students with visual impairment in conveying impact and implications of severe visual impairment on development and learning, on facilitating access to the general and expanded core curriculum to families and members of the education team

b. Role of teachers of students with visual impairment, working collaboratively with families and/or the educational team, in recognizing the need for referral for counseling, therapy, or other services to address the unique needs of visual impairment
c. Role of teachers of students with visual impairments to increase awareness of accessibility in physical and virtual environments and implications of independent, timely, and equitable access to information

SKILLS

a. Collaborate with educational team, including families, on eligibility, placement, specialized services, assessment/evaluation planning and implementation, and service delivery issues unique to visual impairment
b. Communicate with technology, web, and curriculum developers and IT staff on accessibility needs of learners with visual impairments
c. Serve as liaison between medical care providers, families, and other members of the educational team regarding issues unique to treatments and management of visual impairment
d. Collaborate with vision care facilities/professionals, such as low vision specialists, to identify accommodations and modifications to optimize use of vision and other senses to facilitate access to the general and expanded core curriculum
e. Collaborate with families and orientation and mobility specialists to reinforce orientation and mobility skills and other expanded core curriculum skills across settings
f. Collaborate with families and other team members to plan and implement transitions that address needs unique to students with visual impairments
g. Instruct and supervise paraeducators, families, and other members of the educational team in nonvisual strategies that optimize use of all senses, development, and learning, while also promoting independence and autonomy
h. Instruct paraeducators, braille transcribers and/or alternate media, and related resource specialists on the production of accessible media including text, images, and video in collaboration with the educational team and families
i. Structure and supervise the activities of paraeducators who support

Messages From the Field: Anne Corn

I just checked the number of listings for pediatric low vision providers on the TSBVI website (Texas School for the Blind and Visually Impaired). Unfortunately, we have only 74 locations (some have the same clinician in more than one place) in the US and 1 in Canada. I know we are not reaching the numbers of pediatric low vision providers who are seeing children.

If you have ideas of how to spread the word, please use what I have below as a starting point and feel free to edit. If you would like to sign my name along with yours, it is fine but my name is not needed.

The Texas School for the Blind and Visually Impaired (TSBVI) website includes the Directory of Pediatric Low Vision Service Providers. Listing contact information in this Directory at tsbvi.edu/lowvisionservices is a public service for parents and teachers as a resource to locate clinical low vision evaluations for their students.

Kindly check the listing to see if the clinical low vision specialists who provide evaluations for your students are included. If not, please let the clinicians know of the Directory. On the page, there is a link to a form to submit contact information to the site.

students with visual impairments

j. Collaborate with the educational team to promote literacy development
k. Collaborate with assistive technology specialists, assistive technology vendors, instructional technology specialists, and other professionals to support the inclusion of the simplest, and most appropriate, customized tools into the educational programming and accessibility needs of individuals with visual impairment

Council for Exceptional Children
The voice and vision of special education

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Annual membership dues in CEC include $24 for subscription to *Exceptional Children* and $36 for *TEACHING Exceptional Children*. This information is given in order to meet postal regulations. Please do not use as a basis for payment.

Thank you for your support of CEC!

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