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Research and Practice in Visual Impairment and Blindness

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Insight: Research and Practice in Visual Impairment and Blindness

A quarterly journal in the field of education and rehabilitation of persons of all ages with low vision or blindness

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in Visual Impairment and Blindness

Notice to Authors:

Insight will cease publication in December, 2012. Because of the number of accepted manuscripts and manuscripts under revision currently in the system, we regret to report that we cannot accept any more submissions at this time. We wish all potential authors the very best in your efforts to publish your work.

– *Insight* Editorial Team

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Our Editorial team is pleased to offer you the seven excellent articles from the education side of our field that make up this issue. It seems that those who are teaching teachers, and those who are involved in the education of young people who are blind or visually impaired, responded with enthusiasm to the call for papers for this issue.

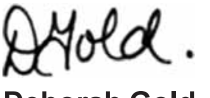
We had a great deal of interest in this special issue, perhaps because there is so much excellent research currently underway on teacher training!

Dr. Bill Penrod correctly called *Insight* a “bridging” journal; that is, a journal that very effectively achieves the goal of bridging the gaps between theory/research and practice through the publication of very applied research and reports of programs and practices that could be replicated by others. This has indeed been our goal, and I am pleased that the present issue is no exception. We offer you: research on teaching, research on teacher preparation, research on teacher perceptions, and research on employment preparation of young people—all worthy subjects not typically grouped together in one current document.

I would like to thank and acknowledge the contribution of our Guest Editor, Dr. Susan Leat, University of Waterloo School of Optometry, on this issue.

I would also like to acknowledge the contributions of all the authors and the reviewers, who give so much to each and every issue of *Insight*. I would encourage all of our *Insight* reviewers, now that the journal is coming to an end, to send your statement of interest in continuing to volunteer as peer reviewers to: Dr. Diane Wormsley, Editor-in-Chief, *Journal of Visual Impairment & Blindness (JVIB).* You have done an excellent job for us at *Insight* as peer reviewers, and I know that if you are not already a reviewer for *JVIB,* there will be interest in talking to you about taking on such a role there. Our field needs many more involved reviewers, and with this outlet closing, you may wish to try another!

Until next time,



Deborah Gold, PhD
Editor-in-Chief

Teaching Strategies for Learning Styles of Students with Visual Impairments

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Mary Jean Sanspree, PhD
Carol Allison, MA
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Abstract

The purpose of the study was to investigate the effects of teaching strategies that address individual learning styles for students with visual impairments. Quantitative data was obtained to determine individual learning preferences. Test scores on the Alabama Reading and Math Test (2002) were collected for five students with visual impairments and compared to typical classmate scores. Qualitative interviews were conducted to explore the students' attitudes concerning school and teachers' perceptions about the benefits of customizing instruction for specific learning styles. Data was converged to address the central research question: "Will providing educators training to differentiate instruction for students who are blind or visually impaired improve students' academic performance and attitudes towards school?" When learning styles were addressed, student test scores remained the same or improved, while attitudes about school remained positive. However, when the test scores of the five participants with visual impairments were compared to peers in the control group, the increase in test scores was not statistically significant, thus providing opportunities for future research with a larger group.

Keywords: teachers of students who are visually impaired, learning styles, teaching strategies, mixed-methods research

Introduction

Pedagogy for students who are visually impaired (that is, those who are blind or have low vision) includes the assumption that learning occurs through tactual or auditory modalities. However, what happens to the student who is visually impaired whose learning style preference is visual or kinesthetic? Is it possible to adjust student learning preferences, or should the methods of instruction be modified?

Individual learning styles provide each learner with a preferred modality of concentrating, processing, absorbing, and retaining new and difficult information (Dunn & Dunn, 1992; 1993; 1999). To date, hundreds of research studies have been conducted around the importance of learning styles. According to Dunn and DeBello (1999), extensive research has been conducted on the effects of the Dunn and Dunn Learning Styles Model on urban, poverty-

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stricken, or minority students. The general results of the past research show that when students are instructed through their preferred learning styles, higher achievement, better behavior, and improved attitudes toward school are demonstrated.

Rochford (2003) defined *learning style* as the way students concentrate on, process, internalize, and recall new and difficult information. Individual differences in how students prefer to gather, absorb, process, and organize data must be taken into consideration (Felder & Siverman, 1988; Van Zwanenberg, 2000). An additional consideration, according to Dunn and Stevenson (1997), is that a student's learning style is an inborn characteristic that is affected by experiences and the environment but that continues to remain fairly stable over time. A review by Coffield, Moseley, Hall, and Ecclestone (2004) revealed that there are more than 70 models of learning styles and processes of identification of the preferred learning model.

While the specific model developed by Dunn and Dunn is strongly supported by years of research, there is a lack of understanding about the individual learning styles of students who are visually impaired. According to Dunn and Griggs (2000), the Dunn and Dunn Model divides a person's individual learning style into five major strands with a combination of environmental, emotional, sociological, physiological, and psychological factors that influence how many individuals learn. The study focused on the multidimensional Dunn and Dunn learning style model (Dunn & Griggs, 2000) that hypothesizes optimal and diversified learning styles of each student. The particular learning styles are used to address, process, absorb, and remember new and difficult information. To investigate the benefits of teaching to the specific learning styles of students who are visually impaired, a study was completed to address the following questions:

1. Quantitative question: Will designing instruction toward the identified learning styles of students who are visually impaired improve their academic performance?
2. Qualitative question: Will designing instruction toward the identified learning styles of students who are visually impaired improve their attitudes toward school?
3. Mixed-method question: Will providing educators with training about differentiated instruction for students who are visually impaired improve academic performance and attitudes toward school?

Methods

Participants

The Mobile Southwest Regional School for the Deaf and Blind is a resource school within the Mobile County Public Schools in Alabama. The principal of the school identified four teachers who were certified in visual impairments and taught visually impaired students in a classroom setting. The four participating teachers have a total of 45 years of experience in teaching students with visual impairments, with the newest teacher having 5 years of experience. The teachers were recruited and informed of the study, the training sessions required, and interviews to be completed concerning learning styles and classroom instruction.

Parents of the students taught by the participating teachers were provided with information concerning the research study. It was explained to them that the purpose of this study was to determine if there is a significant relationship between grade-level instruction using the individual learning styles of students with visual impairments and success in school. The parents were informed that if their child participated, test data would be collected, interviews with the students and teachers would be conducted, and a computer-based assessment would be conducted for each student. Teachers would receive training to address specific teaching strategies for each student. Parents or guardians of 12 students were ap-

Table 1. Student Characteristics

Student	1	2	3	4	5
Age	8	7	9	9	8
Grade	3	2	4	4	2
Gender	M	F	F	M	F
Visual acuity	20/600	20/200	20/200	20/400	20/800

proached, and 5 gave consent for their child to participate. The 5 students participating in the study were aged 7 through 9, three females and two males, and had visual acuities ranging from 20/200 to 20/800, corrected (see Table 1). Two students had other identified concurrent disabilities.

Methodology

The research method was an experimental, mixed-method design in which concurrent data was collected over a 10-month school year and qualitative data was embedded. A triangulation mixed-method design was used to collect the qualitative and quantitative data that are complementary to the research questions. This approach involved the collection of the qualitative and quantitative data during the same time frame, independently of each other. Collecting both quantitative and qualitative data combines the strengths of both forms of research to validate the results. The quantitative and qualitative data collection was weighed unequally in this study because a higher priority was given to the quantitative test scores of the students.

Data Collection

Each of the five students was administered the Elementary Learning Styles Assessment (ELSA) designed by Dunn, Rundle, and Burke (2007). The ELSA electronic assessment provided the students an opportunity to respond to 25 questions, which were presented to them 3 different times in varying order (see Table 2). The students' responses were used to identify their particular learning style preferences. The ELSA measures the patterns through which learning occurs in individual students and summarizes the environmental, emotional, sociological, physiological, and psychological preferences that each student has for learning (Dunn, Rundle, & Burke, 2007).

At the end of each quarter of the academic school year, the Mobile County School System administers the Alabama Reading and Math Test (ARMT), a criterion-referenced test developed using course-specific objectives to each student in kindergarten through grade 5 (Alabama State Board of Education, 2002). The tests focus on areas in reading and mathematics and contain questions related to Alabama teaching standards and objectives that have been taught during that quarter for a specific course. Data from each student's and each participating teacher's class test scores were gathered during the pre- and postphases of the learning styles intervention. The 5 participating students' ARMT criterion test scores were used to test the theory of differentiated instruction by comparing the results of the other students in the participating control group classes who did not participate in the study.

Concurrent with ARMT data collection, qualitative interviews were conducted to explore the students' attitudes concerning school (see Table 3) and teachers' perceptions about the benefits of instruction that used specific learning styles (see Table 4). Student and teacher interviews served as the qualitative data set and were subservient in the research design (Creswell & Plano Clark, 2007). Figure 1 provides a visual model of the research procedures. Students were interviewed at the beginning of the study.

The information provided in the ELSA report was shared with the students' individual teachers (see Table 5). Utilizing the "Bound for Success" curriculum (Dunn et al., 2007), the researchers provided training for the four teachers. The training included instruction on: (1) multisensory instructional materials; (2) small group techniques; (3) development and utilization of tactual resources; (4) development and utilization of contact activity packag-

Table 2. Assessment Question-and-Answer Choices

1.	Do you like the light low?	Do you like the light to be bright?	It doesn't matter.
2.	Do you like the room to be quiet?	Do you like music playing?	It doesn't matter.
3.	To you like to feel cool?	Do you like to feel warm?	It doesn't matter.
4.	To you like to have a snack?	Do you not like to have a snack?	It doesn't matter.
5.	Do you like to lie on the floor?	Do you like to sit at a desk?	It doesn't matter.
6.	Do you like to move around?	Do you like to stay in one place?	It doesn't matter.
7.	Do you like to study in the early morning?	Do you not like to study in the early morning?	It doesn't matter.
8.	Do you like to study in the later morning?	Do you not like to study in the later morning?	It doesn't matter.
9.	Do you like to study in the afternoon?	Do you not like to study in the afternoon?	It doesn't matter.
10.	Do you like to study in the evening?	Do you not like to study in the evening?	It doesn't matter.
11.	Do you like to make things with your hands?	Do you not like to make things with your hands?	It doesn't matter.
12.	Do you like field trips?	Do you not like field trips?	It doesn't matter.
13.	Do you like to hear your teacher talk?	Do you not like to hear your teacher talk?	It doesn't matter.
14.	Do you like to read?	Do you not like to read?	It doesn't matter.
15.	Do you like to study by yourself?	Do you not like to study by yourself?	It doesn't matter.
16.	Do you like to study with a classmate?	Do you not like to study with a classmate?	It doesn't matter.
17.	Do you like to study with classmates?	Do you not like to study with classmates?	It doesn't matter.
18.	Do you like to study with a teacher?	Do you not like to study with a teacher?	It doesn't matter.
19.	Do you like to study in different ways?	Do you not like to study in different ways?	It doesn't matter.
20.	Do you like to take short breaks while studying?	Do you not like to take short breaks while studying?	It doesn't matter.
21.	Do you like to have help while studying?	Do you not like to have help while studying?	It doesn't matter.
22.	Do you like to use your ideas?	Do you like to use your teacher's ideas?	It doesn't matter.
23.	Do you like to take directions?	Do you not like to take directions?	It doesn't matter.
24.	Do you like for your teacher to start with a story?	Do you like for your teacher to begin with the facts?	It doesn't matter.
25.	Do you like to take your time to answer questions?	Do you like to answer questions quickly?	It doesn't matter.

es; (5) development and use of kinesthetic games; (6) programmed learning sequences; and (7) classroom redesign.

Table 3. Script for Student Interviews

1.	How did you feel about coming to school today?
2.	How did you enjoy math class today?
3.	How did you enjoy science class today?
4.	How did you enjoy reading class today?
5.	What did you not like about school today?
6.	What did you not like about your classroom today?
7.	If you could change anything about your classroom, what would it be?
8.	What did you learn new today?

The training occurred during the 6th month of the 10-month school year. Classroom instruction modification to address each student's learning style was implemented after the seventh month of school. Participating students and teachers were interviewed in the ninth month to determine attitudes after instruction modifications.

Data analysis

Analysis of the quantitative data served to answer the research question concerning improving the academic performance of students who are visually impaired by de-

Table 4. Script for Teacher Interviews

1. What strategies do you currently employ to facilitate the learning of a visual learner?
2. What strategies do you currently employ to facilitate the learning of an auditory learner?
3. What strategies do you currently employ to facilitate the learning of a tactile learner?
4. What strategies do you currently employ to facilitate the learning of a verbal learner?

signing instruction for their identified learning styles. Descriptive statistics were used to compare the test scores of the sample and the control group (students who did not participate in the study). One-sample *t* tests, which compare the mean score of a sample to a known value, were performed comparing the mean test scores of the sample set to the mean test score of the control group for the second, third, and fourth school quarters. Data were analyzed using SPSS, version 18.0.

Results

The hypothesis that test scores will increase when a student's learning style is addressed in the classroom was tested. The one-sample *t* test for the second quarter of school compared the mean test scores for student 1 (75), student 2 (88), student 3 (80), student 4 (60), and student 5 (25) to the mean of the remaining 12 students taught by the 4 participating teachers (see Table 6). There was no statistically significant difference at the .05 alpha levels for any of the quarters tested.

The second quarter test scores of the participants were compared to a mean score of 80 for the control group. The results revealed $t = -1.294$, df $= 4$, $p = .265$. The third-quarter test scores were compared to a mean score of 83 for the control group: $t = -1.979$, df $= 4$, $p = .119$. The fourth-quarter test results were compared to a mean score of 80.4 for the control group: $t = 2.672$, df $= 4$, $p = .056$.

Validity of the quantitative data was achieved by utilizing the criterion-referenced ARMT, which produced scores based on external standards established by the local school system. The ARMTs were constructed based on the school system's curriculum in reading and mathematics, along with the scheduled teaching of skills in each area. Possible threats to validity were avoided by drawing quantitative and qualitative samples from the same population.

The analysis for the qualitative data served to answer the research question concerning improving the attitudes toward school of students who are visually impaired by designing instruction for their identified learning styles. The data were collected through pre- and postintervention interviews of the five student participants, as well as those of the four teachers of these students. The results of the interviews were coded by grouping evidence

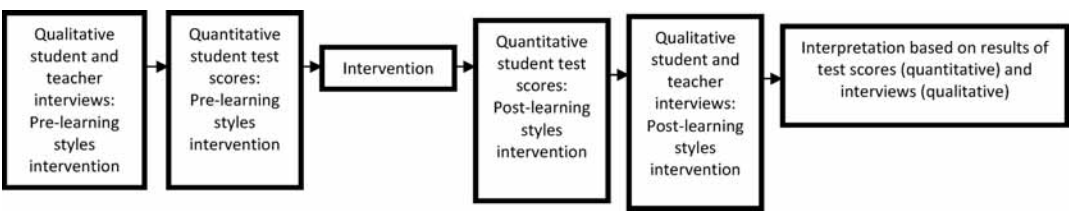

Figure 1. *Visual Diagram of Procedures.*

Table 5. Elementary Learning Styles Assessment of Student Learning Style Preferences

Aspect	Student 1	Student 2	Student 3	Student 4	Student 5
Environment					
Sound	Quiet	Quiet	Sound	Sound	Quiet
Light	Low light	Low/bright	Low light	Bright light	Bright
Temperature	Cool	Warm/cool	Cool	Cool	Warm
Seating	Informal	Formal	Formal	Informal	Formal
Emotional					
Motivation	By others	By others	By others	By others	By others
Conformity	More	More	More	Less/more	More
Task persistence	Single task	Single task	Single task	Single task	Multitask
Structure	More	More	More	More	More
Sociological					
Alone	Depends	Depends	Alone	Depends	Alone
Pair	Pairs	Pairs	Pairs	Pairs	Pairs
Peers	With peers	With peers	With peers	With peers	With peers
Authority	Prefers	Prefers	Prefers	Depends	Prefers
Variety	Prefers	Prefers	Prefers	Prefers	Prefers
Perceptual					
Auditory	Yes	Yes	No	No	Yes
Visual	Yes	Yes	No	Yes	Yes
Kinesthetic	Yes	Yes	Yes	Yes	Yes
Tactual	Yes	Yes	No	Yes	No
Physiological					
Intake	Yes	No	No	No	No
Morning	No	No	Yes	Yes	Yes
Late morning	Yes	Yes	Yes	No	No
Afternoon	No	Yes	Yes	No	Yes
Evening	No	Yes	Yes	No	Yes
Mobility	No	Yes	No	No	No
Psychological					
Reflective/impulsive	Reflective	Reflective	Reflective	Impulsive	Reflective
Analytic/global	Analytic	Analytic	Global	Global	Analytic

and labeling responses into broader themes.

The qualitative validation was achieved by assessing the accuracy of the information gathered during pre- and postintervention interviews of the students and teachers. The three researchers triangulated the data by building codes and themes of the interview data individually and then combining codes and themes until agreement was met. The transformation of the codes and themes was kept straightforward by counting the codes and themes and attaching weight to each of them.

Quantitative and qualitative data were collected and converged (see Table 6) to address the central research question: “Will providing educators training for differentiating instruction for students who are blind or visually impaired improve students’ academic performance and attitudes towards school?”

Discussion

The learning styles study presented here aimed to expand on past research by including students who are blind or visually impaired. The five participants of the study were assessed on their preferred learning styles and the teachers of these students were trained in incorporating strategies that supported the learning styles of the students in their classrooms.

The quantitative data did not indicate a statistically significant difference between the test scores of the control group and the those

Table 6. Quantitative and Qualitative Data

Quantitative Individual Student ARMT Test Results	1	2	3	4	5
Quarter 2	75	88	80	60	25
Quarter 3	82	78	83	75	65
Quarter 4	83	95	90	90	80
Qualitative question 1: How did you feel about coming to school today?					
Pre-	Nervous and tired.	I wanted to come to school because I was absent.	Happy.	Happy.	Happy.
Post-	Bored, don't get to do nothing.	Fantastic.	Good, I like school.	Excited.	I was a little sad, somebody is being mean to me.
Qualitative question 2: How did you enjoy math class today?					
Pre-	Good, I played with cubes, and answered the most questions. I was the winner.	I loved it because I love math.	Yes.	Cool.	I enjoyed doing patterns.
Post-	I did algebra. I liked it.	Yes.	I liked it because I'm good at multiplication.	We didn't do math today.	Good.
Qualitative question 3: How did you enjoy science class today?					
Pre-	I liked learning about rocks.	I liked it because we got to explore soil. I love science.	No.	Good, it is my favorite subject.	I don't like science.
Post-	I liked it.		I don't do science.	I liked learning about volume and mass.	It was bad.

(cont.)

Table 6.
(cont.)

Quantitative Individual Student ARMT Test Results	**1**	**2**	**3**	**4**	**5**
Qualitative question 4: How did you enjoy reading class today?					
Pre-	I liked it, we read books about history.	It was good.	Yes.	I like reading because I want to know what happens.	It was boring.
Post-	It was good because we took turns reading.	I liked it. We did radio reading.	It was good and fun.	It was fun, we did a play.	It was a little good, it was harder.
Qualitative question 5: What did you not like about school today?					
Pre-	I have to get to school so early.	I did not like running seven laps.	I liked everything about school today.	Getting up	We had to read and take a test.
Post-	I liked everything.	Nothing, I love art class.	Doing math, it is hard.	I like everything so far.	The way D treats me.
Qualitative question 6: What did you not like about your classroom today?					
Pre-	I liked everything.	I liked everything.	I didn't like this morning because I had to write my story in order.	Nothing, I like everything.	I don't like to read.
Post-	It is too noisy sometimes.	I love my classroom.	It is too cold.	It is too hot.	I like everything about my class.
Qualitative question 7: If you could change anything about your classroom, what would it be?					

(cont.)

Table 6.
(cont.)

Quantitative Individual Student ARMT Test Results	**1**	**2**	**3**	**4**	**5**
Pre-	I would make it field trip day.	I would have more art class.	I'd rather play.	I would ride my skateboard in the classroom.	There would be a pool, candy, and dancing.
Post-	There would be AL all over for Alabama football.	Nothing.	I would move the desks.	I would turn it into a fair and you could ride your skateboard.	I would change myself into a teacher.
Qualitative question 8: What did you learn new today?					
Pre-	Being a good student is a good choice.	Harriet was a slave and she freed all of the slaves.	How to plant seeds.	Can't remember.	People can be teachers.
Post-	I know all of it about areas with the grid.	Nouns, verbs, adjectives, pronouns.	Time tables.	Didn't learn anything new today.	How to subtract.

of the five participants, indicating that designing instruction for the identified learning styles of students who are visually impaired or blind does not necessarily improve academic performance. Although the significance of the fourth-quarter test scores of both groups approaches a significance level of .056, a significant difference is not indicated.

During the interviewing of the students, a total of 39 positive responses were recorded, with 19 during the pre-interview and 20 during the post-interview. Nineteen negative responses decreased from 10 during the preintervention interview and 9 during the postintervention interview. Although these changes were not significant, movement toward positive attitudes toward school is noted.

The results of the study found that the teachers of the five participants also benefitted from utilizing teaching strategies that focused on the specific learning styles of students. The teachers of these students were asked to list the benefits they received from participating in the study and being trained on teaching students with different learning styles. The comments to this question include:

> I realized that I don't have to reinvent the wheel: I can reach my students better by going back to the simple things.
>
> I found it very interesting to read the learning styles reports of my students and I have tried to incorporate the training I received into our daily work.
>
> I have learned to be even more relaxed with my students and allow them to guide me in what they need as learners.

In summary, when a visually impaired student was allowed to utilize a specific learning style to process, absorb, and retain new or difficult information, his or her test scores remained the same or improved, while his or her attitudes about school remained positive. However, when the test scores of the five participants were compared to the control group, the increase in scores was not statistically significant. The one-sample *t* test for the second quarter (.265), third quarter (.119), and fourth quarter (.056) resulted in a computed significance level that is greater than the alpha level of .05. It is noted that the significance level for both groups improved as the school year progressed, with a significance level of .056 in the fourth quarter of school.

The minimal increase in test scores and attitudes toward school cannot be declared to be a direct result of learning styles instruction. The Hawthorne Effect (McCarney, Warner, Iliffe, van Haselen, Griffin, & Fisher, 2007; Gillespie, 1991), which occurs when study participants improve their behavior in response to the fact that they know they are being studied and receiving extra attention, must be considered in this study (Rosenthal & Jacobson, 1968, 1992). The possibility of the five students improving test scores and attitudes as a result of the extra attention instead of the introduction of instruction focused on particular learning style is very strong. Consideration must also be given to the possibility of the student's improvement being a direct result of student maturation and learning that occurred throughout the school year.

This research was limited by the low number of students who are blind or visually impaired, as well as by the brief amount of time over which data was collected. It would be beneficial for future research to focus on a larger number of students in diverse school settings over a full academic year or longer. It is suggested that teachers receive training over the summer months, pretesting for students be conducted at the beginning of the school year, and that learning style preferences be incorporated throughout the school year.

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Communication Strategies of Teachers Educating Students Who Are Legally Blind in the General Education Setting

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Abstract

This study investigated the communication strategies employed by teachers educating students who are legally blind in the general education setting in public schools. Participants were 20 general education teachers. The research paradigm was descriptive using a combination of naturalistic observation and interviews (Fontana & Frey, 2000). Data were collected from lessons using field notes, an audio recorder, a video camera, and an interview guide. The use of cool and warm analyses helped bring out the communication strategies of the research participants. Interestingly, five significant themes on communication strategies emerged from the study, namely: language, time, space, manipulation, and peer assistance.

Keywords: communication strategies, general education setting, legally blind, inclusion, general education teachers

Introduction

Inclusion of students with disabilities into general education schools has become a worldwide trend (Ammah & Hodge, 2006; Sharma, Forlin, & Loreman, 2008). The education of these children has shifted from primarily occurring in segregated special schools to these students being included in general education schools and classrooms (Parasuram, 2006). This shift occurred because general education classrooms are considered a rich environment for students with disabilities to grow and develop as they learn to interact and work with students without disabilities (Acrey, Johnstone, & Milligan, 2005). This development has influenced educational practices in a number of developing countries including the Philippines. In addition, the Education for All (EFA) movement of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) is a program concerned with ensuring access to (at least) basic education for all students (UNESCO, 2001).

In the Philippines, there are around 200 students with legal blindness accommodated in general education classrooms in public schools (Republic of the Philippines Department of Education, 2012). The challenge of inclusion is to empower teachers to meet the learning needs of these students so that they can thrive in such an academic

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setting. Teachers should have a repertoire of strategies for accommodation of differentiated instruction. In educational settings, “accommodations and special considerations are referred to as *academic adjustments*” (Bloom & Schafer, 2007). A crucial question that can help guide teachers is: “Are these academic adjustments done to accommodate students with legal blindness included in regular classrooms?”

Sahin and Yorek (2009) wrote that because students who are blind have no visual input, they need to learn using other senses such as touching and hearing. With their condition, they have difficulty in understanding concepts presented to them that demand the visual sense for a better understanding. Hence, a classroom for students with visual impairments should be adapted and instruction should be adjusted for better teaching.

Students with legal blindness are not necessarily learning disabled; they may just need accommodations and more time to learn. With the proper guidance and rich opportunities, they can learn anything and achieve the same success as their sighted peers do. Being part of society, they have the right to access to education. To provide this, there must be some accommodations in their learning environment and in the curriculum materials (Sahin & Yorek, 2009). Notably, practices in educating students with disabilities can be made more efficient with careful consideration of the principles of learning (Sauerburger & Bourquin, 2010). These principles include choosing communication strategies that take into consideration the learner’s vision, language skills, cognitive abilities, comfort, and assessment of risks (Bourquin & Sauerburger, 2006). Communication strategies pertain to the employment of verbal and nonverbal mechanisms for the productive communication of information (Brown, 1994). Faerch and Kasper (1983) as cited by Brown (1994) defined communication strategies as “potentially conscious plans for solving what to an individual presents itself as a problem in reaching a particular communicative goal.” Communication strategies are an element of an overall strategic competence in which teachers bring to bear all the possible facets of their growing competence to send clear messages. A teacher who employs varied communication strategies in rendering the input to his or her students is likely an effective communicator, and his or her classroom is a rich environment for learning acquisition and understanding. To adopt these strategies, teachers have to equip themselves with reasonable, basic knowledge of theories, concepts, and philosophies in language. This knowledge is a major part of communicative competence.

The above pedagogical principles served as the starting point for this research. This study aimed to explore the choice in communication strategies as used with students with legal blindness by general education teachers. It studied how the general education teachers present the skills to accommodate learners with legal blindness so they may adequately learn academic materials despite their physical limitation.

Review of Research

There has been little research conducted on the choice of communication strategies used in educating students with legal blindness, despite its importance from the educational point of view. Nonetheless, some recent research related to communication and blindness was mined for insights in order to enrich this study.

Janssen, Riksen-Walraven, and van Dijk (2006) conducted a case study to identify the effects of applying the Diagnostic Intervention Model, which they developed for fostering effective communication between children with deaf-blindness and their educators. The model that they used as a guide in the design and conduct of interventions to encourage communication between educators and students who are deaf-blind was proven to be effective.

In an analysis of the communicative functions of teachers and their students who are congenitally deaf-blind, Bruce, Godbold, and Naponelli-Gold (2004) found that children who are congenitally deaf-blind require adults to teach deliberately what a child with hearing and vision learns incidentally. Adult modeling, according to them, is important for acquiring some of the early functions, although it is ineffective in supporting the acquisition of others.

Rosel, Caballer, Jara, and Oliver (2005) examined the use of verbalisms by children who are totally blind from birth and by sighted children. In their discussion, they pointed out that all children, regardless of their visual status, tend to use verbalisms in a similar way, and this can be interpreted as a positive sign of the capacity of children who are blind to adapt to the general linguistic behavior of the community they live in. It was also noted in their research that language allows people to share information and experiences by using specific nuances of meaning, which are, at the same time, universal within the language of the speakers. This literature conveys that teachers' communication strategies in teaching students with blindness can be affected by the latter's use of verbalisms.

In a study conducted by Bourquin and Sauerburger (2006) about teaching persons who are deaf-blind to communicate and interact with the public, they developed procedures that have proven to be highly effective for communication. Some of the procedures ask for instructors to consider possible communication techniques and to choose as many techniques as possible that are appropriate and feasible in preparing individuals who are deaf-blind to experience interacting with the public.

In teaching specific subjects such as physical education, mathematics, and science, several studies were conducted to assess how concepts in these subjects are communicated. The research of O'Connell, Lieberman, and Petersen (2006) established that two important teaching techniques to improve the motor skills of students who are blind are physical guidance and tactile modeling. Aside from these two techniques, demonstration was also utilized. Their study also highlighted that it is important for teachers to use effective pedagogical techniques, such as matching specific teaching styles and learning styles to each child, to help these children improve their levels of motor skills. It was further noted that it is only when instructions are clear and high expectations of the performance of skills are clarified that students who are blind will improve their performance and increase their physical activity.

In this brief review of research, it can be inferred that as a result of the visual limitations of the students with legal blindness, much creativity on the part of their teachers is needed. This finding suggests that teachers who are educating these types of learners must indeed have a repertoire of skills and knowledge on how to communicate concepts and skills and maximize their usage.

Method

The research paradigm is qualitative, using triangulation and coding. Triangulation involves checking what one hears and sees to establish the validity of the information taken (Fraenkel & Wallen, 2006). It was done through gathering data using a combination of naturalistic observation (Gay, 1996) and interviews (Fontana & Frey, 2000). The aim of naturalistic observation is to examine behavior within the normal context in which it occurs (Gay, 1996). The interviews involved individual, face-to-face, and verbal interchange with the teachers under study. This combined approach of observing and interviewing allowed the researchers to determine and describe the communication strategies of the participants in the normal context of their inclusive practices. Coding was employed to organize and analyze the overwhelming amount of data collected and to assign themes or meanings to them (Hahn, 2008).

Participants and Setting

Twenty general education teachers were the participants in this study. At the time of the study, the teachers were educating five students with legal blindness enrolled in different secondary public schools in the city of Baguio and in the province of Benguet, Philippines. These general education teachers did not undergo any formal training in educating students with physical disabilities; thus, they were completely responsible for adaptations for their students with legal blindness. Moreover, most if not all of the materials these teachers used in educating their students with legal blindness were not written in braille, since there is only one office that has a braille machine in the region. There were no teacher respondents from the elementary level, since no pupils with legal blindness are presently enrolled at that level.

Materials and Procedures

The main tool used in this study was an audiotape and video recorder to capture the classroom proceedings of the classes and the responses of the respondents during the interview. Interview guides with their key questions were also used.

In the initial phase, letters of request were addressed to the respondents. With the permission and the willingness of the participants involved, interviews and classroom observations were scheduled based on the availability of the subjects. To elicit more natural responses, all the respondents were interviewed in locations of their own choice, on the assumption that they would be more comfortable in a familiar environment. Classroom proceedings were also observed and recorded, always ensuring that the process did not disrupt the facilitation of the class activities by the teacher. Respondents were guaranteed anonymity and were told that they could refuse to answer any question or stop the interview at any time, and that participation was completely voluntary (Fraenkel & Wallen, 2006). Before conducting the classroom observations and the interviews, the purpose and design of the study were presented to ensure that everyone would receive consistent orientation.

For the classroom observation, one teacher for every core subject in each school with a student with legal blindness was chosen. The respondents were informed about the observation done in their classes. Dates for trial and final observations and video recordings were scheduled. The recorded classroom proceedings were transcribed to produce the field text that was utilized for the analysis. The lessons were not predetermined; lessons taken up followed the natural flow of topics in the syllabus of the teacher.

Two observations and video recordings for each teacher were undertaken. These excluded the trial observation and the interview with each teacher recorded before the final collection of data. The trial observations and recordings were conducted for the teachers and their students to get used to the process, thus reducing any "halo effect" during the final data collection. The data gathered during the trial observations and recordings were not included in the analysis of the data.

The classroom observations and interviews were recorded on audiotape, transcribed accurately, and cleansed of "transfer error" through corrective listening (Flick, von Kardoff, & Steinke, 2004). Although there were key questions identified in the researchers' lists, follow-up questions were raised to further probe the participants' responses during the interview.

The extended text that was the transcribed result of the observations and interviews was subjected to phenomenological reduction through the construction of a repertory grid or coding. This grid was constructed to enable the researchers to observe both cool and warm analyses. The cool analysis part consisted of the identification of the significant statements of each respondent. These statements served as bases for the conduct of the warm analysis stage, in which the data categories were formulated and from which themes evolved. Reading and rereading of the significant statements, as well as the researchers' constant vigilance, helped facilitate the surfacing of the essence of the investigation. The themes that emerged from the central questions asked were subjected to a member-checking procedure via the correspondence technique (Lincoln & Guba, 1985; Patton, 1990), by which each of the study participants would be individually approached to verify the consistency of the transcription and interpretation. The technique was used by the researchers to assure the validity and reliability of the data reported.

Results

After careful analysis of the video-recorded observations and interview responses given by the respondents, five significant themes emerged on the communication strategies that they used in teaching their students with legal blindness who were included in their regular classrooms. These themes are results of the interviews and the observation results. Specifically, the five categories of communication strategies being used are: (1) communicating through language, (2) communicating through time, (3) communicating through space, (4) communicating through manipulation, and (5) communicating through peer assistance.

Communicating through Language

All the teacher respondents regard language as a main tool in communication, especially in making their input comprehensible to students. They believe that because of the visual limitations of the students, teachers really have to maximize language use, whether in oral or written form. Maximizing the use of language entails competence in knowing the different backgrounds and learning situations of the learners in order for the teachers to fit its use to productive communication of information (Brown, 1994).

In the Oral Form

The teachers said that they use a variety of communication strategies to convey meaning to their students with legal blindness. One of these strategies is description. Description is identified as an effective tool in making students with legal blindness understand and visualize the concepts through their imagination. The teachers play with words and describe concepts in their simplest forms. In all the classroom observations, most of the teachers of the different subjects made use of this strategy. Many respondents expressed, ". . .I let students imagine through the use of description. They have to use their fertile imagination in order for them to visualize what is discussed in class"; "I describe the concepts in words slowly, or I have to be good with words and I also give supplemental discussions"; and "I use description, using words in their simplest form." Interestingly, not only the students with legal blindness benefited from this strategy, but also the other students in the class. This was echoed by one respondent who said, "In discussing, I employ descriptive method. I explain and repeat the explanation for the benefit of the other students also." The teachers also expressed that describing is one of the best alternative ways for students with legal blindness to complete tasks that need visual representations, like drawing. Almost all respondents said, "For the requirements, instead of letting them draw the objects, I let them identify or describe what they can describe"; and "For the requirements in drawing, for example, I give alternative work. Instead of them drawing, they verbally explain or describe to me what is in their minds." However, not all students with legal blindness can easily understand descriptions; they still need additional ways of understanding, such as illustrations. Some teachers agreed to this: "For those who don't understand, I give other descriptions, illustrations, and others"; and "As an alternative, I use illustrations using clay to mold models."

Communication Strategies

The use of description as articulated by the teachers was evident during the classroom observations conducted. In fact, most of the teachers of the different subjects frequently made use of this strategy. In one science lesson observed, the teacher made use of extensive descriptions to elucidate and illustrate the law of momentum by using a recent boxing event watched on television. To explain mass and velocity, the teacher described vividly the physical appearance of the boxers and the speed of each of them.

Explanation

Another observed strategy the teacher-respondents are using is explanation. They tried their very best to explain concepts to ensure understanding. They spoke loudly and clearly to be understood not only by their students with legal blindness but also by the whole class. Most of the time, they simplify complex concepts through illustrations. In fact, they use different ways of explaining concepts, such as using analogy— "I use analogy to explain further the concepts"; using examples and clues—". . .have to use thorough example or ample clues to support my explanation"; using clear and simple explanation—"I see to it that I will make clear explanation, by making it as simple as possible"; and using some situations in the case of drawing and film viewing, for instance—". . .to verbally explain the drawing or give some situations that would clearly explain what is in drawing." Furthermore, another strategy seen to be very important in explaining concepts not only to students with legal blindness, but also to their classmates, is the use of their mother tongue or vernacular language. The teachers recognize the importance of code switching whenever it is necessary, because it facilitates students' comprehension and their ability to relate to the discussion. The respondents shared, "I speak in the dialect or language that my students understand. Example, I use Ilocano or Tagalog in explaining the concepts" and ". . . I use Ilocano to explain the concept for the sake of those who can't understand."

Repetition

Another communication strategy evident in the classroom observations conducted is repetition. This was used by the teachers especially when they realized that a student with legal blindness did not understand the idea or concept presented, as manifested by the latter's facial expression or reaction. It was observed that all the teachers have a tendency to repeat or emphasize terms or statements that they deem very important but that were not understood by the class as revealed by their responses. In some classes, the teachers tasked some students to repeat or rephrase some of their classmates' answers if these were not understood by the class or by the teachers themselves. This strategy also surfaced in one of the interviews conducted. The respondents articulated that they indeed repeat the sentences or phrases for emphasis: "I also need to repeat the instruction and make a follow-up"; "I ask them if they understood the concept. If they did not understand, then I will repeat the concept"; and "I also interview them. Sometimes, I intentionally call them if they know the topic; if they don't know, I'll repeat the lesson to the whole class."

Dictation

Another way of conveying messages to students with legal blindness is dictation. This strategy was used by the teachers during the classroom observation especially during quizzes or exercises that require reading, or if they did not have the examination papers brailled. In giving dictation, teachers did it slowly so that the students would be able to understand. Some of the teachers pointed out that "For examinations, I read or dictate to the student with legal blindness the examination items and he answers in braille. I do the dictation slowly while the student writes the information in braille."

Comprehension Check

A comprehension check is seen as an important practice in communication, as cited by the teachers and as observed during the classroom visits. The respondents do this by asking questions to check whether the students did understand the lessons taught to them. The majority of the teachers affirmed that they have employed this method: "I ask them if they understood the concept. If they did not understand,. . .then I will repeat the concept, or have a one-on-one activity." Some of the teachers ask the students to expound their answers—"I ask them questions to see if they understood my lesson. I also let them supplement their answers or explain their answers. If they know what they're saying, it means they understood our lessons. It's one way of checking if they understood the topics." They also elicit application of the discussion to real-life situations—"I let them explain in real-life–situation terms. If they can apply it or if they can give some practical examples of applying the concepts to real-life situations, then I would know that they understood the concept."

Modification of instruction is commonly done by teachers because of the nature of students with legal blindness. As told by the teachers and as was observed in the classrooms, modifications came in the forms of differentiated instruction or clarification, using formative and different assessments that would help them in coping with the demands inside the classroom with the regular students. In an economics class that was observed, the students were tasked to fill out a revenue form to orient them to its contents. Since the student with legal blindness could not fill in the boxes that had to be to ticked, the teacher modified the form by using a selection type of questions that allowed the student to answer the items in braille.

In the interviews, the teachers said that they gave the same activities to both sighted students and students with legal blindness according to the competencies required of them at their level, with some modifications in terms of instructions but still ensuring that the same skills are being learned by these students. The respondents pointed them out in their interviews: "Modification of instructions, after the general instructions for all, I am giving specific instructions"; "I give an alternative work like giving positive and negative views of what he has observed"; "I also use differentiated instruction in my examination and quizzes because I modify it for the students with visual impairments. For example, instead of them drawing the figure I give them, I give a multiple-choice type of exam because I can't decipher their drawing if they do it in braille." "For other activities, I'll use specific instruction or modification and for clarification if they did not understand. I also give some activities as homework" and "I use formative and different assessment types to ensure they understand the lesson."

In the written form, the teachers admitted that they do not know braille or that they are not trained in braille. However, they are doing their best to accommodate the needs of students with legal blindness by letting these students write their exercises in braille to be transcribed by a braille reader or by letting the inclusive center/office provide some brailled materials. They said, "I let the exercises be brailled" and "For some specific topics like reading, I give them a book for advance reading or so that they can braille it."

Communicating through Time

Although communication is usually viewed through the use of language, the respondents believe that time is of critical importance in communicating meaning and concepts to students with legal blindness in order to accommodate their visual limitations. Wait time is a strategy that gives students an opportunity to prepare and to analyze the concepts given them. This is done during discussions. As many teachers mentioned, "I give more time for the students to answer the question, or they may use their notes to use as their guides." Giving ample time for the students with legal blindness to read and prepare in advance leads to better sense and meaning of the ongoing discussion. This is supported by the teachers' statements: "We also have one-on-one extra activities for reinforcement of what I have taught; I allow them to have advance reading." Giving extra time for assignments and homework is also practiced: ". . . give some extra time for her to do assignments or quizzes, especially those that need some descriptions or illustrations"; "I give worksheets ahead of time"; and "I give them handouts in advance for them to read." Several of these practices were also observed during the classroom visits.

Communicating through Space

Spatial communication is another strategy practiced by the teachers to accommodate students with legal blindness. It is said that, if the child has any vision at all, then being placed in front of the classroom would almost always be recommended and beneficial. Communicating through space includes clearly listening to what is being discussed and at the same time being strategically located in the class, such as in the front rows. These strategies are identified in the respondents' statements: "Usually, I let them sit in front so that they can hear what I am saying" and "For lectures, I assign them in front because they said that they can hear our lectures better." By strategically placing these students in a space where they are comfortable, the teachers are in effect helping them in their quiet time to ponder what they are listening to or reading; this helps in developing the students' skills to analyze and understand their lessons. One of the respondents clarified this in his answer: "I let them sit in front so that they will not be disturbed by others when they are reading their books."

Communicating through Manipulation

For students with legal blindness, tactile skills are developed to compensate for their visual limitations. The teachers agreed that communicating through touch or manipulation is an effective way of conveying meaning to these students. Touching and using manipulations can be among the rich strategies used by teachers, complementary to the use of language. This strategy includes letting students with legal blindness learn by touching their body to explain the lesson; as one respondent said, "I'll let them face one direction and I have to touch the right and left"; and by touching the materials used, as mentioned by a teacher, "For the musical instruments, for instance, I let them touch the instruments." The strategy also includes giving a model to the class or a pattern to be followed, as expressed by one respondent: "In arts, I give them a pattern to be followed because it is easier for them to do it. I do it step by step so that they can easily follow the instructions."

Using a manipulation is a very practical way by which the teachers can make the students with legal blindness better understand the concepts being taught to them. The teachers confirmed that this strategy is indeed an alternative way of conveying or clarifying meaning to students with legal blindness, as expressed in their responses: "As an alternative, I use illustrations using clay to mold or models"; "I use materials out of clay to let them have a touch of what I am discussing"; "I let them mold clay to feel the objects"; and "For mathematics, I use counters like popsicle sticks or a paper clock for them to have hands-on." The practice of communicating concepts through using manipulative materials by the teachers was observed in one mathematics class with a lesson on calculating the arc length in a circle. To help the student with legal blindness understand the concept and acquire the skill, the teacher brought with her a power board with rubber bands and push pins. With the teacher assisting the student with legal blindness in manipulating the materials to explain the important concepts, the student with legal blindness was able to follow along and to complete the drills.

Communicating through Peer Assistance

Peer assistance is widely used by teachers to convey meaning to students with legal blindness. Almost all of them responded that the peers of students with legal blindness help tremendously in making the latter understand the lesson. The peer has several functions.

First, the peer becomes an instruction guide to clearly explain the lesson, and this was relayed by some respondents: "I have their classmates as guides to what is present in the classroom as instructional materials. For example, in discussing the prepositions 'behind' and 'beside,' aside from demonstrating and describing them, I let somebody sit behind or beside the student with visual impairment and let him touch his classmate in relation to the concept presented to him so he can understand fully the concept of the lesson"; and "I did not use instructional materials,. . .I use the parts of the body as my instruments in teaching the lessons that need demonstration, and sometimes I let them touch their body parts, too."

Second, the peer acts as dictator of information, especially of things written, as many respondents affirmed: "I let the student with legal blindness work with a seatmate so that the seatmate can help dictate some information. . ."; and ". . .the peer will help in repeating the concepts or in the case of written words on the blackboard or in printed materials, the peer will be the one to read aloud or dictate what is written."

Third, the peer can be the monitor and reporter of the performance of the student with legal blindness. One respondent said, "I assign a bright student to help her; the peer will be the one to monitor and report to me some updates about the difficulty of the student with legal blindness. He becomes responsible for giving me feedback on the performance because sometime, the student with legal blindness is shy in asking me as her teacher about the topics that she did not understand. I assure her that if she can't voice her problems or difficulty to me, she can relay it to her peer."

Fourth, the peer becomes a tutor. Some of the respondents said: "I use peer tutoring"; "I ask the assistance of the classmates because in a class consisting of more that 50 or 60 students, sometimes I can't entertain individual needs"; and ". . .so that they will learn from their designated pair and at the same time interact with them."

Fifth, the peer can assist as evaluator. A respondent mentioned, "I also give them peer evaluation for them to have feedback."

Peer assistance was manifested during the classroom observations conducted. The seatmates of the students with legal blindness were automatically repeating the instruction of the teacher, or a seatmate was requested by the teacher to read the items of the activity to the student with legal blindness.

Discussion

The inclusion of students with disabilities in regular classrooms is undoubtedly interesting and challenging for general education teachers. Notably, inclusion requires that the necessary supplemental supports and services be available in the classroom instead of offering such supports outside of the general environment (Villa & Thousand, 2003, as cited by Bargerhuff, 2010). This practice becomes an opportunity for teachers to think of many strategies in order to ensure that these students with legal blindness, along with their peers, will understand the lessons. As shown in the findings of this study, the participants were able to develop and to think of several strategies for them to communicate to their students with legal blindness the concepts of their lessons, especially those that require visual input. It is interesting to note that these teachers did not undergo training on how they might accommodate students with legal blindness with the other students who are sighted; however, they have discovered creative ways and means to address this concern. These findings indicate that the attitude of the teachers toward inclusion of students with legal blindness in their classes is generally positive. It shows that teachers with positive attitudes toward inclusion can readily adapt the ways they work in order to benefit students with a range of learning needs (Bender, Vail, & Scott, 1995; Brophy & Good, 1991; Sharma et al., 2006; Subban & Sharman, 2005—all cited in Sharma et al., 2008).

The general feeling of accountability among the general education teachers has developed in them flexibility and resourcefulness in using the most basic tool of teachers—language. This is manifested in the optimized employment of language as a means of communicating effectively with their students with legal blindness. This approach becomes a rich opportunity, because playing with words, choosing appropriate words and symbolisms, and describing in words concepts that may be abstract to students with legal blindness all allow their students to imagine and understand what is being presented. With the use of language, students with legal blindness, along with their sighted peers, are able to understand and value their lessons. It must be underscored that students with legal blindness are not learning disabled; they may just need accommodations and more time to learn the same things their sighted peers do. If they are given the opportunity, they can learn anything and achieve success parallel to that of the sighted learners. Since they are part of society, they have the right to equal opportunity to education. To provide an equal opportunity to education for students with visual impairments, there must be some accommodations in the learning environment and in the curriculum materials (Sahin & Yorek, 2009).

Notably, the teachers in this study have recognized the value of time and its merits to facilitate the understanding of lessons by the students with legal blindness. They affirmed that managing time properly allowed the students who are legally blind to cope with the lessons that they may not understand because of their visual limitations. Specifically, the practice of wait time and of giving ample time to accomplish tasks allowed the students with legal blindness to clarify vague areas and to verify relatively new concepts. The study of Bruce et al. (2004) found that teachers' expressing multiple functions without pause for the student's response was a phenomenon that confused children by limiting their processing and responding time. The researchers concluded that the expression of one function at a time, with wait time appropriate to the child, would maximize the student's opportunity for success. This research finds support in the study of Stremel, Bixler, Morgan, and Layton (2002), which found that if a child has disabilities, he or she may need even more time and more intense strategies in learning to communicate effectively.

As seen in this study, the consideration shown by the teachers in planning and managing the classroom environment facilitated communication. Special seating arrangements, as a way to accommodate the needs of students with legal blindness, enabled the teachers to communicate their lessons better. In contrast to students who are sighted, students with legal blindness cannot maximize the use of lip reading to understand the teacher; thus, accommodations such as seating arrangement are imperative. The nearer the student with legal blindness is to the teacher, the better the opportunity to access the information being delivered. Managing the environment, particularly its spacing, is helpful to both the teachers and the students with legal blindness. It ensures that the students have access to the teachers—for receiving handouts, turning in papers, and so on (DRES, 2008). Inquiry, creativity, and flexibility are critical in evaluating the learning environment for students and making modifications based on their performance (SERGE, 2008).

Accommodating students with legal blindness necessitates the use of manipulations because they can learn better using tactile materials. Sahin and Yorek (2009) showed in their study that students with legal blindness need to learn using other senses, such as touching and hearing, and recommended that the classroom be adapted and instruction be adjusted for better teaching. The respondents in this study have proven themselves ingenious, since they were able to devise ways to make the students understand their lessons by using concrete materials that the students may touch. The deficiency in training did not keep them from thinking creatively how they might make the best use of available materials around them. It must be noted that the schools where these teachers are do not provide assistive technologies; hence, the teachers produce on their own any materials that they might use to make certain that their students with blindness will not be left behind. O'Connell (2000) as cited by O'Connell et al. (2006) proved that the use of tactile modeling and physical guidance, when coupled with an explanation, was equally effective in increasing the self-efficacy of goal ball participants who are blind.

Human beings live neither in a vacuum nor in isolation. To find meaning in one's existence is to recognize the presence of peers. In this study, the teachers recognized the value of allowing their students with legal blindness to collaborate with their sighted peers. The teachers found it very helpful to work with the other students in their classes in conveying to their students with legal blindness some concepts or discussions. They recognized that this works because there are concepts better explained by the sighted peers of the students with legal blindness than by the teachers themselves. Both groups of students can really relate with each other, because they have the same basic human needs for companionship and emotional support. These needs are best met through contact with peers (Romer, White, & Haring, 1996, as cited by Correa-Torres, 2008). It was shown in this study that reinforcing the peer assistance among the students who are legally blind and their classmates aided the teachers in communicating their messages as desired. This concurs with the suggestion of Eichenberger (1974, as cited by Sahin and Yorek, 2009) that since a person with legal blindness lacks the skills of taking notes and recording data, it is helpful for him or her to work with a sighted peer. The study of Stremel et al. (2002) stated that communication has a strong social base. This means that people can communicate and understand what is happening around them through interacting with peers. Pellegrinin (1984a, 1984b, as cited by Correa-Torres, 2008) found that peer presence facilitated the development of students' interactions but that adult presence may have reduced or delayed development of the interaction. General education settings provide natural opportunities for interactions between a student with disabilities and nondisabled peers that specialized instructional environments often lack (Giangreco & Cloringer, 1995; Mar & Sall, 1995; Romer & Haring, 1994; Romer et al., 1996—all as cited by Correa-Torres, 2008). Allowing students with legal blindness to work with their sighted peers thus benefits them not only academically but on many levels—particularly, socially and psychologically.

Conclusion

Understanding the pathways that general education teachers of students with legal blindness take is a serendipitous task. Finding ways to better communicate with these learners entails ingenuity and flexibility. As indicated by the findings of the study presented here, particularly in the themes that emerged from the teachers' journey in accommodating these students, the use of nonverbal communication strategies complemented by verbal communication strategies aided the teachers. The discovery and employment of these communication strategies was contextual. Regardless of the subject areas taught, the teachers found these strategies to be functional in conveying the messages or subject concepts needed in their classes.

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Job Preparedness and Program Effectiveness of a Teacher Preparation Program

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Abstract

The purpose of the present study was to identify independent predictors of perceived job preparedness (rated by the employers) and perceived program effectiveness (rated by the graduates) of a teacher preparation program in visual impairment. The study used an anonymous mail survey to gather information from the individuals who recently graduated from a teacher preparation program in visual impairment. The study results indicated that age and presence of visual impairment were the significant negative predictors of perceived job preparedness, while faculty-student interaction, fair evaluation, and practicum/internship experience were the significant positive predictors of perceived program effectiveness. There was no significant correlation between perceived job preparedness and perceived program effectiveness. The findings of this study suggest that it is critical for university teacher preparation programs in visual impairment to receive feedback on their programs not only from their graduates, but also from the graduates' employers in order to ensure balanced program assessments.

Keywords: personnel preparation program, program evaluation, program assessment, blindness, student satisfaction

Introduction

General teacher preparation programs are often assessed by measuring student-perceived program effectiveness, students' academic performance, quality of student portfolios, and/or teaching performance ratings by graduates' employers (Conderman, Katsiyannis, & Franks, 2001). Many studies have attempted to identify the predictors of general education teacher preparation programs' effectiveness. Brevik (2009) stated that gender was significantly associated with first-year teachers' perceived program effectiveness, but eth-

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nicity, level of education, and household income were not. Wilson, Floden, and Ferrini-Mundy (2001) reported that clinical experiences were seen as the single most powerful element of teacher preparation programs by both experienced and newly certified teachers. Cooperating teachers rated student teachers who successfully completed their teaching assignments significantly higher on objective competency measures than those who did not complete their teaching experience (Hall & Serna, 1992). This was also true for subjective measures in the areas of personal qualities, human relations, and professionalism. According to Ferguson and Womack (1993), students' performances on key education coursework accounted for almost half of the variance in the ratings of on-site supervisors of students' teaching performance, while the standardized test scores did not serve as strong predictors of such ratings. In addition, Guyton and Farokhi (1987) showed that the GPAs of recent graduates were significantly correlated with their on-the-job performance as rated by their employers and peer teachers.

Only a handful of studies sought to identify the predictors of student- (graduate-) perceived program effectiveness in special education teacher preparation programs. Battle (2008) found that age, grade level taught, and years of teaching experience were not significantly associated with program effectiveness as perceived by new classroom teachers. Similarly, Hussain (2009) found no significant association between gender and program effectiveness as perceived by recent special education program graduates. However, field experience (internship) was reported as one of the key factors that affected how new teachers perceived the effectiveness of their teacher preparation programs (Sebastian, Calmes, & Mayhew, 1997). In addition, Koenig and Robinson (2001) indicated that adequate technology and independent learning skills are the key requirements for successful, high-quality online braille instruction.

Few studies have attempted to identify the predictors of special education teachers' job preparedness as rated by their employers. This dearth in research is particularly problematic, given some of the pedagogical differences observed between general teacher education and special education teacher preparation programs (general teacher education tends to emphasize subject matter pedagogy, while special education programs focus on more generic pedagogy, including assessment and instructional methods) (Brownell, Ross, Colon, & McCallum, 2005). Harper (1994) found no significant differences in teaching performance ratings by the employers of first-year special education teachers whether they graduated from the traditional program (median age = 27) or the alternative certification program designed for older, nontraditional students (median age = 42). Cepello (2000) also reported that, according to novice special education teachers' employers, behavior management skills and effective communications skills were two of the most critical skills needed to be successful in their jobs.

In the area of teacher preparation for individuals with visual impairments, Davis (2011) stated that the recent graduates from these programs felt well prepared in assistive technology, assessment of students with visual impairments, braille, and low vision devices, but were less prepared to manage student behavior and teach content areas. We found no published studies that identified the predictors of employer-rated job preparedness of teachers in visual impairment. The purpose of the present study was to identify independent predictors of perceived job preparedness (rated by the employers) of the individuals who graduated from a teacher preparation program in visual impairment. Another aim of the study was to identify independent predictors of perceived program effectiveness (rated by the graduates) and to examine to what extent perceived program effectiveness is correlated with perceived job preparedness.

Method

Participants

As part of an effort to assess its programs, Western Michigan University's (WMU) Department of Blindness and Low Vision Studies (BLS) has conducted two different types of surveys—the Graduate Survey and the Employer Survey—in the past several years. Both (paper-based) surveys were mailed to the individuals who graduated from one of the BLS programs between the fall of 2004 and the summer of 2009. Graduates were asked to return the Graduate Survey directly and to forward the Employer Survey to their immediate supervisors, who then returned the surveys directly to the BLS. The surveys were sent to both on-campus and distance-education program graduates. On-campus students took all required courses face-to-face, while the distance education students took most of the courses online with face-to-face, hands-on courses during one or two intensive summer sessions at the WMU campus.

Out of the 241 surveys mailed, 108 graduate-employer dyads were returned; 70 of these dyads were completed and were used for analyses (response rate of 44.8%, according to the standard definitions by the American Association for Public Opinion Research, 2009). The study was approved by the university's Human Subjects Institutional Review Board.

Measures

The Graduate Survey included General Program questions and Core Program questions, while the Employer Survey had a set of questions that measured the graduates' job preparedness as assessed by their supervisors (see Tables 1, 2, and 3, respectively). Responses to part of the General Program questions, Core Program questions, and Employer Survey questions were examined in this study. The General Program questionnaire was developed and pilot tested based on the existing standardized instruments on instructional and program evaluation in higher education (Cashin, 1992; Centra, 1993), while the Core Program questions and Employer Survey questions were developed and pilot tested based on the key competency criteria outlined by the Association for Education and Rehabilitation for the Blind and Visually Impaired (AER), a certifying body for professionals in visual impairment at the time of our survey development (Wiener & Siffermann, 1997). The pilot study's aims were to assess the response rate and take appropriate measures to improve the rate if it was deemed inadequate. Given its low response rate of 31.7% (26 out of 82 mailed surveys were returned), additional steps (enclosing postage-paid envelopes, crosschecking graduates' contact information with the Alumni Relations Office, and multiple reminder e-mails and letters) were taken to improve the response rate for the full study.

Information on participant characteristics, including gender, age, and presence of disability (none, visual, other disability), was collected. The survey also asked: (1) whether the survey participant graduated from the on-campus or distance education program, (2) whether he or she was employed in the program area for which he or she was most recently prepared (yes, no), and (3) the name of the program he/she most recently completed at WMU: Orientation and Mobility for Children (OMC), Teacher of Children with Visual Impairments (TCVI), OMC/TCVI dual, Orientation and Mobility for Adults (OMA), Vision Rehabilitation Therapy (VRT), VRT/Rehabilitation Counseling (RC) dual, and other. These program areas were categorized into the following three groups for analyses based on similarities and differences in their coursework: (1) OMC and/or TCVI, (2) VRT or VRT/RC, and (3) OMA. The General Program questionnaire (Table 1) measured graduates' satisfaction with the program in six main areas: (1) faculty-student interaction (items A and B), (2) student-student

Job Preparedness and Program Effectiveness

Table 1. General Program Questions: Please circle the number that best describes your perception. 1: strongly disagree, 2: disagree, 3: undecided, 4: agree, 5: strongly agree

A	There was sufficient interaction between faculty and students.	1	2	3	4	5
B	I was able to ask questions and receive answers from faculty members.	1	2	3	4	5
C	There was sufficient interaction between students.	1	2	3	4	5
D	There were effective mechanisms to facilitate interaction with other students.	1	2	3	4	5
E	I was evaluated fairly.	1	2	3	4	5
F	The evaluation tool was fair.	1	2	3	4	5
G	Faculty members were well organized in the delivery of their courses.	1	2	3	4	5
H	Faculty members were well prepared for their courses.	1	2	3	4	5
I	The faculty exhibited excellent scholarly and professional standards.	1	2	3	4	5
J	The program was intellectually stimulating.	1	2	3	4	5
K	The program was adequately challenging.	1	2	3	4	5
L	The internship provided new learning experiences.	1	2	3	4	5
M	Local supervision on the internship was helpful.	1	2	3	4	5
N	The variety of assignments and activities on internship was instrumental in helping with preparation of practice.	1	2	3	4	5

interaction (items C and D), (3) student performance evaluation (items E and F), (4) course organization (items G, H, and I), (5) course difficulty (items J and K), and (6) practicum/internship experience (items L, M, and N). A Likert scale of 1 (strongly disagree) to 5 (strongly agree) was used for the assessment.

The Core Program questions (Table 2) assessed the graduates' self-rated competency in 11 core competency areas. A Likert scale of 1 to 5, 1 being poorly prepared and 5 being very well prepared, was used for each question. The Employer Survey questions (Table 3) measured perceived job-preparedness (rated by the employers) of the graduates (if employed) in 7 key areas, using a Likert scale of 1 (very weak) to 5 (very strong). The perceived program effectiveness score was calculated by taking the

Table 2. Core Program Questions: How well did WMU prepare you in the following areas? 1: poorly prepared, 2: somewhat prepared, 3: undecided, 4: well prepared, 5: very well prepared

A	History and the development of your profession	1	2	3	4	5
B	Anatomy and physiology of the visual system	1	2	3	4	5
C	Psycho-social aspects of disability	1	2	3	4	5
D	Medical and functional aspects of disability	1	2	3	4	5
E	Low vision principles and practices	1	2	3	4	5
F	Theories of learning and teaching	1	2	3	4	5
G	Demography, legislation, and services	1	2	3	4	5
H	Methods of teaching	1	2	3	4	5
I	Interdisciplinary Teaming	1	2	3	4	5
J	Research theory and practice	1	2	3	4	5
K	Preparation to work with population with multiple disabilities	1	2	3	4	5

Table 3. Employer Survey Questions: Please circle the number that best describes this WMU graduate's academic preparation. 1: very weak, 2: weak, 3: average, 4: strong, 5: very strong, 6: not applicable

A	Demonstrates knowledge of adaptive skills	1	2	3	4	5	6
B	Adapts instruction to level of visual impairment	1	2	3	4	5	6
C	Engages in interdisciplinary work with related professionals and parents	1	2	3	4	5	6
D	Interprets medical, social, and psychological reports	1	2	3	4	5	6
E	Maintains accurate and appropriate records	1	2	3	4	5	6
F	Practices realistic self-evaluations of professional effectiveness	1	2	3	4	5	6
G	Keeps up with new developments in the field through professional journals and/or continued education	1	2	3	4	5	6

mean of the individual item scores of the Core Program questions, while the perceived job preparedness score was computed by taking the mean of the Employer Survey's individual item scores.

Statistical Analyses

Pearson product-moment correlation coefficients were calculated between the independent variables (demographic characteristics and level of satisfaction) and the dependent variables (perceived job-preparedness and perceived program effectiveness) to examine their bivariate associations. Subsequently, multiple linear regression analyses were performed to identify independent predictors of perceived job preparedness and perceived program effectiveness. The models were built with the forced-entry method. All independent variables significantly associated with the dependent variables in bivariate analyses ($p < .10$) were first included, and then the nonsignificant variables were removed in backwards fashion, albeit with exceptions based on their potential significance in program assessment. Assumptions needed for the use of a linear regression procedure (e.g., normally distributed residuals, homoscedasticity, acceptable level of multicollinearity, etc.) were checked to ensure the appropriateness of such use. All statistical analyses were conducted with SPSS version 16.0.

Results

Demographic Characteristics of the Participants

The sample consisted of 70 graduates (89% were female). Graduates' ages ranged from 24 to 62 (median = 33.0). Nine percent of the participants had visual impairments, three percent had other disabilities, and the rest had no disabilities. Sixty-nine percent obtained their degrees via distance education, while the rest completed their degrees on campus. Ninety-seven percent of the graduates were employed in a position that provided service in the program area for which they were most recently prepared. The most recently completed programs of the participants were as follows: 21% for OMC, 17% for TCVI, 13% for OMC/TCVI dual, 21% for OMA, 24% for VRT, and 4% for VRT/RC dual.

Perceived job preparedness

In bivariate analyses, as shown in Table 4, age ($r = -.276$, $p = .021$), presence of visual impairment ($r = -.360$, $p = .002$), and graduating from the VRT/RC program (compared to graduating from the OMA program) ($r = -.256$, $p = .033$) were significantly negatively associated with perceived job preparedness. None of the satisfaction scores were significantly associated with perceived job preparedness.

Job Preparedness and Program Effectiveness

Table 4. Graduate Characteristics and Perceptions Associated with Perceived Job Preparedness[a] and Perceived Program Effectiveness[b] ($N = 70$)

	Job Preparedness		Program Effectiveness	
	r	***p***	***r***	***p***
Age	−.276	.021	−.172	.154
Being female	−.128	.291	−.138	.254
Presence of visual impairment[c]	−.360	.002	−.041	.736
Distance education modality[d]	.034	.781	−.146	.229
Employed in program area[e]	4.72	.47	4.24	.62
VRT/RC program[f]	−.256	.033	.087	.472
OMC/TCVI program[f]	.199	.099	−.361	.002
Faculty-student interaction	.102	.399	.663	<.001
Student-student interaction	−.024	.845	.544	<.001
Fairness of evaluation	−.057	.640	.689	<.001
Course organization	−.045	.709	.612	<.001
Adequacy of course difficulty	−.040	.742	.658	<.001
Practicum/internship experience	.064	.601	.622	<.001

Note. r = Pearson Product-Moment Correlation Coefficient. VRT = vision rehabilitation therapy. RC = rehabilitation counseling. OMC = orientation and mobility for children. TCVI = teacher of children with visual impairments.
[a] Rated by the employers.
[b] Rated by the graduates.
[c] Reference group is the graduates with normal vision.
[d] Reference group is those who graduated from the on-campus program.
[e] Reference group is those who were not employed in the program area.
[f] Reference group is those who graduated from the O&M for Adults program.

Even after controlling for possible confounding variables—including program modality, whether a graduate was employed in the trained program area, and the level of faculty-student interaction—the graduate's age ($p = .010$) and presence of visual impairment ($p = .005$) turned out to be significant negative predictors of perceived job preparedness (see Table 5). That is, the perceived job preparedness rating was lowered by .02 for each one-year increase in graduates' age (−.030 – −.004, 95% *CI*). Employers also rated the graduates with visual impairments .62 lower than those without such impairment (−1.045 – −.191, 95% *CI*).

Perceived Program Effectiveness

Bivariate analysis results indicated that none of the participant characteristics were significant correlates of perceived program effectiveness (see Table 4). However, all six satisfaction scores were significantly positively correlated with perceived program effectiveness: (1) faculty-student in-

Table 5. Multivariable Analysis of Factors Associated with Job Preparedness Perceived by the Employers ($N = 70$)

Variables	*B*	*SE B*	β	*CI (95%)* Lower	Upper
Constant	4.194	.874		2.448	5.939
Age	−.017	.007	−.347	−.030	−.004
Presence of visual impairment[a]	−.618	.214	−.323	−1.045	−.191
Distance education modality[b]	−.259	.155	.224	−.050	.568
Employed in program area[c]	.177	.371	.055	−.564	.918
Faculty-student interaction	.046	.101	−.056	−.155	.246

Note. $R^2 = .224$ (*adjusted* $R_2 = .163$), $F(5, 64) = 3.691$ ($p = .005$), Durban-Watson = 2.386. All variables shown in the table are included in the final model.
[a] Reference group is the graduates with normal vision.
[b] Reference group is those who graduated from the on-campus program.
[c] Reference group is those who were not employed in the program area.

teraction: $r = .663$, $p < .001$; (2) student-student interaction: $r = .544$, $p < .001$; (3) fairness of evaluation: $r = .689$, $p < .001$; (4) course organization: $r = .612$, $p < .001$; (5) adequacy of course difficulty: $r = .658$, $p < .001$; and (6) practicum/internship experience $r = .622$, $p < .001$.

Once adjusted for age, presence of visual impairment, program modality, and course organization, faculty-student interaction ($p = .002$), fairness of evaluation ($p = .001$), and practicum/internship experience ($p < .001$) turned out to be the significant positive predictors of perceived program ef-

Table 6. Multivariable Analysis of Factors Associated with Program Effectiveness Perceived by the Graduates ($N = 70$)

Variables	*B*	*SE B*	β	*CI (95%)* Lower	Upper
Constant	−.442	.452		−1.345	.461
Age	.001	.004	−.016	−.009	.008
Presence of visual impairment[a]	.059	.141	.028	−.224	.341
Distance education modality[b]	.111	.106	.088	−.102	.323
Faculty-student interaction	.285	.088	.319	.110	.461
Fairness of evaluation	.310	.092	.295	.126	.494
Course organization	.132	.074	.159	−.016	.279
Practicum/internship experience	.293	.062	.358	.169	.416

Note. $R^2 = .724$ (*adjusted* $R_2 = .692$), $F(7, 62) = 23.187$ ($p < .001$), Durban-Watson = 2.379. All variables shown in the table are included in the final model.
[a] Reference group is the graduates with normal vision.
[b] Reference group is those who graduated from the on-campus program.

fectiveness (see Table 6). In other words, the perceived program effectiveness score was increased by .29 (.110–.461, 95% *CI*), .31 (.126–.494, 95% *CI*), and .29 (.169–.416, 95% *CI*) for each one-point increase in faculty-student interaction, fairness of evaluation, and practicum/internship experience scores, respectively. No significant correlation was found between perceived job preparedness (rated by the employers) and perceived program effectiveness (rated by the graduates), $r = .087$, $p = .472$.

Discussion

Age and presence of visual impairment were the significant negative predictors of perceived job preparedness in a teacher preparation program in visual impairment. In contrast, faculty-student interaction, fairness of evaluation, and practicum/internship experiences were the significant positive predictors of perceived program effectiveness. There was no significant correlation between perceived job preparedness and perceived program effectiveness.

Interpretation of the Findings

Our finding of a significant negative effect of age and presence of visual impairment on the employers' perception of the subjects' job preparedness is consistent with the literature on the topic, which states that, in general, competencies of older individuals tend to be rated lower than those of younger individuals, albeit with some moderating effects of evaluators' age and the amount of information available about the target person (Berg & Sternberg, 1992; Kite & Johnson, 1988; Kite, Stockdale, & Whitley, 2005). The fact that graduates' satisfaction in the areas of faculty-student interaction, fairness of evaluation, and practicum/internship experience turned out to be significant positive predictors of graduates' perceived program effectiveness is also consistent with the literature on this topic, in that those who are more satisfied with the program tend to have better learning outcomes (Pascarella, Terenzini, & Hibel, 1978; Swan et al., 2000).

However, it was somewhat surprising to find no significant correlation between perceived job preparedness (rated by the employers) and perceived program effectiveness (rated by the graduates). Although this study was not designed to determine why we obtained no significant correlation between these two variables, it is possible that the number of individual differences in content knowledge among graduates was not large enough to significantly affect their employers' perception of job preparedness, while readily observable employee characteristics, including age and presence of visual impairment, influenced their perceptions substantially. It is also possible that graduates' self-rated proficiency in key professional competency areas does not accurately reflect their actual proficiency in those areas. Another possible explanation for this result is that Core Program questions (see Table 2) primarily measured the graduates' knowledge in specific content areas, whereas the Employer Survey questions (see Table 3) measured more general job skills as well, including the ability to keep accurate and appropriate records and to practice realistic self-evaluations. In addition, it is possible that some of the student-satisfaction-related factors (e.g., faculty-student interaction and fairness of evaluation) may be irrelevant to actual job preparedness for the graduates.

Practical Implications

Given the findings of this study, teacher preparation programs in visual impairment may want to place an emphasis on ensuring sufficient faculty-student interaction, fair evaluation, and high-quality practicum/internship experience. In addition, the absence of significant correlation between perceived program effectiveness and perceived job preparedness suggests that it is critical for university teacher preparation programs in visual impairment to receive evaluations on their programs not only from their graduates but also from their employers for a balanced assessment of the programs.

The findings of the study also suggest that graduates from teacher preparation programs in visual impairment need to be aware of the possibility that how their employers rate their job preparedness may be substantially different from how they perceive themselves to be prepared for their jobs. In addition, graduates from these programs need to be cognizant of employers' possible negative perceptions in job preparedness of the individuals who are older or visually impaired.

Strengths and Limitations

To our knowledge, this study was the first attempt to identify independent predictors of perceived job preparedness and perceived program effectiveness for teacher preparation programs in visual impairment. One of the limitations of the study is related to the validity of the instruments. That is, although part of the survey items used in the study were developed based on the competency guidelines outlined by a professional certification body, they had not been validated against a gold standard. In addition, generalizability of the study findings is limited because the survey respondents were the graduates and their employers of a single teacher preparation program in visual impairment. It is also possible that the small variability in the graduates' responses, resulting from the fact that they graduated from a single teacher preparation program, limited the study's ability to find a significant correlation between perceived job preparedness and perceived program effectiveness.

Recommendations for Future Studies

Developing systematically validated instruments for measuring job preparedness and program effectiveness in teacher preparation programs in visual impairment is necessary to improve the validity of the study results. In addition, inclusion of internship evaluation results and objective student performance measures, including GPA and certification exam scores, would enable us to perform a more comprehensive assessment of a program.

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Perceptions of Science Educational Practices for Students with Visual Impairments

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Abstract

Science is a core academic content area; however, little research has been conducted on students with visual impairments in that area. To investigate science educational practices for these students, members of the Educational Curriculum Division and the Itinerant Personnel Division of the Association for Education and Rehabilitation of the Blind and Visually Impaired were asked a series of 10 open-ended research questions concerning curriculum standards, pedagogical practices, frequency of inclusion, assessment, and collaboration with science content educators. The study provided insights into how teachers of students with visual impairments perceived their students' access to the science curriculum, based upon standards, pedagogical practices, frequency of inclusion, assessment, and collaboration with science content educators.

Keywords: inquiry-based education, collaboration, inclusion, testing, science

Introduction

Science is a core academic content area; however, little research has been conducted on students with visual impairments in that area (Erwin, Perkins, Ayala, Fine, & Rubin, 2001; Gough, 1977; Linn & Their, 1975; Long, 1973; Struve, Their, Hadary, & Linn, 1975; Waskoskie, 1980; Wild & Trundle, 2010a; 2010b). Missing from this literature is a report on current educational practices. To investigate science educational practices for students who are blind or have low vision, members of the Educational Curriculum Division and the Itinerant Personnel Division of the Association for Education and Rehabilitation of the Blind and Visually Impaired (AER) were asked a series of 10 open-ended research questions concerning curriculum standards, pedagogical practices, frequency of inclusion, assessment, and collaboration with science content educators.

Factors That Affect Curriculum Practices

Inclusion Practices

The special education law—Individuals with Disabilities Education Act, known as IDEA—adopted the concept of the least restrictive environment (LRE). This mandate

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requires that children with disabilities be educated with their nondisabled peers to the maximum extent possible. However, in 2004 it was reported that most students are not receiving their education in LREs and that they do not have access to the general education curriculum at the same time as do their sighted peers (Smith, Geruschat, & Huebner, 2004).

Science Education Pedagogical Practices

Even though the law mandates that students with visual impairments have access to science and that they work within the science education standards in an LRE, students had limited access to science labs, as reported in both survey and oral accounts of laboratory performance (Waskoskie, 1980). In addition, in a national survey, general education teachers remarked that they were not prepared to teach science effectively to students with visual impairments (Norman, Caseau, & Stefanich, 1998).

The use of inquiry-based instruction has been found to be beneficial to students with disabilities. Students with disabilities benefit from an inquiry-based instructional method in the science curriculum (Mastropieri, 2005), and more recent research has begun to show effectiveness for students with visual impairments as well (Erwin et al., 2001; Wild & Trundle, 2010a; 2010b). Inquiry-based instruction techniques are activity based and can facilitate the efforts of teachers as well as specialists in making appropriate modifications based upon the needs of the student.

Assessment

State-mandated science tests can become another obstacle for students with visual impairments. According to Allman (2002), there is much room for improvement when it comes to administering assessments to these students. Additional information on the assessment process at the local level regarding test accommodation is needed.

Collaboration

Collaboration between the teacher of students with visual impairments and the science content educator is crucial in order for students with visual impairments to be successful in gaining content knowledge resulting in an acceptable performance on state-mandated science tests. The teacher of students with visual impairments is to serve as a resource for the content educator (Hudson, 1997). Such teachers can help the educator understand the needs of students with visual impairment in the classroom. In a collaborative setting, it is the content educator's (i.e., general education teacher's) job to create a classroom where the student can learn. Krebs (2000) found that collaboration was the key to providing a successful academic experience.

Purpose of Present Study

The present study sought to provide insight not only into how students with visual impairments gain access to the science curriculum, but also how teachers of students with visual impairments perceive the ways in which students obtain the scientific knowledge necessary to perform on state-mandated assessments by utilizing the content standards. Specifically, the following research questions were examined:

What were the teachers' beliefs concerning: (1) inclusion, (2) pedagogical practices, (3) assessment, and (4) collaboration for students with visual impairments?

Method

Participants

Members of the Educational Curriculum Division and the Itinerant Personnel Division of AER were asked to participate in the study. The sample was one of convenience (i.e., a convenience sampling procedure was used), as the leading researcher was a member of the organization. Of the participants, the majority were female (94.5%), Caucasian (97.6%) teachers with considerable experience in the classroom (on average, 17.6 years). Most of the teachers

(76.8%) possessed a license or certification to teach students with visual impairments. In addition, most participants (76%) had preschool through 12th-grade experiences and many (78%) had earned master's degrees. On average, these individuals each worked with 17 students, and slightly more than half of their caseload (9) possessed multiple disabilities.

Instrument

Ten open-ended, researcher-developed questions, concerning TVIs' perceptions about science education for students with visual impairments, were used. The open-ended questions were based on a literature review pertaining to curriculum standards, inclusion, pedagogical practices, assessment, and collaboration with science content educators. The instrument developed for this appeared at the end of a Likert-scale survey (in a larger study) about teacher efficacy that was presented online (Kurz, Wild, & Paul). The questions were assessed for readability by two university personnel who were not involved in the present study.

Procedures and Design

A survey research design was utilized to capture the data. A list of the names and contact information for members of the Educational Curriculum and Itinerant Personnel Divisions of AER was obtained from the national headquarters. To recruit volunteers for this research, members were sent an initial letter asking for their participation in the online survey. The act of reading the letter served as an informed consent for all participants. Two weeks after the initial letter was sent, a postcard reminder followed. Of the 635 letters sent to members, 130 responses were received and reviewed. All specific participant information has remained confidential.

Data Analysis

The results of the survey questions were analyzed by observing themes and patterns across the data. With the emergence of specific themes, the researcher assigned each theme with a number. The data were then reviewed, and a mark (the numeral 1) was assigned to the theme based on the number of responses of the participants. Each mark was tallied for rate of occurrence. This resulted in a percentage associated with the responses for each theme. The discussion of the results was driven by the themes and the percentages of the responses.

Results

Question 1

Is the student with visual impairments receiving science instruction based upon curriculum standards?

When asked about science instruction reflecting the curriculum standards, the majority of participants (84.9%) reported that their students were receiving instruction based upon the curriculum standards. Some survey participants commented that instruction was modified to fit the needs of the student, but still reflected the curriculum standards. One participant commented that she felt that her student with visual impairments was not receiving science instruction because the emphasis is on reading and math, and that other content areas were not addressed as they should be. Another participant indicated that the student received instruction in science only if the science teacher was open to having a student with a visual impairment in the classroom.

Question 2

Does the science teacher use inquiry-based instruction when teaching students with visual impairments?

Sixty-one percent of the participants said that science teachers were using an inquiry-based instructional approach when teaching students with visual impairments. Only 6% indicated that teachers did not use this method, whereas 8% indicated that they sometimes used the methods, and 1% said that it was different for all teachers. Additionally, 16.67% of the participants commented that the question was not applicable or they did not know. Participants provided additional comments to this question as well. The comments made by the survey participants indicated that this method was popular among classroom teachers. One participant wrote, “This is the best way for my students to learn because of their visual impairment.” Another participant indicated that the students’ ability to engage in inquiry-based instruction varied. Still another participant stated that the student with visual impairment was engaged with inquiry-based learning for the same amount of time as his peers.

Question 3

Does the student with visual impairments get included when working on scientific experiments? How?

A majority of the survey participants (82.2%) indicated that students with visual impairments were included when working on scientific experiments. Only 4.4% indicated that the students were not included. When asked how the students were included, the largest percentage of participants indicated that students work with a lab partner or a group (31.8%), in cooperative groups (4.4%), or used adapted equipment or modifications (28.3%). However, other participants indicated that an adult participated with the student in the form of a teacher of students with visual impairments (2.6%) or a classroom aide (2.6%). Other participant responses indicated the student was the recorder of data (2.6%).

Question 4

How does the student with visual impairments participate in physical and biological science?

The majority of the participants (26.32%) indicated that materials within the physical and biological sciences were adapted specifically to meet the needs of the student. The use of a classmate or lab partner was mentioned by 20.1% of the participants, whereas hands-on manipulatives (18.4%) or specific adapted materials (26.3%) were also indicated as ways in which the student with visual impairments was able to participate in physical and biological science.

Question 5

How does the student with visual impairments learn concepts related to astronomy?

Forty-one percent of the participants indicated that tactile diagrams and manipulatives were used in an effort to help students with visual impairments learn astronomy. However, other forms that participants stated they used included audio descriptions (3.67%); actual experiences in the field such as talking to an astronomer, visiting a planetarium, or talking with community scientists (3.67%); and the student memorizing facts related to astronomy (1.83%). Of the comments made by participants, one indicated: “I would like more ideas on how to adapt astronomy better.”

Question 6

What specific techniques are used in the science classroom when teaching science materials based upon observations?

Twenty-eight percent of the participants indicated that verbal descriptions were used when teaching science materials based upon observations. However, 12.23% indicated that the student with visual impairments was paired with another student, whereas 18.71% indicated that tactile diagrams and manipulations were used. These responses were reflective of previous questions concerning learning-specific science concepts.

Question 7

How is the learning and knowledge of the student with visual impairments assessed?

Over half of the participants (54.70%) indicated that tests were used as assessments for learning and knowledge of the student with visual impairments. However, a small portion of the participants indicated that alternative forms of assessments—such as observations (6.84%); student conferences (1.71%); demonstration of knowledge (3.42%); and logs, lab reports, homework, and projects (5.98%)—were used as forms of assessment.

Question 8

Are state science testing materials adapted properly for the students with visual impairments?

The response to this question indicated that there was a division as to whether or not state science testing materials were properly adapted, with 30.34% feeling they were, and 30.34% feeling that they were not. Of the participants, 11.24% indicated that some of the tests were adapted properly. One participant stated that the tests were only modified properly because "I adapt the materials." Of the remaining responders, 11.24% indicated that they did not know.

Question 9

How long does the student with visual impairments spend in the general education classroom?

Participants indicated that students with visual impairments are spending the majority of their time in regular education classrooms, with 22% spending over 90% of their time in the regular education science classrooms, whereas 33% spend 100% of their time in classrooms with their peers. Only 6% of the participants indicated that their students with visual impairments spent no time in regular education classrooms.

Question 10

How does the teacher of the visually impaired support the general education science teacher in helping students with visual impairments?

The majority of the participants indicated that they supported general education science teachers and students by providing lesson plan adaptations (38.78%) or by collaborating with teachers (25.17%). Other tasks mentioned included providing assistive technology, providing teacher in-service training sessions, and communicating with parents.

Discussion

The data seem to indicate that students with visual impairments have access to general education classrooms, with over 50% of the participants indicating that their students spend at least 90% of their time in general education science classrooms. This was a higher rate than has been reported in recent research (Smith et al., 2004). Within general education classrooms, students with visual impairments are receiving instruction based on curriculum standards that utilize the assistance of a sighted peer and curriculum modifications made by the teacher of students with visual impairments in collaboration with the science content educator. Assessing students involves the use of formal tests; however, alternative assessments were also used by a few educators. This reflects the current educational climate of high-stakes, standardized testing. Research on the validity of the tests should be conducted, and the equity in administering these tests to students with visual impairments should be examined. With respect to alternative assessments, further research into their nature and effects on conceptual understanding of students with visual impairments would be beneficial as well.

Participants indicated that inquiry-based teaching methods were being used for students with visual impairments in their learning of science concepts. However, little research has been conducted to determine the effectiveness of inquiry-based educational practices for such students (Erwin et al., 2001; Wild & Trundle, 2010a, 2010b). Furthermore, research in this area should be conducted involving other areas of science (physical science, life science, earth and space science, etc.).

The survey presented here provided some information on how students with visual impairments access science content. Despite the limitations of this study, the findings can serve as a starting point for further investigations. The findings provide the field with a glimpse into what is currently happening in science classrooms for students with visual impairments, something that has not been reported in the research literature. This study can also serve as a starting point for future research on practice, assessment, inclusion, collaboration, and examination of the standards used in classrooms.

Limitations

There are a few limitations in the present study. For example, although the survey questions were assessed for readability by two university personnel who were not involved in the present study, the survey instrument was not standardized. Only one researcher coded the data using qualitative data methodologies. Given the range of factors that were of interest, and given the total number of questions (10), it should be recognized that only limited insights can be obtained. Nevertheless, this study can serve as a starting point for further investigations.

This research was conducted using a convenience sample from members of AER. The findings might be only representative of the opinions of the respondents and not of the entire population of practicing TVIs. Further limiting this study were inaccurate addresses provided to the researchers: not all intended members received invitations to complete the survey. Due to the limitations of the software survey program utilized, the researchers were unable to determine which members of the divisions had completed the survey. Thus, the researchers were unable to follow up with those members who did not complete the survey in an effort to determine any bias that may have been expressed in the results. This situation also limited the ability of the researchers to conduct further interviews with respondents in order to check for reliability of the data collected.

Definitions of educational terminology such as *inquiry-based curriculum* utilized in this study were not provided by the researchers. The members of the educational organization were relied upon to understand the definitions of all educational terminology. Another limitation was that the results were not subjected to an interrater's reliability check to ensure that the answers were properly coded, due to time constraints placed upon the reporting of the research.

Conclusions

Beliefs about how students with visual impairments were accessing science classrooms were assessed by asking teachers of students with visual impairments questions pertaining to science instruction. The results indicated that students were receiving instruction utilizing inquiry-based instruction. While receiving instruction in this method, students were included in scientific experiments and used adapted equipment or the assistance of a lab partner. Additional questions within this survey regarding pedagogy and instructional methods in specific areas of science had similar findings. Students experienced similar adaptations in the physical and biological science curriculum, as well as when receiving specific instruction in astronomy.

The teachers of students with visual impairments indicated that they spent time providing lesson plan adaptations and in collaboration with science education teachers. Other ways in which they spent their time consisted of working with assistive technology, providing in-service training sessions, and communicating with parents—all of which indicate a collaborative environment.

The results show that teachers of students with visual impairments indicated that they believed students with visual impairments were receiving instruction based upon curriculum standards.

The teachers of students with visual impairments stated that most students were assessed using tests. Tests that were required by the state seem to indicate that an equal number of teachers of students with visual impairments believed or did not believe that they were modified properly.

According to the survey responses, students with visual impairments were reported to be placed in general education classrooms, as mandated by the least-restrictive environment, over 90% of their time.

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A Short-term Training Model on Assistive Technology: Perceptions of Preservice Teachers of Students with Visual Impairments

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Abstract

The expanded core curriculum area of assistive technology for students with visual impairments allows them to access the core curriculum and to be more independent. Finding a way to prepare preservice teachers of students with visual impairments with knowledge and skills in assistive technology is a challenge. This study evaluated teacher perceptions as to the effectiveness of one model, an intensive weekend of assistive technology training for preservice teachers embedded into an existing university course. Four cohorts of preservice teachers participated in a pretest/posttest "knowledge and skill assessment" with both quantitative and qualitative questions. A follow-up survey was sent to evaluate their perspective on retention and use of what they learned. The study results supported a positive impact on perceived levels of knowledge and confidence for the participating preservice teachers.

Keywords: assistive technology, distance education, teacher preparation, teachers of students with visual impairments, program evaluation

Introduction

The use of adaptive equipment and materials has long been an essential element in the effective instruction of children with visual impairments (Kapperman, Sticken, & Heinze, 2002; Mack, Koenig, & Ashcroft, 1990). In fact, the use of assistive technology has had an overwhelmingly positive impact on the quality of life for many students with visual impairments (Cooper & Nichols, 2007; Goodrich, Kirby, Wagstaff, Oros, & McDevitt, 2004; Holbrook, Wadsworth, & Bartlett, 2003; Kelly & Smith, 2011; Loomis, Marston, Golledge, & Klatzky, 2005; Ponchillia, Rak, Freeland, & LaGrow, 2007). For those students who are academically comparable to their peers with vision, assistive technology can provide equitable access to the same equipment and materials available to other students. For students with additional intellectual and/or physical disabilities, assistive technology devices such as communication boards and

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switches often provide their sole method of communication.

In recognition of the need for explicit assistive technology instruction for children with visual impairments and/or additional disabilities, leaders in the field of visual impairment specifically call for technology instruction (Huebner, Merk-Adam, Stryker, & Wolffe, 2004). While the importance of assistive technology for the success of students with visual impairments is no longer in question, there remains considerable concern as to whether these students are receiving adequate instruction and training in this area. One early study found that teachers of students with visual impairments had little or no knowledge of many areas of assistive technology (Parker et al., 1990). In another study, by Mack et al. (1990), on computer training of students with visual impairments, it was concluded that teacher education programs have a "critical obligation to produce graduates who have the necessary knowledge, skills, and motivation to provide a link to microcomputers for their students" (p. 530). Since 1990, five studies have evaluated the assistive technology knowledge of teachers of students with visual impairments (Abner & Lahm, 2002; Candela, 2003; Edwards & Lewis, 1998; Kapperman et al., 2002; Zhou, Smith, Parker, & Griffin-Shirley, 2011), with a recurring theme emerging that teachers of students with visual impairments are not prepared to use and teach their students how to use assistive technology in the classroom.

As a result of these studies, there have been numerous professional calls for the inclusion of assistive technology in preparation programs for teachers of students with visual impairments. The Council for Exceptional Children (CEC) Division on Visual Impairment holds the position that assistive technology must be incorporated into all teacher preparation programs (Erin, Holbrook, Sanspree, & Swallow, 2006). The CEC Knowledge and Skill Base for All Entry-Level Special Education Teachers of Students with Visual Impairments includes at least 10 standards directly related to the use of assistive technology (CEC, 2003). However, Smith and Kelley (2007) found that only 60% of the personnel preparation programs for teachers of students with visual impairments in the United States and Canada offered an assistive technology course. The other 40% of the universities surveyed either integrate assistive technology instruction throughout their programs or embed assistive technology instruction as one unit within a course.

No studies have been conducted, though, to determine the effectiveness of embedding assistive technology instruction within an Internet-based distance education course. Due to the complex nature of assistive technology content, it is important that students are given authentic, "hands-on" opportunities to interact with the technology. Therefore, for an Internet-based course, arrangements need to be made to ensure that students are provided with quality instruction and authentic learning experiences with assistive technology. One way to address this would be to provide students with a hybrid model that uses an intensive focusing solely on assistive technology as part of the course.

The purpose of this study was to review evaluation data from one teacher-preparation course that embeds assistive technology instruction for teachers of students with visual impairments in a short-term, intensive training weekend. Through the review of the evaluation data, the researchers intended to determine if the training model had a positive impact on perceived knowledge of, skill attainment with, and attitude toward assistive technology for teachers of students with visual impairments in training.

Method

Participants

The participants of this study were students enrolled in a university instructional strategies course for preservice teachers of students with visual impairments from fall

2008 through spring 2010 (n = 66). The students in this course were all graduate students who were completing requirements to earn certification and/or a master's degree in special education with an emphasis in visual impairment. All students were required to participate in an intensive assistive technology weekend. The students were instructed by two assistive technology specialists from the state school for the blind over a two-day period.

The participants were a convenience sample of those students enrolled in the class. Out of the 66 participants, 5 were male and 61 were female. The range of ages was from 24 to 58, with the mean age of the participants being 37. Fifteen were ages 24 to 30, 29 were ages 31 to 40, 15 were ages 41 to 50, and 7 were over age 50. Out of the 66 participants, 35 were already working on a probationary certification as teachers of students with visual impairments either in public school districts or at residential schools. Fourteen were working at residential schools for students with visual impairments, either as teachers of students with visual impairments, teaching assistants, or residential instructors. Thirty-one were not yet working in the field of visual impairment and were only in preservice training at the time of the assistive technology weekend. The students were divided into four cohorts based upon when they took the course; thus, for this study there are four separate experimental units.

The study was approved by the Human Subjects IRB committee of one of the researchers' university, and all subjects consented to participate in the study. Participants experienced training not only on a variety of assistive technology devices, but also on the appropriate uses of technology to ensure equitable access to classroom instruction and materials. The students received written handouts and reading assignments within their online course and also received handouts and supplemental materials on assistive technology on a thumb drive at the training to use as resources beyond the weekend. It was hypothesized that by implementing an intensive weekend training program, these preservice teachers would fill in their knowledge gaps and be given some introductory hands-on experience, beyond an awareness level, with the devices they would be utilizing with their students in the future.

Design and Procedure

Students arrived on Friday evening, attended the training sessions on Saturday from 8:30 a.m. until 5:00 p.m., and continued on Sunday from 8:30 a.m. until 3:00 p.m. Students were asked to take identical pre- and posttest "knowledge and skill assessments" that examined their knowledge of assistive technology. The instrument was developed by the researchers and was reviewed for face validity by other researchers not connected to the study. Questions were both quantitative (Likert scale) and qualitative (open-ended short answer) in nature and can be found in Tables 1 and 2, respectively.

The assistive technology weekend was composed of multiple lectures, demonstrations, and activities organized so that the participants would gain an understanding of the purpose of assistive technology for students with visual impairments. See Table 3 for a listing of topics included in the training and the type of presentation provided.

The length of training for each specific device varied depending on the technology, with some devices only needing 10–15 minutes while others needed several hours of focused training. The participants were exposed to various software programs and were asked to complete an activity with one of the software packages. In the limited time of the two-day training, it was not expected that the students would become proficient in specific devices, but rather that they would have a basic understanding of what the devices were, their purpose, and how they worked. It was hoped, however, that they would gain skills in how to conduct an assistive technology evaluation, how to create tactile reproductions of visual materials, how to use enlargement software, etc. in

Table 1. Descriptive Statistics of Pre- and Posttest Measures ($N = 66$)

Quantitative Questions	Pre-Post	Mean	Std. Deviation	Std. Error Mean
Q1: I understand how a screenreader works and can effectively teach my students how to use screenreader software (i.e., JAWS, Window Eyes).	Pre1	1.9552	1.00654	.12297
	Post1	3.8657	.67185	.08208
Question 1 Change	+1.9105			
Q2: I can evaluate the effectiveness of specific assistive technology devices according to the needs of my students.	Pre2	2.3955	1.09246	.13346
	Post2	3.8507	.58397	.07134
Question 2 Change	+1.4552			
Q3: I understand how screen magnification works and can effectively teach my students how to use screen magnification software (Zoom Text, Lunar, Big Shot).	Pre3	2.2537	.99000	.12095
	Post3	4.0149	.54335	.06638
Question 3 Change	+1.7612			
Q4: I understand how video magnifiers work and can effectively teach my students how to use them (CCTV, handheld).	Pre4	2.8358	1.22594	.14977
	Post4	3.9478	.67495	.08246
Question 4 Change	+1.112			
Q5: I can use braille translation software (Duxbury, Braille 2000, MegaDots) effectively and can also teach my students how to use this software.	Pre5	2.9030	1.19734	.14628
	Post5	3.8060	.76354	.09328
Question 5 Change	+0.903			
Q6: I can use braille notetakers appropriately (BrailleNote, Braille Sense, PacMate), and can support my students in their use.	Pre6	1.7836	.89707	.10959
	Post6	3.4179	.85101	.10397
Question 6 Change	+1.6343			
Q7: I am familiar with a number of adaptive devices for both near vision tasks (i.e., dome magnifier, handheld magnifier, stand magnifier) and distance vision tasks (i.e., bioptics, telescopes, monoculars), and I can support my students that use these devices.	Pre7	2.8955	1.00203	.12242
	Post7	3.8060	.82092	.10029
Question 7 Change	+0.9105			
Q8: I am comfortable writing an official assistive technology evaluation report.	Pre8	1.8209	.88635	.10828
	Post8	3.4179	.77654	.09487
Question 8 Change	+1.579			
Q9: I understand the differences between low-tech and high-tech assistive devices, and when to use either type.	Pre9	2.7910	1.02303	.12498
	Post9	4.1343	.77646	.09486
Question 9 Change	+1.3433			
Q10: I am confident in my abilities to both use and to teach my students how to use a variety of assistive technology devices.	Pre10	2.0896	.90002	.10996
	Post10	3.8060	.73832	.09020
Question 10 Change	+1.7164			

addition to learning about resources available to assist them in the future.

Follow-up surveys were sent to the participants of the assistive technology weekends, with a response rate of 31.89% ($n = 21$). The surveys were sent 6–9 months after participation to determine if the material covered in the assistive technology

Table 2. Comparison of Correct Answers Pre- and Postweekend Training Intervention

Qualitative questions	Pretest (N = 66)	Posttest (N = 66)
1. Describe how screenreader software works and how this software differs from screen magnifier software.	48.5%	100%
2. Describe the process of assistive technology assessment and what components need to be in place for this assessment to be accurate and effective.	34.4%	90.9%
3. What entry level skills should be taught when introducing any assistive technology device to a student?	54.5%	84.8%
4. What student behaviors should you observe to determine if a device will be appropriate for that student?	69.7%	93.9%
5. Who do you go to for technology support?	77.3%	98.5%
6. What is the importance of assistive technology for your students with visual impairments?	84.8%	100%
7. Choose any assistive technology device that you would like and briefly describe how you would teach a student to use that device.	43.9%	84.8%

weekend was still being used and if the participants felt the experience was of continued relevance. The follow-up survey is contained in Table 4.

Data Analysis

The quantitative data from the "Knowledge and Skill Assessments" were compiled in SPSS 18.0 for analysis. For the quantitative data, descriptive statistics (mean, standard deviation, standard error of the mean) were provided to show a difference in the level of knowledge. Inferential statistics were not used, as the practice effect could compound the effects.

For the qualitative data, the researchers followed the procedures outlined by Krippendorff (2004) for a content analysis of the data. For each question, the research team coded the data from the pre- and posttest student responses. For these questions, the researchers worked individually to develop categories grounded in the collected data and then examined these categories for emerging themes. These themes were then compared by the researchers to reach a consensus to ensure more reliable results. The large pool of skill assessment surveys across cohorts provided ample amounts of qualitative data to determine pertinent themes. The research team analyzed the combined data and attempted to determine the impact of the intensive weekend training on the students' perceived knowledge, skills, and attitudes.

Results

The quantitative data shows the mean scores for both the pre- and posttest surveys in Table 1, along with the standard deviations and standard measure of error. Included in the table is also the level of change. For each question using a Likert scale, the students' perceptions towards their knowledge increased positively with a range of +1.9105 for Question 1 to +0.903 for Question 5. While there was some variance reported by the standard deviation scores, the overall changes were all positive.

The qualitative data was coded by question and was reviewed individually by each

Table 3. Topics Covered in the Assistive Technology Weekend

Topic	Type of Presentation
Assistive technology (AT) evaluation process and needed entry-level skills	Lecture and group analysis of videotaped case studies
Technology for students who use braille	Lecture, instruction, and demonstration of braille displays, Mountbatten, electronic braille notetakers, etc.
Technology for students with low vision	Lecture, instruction, and demonstration of video magnifiers, screen magnification systems, etc.
Technology for students who are auditory learners	Lecture, instruction, and demonstration of digital talking book devices, screenreaders, etc.
Technology for students with multiple impairments	Lecture and demonstration of switches, software for learning, etc.
Tactile graphics production	Lecture, demonstration, and hands-on activities with embossers, tactile graphic makers, etc.
BrailleNote, Duxbury, JAWS, WindowEyes, ZoomText, MAGic	Instruction and hands-on small-group activities
Additional AT: American Printing House for the Blind products, evaluations and curriculum, accessible cell phones, and other high- and low-tech devices and materials	Displays, demonstrations, and hands-on access

reviewer to look for the participants' perceptions of the assistive technology weekend and their understanding of the concepts. Each researcher reviewed the answers of all participants to determine a level of correctness, based on predetermined criteria for correct and incorrect answers for each question. Once the reviewers had individually determined their percentages, they compared their findings to ensure reliability of the findings. Overall, the findings of the researchers were consistent. In times of disagreement, the researchers reviewed the data together to come to consensus.

As shown in Table 2, it was determined that the intensive assistive technology weekend did have an impact on the understanding and attitudes of the participants. This table identifies each qualitative question and compares the percentage of those participants ($n = 66$) who gave a correct answer in the pretest to those who gave a correct answer in the posttest. There was improvement in participant understanding of the concepts and skills on all questions.

Follow-up Survey

Seventy-six percent ($n = 16$) of respondents to the follow-up survey said they now knew more about the array of assistive technology options for their students, that they incorporate assistive technology into

Table 4. Assistive Technology Weekend Follow-up Survey

Questions
1. Have you used any assistive technology with any students with visual impairments since you attended the assistive technology (AT) training weekend that was part of the instructional strategies course? If so, what assistive technology have you used and with what age(s) of students?
2. If you are currently working with students with visual impairments or have done so in your internship, what information from the AT weekend has been most valuable to you in your role as a service provider for students with visual impairments?
3. How has your participation in the AT weekend seminar changed the way you provide instruction and/or accommodations for your students?
4. What components of the AT weekend have been least helpful in your daily responsibilities up to this point?
5. Briefly outline the steps you would take to evaluate the efficacy of a newly introduced assistive technology device with one of your students.
6. Briefly outline the steps you would take to prepare a student for the introduction of a new AT device. How would you then teach the use of the new device?
7. Do you feel the skills and knowledge you received during the AT weekend training were or will be valuable to you in your career as a teacher of students with visual impairments? If so, which ones? If not, why not?
8. What would you change about the AT weekend to make it a more valuable experience for new teachers?

their instruction, and that they suggest it for their students in their Individualized Education Program (IEP) meetings. In addition, 90% ($n = 19$) said they are continuing to use what was learned at the assistive technology weekend with their current caseload of students. While this result is based upon a small sample of all of the participants, it indicates that most of the participants responding to the survey found that the weekend was useful to their jobs. By the time the follow-up surveys were sent, most of the participants were working in a job as a teacher of students with visual impairments with either full or probationary certification. Nineteen respondents (90%) stated that the information presented at the assistive technology weekend will continue to be helpful throughout their careers, because they now had a basic knowledge of assistive technology that can benefit all types of students, even if they were not serving students with visual impairments at this time.

Discussion

Overall, the intensive assistive technology weekend appears to have had a positive impact on the perceived levels of knowledge and confidence of the participants. In reviewing the quantitative data, the participants made the most significant changes in opinion on questions 1 (screenreader knowledge), 3 (screen magnification knowledge), 6 (braille notetaker knowledge), 8 (assistive technology evaluation report knowledge), and 10 (confidence in using and teaching assistive technology devices). Under further review, it is of note that questions 1, 3, and 6 focused primarily on specific devices (see Table 1 for the specific questions). Thus, the students perceived that their knowledge and skills in using these specific devices had grown substantially through the intensive weekend. There was also a positive change in their responses to question 8, which focused on the perceived confidence in writing a formal assistive technology evaluation report. This difference is important, as many teachers of students with visual impairments are required to be the assistive technology specialist for students with visual impairments in their respective districts. Question 10 was an overall confidence question, and the large difference in the pre- and posttests further supports the success of the intervention.

Although there was a statistically significant difference between each pair of questions, questions 5 (on "teacher-driven" braille translation software) and 7 (on the use of magnification devices) saw the smallest gains. There are multiple reasons for such a small change in perceptions. First, a review of the mean scores shows that the students ranked their perceived knowledge high for this item in the pretest. Therefore, it may be surmised that the students had a high level of understanding of how to use this type of assistive technology before the intensive weekend. Since question 5 referred to a "teacher-driven" management tool, it is possible that the participants had used the software in other coursework or in their current jobs. In similar fashion, question 7 also reported a small change. Again, the students may have had more exposure to the type of device referred to by question 7 in other courses or simply in everyday life, as magnifiers are more commonplace.

The results of the qualitative data also indicated the definite impact the weekend training had on the participants. For example, less than half of the students had heard of screenreaders or screen magnification software prior to the training, while 100% were able to describe their purpose and how they generally worked after participating in the training. There was a significant increase in confidence as to how to conduct an assistive technology evaluation, from 34.4% prior to training to 90.9% at the end. This topic was presented and modeled thoroughly during the training. One participant responded, "I have definitely increased my knowledge of doing an assistive technology evaluation. I feel confident that I can go through the steps now of how to go through this kind of evaluation with my students."

Knowing what entry-level skills to teach and how to observe student behaviors were also skills that resulted in increased confidence from the training. Although many of the students already had some ideas as to where to go for assistive technology support, it was mostly at the local level, such as their district assistive technology specialist. After the training, they all (100%) realized that there were also other supports statewide—through residential school outreach programs, manufacturing companies, regional consultants, etc.—who may be more knowledgeable about assistive technology devices designed specifically for students with visual impairments than a local assistive technology specialist.

Although most of the participants (84.8%) had some idea of the importance of assistive technology for students with visual impairments, the responses (100%) after the training were much more thorough and in depth. A typical response in the pretest was "It gives them equal access to curriculum." In the posttest, more typical responses were "To increase access to regular classroom curriculum, to increase access to study skills/support, to increase independence in producing, storing, and accessing work, and to increase leisure options," and "Lack of computer knowledge is one of the main reasons for high unemployment statistics. . . .It helps them have equal access for homework, literacy, rec/leisure, and jobs. Technology can make tasks easier, reduce eye strain/fatigue, and improve work and quality of life." Most of the posttest responses addressed the three limitations imposed by visual impairment as identified by Lowenfeld (1973): (1) limitations on the quality and quantity of information, (2) limitations to access to experiences, and (3) limitations in interaction with the environment.

The follow-up survey data further supported the longer-term impact of the weekend training program, which could be significant considering that information from one-time interventions often does not carry over beyond the immediate period of the intervention (Fitzpatrick, Sanders, & Worthen, 2004). Providing the participants with hands-on experiences with assistive technology devices, resources, relevant materials, and information about whom to contact for ongoing support strengthened the longer-term impact of the training. The fact that 90% of the follow-up respondents felt that they were continuing to use the information they had learned at the weekend training and were incorporating assistive technology into students' IEPs speaks well of the impact.

Limitations

As with any research, this study has distinct limitations due to the inherent nature of the study. First, with research that surveys the participants "perceptions," there are multiple influences that may affect the participants' responses. For example, participants may rate themselves highly on a pretest in order to avoid appearing unknowledgeable to the researchers. Participants may also score themselves too high on a posttest to impress the researchers. Anytime perceptions are measured, there are possibilities for error. The researchers addressed this issue by discussing it before administrating the evaluations and by having the evaluations coded for anonymity. The students were told that there were no right or wrong answers and that their responses in no way affected their grade in the associated course. The researchers did not know who had answered which knowledge and skills assessment.

Second, the evaluation used for this survey is not a standardized instrument; it was created by the researchers for this particular evaluation study because no relevant instrument to address the purpose of this study previously existed. Therefore, the reliability and validity of the instrument may be questioned. In order to address this issue, the instrument was developed by one researcher who contributed to the present study and reviewed by three other outside researchers for "face validity" (Orcher, 2007). After multiple revisions, it was determined that the evaluation instrument was sufficient for its purpose.

The survey was provided to the participants at the beginning of the assistive technology weekend and at the end of the two-day training session. The timing of the administration of the posttest may be a limiting factor, as the participants were tired from the weekend and may not have spent as much time on the survey as needed. It is for this reason, as well as to see if there was a long-term effect of the training, that the researchers decided to complete a follow-up survey in order to gather more information about the impact of the weekend under better conditions and over time.

As with any type of similar research, there is a limitation to the study being generalized to the larger population, based upon the uniqueness of each teacher of students with visual impairments' preparation program. While the design and results indicate that the training was useful to participants and that they were using it, it cannot necessarily be assumed that the participants are implementing, evaluating, and teaching assistive technology as demonstrated in the trainings.

In regard to the qualitative data, there exist issues of researcher bias and misunderstanding of the data. Researcher bias may have occurred, since at least one of the researchers was an instructor of each participant. In order to address this issue, the researchers completed a review of the data individually first before meeting together to develop conclusions from the data. Cohen's kappa coefficient of interrater reliability measurement was used to ensure interrater reliability on the qualitative data, and the results were found to be at least 90% in agreement between raters.

The return rate (31.89%) of the follow-up survey was somewhat low—it only provides information from a small sample of the original 66 participants. Multiple attempts were made to obtain follow-up survey responses, but some of the participants were new teachers of students with visual impairments who were very busy and therefore did not respond.

Conclusion

Technology and adaptive devices continue to play an important role in the effective instruction of students with visual impairments. This study provides data on teachers' perspectives on assistive technology as well as on the efficacy of the weekend intensive training model and whether this model is an effective one in terms of meeting the needs of teachers in training. Based on the study results, it can be determined that the described model of instruction in the use of assistive technology for teachers of students with visual impairments is a viable way to increase knowledge, skills, and confidence for preservice teachers. When asked, as part of the posttest, what new information was learned over the course of the weekend, typical responses included "There is an amazing amount of technology for this population. I had no idea!" and "How to use JAWS, ZoomText, BrailleNote—did not know anything about this!" and "I learned a lot of new information. It was great to do lots of hands-on activities, and the entire weekend was a tremendous professional development activity to me." This model could be replicated in other personnel preparation programs that face similar challenges in providing assistive technology information to their students, or this study can be used as a springboard for alternative assistive technology training models in the future. The ultimate goal of this project was to support new teachers of students with visual impairments in becoming more skilled in the use of assistive technology, and in stressing the importance of technology for the continued success of their students.

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Project H.I.R.E.: An Online Employment Preparation Program for College Students

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Abstract

Youth with visual impairments have educational attainments that are similar to youth without disabilities, yet their employment rates are consistently lower. The purpose of this study was to develop, implement, and evaluate an online employment preparation program designed specifically for college students and recent graduates with visual impairments to address this problem. Nine participants from across the country completed the eight-week program. Participation in the program resulted in increases in job search knowledge, career decision self-efficacy, and job search locus of control.

Keywords: employment preparation, online intervention, transition, college age

Introduction

Difficulty obtaining employment for youth with visual impairments (those who are blind or visually impaired) has long been a problem. The original National Longitudinal Transition Study (NLTS) and the NLTS2 both documented that youth with visual impairments were less likely to obtain employment experience while in high school and were less likely to be employed after leaving high school compared to the general population of youth (Newman, Wagner, Cameto, & Knokey, 2009; Newman, Wagner, Cameto, Knokey, & Shaver, 2010; Wagner et al., 2003). Obtaining early employment experiences is strongly associated with future employment for all youth, including youth with visual impairments (e.g., Carr, Wright, & Brody, 1996; McDonnall, 2010a, 2011).

In addition to providing data on the employment experiences of youth with visual impairments, the NLTS2 has provided current information about their educational status. Results indicate that the vast majority of these youth graduate from high school and a large majority attend postsecondary school (McDonnall, 2011; Newman et al., 2009). These educational attainments are similar to those of the general population (McDonnall, 2010b). The National Postsecondary Student Aid Study of 1995–1996 also supports the finding that youth with visual impairments are as likely as youth without disabilities to attend postsecondary school (Horn & Berktold, 1999). (Note that the National Postsecondary Student Aid Study is the most recent published national data including outcomes *following* postsecondary education for youth with disabilities.) In addition, results from this study indicate that youth with visual impairments are just as likely as youth without disabilities to per-

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sist in college, which is also supported by recently released analyses of NLTS2 data (Sanford et al., 2011). It is after obtaining a college degree that differences between youth with visual impairments and youth without disabilities appear: approximately one year following graduation, 57.8 percent of youth with visual impairments were employed full-time compared to 73.2 percent of youth without disabilities. A higher percentage of youth with visual impairments were unemployed (14.5 percent vs. 4.3 percent) or out of the labor force (12.8 percent vs. 8.3 percent). Of college graduates with disabilities, youth with visual impairments had the lowest rate of full-time employment.

Youth with visual impairments have educational attainments that are on par with youth who do not have disabilities, yet their employment rates are lower across all time points (during high school, after high school, and after college). Even obtaining a college degree does not seem to equate to the same advantages in terms of employment for youth with visual impairments. These youth are often encouraged to focus on academics while in high school and college, limiting the early work experiences they obtain (O'Day, 1999). Although barriers external to the youth may exist, such as negative employer attitudes toward blindness, and lack of early work experience and its associated deficits are likely to contribute to the difficulties college graduates face with employment. Deficits we hypothesize to be associated with limited work experiences are limited knowledge of the world of work, a limited network to aid in finding a job, and lack of knowledge about how to most effectively search for a job. Findings from the NLTS2 support this hypothesis, as youth with visual impairments do not report using the most effective job search methods available (Newman et al., 2009). Very few of the unemployed youth were even looking for a job (34.9 percent), which is a much smaller percentage compared to all other youth with disabilities who were unemployed. Adults with visual impairments who experienced their vision loss at or near birth were also found to primarily use ineffective job search methods (O'Day, 1999).

Currently, numerous interventions exist for transition-age youth with visual impairments: most state vocational rehabilitation (VR) agencies have one or more transition programs for this population, and many private agencies also offer transition programs. However, rigorous scientific evidence for the effectiveness of these programs is lacking. In addition, these programs almost exclusively focus on the transition from high school to college or employment. The transition services typically received by youth graduating from college are traditional VR services, as formal programs targeting this group are generally not available. Research supports the need for a program with evidenced effectiveness, targeted to the population of college-educated youth with visual impairments who are transitioning to employment. The intervention described here was created to address this need.

With limited experience working or looking for work, many youth with visual impairments are expected to have limited job search knowledge and skills, as well as limited knowledge of the world of work in general. This lack of knowledge was the basis for the employment preparation program developed for college seniors and recent graduates with visual impairments. Finding a job will be even more challenging if these youth do not know the best job search methods. In addition to job search information, this group is likely to benefit from general job search assistance and advice, as well as job search information specific to having a visual impairment. This information was provided to youth within a traditional career development model, which involves working through a number of phases such as self-assessment, exploration of options, decision making, and job search and implementation.

Although other employment preparation programs are available, several aspects of this program make it unique: it includes information specific to job searching for persons with a visual impairment, it is available entirely online in a fully accessible format, and it focuses on a group of transition-age youth that particularly need assistance moving into employment. The goals of the program presented here were helping youth with visual impairments:

- Learn more about themselves and how their personalities and interests influence their job choices;
- Learn more about jobs they are interested in;
- Gain job search knowledge and skills;
- Identify accommodations needed for jobs they are interested in;
- Learn how to talk to employers about blindness; and
- Learn how to interview for a job.

The purpose of the research project was to develop, implement, and empirically evaluate the effectiveness of a new intervention designed to lead to improved employment outcomes for college students and recent graduates with visual impairments. The program was evaluated by measuring gains in participants' job search knowledge, self-efficacy associated with career decisions and job searching, and locus of control for job searching. There are four objectives of this article: (a) provide a description of this new intervention that was designed for college youth who are or will soon be seeking employment, (b) report evaluation results for the intervention, (c) show an evaluation design context that can be used within the typical constraints for the target population (e.g., small samples, need for full participation opportunity), and (d) provide information about revisions to and current availability of the program. For the evaluation component, the following hypotheses were investigated:

- Participation in the program will result in increased job search knowledge, self-efficacy, and locus of control.
- Job search knowledge, self-efficacy, and locus of control will show stability prior to program participation.
- Job search knowledge, self-efficacy, and locus of control gains after program participation will be maintained for at least two months.

Method

Intervention Description

Project H.I.R.E. (which stands for Hip, Independent, and Ready for Employment) was the program developed for the intervention. It is an eight-week program that consists of modules covering the following topics: (a) self-assessment, (b) career exploration, (c) job search techniques, (d) resume development, (e) accommodations on the job, (f) talking to employers about vision loss, (g) interviewing, and (h) career portfolios and applying for jobs or volunteer activities. A brief description of each module is provided in Table 1. The content for each week came from popular job search resources and resources specifically developed for consumers who are blind, Internet resources, and original content developed by project personnel.

The entire program was conducted online. Each participant had a program contact person assigned to him or her. This contact person assisted the participant as necessary with any questions or problems encountered during the program. At the end of each module were "Check Your Understanding" (CYU) questions that allowed participants to review some of the major points of the content. After submitting their answers, they received information about how many were correct and an explanation associated with the correct answers. Each module had assignments associated with it that participants were to complete and submit to their program contact person. The assignments included activities such as searching for information about jobs of interest on career information websites, conducting informational interviews, developing a resume, and conducting a mock

Table 1. Description of Project H.I.R.E. Contents

This eight-week online program consisted of seven modules:

1. **Self-Assessment**. This module involved completing an interest inventory, personality assessment, values inventory, and skills checklist. An external website for the personality assessment allowed the students to explore career options most closely associated with their personality types.
2. **Career Exploration**. This module provided information about techniques that can be used to explore careers, including informational interviews. Students used multiple Internet resources to learn more about specific jobs they were interested in.
3. **Job Search Techniques and Resume Development**. This module provided information about the most effective job search techniques, and how to develop a resume and cover letter. They developed a resume and cover letter that were evaluated by career center personnel.
4. **Accommodations on the Job**. This module involved identifying appropriate accommodations they might need, learning what employers are required to provide, and Internet resources available regarding accommodations.
5. **Talking to Employers about Vision Loss**. This module provided information about when and how to disclose a vision loss to a potential employer, as well as information from interviews with employers of their views about hiring a person who has a visual impairment.
6. **Interviewing Techniques**. This module helped students prepare for an interview by providing information about what to do before, during, and after the interview. Students also participated in practice interviews.
7. **The Next Steps**. The final module covered creating a career portfolio and included tips for identifying and applying for jobs and volunteer activities.

The revised version of this program is referred to as *Career Advantage for V.I.P.s*, and consists of eight modules (Job Search Techniques and Resume Development was divided into two separate modules). It is available through the authors' website: http://www.blind.msstate.edu/advantage.

interview. The program contact person reviewed the assignments and provided feedback as appropriate. Résumés were reviewed by a career services expert who provided detailed feedback and suggestions.

In addition to their contact with the program contact person, an interactive component was included. The purpose of this component was to develop a sense of group cohesion by allowing interaction among program participants and offering interaction with a peer mentor. A sense of group cohesion was expected to encourage continued participation and reduce dropouts. The peer mentor was a successfully employed person, approximately the same age as participants, who was legally blind. A discussion board on Google Groups was set up for use by program participants, contact persons, and the peer mentor. Participants provided a short autobiography to help them get to know each other and questions were posted each week by the peer mentor, primarily but not exclusively pertaining to the program content.

Participants

Participants were recruited through advertisements in newsletters and on listservs, and through personal contacts with personnel from VR agencies, residential schools, private transition programs, and university disabled student services. Criteria for participation were legal blindness without significant additional disabilities, being a college student approaching graduation or a recent college graduate, currently seeking employment or expectation of seeking employment after graduation, resi-

Table 2. Participant Demographics

Variable	All participants Percent	All participants N	Noncompleters Percent	Noncompleters N	Completers[b] Percent	Completers[b] N
Age						
21–24	61	11	67	6	56	5
25–29	39	7	33	3	44	4
College status						
College student	39	7	44	4	33	3
Recently graduated[a]	61	11	56	5	75	6
Level of vision						
Legally blind	73	13	78	7	67	6
Totally blind	28	5	22	2	33	3
Race						
White	67	12	78	7	56	5
African American	28	5	11	1	44	4
Hispanic	6	1	11	1	0	0
Gender						
Male	56	10	67	6	56	4
Female	44	8	33	4	44	5
Number of jobs						
0–2	56	10	67	6	44	4
3–4	22	4	11	1	33	3
5–6	22	4	22	2	22	2
Total months of experience						
0–6	41	7	44	4	44	4
7–12	24	4	11	1	33	3
13–24	18	3	33	3	0.0	0
25+	18	3	11	1	22	2

[a] This category includes the participant who was currently employed.
[b] This includes all nine participants who completed the program, although one did not have outcome data available.

dence in the United States or Canada, and having basic computer and assistive technology literacy that would enable participation in an online program. A total of 19 youth who met these criteria signed up to participate in the program; an additional youth who had graduated from college and was currently employed, but planned to seek other employment, was allowed to participate in the program. These youth were randomly assigned to receive the intervention in the fall of 2009 or the spring of 2010. A number of them dropped out before officially beginning the program. Fourteen youth began participation in the program, nine of whom completed more than half of the program. Three data points (at least one of which included postintervention data) were available for eight participants.

Demographics are presented for youth who had at least one data point available (preintervention; $N = 18$), and for the subgroups of youth who completed the program ($N = 9$) and those who did not complete the program ($N = 9$; see Table 2). The participants were located across the United States, from California to Massachusetts to Alabama, and in Canada. A majority were male and white. They were in their early to mid-20s, with one exception. The majority of participants were recent college graduates rather than currently in school. Most were legally blind rather than totally blind. Two participants reported mild additional disabilities (both had cerebral palsy). Only one participant reported no work experience, but half had held only one or two jobs. Work experience was defined to include working any number of hours per week. The total number of months of work experience ranged from 1 to 54 (for the participant who was currently working), with a mean of 13.53 ($SD = 13.03$). The majority of youth had less than one year of total work experience. A majority of the participants (55.6 percent) were interested in pursuing careers in the helping professions (e.g., social work, counseling, teaching). Other career interests included accounting, radio, business, and computer-related positions (e.g., programming or web design).

Outcome Measures

Although the ultimate objective of participation in the intervention was to assist youth with visual impairments increase their chances of obtaining employment, intermediate outcome measures were necessary as longer-term follow-up of participants was not possible due to the project timeframe. These intermediate measures were associated with the goals of the intervention, and are also believed to be associated with obtaining employment.

Job-Search Knowledge

Job search knowledge was measured with a standardized instrument, the Job Search Knowledge Scale. This scale consists of 60 true–false items, 12 items on each of the five subscales: identifying job leads, submitting direct applications to employers, writing resumes and cover letters, conducting employment interviews, and following up after the interview. Scores range from 0 to 60. The five scales represent the major areas of job search knowledge and skill needed to be successful in the job market (Dean, 2007). Content validity was provided by expert evaluation, and reliability was established with internal consistency estimates for the five scales ranging from .75 to .91 and test-retest values of .79 to .90 (Dean, 2007).

Self-Efficacy for Career Decisions and Job Search

Self-efficacy refers to a person's belief in his or her capability to perform specific actions or behaviors (Bandura, 1997). Research supports that self-efficacy is believed to influence behavioral choices, performance, and persistence (e.g., Bandura, 1997; Stajkovic & Luthans, 1998). Situation-specific self-efficacy has in particular been found to be a useful construct as it relates to career development (Hackett & Betz, 1991; 1992). Self-efficacy specific to career decisions and job searching was therefore a key outcome for this study. A shortened version of the Career Decision Self-Efficacy Scale (CDSE; Betz & Klein, 1996), with additional self-efficacy items related to the job search process, was used to measure this outcome. Fourteen of the original 50 items of the scale (11 of them from the 25-item shortened version) were used, along with 14 items created for this study. The items taken from the CDSE focused on self-appraisal, occupational information, and goal selection (e.g., Determine what your ideal job would be, Use the Internet to find information about occupations that interest you, Choose a career that will suit your abilities). The items created for the study focused on preparation for job searching, interviewing, and disability-specific items (e.g., Ask friends and relatives for names of people to contact about jobs, Prepare yourself for a job interview, Discuss your vision loss with a potential employer). One item from the CDSE fit with the job search items (Prepare a good resume), and was therefore included in that subscale. These 28 items were rated on a 5-point confidence scale (No confidence at all to Complete confidence), resulting in scores ranging from 28 to 160, with higher values indicating greater levels of self-efficacy.

The CDSE has been used extensively in research, and there is considerable evidence for its reliability and validity (Betz & Taylor, 2006). Internal consistency reliability estimates were calculated for the version of the scale used in this study, using a sample of youth with visual impairments or other disabilities (including study participant responses at time 1, $N = 62$). The alpha coefficient for the entire scale was .94; the coefficients for the CDSE items and the job search items were .90 and .91, respectively.

Locus of Control for Job-Search Activities

Locus of control (LOC) is a belief that one's actions affect life events—ranging from external (event control due to luck, fate, other people, or external circumstances) to internal (event control due to one's own actions) (Rotter, 1966). Those with an internal LOC are more likely to be motivated to take action, as they believe their actions can influence events. An association between LOC and several employment outcomes has been established (see Ng, Sorensen, & Eby, 2006 for a review). The 32-item Job Search Attitude Inventory (Liptak, 2010) was used to measure LOC for job search activities. It is a measure of the motivation level of individuals who are job searching, with a focus on self-directed (internal LOC) and other-directed (external LOC) attitudes. It has four subscales: luck versus planning, uninvolved versus involved, help from others versus self-help, and passive versus active. Agreement ratings made on a 4-point scale yield total scores from 32 to 128. Higher scores indicate a more self-directed attitude, or internal LOC, for job search activities. Expert review provided content validity for the scale. Reliability estimates are adequate (alpha = .85 to .91; Liptak, 2010). We conducted additional reliability assessments with a sample of youth with visual impairments or other disabilities ($N = 48$; study participants plus volunteers) and found total instrument alpha was adequate (.79), but low for subscales. Analyses were therefore limited to overall scores.

Research Design and Statistical Analyses

A true experimental design, the time-lagged crossover design for randomly assigned groups (Shadish, Cook, & Campbell, 2002) or "switching replications design" (Trochim, 2006), was employed. Design diagram showing measurements (O) and intervention (X):

Group 1	O	X	O	O
Group 2	O	O	X	O

Trochim considers it one of the strongest experimental designs. This design has several features that make it preferred over a randomized controlled trial (RCT) in this research context. The design ensures that all participants will eventually receive treatment. It provides considerable information regarding measurement effects, and importantly, because samples are likely to be small, it is uniquely powerful because the treatment effect is evaluated "within subjects," giving the design a substantial power advantage over an RCT where the treatment effect is tested "between subjects" (Jones & Kenward, 1989). The design was implemented by random assignment of participants to receive the intervention either in fall 2009 or spring 2010. Data were collected from each youth three times: either once before the intervention and twice following it (fall group) or twice before the intervention and once following it (spring group).

We used repeated-measures ANOVA to test the hypotheses. We used an alpha level of .10 for statistical significance. A lenient alpha level was selected because of the exploratory nature of the research and to increase power due to the small sample size.

Procedure

Following recruitment, which occurred March through September 2009, 20 participants were randomly assigned to receive the intervention in fall 2009 or spring 2010. Participants completed the initial inventories and demographics in early October via a secure online survey site. Fall participants were engaged in the program mid-October to mid-December, although two participants, by request, received access to online content until January. All participants again completed inventories in late December or early January. Spring participants were engaged mid-January and the program officially continued until mid-March; three participants requested additional time to complete the program. The final set of inventories was completed by all participants in March or April. The content of the program was provided online via a secure website, which required individual user names and passwords for access. The project coordinator received e-mail notification of answers selected when participants completed the CYU items at the end of each module. Program contact people followed up with participants who did not complete assignments to encourage participation.

Results

Ten participants were assigned to each group (fall or spring); of these, nine in each group completed the first set of inventories and indicated that they would participate. Completion status for the fall group was as follows: one person dropped out before starting, four completed half or less of the program, and four completed more than half of the program. Completion status for the spring group was as follows: three people dropped out before starting, one completed less than half of the program, and five completed more than half of the program. Three data points were available for eight of the nine participants who completed more than half of the program content. Discussion board participation was limited, and participants did not use the peer mentor as a resource as intended.

Evaluation of Intervention

The general analysis strategy was to (a) evaluate the intervention effect pre–post across groups combined (Hypothesis 1), (b) evaluate pretesting effects (Hypothesis 2, spring group only), (3) evaluate intervention "persistence" post–post testing (Hypothesis 3, fall group only), and (4) examine if the intervention effect was affected by pretesting. A 2 $\times$ 2 (Pre–Post Intervention $\times$ Semester) mixed ANOVA analysis was employed. Pre–Post Intervention was the within-subjects factor, and Semester was the between-subjects factor [representing repeated pretesting before the intervention (spring) or not (fall)]. A significant main effect for Intervention indicated an overall change in the outcome measures associated with the intervention. A significant Intervention $\times$ Semester interaction indicated that the intervention effect was affected by repeated pretesting.

Job-Search Knowledge

The ANOVA yielded a significant intervention effect, $F(1,6) = 7.81$, $MSE = 6.93$, $p = .03$, partial $\eta^2 = .57$, and no Intervention $\times$ Semester interaction, $F(1,6) = .78$, $p = .41$. Job search knowledge increased pre- to postintervention, Pre M(SE) = 46.20(1.63); Post M(SE) = 50.00(0.94).

To evaluate the effect of repeated pretesting, a repeated-measures ANOVA was conducted on the two preintervention measures available from spring participants: $F(1,4) = 3.61$, $MSE = 3.35$, $p = .13$, Pre1 M(SE) = 46.20(1.46), Pre2 M(SE) = 48.40(1.81). Job search knowledge scores showed a nonsignificant increase of about 2 points with repeated pretesting.

To evaluate intervention effect persistence, the same analysis was conducted on the two postintervention measures available from fall participants. There was maintenance of the intervention effect—no significant change in job search knowledge scores with repeated posttesting, $F(1,2) = .33$, $p = .62$, Post1 M(SE) = 49.0(0.58), Post2 M(SE) = 50.0(2.08).

Self-Efficacy

We examined the total scale, which included career decision items from Betz and Klein (1996) and items we developed related to job searching. We were interested in evaluating the specific effects of our intervention on the career decision and job searching facets of the self-efficacy measure. Thus, we also analyzed the two subscales separately.

Total Career and Job Search Self-Efficacy. The intervention effect approached significance, $F(1,6) = 3.74$, $MSE = 44.56$, $p = .101$, partial $\eta^2 = .38$, with no Intervention $\times$ Semester interaction, $F(1,6) = .60$, $p = .47$. Self-efficacy increased pre- to postintervention, Pre M(*SE*) = 114.93(5.10), Post M(*SE*) = 121.60(3.55).

The effect of repeated pretesting was not significant, $F(1,4) = 1.30$, $MSE = 33.85$, $p = .32$, Pre1 M(*SE*) = 108.0(8.60), Pre2 M(*SE*) = 112.20(7.44). There was not a significant change in total self-efficacy scores with repeated posttesting, $F(1,2) = .75$, $MSE = 2.00$, $p = .48$, Post1 M(*SE*) = 127.00(4.04), Post2 M(*SE*) = 128.00(3.61); therefore the intervention effect was maintained.

Career Decision Self-Efficacy Subscale. The intervention effect was significant, $F(1,6) = 4.38$, $MSE = 23.46$, $p = .08$, partial $\eta^2 = .42$, with no Intervention $\times$ Semester interaction, $F(1,6) = .03$, $p = .87$. Career Decision Self-Efficacy increased pre- to postintervention, Pre M(*SE*) = 52.00(3.11), Post M(*SE*) = 57.23(1.70).

The effect of repeated pretesting was not significant, $F(1,4) = .53$, $MSE = 12.15$, $p = .51$, Pre1 M(*SE*) = 49.40(4.71), Pre2 M(*SE*) = 51.00(4.44). Also, there was maintenance of the intervention effect—no significant change in career decision self-efficacy scores with repeated posttesting, $F(1,2) = 4.00$, $MSE = .17$, $p = .67$, Post1 M(*SE*) = 58.67(1.20), Post2 M(*SE*) = 58.00(1.53).

Job Search Self-Efficacy Subscale. The intervention effect was not significant, $F(1,6) = 0.77$, $MSE = 9.96$, $p = .418$, partial $\eta^2 = .114$, and no Intervention $\times$ Semester interaction, $F(1,6) = 1.88$, $p = .22$. Job Search Self-Efficacy did not increase enough pre- to postintervention to be statistically significant, Pre M(*SE*) = 62.96(2.44), Post M(*SE*) = 64.37(2.04).

The effect of repeated pretesting was not significant, $F(1,4) = 2.64$, $MSE = 6.40$, $p = .18$, Pre1 M(*SE*) = 58.60(4.40), Pre2 M(*SE*) = 61.20(3.51). The intervention effect was maintained, with no significant change in job seeking self-efficacy scores with repeated posttesting, $F(1,2) = 1.92$, $MSE = .2.17$, $p = .30$, Post1 M(*SE*) = 68.33(3.28), Post2 M(*SE*) = 70.00(2.31).

Locus of Control for Job Search Activities

The intervention effect was significant, $F(1,6) = 7.84$, $MSE = 23.66$, $p = .03$, partial $\eta^2 = .57$, with no Intervention $\times$ Semester interaction, $F(1,6) = 0.42$, $p = .54$. Job Search LOC increased pre- to postintervention by approximately 7 points, Pre M(*SE*) = 96.43(1.84), Post M(*SE*) = 103.47(1.99).

The effect of repeated pretesting was not significant, $F(1,4) = 0.06$, $MSE = 14.40$, $p = .82$, Pre1 M(*SE*) = 94.60(3.34), Pre2 M(*SE*) = 95.20(1.72). Also, there was maintenance of the intervention effect—no significant change in job seeking self-efficacy scores with repeated posttesting, $F(1,2) = 0.09$, $MSE = 44.67$, $p = .79$, Post1 M(*SE*) = 106.33(1.86), Post2 M(*SE*) = 108.00(3.61).

Summary of Intervention Findings

Considering the four measures, three showed significant effects associated with the intervention with just eight participants. The average partial η^2 was .41 for all four measures—a *large* effect size. No significant effect of repeated pretesting was found on any measure, although there were some increase trends from the first to second pretest: three of the five participants consistently scored higher at the second pretest, whereas two did not. There was no reduction in the post-posttest scores on any measure, meaning that the gains obtained following program participation were maintained.

Discussion

We have provided a description of a new online employment preparation program created for college students and recent graduates who are blind or visually impaired, and an empirical evaluation of its effectiveness. In addition, we have illustrated use of a research design and procedure uniquely well suited for a small-sample context (typical with this population) that allows everyone to participate. Results clearly and strongly support the effectiveness of the intervention in increasing job search knowledge, self-efficacy (for career decisions), and job search locus of control in the context of a true experimental design. Repeated pretesting with the outcome measures showed nonsignificant trend increases in job search knowledge and self-efficacy. Our post hoc speculation is that exposure to questions related to job search knowledge and efficacy issues related to specific behaviors may trigger increased awareness, knowledge seeking, and self-assessment cognitions that have positive consequences for specifics of employment preparation. Such possible effects will need confirmation by replication with a larger sample, but those adopting the intervention should be aware of this possibility. The effect of the intervention was clearly maintained over time, without any decrease in outcome measures 2 months post-intervention. Again, there were increased trends that, speculatively, suggest continued cognitive involvement.

Returning to intervention effects, job search self-efficacy was the only outcome measure that did not show a statistically significant increase. A ceiling effect may be possible: the measure level was high at pretest (84 percent of maximum). Also, several participants did not complete the entire program, and the content associated with these items was primarily covered in the second half of the program.

Mechanisms of Effectiveness

The intervention components and content addressed deficits related to knowledge of the work world and job search issues. Additionally, we addressed motivational and efficacy components that have relationships to employment outcomes. Thus, increases in the three outcomes measures are expected to result in better chances of obtaining employment: increased sense of control, or internal LOC for job searching, should be associated with greater motivation for searching for a job and willingness to continue searching in the face of adversity; higher job search knowledge should be associated with a more effective and informed job search; higher self-efficacy also should foster increased attention, heighten and sustain efforts, and increase persistence in job search activities.

Problems, Challenges, and Modifications

These results indicate that participation in the program resulted in positive outcomes, with completion of five or more weeks of the content. A major challenge to implementation of the intervention was dropout from the program, either prior to its start or after the first few weeks. Of the 20 youth who originally signed up to participate, 9 completed more than half of the program. Examination of differences in job-related self-efficacy levels between participants prior to implementation indicated that youth with lower levels of self-efficacy—who might benefit most from the program—were less likely to even attempt participation. This may speak to the difficulties of involving this population of youth with visual impairments in *any* such employment preparation program. Self-reported reasons for dropout varied, but the majority indicated it was due to reasons not related to the program: time constraints (e.g., got too busy with school, then was too far behind to continue) or personal issues (e.g., personal illness, illness or death in the family). Another challenge, and one that contributed to some of the dropout, was inability to complete the program in the eight-week time frame. Thus, time demands and lack of flexibility in terms of timeline for completing modules contributed to dropout. In terms of demographic differences between completers and dropouts (non-completers), only a few differences were noted (i.e., race and gender; see Table 2). These apparent differences were not statistically significant.

The program was offered in an eight-week time frame to allow for group interactions among participants, with the goal of developing a sense of community and offering peer support, both through the peer mentor and the other participants. However, because participation in the discussion boards was limited, a sense of group cohesion did not develop and participants had very limited interactions with the peer mentor. Feedback from participants (including dropouts) indicated these components were not found to be particularly valuable. This, along with the difficulty several participants had in completing the content in the eight-week time frame, led to a program revision that eliminated the group interaction and peer mentoring aspects and made the program available online in a modular, self-paced format. The complete revised program is now freely available from the authors' website (http://www.blind.msstate.edu/advantage).

Limitations

Even though strong intervention effects were obtained, the small sample size limited use of conventional standards for statistical significance. The sample size poses limits on generalizability, in that findings may be idiosyncratic to our small sample, yet effects were quite strong. Additionally, participant attrition may have operated to select the most motivated participants. Of course, self-selection bias may be an issue, as it always is in elective program participation.

Conclusion

This article presents the first empirical evaluation of an employment preparation transition intervention for college students and recent graduates with visual impairments. This program was developed to address the problems in obtaining employment many of these college graduates face. Dropout from the program was a substantial problem, which indicates that self-motivation is a prerequisite for participation in an online program such as this. Current evidence strongly supports intervention effectiveness for our "completers"; replication employing the new revised program along with the modular, self-paced format should provide the flexibility needed for a broader spectrum of youths and young adults with visual impairments to benefit from the program.

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Considerations in Adapting Alternate Assessments for Students with Visual Impairments

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Abstract

This article describes a test item-review simulation of a performance-based alternate assessment. Two experts in visual impairment conducted the item review. Outcomes from this item-review process, in conjunction with analyses of performance and accommodation use from a larger study, guide a list of considerations that item-review teams and test developers should contemplate for students with significant cognitive disabilities and visual impairment who are taking alternate assessments. The study findings are also relevant to test administrators who are involved in adapting alternate assessments for students with visual impairments. Unique factors that must be considered for different types of accommodations are discussed, including the need to analyze how adapting a test item into another sensory mode affects the difficulty, clarity, and memory load requirement of a test item.

Keywords: alternate assessment, visual impairment, blind, accommodations, severe cognitive disabilities

Introduction

Applying universal design for learning principles to assessments ensures that intended constructs are measured, that the diversity of the assessment population is considered, that text is readable by the broadest range of individuals, that testing formats and visual elements of such tests are clear, and that allowable changes to the format do not alter the meaning or difficulty of the test items (Thompson, Johnstone, & Thurlow, 2002). In creating a universally designed assessment, both the physical layout of the tests and students' opportunities to learn the constructs being tested are also important considerations (Johnstone, Thompson, Bottsford-Miller, & Thurlow, 2008; Ketterlin-Geller, 2005).

While the application of universal design for learning principles can reduce issues of

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bias or validity in exams, such guidelines do not necessarily replace the need for accommodations for students with visual impairments and will not be the "cure" for accessibility for all students (Thompson, Johnstone, Anderson, & Miller, 2005). In fact, some elements of universal design that are meant to improve accessibility might make test items *less* accessible for some students (Thompson et al., 2005; Allman, 2004). Evaluation of test items for bias often occurs by convening expert item-review teams (Johnstone et al., 2008; Thompson et al., 2005). Considerations of universal design for learning principles provide one framework that can guide the item reviews (Johnstone et al., 2008). In addition, reviewers need to understand the purpose of each test item, the extent of allowable accommodations, and the characteristics of the intended test takers. They should also have access to test instructions, as well as to test items, and should see the test items in their original format and order (Johnstone, Altman, & Thurlow, 2006).

For assessments that will be taken by students with visual impairments, expert item-review teams should include individuals with expertise in visual impairment who can consider whether braille, large print, or aural format changes will alter the meaning or difficulty of the test items (Allman, 2004; Johnstone et al., 2005; Knowlton, Seeling, Martin, & Archer, 2003). They should also consider test graphics and whether such visual elements can be recreated tactually and still be meaningful to test-takers with visual impairments (Knowlton et al., 2003). Most of the literature on the use of expert item-review panels and item bias refers to standard large-scale assessments, and is not specifically applicable to alternate assessments. Alternate assessments, which target students who have significant cognitive disabilities, demand unique considerations, since all students taking the assessments have disabilities but are very heterogeneous in their accommodation needs. Students with visual impairments and significant cognitive disabilities are likely to have unique accommodation needs, depending on their cognitive level, their mode of communication, and the components used within functional literacy instructional programs. For example, alternate assessments for most students who are prereaders invariably use pictures instead of print in their test items; for students with visual impairments plus significant cognitive disabilities, picture-based accommodations and adaptations present particular challenges. The purpose of this article is to describe additional considerations that are required for determining accessibility and bias for test items on alternate performance-based assessments for students with visual impairments and significant cognitive disabilities. Recommendations are based on the procedural outcomes from an item-review simulation (described in this article) and additional performance and accommodations data from the same set of test items investigated in the larger study (see Zebehazy, Zigmond, & Zimmerman, 2012a; 2012b).

Method

Context

The focus of the investigation presented here was on whether accommodations for test items that are intended to increase accessibility for students with visual impairments and significant cognitive disabilities also, inadvertently, change the intent or difficulty of the test items, and whether such instances could be easily identified by a test item-review team—one of the most common forms of review prior to an assessment being approved for use with students. The item-review simulation focused on test items were the Level A grade 3/4 and Level A grade 7/8 of the Pennsylvania Alternate System of Assessment (PASA, n.d.) in reading and mathematics.

PASA is a performance-based alternate assessment taken by students with significant cognitive disabilities who cannot meaningfully take the annual spring standard Pennsylvania accountability assessment. Level A is the most basic level of the PASA; Levels B and C at each grade level contain increasingly more difficult and abstract test items. In Level A, PASA *reading* is defined as "getting information." "Reading" items at grade 3/4 A involves manipulating objects to perform prereading skills such as matching, selecting items by name, selecting items by category, finding an object of similar function, and answering basic listening comprehension questions. Grade 7/8 A "reading" skills are very similar, except that pictures are used in place of objects. In math, 3/4 A and 7/8 A include skills of selecting biggest/smallest and longest/shortest, matching by same number in a set or by size (area or volume), finding heaviest/lightest, differentiating money from other items, and selecting an item used for telling time. In 2005, Level A was taken by 76% of students with visual impairments and significant cognitive disabilities.

Reviewers

In order to simulate the likely situation of expert item-review teams that would include only one or two people in visual impairment, if any, two experts in visual impairment were selected for this review. They were charged with reviewing the PASA test items and determining what factors should be considered when making accommodations or adaptations for students with visual impairments plus significant cognitive disabilities. Both experts had significant experience with children with visual impairments. One was a recognized expert in literacy for students with visual impairments; the other had considerable training and experience working with students with visual impairments who have multiple disabilities, including deaf-blindness.

Process

The selected process for the review was designed to simulate the information that would be provided to item reviewers on a team and the consensus process that might take place on these review teams. Each expert independently reviewed each of the 20 test items in the 3/4 and 7/8 Level A PASA reading and math assessments, using a set of instructions that established the context for their reviews. The instructions included information about PASA, scoring procedures, instructions on how to carry out the reviews, and directions for using an Excel spreadsheet to record their responses.

The test items were provided in their regular format ("as is"), in the order in which they occurred in the assessment, and with a description of the skill being measured for each. Using these instructions, the reviewers considered each test item "as is" for students at three levels of functional vision: students who use vision for most tasks (V), students who use a combination of vision and other senses for most tasks (CV), and students who use other senses in place of vision for most tasks (NV). The reviewers flagged those items they felt might function differently or be inaccessible for those groups of students. Then, they considered each item under accommodated conditions at each level of functional vision and decided whether the accommodated item "functioned" differently (e.g., was easier, harder, changed intent, etc.). When conducting the second portion of the review, reviewers specified the type of accommodations they were considering. Specific accommodations were not disclosed to the reviewers, since PASA, in the year reviewed, left accommodations and adaptations of items for students with visual impairments up to the test administrators. In addition, a wider range of accommodations, given the heterogeneous needs of students with significant cognitive disabilities, is a reality in alternate assessments.

The two independent reviews served as catalysts for two follow-up meetings of the reviewers and the researcher (first author). The purpose of the meetings was to arrive at consensus (such as may be done by an item-review team), to discuss the particular issues and considerations surrounding the accessibility of performance-based alternate assessment test items for the target populations, to summarize conditions under which a test item would be problematic for students with visual impairments, and to discuss challenges in coming to conclusions about items that might be biased. The researcher (first author) guided the discussions, posed questions, and recorded the comments and decisions of the expert reviewers.

Results

Flagging a single set of items that might be problematic for students with visual impairments was challenging. Both reviewers felt that whether a test item was accessible and measured the intended skill depended on a wide variety of circumstances, including the student's level of experience and the types of accommodations made. This challenge encountered by the expert reviewers in this simulation was also found in another context by Zebehazy, Zigmond, and Zimmerman (2012b) in the larger study. Twenty-two teachers of students with visual impairments who reviewed videos of the Level A PASA alternate assessment (the same assessment the item reviewers examined) for accommodations varied in their opinions about whether a specific accommodation selected for a student changed the intent on each specific test item. Teachers of students with visual impairments and the researcher only came to a 20% agreement for items flagged as problematic.

Initial Independent Review

Despite working from the same set of instructions, the two reviewers took very different approaches to the independent review. When reviewing the items "as is" (i.e., before accommodations), Reviewer A took a very literal perspective. She flagged as problematic, for the students with significant cognitive disabilities and CV or NV levels of functional vision, any items for which there were no explicit directions in the instructions on how to develop a nonvisual way of administering the test item. This resulted in her flagging every item except those comparing weights (i.e., which object is heaviest/lightest) on the 3/4 and 7/8 math tests. Directions for these items explicitly instructed the test administrator to have the student pick up each object to gauge its weight. In contrast, Reviewer B flagged fewer "as is" items because she assumed that the test administrator would allow (perhaps even encourage) the student to touch the materials if needed, even if that direction was not explicitly given in the test item instructions. Similarly, Zebehazy et al. (2012b) reviewed accommodations data and reasons for score differences for the test items that were statistically flagged as functioning differently for students with visual impairments. The qualitative logical analysis indicated that the manner of presentation and the amount of reorientation provided by the test administrator could be a contributing factor to differences in scores. This finding supports item reviewers who attended to the manner of presentation of a test item, and highlights the need for item reviewers to know whether or not test administrators are allowed to stray from the designated "script" when presenting items or if it is likely they will follow the test items exactly as indicated.

The item reviewers agreed that the assessment for both grade levels and in both subjects should have been accessible "as is" to most students at the V level of functional vision, given that PASA test items adhere to principles of universal design for learning and use large print and large, bold pictures. In addition, they both agreed that all items in the 7/8 reading test, in which the "as is" version requires selecting the correct picture from a choice of three pictures, were inaccessible to students in the NV level of functional vision group. The reviewers' assumption in part appears true, based on the performance findings of Zebehazy et al., (2012b). In the year in which the tests were administered, V-group students scored significantly better than the CV and NV students. However, there were still some items flagged as functioning differently for the V group (see Zebehazy et al., 2012b, for specific details).

The two reviewers also took slightly different approaches when considering test items under accommodated conditions. This was most apparent within their reviews of the 7/8 Level A reading test. Reviewer B assumed that teachers would use context flexibility and automatically substitute real objects for pictures, while Reviewer A considered using tactile symbols for picture-substitutions in many of the test items or kept the context standard. Consequently, Reviewer B did not flag any accommodated items for students in the CV or NV groups, while Reviewer A flagged all the items as potentially harder for the NV group and seven of the items as potentially harder for the CV group, depending on the testing circumstances. This difference in rating highlights the importance of test item–review teams who understand the typical accommodations that may be used and can consider all possibilities. In this test year, Zebehazy, Zigmond, and Zimmerman (2012a) report that using objects in place of pictures was one of the most frequently employed accommodations, and noted very few instances of in which tactile symbols or simple tactile pictures were used.

Results after Conferencing

After their initial independent reviews, the experts were asked to reconsider accommodated versions of test items for students at the CV and NV levels of functional vision if context could not be changed (e.g., replacing a couch and chair picture for "selects similar function" with different objects like a brush and comb). They discussed different accommodation possibilities such as substitution of objects for pictures, use of tactile symbols, use of simplified pictures, etc. After the meetings, the experts highlighted four test items in the Level A PASA math that may be problematic. The items corresponded to the following item types: finds item that "shows time," identifies result of addition or subtraction, "finds money," and matches digital time. In Level A PASA reading, six items that might be problematic were flagged within the following item types: selects category, selects by function, selects similar function, answers comprehension question by selecting objects/pictures, selects related items, and selects item named.

The individual test items flagged within these item types were based on features that those items contained. For example, the reviewers flagged test items for which incidental learning could not be assumed for students with visual impairments and in which natural direct experience might be less likely. They also flagged items for which picture substitution would likely involve the use of "miniatures," since miniatures often do not provide enough tactual differentiation for nonvisual discriminations. Table 1 summarizes the common features of the items that were flagged. Some of the flagged items shared some similar features.

The item reviewers' selections and considerations did correspond, in part, to a differential item-function analysis conducted on these Level A test items (Zebehazy et al., 2012b). Two of the four math item types were flagged by the item reviewers ("shows time" and "finds money"). Four of the six reading item types flagged by the item reviewers (selects similar function, answers comprehension questions by selecting objects/pictures, selects related items, and selects item named) were also statistically flagged once or more than once, depending on grade level, functional vision level, and specific item makeup (see Zebehazy et al., 2012b, for specific details).

Discussion

It is not standard practice to analyze alternate assessment test items statistically for bias for students with significant cognitive disabilities and visual impairments or to look at performance specifically for these students. Often, the only review that may occur is through the item-review team pro-

Table 1 Features of Items Reviewers Felt Might Be Problematic

Considerations Resulting in Items Flagged by Expert Reviewers	Visual Impairment Groups Affected (V, CV, NV)	Examples of PASA Test Item Types for Which Students May Need Accommodations
Context or target items outside the experience of students with VI	All, but especially CV and NV	Selecting a wall clock for "what shows time;" matching a coloring book and a notebook as similar items
Objects substituted for are not easily identifiable by touch	NV, and some CV	Differentiating among plastic miniature figurines to a "who" listening comprehension; recognizing plastic or foam objects as "fruit"
Setup too spatially elaborate; multiple comparisons or the inability to view all items at once hinders understanding	All, but especially CV and NV	Selecting one of three boxes containing objects representing the category of a target object; finding a set of items the same size as a target set
Distractor too similar either tactually or visually	All, but especially NV for tactual comparisons and some CV	Selecting "the money" (a dollar bill) from three choices that include a paper receipt; selecting "find the plate" from three object choices that include a plastic plate and a plastic Frisbee
Intended underlying construct not relevant to students with VI and SCD	All, especially CV and NV	Matching printed digital times for students with not enough vision to see a digital clock; interpreting complex pictures
Aural presentations of items lack contextual support (e.g., supporting pictures) and increase memory load (remembering all choices)	CV and NV	Responding to the question "where would you find swings" after providing aural labels or descriptions of three scenes depicted in complex pictures
Using students' tactile symbol systems to represent objects	NV, and V and CV if using symbol systems	Selecting "which one is used to dry off" from among three familiar tactile symbols [functionally, tactile symbols represent a location or action; a symbol with a piece of towel likely means "bath time" or other routine, not towel]
Replacing pictures with objects/miniatures that make interpretation of the context difficult	NV and some CV	Selecting the category "things you ride in" when the choices use toy animals to represent animals and toys/miniature cars and trucks to represent vehicles [although one cannot ride in either a toy-sized car or a picture of a car, the former requires a greater degree of abstract understanding]; using objects (e.g., ball = playground) to represent locations depicted in complex pictures to answer "Where would you find swings?"

VI = visual impairments; SCD = severe cognitive disabilities; V = students who use vision for most tasks; CV = students who use a combination of vision and other senses for most tasks; NV = students who use other senses in place of vision for most tasks (NV).

cess. This investigation, using two experts in the field of visual impairment, simulated an item review in order to highlight procedural components that may be helpful, as well as to indicate considerations in trying to decide if test items can be fairly accessed and interpreted in the same way for students with significant cognitive disabilities and visual impairments as for other students taking the alternate performance-based assessment.

The different approaches taken initially by the reviewers highlight the need to provide item-review teams with as much information as possible regarding the actual practice of administering the assessment, to build in universal design for learning features, and to distinguish between allowed versus typically used accommodations by the population of students for which the items are being reviewed. It also highlights the importance of coming to consensus.

Comparison of the process and considerations used by the item reviewers in this simulation to some of the findings from the larger studies on the same test items (Zebehazy et al., 2012a; 2012b) revealed some parallels in assumptions the reviewers made based on their knowledge of the population with the actual performance and accommodation findings of the students with visual impairments who took the assessment, which is promising. However, the item review is based on opinions (albeit those of experienced experts), so decisions would be enhanced when a combination of methods is used to ensure fairness and interpretability in alternate assessments for this population of students, who are often not the main concern of test developers.

Results from this study and the larger studies led to the creation of an adapted version of the PASA for students who cannot visually access pictures or print. This adapted version has been available for Pennsylvania test administrators for several years, and incorporates consideration of the emerging questions, principles, and considerations described in this article (see PASA, n.d.). Future research, analyzing the effectiveness of adapted versions specifically for students with visual impairments and significant cognitive disabilities, such as the one for PASA, would further enhance our understanding of alternate assessment accessibility. In addition, regular performance analyses on the part of test developers for this population of students would be beneficial, although sample size is often an issue in using standard statistical analyses.

Overall, the expert item-review simulation raised interesting questions regarding adapting and interpreting results of alternate performance-based assessments for students with visual impairments and significant cognitive disabilities. The questions posed by the item reviewers underscore how little we actually know about the equivalency of presentation formats when adaptations are made from one sensory modality to another, particularly for students with comorbid disabilities. For example, reviewers considered the use of tactile symbols, which in that test year were employed very rarely (Zebehazy et al., 2012a). They questioned whether by using objects as symbols, test administrators had changed the nature of the skill being assessed. They wondered whether the learning progression in “reading,” which consists of moving from objects to abstract symbols to braille for students with visual impairments, is equivalent to the progression from objects to pictures to complex pictures to text for students without visual impairments. They asked whether functionality took precedence over the theoretical learning progression of concrete to abstract in determining the sequence of skill instruction. They questioned whether item difficulty depended on student familiarity with distractor choices; whether objects or tactile symbols functioned as well as pictures to support memory for choices; whether having to remember what symbols stand for or to remember that an object, which also has a literal meaning, also stands for an event helps or hinders memory load and contextual understanding. Currently, very little research guides answers to these questions; functional literacy and numeracy assessment, as well as instructional practices for visually impaired students with significant cognitive disabilities, need much further investigation.

Based on procedural results of the expert item-review simulation discussed here in conjunction with results from the larger studies (Zebehazy et al., 2012a; 2012b), the following are recommendations for test item developers and item-review teams as they consider the accessibility of performance-based alternate assessments for students with visual impairments and significant cognitive disabilities:

1. Include an expert in the area of visual impairment on the item-review team for alternate assessments. That person, ideally, should also have extensive experience with students with significant cognitive disabilities.
2. Examine each test item from the per-

spective of students with different levels of functional vision. The degree of, and how a student uses, vision will impact access to visual material and will factor into incidental learning opportunities. Also consider the impact that the combination of significant cognitive disabilities and visual impairments has on experiential opportunities.

3. Consider the memory load that may accompany accommodations that remove picture/object supports for comprehension questions and replace them with aural presentations. Will students with visual impairments and significant cognitive disabilities understand the labels for answer choices or descriptions of pictures when they are only presented aurally?
4. Consider logistical aspects of item presentation, including the amount of material and spatial requirements. Will the layout, types of comparisons, or materials be impacted when a student cannot view everything at once? Do the instructions to the test administrators specify allowing students to tactually explore items, and do they suggest a reasonable organization of the items (e.g., use of a divided tray to create a predictable space for answer choices)? Do the instructions allow the test administrator to reorient the student to the items before answering?
5. Consider meaningful learning progressions for students who are not accessing test items visually. Tactual symbol systems are very individualized and require prior exposure to them for functional use. Will the use of tactile symbols be meaningful within the context of a novel test item, or does the test item lend itself to use by the student's own symbol system?
6. Consider the tactual qualities of the testing materials used. Can objects be discriminated tactually as well as visually? Are materials sturdy enough to allow tactual manipulations and comparisons (e.g., math materials where comparisons need to be made by size, etc.)? Do the tactual qualities match the intent of the question (e.g., is texture consistent when size is being compared or is texture very different when differentiation of objects from each other is important)?

Universal participation in statewide accountability systems through alternate assessments can be made more meaningful to students and more interpretable to test administrators if we are conscientious about taking students with significant cognitive disabilities and visual impairments into account when designing alternate assessments and considering the impact on assessment interpretation. Attending to visual impairment within the test item review process, along with future research that specifically investigates access barriers to test items that regularly are discussed in item reviews, are two ways to begin to improve our understanding of assessing this population of students.

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