

**The Journal  
of the  
International Association  
of  
Special Education**



*Official Journal  
of the  
International Association of Special Education*

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## Note from the Editor

I am excited to welcome you to the 2014 edition of the JIASE. This edition covers a variety of special education topics including co-teaching, school consultation, autism spectrum disorders, hearing impairment, ADHD, and intellectual disabilities. Also featuring in this edition are two *PRAXIS* articles focusing on how to improve response rates among students with orthopedic and multiple disabilities and how to use multisensory learning experiences to strengthen student learning. I hope you will enjoy each of the articles in this edition as much as I have and find them useful for your research and/or practice.

As always, I seize this opportunity to acknowledge all those who contribute to this publication. These include the authors, the editorial team, and the Department of Counselling, Psychology, and Special Education at Duquesne University; without their support this publication would not have been possible.

I would also like to take this opportunity to invite IASE members from different countries who may be interesting in becoming consulting editors. If this applies to you, please send a brief letter of interest and curriculum vita to me via email ([chitiyom@duq.edu](mailto:chitiyom@duq.edu))

Let me conclude by reminding you of the 14<sup>th</sup> biennial conference of the IASE to be held in Wroclaw, Poland, from June 21<sup>st</sup> to June 25<sup>th</sup>, 2015, under the following theme “*new dimensions toward education, advocacy and collaboration for individuals with special needs.*” The deadline for submission of proposals is October 1<sup>st</sup>, 2014. Please visit the IASE website ([www.iase.org](http://www.iase.org)) for more information about the conference.

Sincerely,

Morgan Chitiyo, Editor

# Results of Co-Teaching Instruction to Special Education Teacher Candidates in Tanzania

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## Abstract

*This mixed-method descriptive pilot investigation addressed co-teaching as an inclusive school practice for special education teacher candidates at Sebastian Kolowa Memorial University (SEKOMU) in Tanzania. The investigation results, though preliminary, indicate that course content and instruction in co-teaching had a positive impact on the post-course knowledge of the 101 participants in this convenience sample in terms of increasing their knowledge and awareness of this inclusive school's practice for students with disabilities. Participants were positive about the future use of co-teaching and collaboration in their schools. At the time of this investigation, SEKOMU was offering the first university-level special education teacher preparation program in the history of Tanzania. This pilot investigation is a positive contribution to teacher preparation efforts in Tanzania and supports ongoing research and evidence-based practices to meet educational needs of students with disabilities.*

Students with disabilities across Africa have not been given proper planning or organizational orientation and/or funding commitment (Abosi, 2007; Kurtz & Shepherd, 2011; Obiakor & Afolayan, 2012). Teacher training and recruitment is critical to effective special education in Africa where students with disabilities frequently live in isolation (Abosi, 2007; Stone-MacDonald, 2012). Inclusion of students with disabilities in the general education setting has international relevance for the continent of Africa in the 21<sup>st</sup> century (Mukhopadhyay, 2013; Ntuli & Traore, 2013; Winzer & Mazurek, 2009). Sun (2007) reported that children with special needs, regardless of disability, improved their likelihood for post-school independence as a result of increased participation in the general education setting. Stone-MacDonald (2012) highlighted the challenges facing students with disabilities in Tanzania, where less than one percent in the eligible age ranges attends school. Sebastian Kolowa Memorial University (SEKOMU) in Lushoto, Tanzania, founded in November 2007, offered one of the few university-level special education teacher preparation programs in Tanzania. One of the three overarching institution goals of SEKOMU is to expand the quality and accessibility of educational services for individuals with special needs in the Tanga Region. To help reach that goal, the SEKOMU administration requested that the investigators teach a course on classroom management that would integrate co-teaching content and model co-teaching instruction delivery to prepare special education teachers to use inclusive practices for students with disabilities.

## Co-Teaching

Co-teaching brings the expertise of two teachers together in one classroom. It is an instructional delivery model for special and general education teacher preparation that is supportive of students with disabilities receiving instruction in inclusive environments (Friend, 2007; Kamens, 2007; Murawski, 2006). Co-teaching results in improved program intensity and continuity through reduction in the student-teacher ratio and increased student participation (Cook & Friend, 1995; Dieker, 2001; Friend & Cook, 2004; Murawski, 2006; Rice, Drame, Owens, & Frattura, 2007). Implementation of co-teaching structures has also been reported to reduce the stigma for students with special needs (Cook & Friend, 1995; Dieker, 2001; Friend & Cook, 2004; Walther-Thomas, 1997). Fundamental to the success of co-teaching models in school settings are teacher preparation programs that prepare general education and special education teacher candidates for their roles of working together to show knowledge, skills, and dispositions to collaborate (Conderman & Johnston-Rodriguez, 2009; Winn & Blanton, 2005).

Walther-Thomas (1997) highlighted four benefits for students associated with co-teaching: (a) positive feelings about themselves as capable learners, (b) enhanced academic performance due to more time and attention from the teacher, (c) improved social skills, stronger peer relationships, and (d) improved classroom communities. Teachers reported increased support through use of co-teaching since they can share unique perspectives and strengths with each

other (Cook & Friend, 1995; Dieker, 2001; Friend & Cook, 2004; Walther-Thomas, 1997). The positive learning environment created by co-teaching is due to the fact that in co-taught classrooms teachers tend to vary their instruction, which benefits students who have different learning styles so that virtually no time is spent on managing behavior (Dieker, 2001; Murawski, 2006; Scruggs, Mastropieri, & McDuffie, 2007; Spencer, 2005). Kloo and Zigmond (2008) reported that co-teaching is a service-delivery model for students with individual education plans to get the necessary support that they need to function successfully in general education classrooms. In a co-taught structure, no student is singled out, the whole class gets assistance, and this can help reduce the stigma of getting extra help.

Mastropieri, Scruggs, Graetz, Norland, Gardizi, and McDuffie (2005) drew general conclusions about the experience of co-teaching from their findings of four co-teaching case studies: (a) upper elementary and middle school earth science, (b) middle school social studies, (c) high school world history, and (d) high school chemistry. Academic content across the four case study content areas did not have a significant influence on co-teaching success. However, the interaction of the course content and teacher knowledge did influence co-teaching. Mastropieri and colleagues found that when the co-teachers got along and worked well together, students with disabilities were more likely to be successful and have positive experiences.

Scruggs and colleagues (2007) conducted a meta-synthesis of qualitative research on co-teaching. Ten out of 32 reports of qualitative research specifically targeted outstanding examples of co-teaching for investigation. Teachers reported that they benefited professionally from co-teaching experiences including an increase in (a) content knowledge, (b) classroom management, and (c) curriculum adaptation. Students without disabilities were reported to show increased cooperation and experience a positive social model from teachers in co-taught, inclusive classrooms. Students with disabilities received additional attention and support to meet their academic and social needs than what would have been available from a solo general educator taught classroom (Scruggs et al., 2007).

### *Purpose of the Study*

This pilot investigation included intent to increase understanding of the impact of instruction on co-teaching as an inclusive school practice on special education teacher candidates at SEKUMU in Lushoto,

Tanzania. The investigation was integrated into the course *Classroom Administration and Management in Inclusive Classes* taught by project investigators at SEKOMU. The course was designed to develop special education teacher candidates' knowledge and skills to translate learning-teaching theories into meaningful classroom practices for effective learning. The SEKOMU administration requested the investigators (who were also the course instructors) present co-teaching content in the course. The investigators sought to establish a process to educate and assess the special education teacher candidates' understanding of the concepts of co-teaching, inclusion, and inclusion practices relevant to the field of special education in Tanzania.

## **Method**

### *Participants*

The investigators used convenience sampling in that the study participants (n = 101) were enrolled in the course *Classroom Administration and Management in Inclusive Classes* taught by investigators at SEKOMU in Lushoto, Tanzania. Fifty-eight percent of the special education teacher majors were male and 42% were female. Participants ranged in age from under 25 years (16.8%), 25-30 years (14.9%), 31-36 years (36.6%), 37-41 years (10.9%), and to over 41 years (20.8%). Thirty percent of the participants reported that a high school diploma was the highest degree completed. Forty-nine percent reported having completed a bachelor's degree, while 3% had a master's degree, 17% had a specialist degree, and 1% had completed a doctorate. More than two-thirds of the participants (70.3%) reported they had 0-4 years of experience in special education, 20.8% reported 5-9 years of teaching experience, 5% had 10-14 years of experience, while 2% reported 15-20 years and over 20 years of experience, respectively.

### *Teaching Activities*

This mixed-method descriptive investigation was integrated into the course *Classroom Administration and Management in Inclusive Classes*. This course was taught by project investigators for six hours daily over a 10-day period at SEKOMU. The intended outcome of this required special education teacher preparation course at SEKOMU was to develop participants' capabilities in organizing classroom practices for effective learning and teaching, including approaches that enhance inclusive education.

This investigation received approval from the three participating institutions, the administration at SEKOMU, as well as the Institutional Review Boards at Kansas State University and Central Michigan University. The investigators used co-teaching philosophy to plan all aspects of the course and project. They also used co-teaching structures onsite at SEKOMU to teach and disseminate all course content to participants, emphasizing co-teaching equity and collaboration.

The research team began by explaining all components to the course participants and securing confidential informed consent during the first morning session of the course. Completion of the research instruments was voluntary. All course participants received course content regardless of their consent to participate in the study. Participants could also withdraw themselves from the research investigation after initially indicating consent and still receive all course content. To ensure confidentiality, participants' responses were coded using a preselected 3-digit number listed on each instrument. The investigation concluded on the last course day with participants completing post-assessment research instruments.

Each participant received a pre-developed course pack that included content on the foundations of co-teaching as well as examples of all basic co-teaching structures. The project investigators started each day with the structure of classic co-teaching. Throughout the course the investigators modeled and actively arranged course participants into the additional co-teaching structures: (a) One Teach, One Observe, (b) Parallel Teaching, (c) Alternative Teaching, (d) Station Teaching, (e) Classic Co-Teaching, and (f) One Teach, One Support.

The project investigators used a co-teaching format to lead content dissemination on: (a) inclusion, (b) stages of a lesson plan, (c) differentiated instruction, and (d) a review of 13 special education disability categories. Course participants were given 22 different student profiles representing different learning challenges in the areas of (a) reading, (b) math, (c) behavior, (d) language and written expression, (e) communication, (f) independent living, and (g) motor skills. The investigators continued their collaborative teaching arrangement to present the foundation of co-teaching to the course participants as an inclusive school best practice structure to differentiate instruction and accommodate students' needs. The investigators co-taught: (a) general definition and foundation of co-teaching, (b) co-teaching structures, (c) guidelines for effective co-teaching, and (d) principles of effective co-teaching communication. During the dissemination of this content, the project

investigators implemented experiential learning to include course participants in each of the six co-teaching structures. The course participants collaborated to review student profiles and discuss strategies to differentiate and accommodate students' learning needs. The participants also identified co-teaching structures to implement in their own future teaching activities.

### *Data Collection*

Quantitative and qualitative pre-, post-, and formative instruments used throughout the instructed course were grounded in the research on the best practice components of co-teaching (Cook & Friend, 1995; Friend, 2007; Friend & Cook, 2004; Rice, Drame, Owens, & Frattura, 2007; Spence, 2005; Weiss & Lloyd, 2003). The quantitative source of data collection was the *Knowledge of Inclusive Practices Survey* and qualitative end-of-course data were, *Portfolio Reflections*. The research team (authors) developed the instruments for use in this investigation.

*Knowledge of Inclusive Practices Survey*. This pre-post quantitative survey was designed by project investigators as a pilot instrument to gather descriptive data on course participants' knowledge of specific skills and practices within co-teaching. This instrument included: (a) knowledge about the conceptual foundation of co-teaching and necessary teacher skills for effective co-teaching, (b) knowledge of the six basic co-teaching structures and perception on skills to implement and effectively meet student needs, and (c) participants' perception of school site support and readiness for co-teaching. The latter was included as a control variable in projecting that changes would not be expected. Reported items from this instrument were rated on a 5-point Likert scale consisting of a response menu continuum from "excellent" to "nonexistent". The project investigators completed a test-retest reliability check on the *Knowledge of Inclusive Practices Survey* before it was disseminated for investigation use prior to dissemination at SEKUMU. This instrument was given in a test-retest format to 37 pre-service undergraduate and graduate teacher candidates at Kansas State University who were completing an area of concentration in special education. There were three weeks between the first and second survey administration. Results showed relatively strong Pearson product-moment correlation coefficients, ranging from .701 to .983. The project investigators were satisfied with these results and moved forward with instrument dissemination.



Table 1

*Knowledge on Foundation of Co-Teaching Concepts*

Co-Teaching Concept						Pre-Mean	Post-Mean
Two or more teachers jointly delivering instruction in shared space.						3.64	4.30
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	22.8%	41.5	22.8	3.0	9.9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	48.5%	37.6	10.9	1.0	2.0%		
Shared delivery of teaching responsibility with another teacher.						3.68	4.20
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	16.8%	48.5	23.8	7.9	3.0%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	40.6%	42.6	13.8	2.0	1.0%		
Teaching to heterogeneous group of students in shared space.						3.25	3.98
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	7.9%	44.5	23.8	11.9	11.9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	33.5%	43.6	13.9	5.0	4.0%		
Voluntary participation of the two teachers involved in co-teaching.						3.43	4.16
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	11.9%	44.6	25.7	10.9	6.9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	41.6%	41.6	10.8	3.0	3.0%		
Reciprocity of ideas between co-teachers.						3.25	3.93
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	6.9%	39.6	32.7	12.9	7.9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	25.7%	51.5	15.8	4.0	3.0%		

Note:  $n = 101$ ; Mean scale: 1-5 (nonexistent to excellent)

*End-of-Course Portfolio Reflections.* Portfolios were used as a qualitative data collection instrument to gain insight into participants' knowledge about effective classroom practices for teaching students with disabilities and the work they completed during the course. The day before the course final, project investigators reviewed all course content and provided time for participants to complete a reflective memo activity on knowledge gained from the co-teaching content.

## Results

### *Co-Teaching Knowledge Survey*

Highlighted in this section is data on the impact of instruction in co-teaching on the special education teacher candidates at SEKOMU. The descriptive results present participants' pre-post course knowledge on relevant areas of co-teaching. The authors provide item-by-item reporting in Tables 1-4 to clarify the results and to avoid overgeneralization of analysis of the descriptive data.

*Foundation of Co-Teaching Concepts.* Five items from the survey instrument comprised an introduction to the concepts of co-teaching as identified in the literature consisting of (a) two or more teachers jointly delivering instruction in a shared space, (b) shared delivery of teaching responsibility, (c) teaching to a heterogeneous group in a shared space, (d) voluntary participation of two teachers, and (e) the reciprocity of ideas between teachers. The results indicated an average pre-course mean of 3.44 or a perception of “fair” knowledge about the foundations of co-teaching compared to a post-course average mean of 4.11 or a perception as having “good” knowledge. Participants’ post-course perception of having “excellent/good” knowledge increased on all five items. The results indicate course participants increased their post-course perception of excellent/good knowledge on the foundation of co-teaching an average of 25% per item. The participants’ excellent/good knowledge that co-teaching involved reciprocity of ideas between co-teachers increased 31% at post-course.

*Co-Teacher Communication and Collaboration.* Eight items on the survey instrument identified communication and collaboration skills for co-teachers including (a) interactive communication, (b) effective problem solving, (c) effective conflict resolution skills, (d) balance of power, (e) trust, (f) teacher parity in co-taught rooms, (g) teacher confidentiality, and (h) macro and micro planning time. The results indicated an average pre-course mean of 3.17 (fair knowledge) compared to a post-course average mean of 3.96 (good knowledge). The post-course perception of excellent/good knowledge increased on all eight items, with an average increase of 28% per item. The course participants’ post-course perception of excellent/good knowledge on displaying effective problem-solving between co-teachers, understanding teacher confidentiality in a co-taught room, and teacher parity in a co-taught classroom increased 31%, 33%, and 35% from pre-course perceptions.

*Co-Teaching Structures.* Six items on the survey instrument focused on co-teaching structures. The results indicated the course participants’ perceived themselves as having improved knowledge on the following co-teaching structures: (a) One Teach, One Observe, (b) Station Teaching, (c) Parallel Teaching, (d) Alternative Teaching, (e) Classic Co-Teaching, and (f) One Teach, One Support. The average pre-course mean was 3.01 (fair knowledge) compared to a post-course average mean of 4.33 (good knowledge). The post-course perception of excellent/good knowledge increased on all six items, with an average increase of 48% from pre-course perceptions.

*Co-Teaching and Meeting Student Needs.* Five items in the survey instrument aligned with meeting students’ needs in a co-taught classroom including (a) classroom management, (b) sharing teaching and learning, (c) teaching to meet all student needs, (d) addressing student attention, and (e) meeting diversity of student learning levels. The results indicated an average pre-course mean of 3.11 (fair knowledge) compared to a post-course average mean of 4.04 (good knowledge). The post-course perception of excellent/good knowledge increased on all five items, with an average increase of 40% from pre-course perceptions.

#### *School Site Co-Teaching Support Survey*

This investigation included a series of items referred to as participants’ perception of school site support and readiness for co-teaching. These items were included as a control variable and projected not to change in value from pre-to-post course assessment because participants were not involved during the course (nor in this investigation) in using content to directly impact a specific school setting. The obtained results support this projection. The results in this section provide the reader with an initial understanding of course participants’ perception of the school site use of co-teaching as an inclusive schools practice. Further investigation is recommended.

*Curriculum and Materials for Co-Teaching.* Three items on the survey looked at identified curriculum and materials for co-teaching in the school setting. The participants responded to statements regarding the presence of these elements in their school setting as follows: (a) adequate, clear curriculum for co-teaching; (b) adequate materials and textbooks for co-teaching; and (c) adequate technology resources for co-teaching. The results indicated a consistent pre- and –post-perception of disagreement with these statements (means of 2.33 and 2.19, respectively). At the beginning of the course, an average of 15% of the course participants reported an “agree or strongly agree” perception on the three above areas for co-teaching in their school setting. This reduced to an average of 12% at the post-course.

*School Setting Vision for Co-Teaching.* Six items in the survey focused on the school setting vision and comprehensive planning for co-teaching. The components for a school’s vision co-teaching included; (a) collaborative culture for co-teaching, (b) clear vision of co-teaching for special education, (c) comprehensive planning to implement co-teaching, (d) ongoing evaluation plan for co-teaching, (e) ongoing improvement plan for co-teaching, and (f) school

Table 2

*Co-Teacher Communication and Collaboration*

Communication & Collaboration Skills						Pre-Mean	Post-Mean
Interactive communication between the co-teachers.						3.53	4.18
Pre:	Excellent 12.9%	Good 50.5	Fair 20.8	Poor 8.9	Nonexistent 6.9%		
Post:	Excellent 41.6%	Good 39.6	Fair 15.8	Poor 1.0	Nonexistent 2.0%		
Display of effective problem solving between co-teachers.						3.22	3.97
Pre:	Excellent 8.9%	Good 33.7	Fair 35.6	Poor 13.9	Nonexistent 7.9%		
Post:	Excellent 32.6%	Good 40.6	Fair 19.8	Poor 5.0	Nonexistent 2.0%		
Effective conflict resolution skills between co-teachers.						3.06	3.80
Pre:	Excellent 10.9%	Good 23.8	Fair 37.6	Poor 15.8	Nonexistent 11.9%		
Post:	Excellent 24.7%	Good 39.6	Fair 28.7	Poor 5.0	Nonexistent 2.0%		
Balance of power between the co-teachers.						3.24	4.04
Pre:	Excellent 6.9%	Good 42.6	Fair 26.7	Poor 14.9	Nonexistent 8.9		
Post:	Excellent 36.6%	Good 39.6	Fair 16.8	Poor 5.0	Nonexistent 2.0%		
Trust between co-teachers.						3.30	4.03
Pre:	Excellent 10.9%	Good 39.6	Fair 26.7	Poor 13.9	Nonexistent 8.9%		
Post:	Excellent 36.5%	Good 34.7	Fair 24.8	Poor 3.0	Nonexistent 1.0%		
Teacher parity in a co-taught classroom.						2.94	3.77
Pre:	Excellent 4.0%	Good 30.7	Fair 32.6	Poor 20.8	Nonexistent 11.9%		
Post:	Excellent 19.8%	Good 49.5	Fair 22.7	Poor 4.0	Nonexistent 4.0%		
Teacher confidentiality in a co-taught classroom.						3.25	4.17
Pre:	Excellent 9.9%	Good 39.6	Fair 24.8	Poor 16.8	Nonexistent 8.9%		
Post:	Excellent 37.6%	Good 44.6	Fair 15.8	Poor 1.0	Nonexistent 1.0%		
Co-teachers' macro and micro planning time						2.85	3.77
Pre:	Excellent 5.0%	Good 29.7	Fair 28.7	Poor 18.8	Nonexistent 17.8%		
Post:	Excellent 18.8%	Good 44.5	Fair 32.7	Poor 3.0	Nonexistent 1.0%		

Note: n = 101; Mean scale: 1-5 (nonexistent to excellent)

Table 3

*Co-Teaching Structures*

Co-Teaching Structures						Pre-Mean	Post-Mean
Co-Teaching Structure of One Teach, One Observe.						3.30	4.39
Pre:	Excellent 5.9%	Good 44.6	Fair 32.7	Poor 6.9	Nonexistent 9.9%		
Post:	Excellent 57.4%	Good 30.7	Fair 6.9	Poor 3.0	Nonexistent 2.0%		
Co-Teaching Structure of Station Teaching.						2.87	4.12
Pre:	Excellent 7.9%	Good 25.7	Fair 33.7	Poor 10.9	Nonexistent 21.8%		
Post:	Excellent 39.6%	Good 45.5	Fair 6.9	Poor 3.0	Nonexistent 5.0%		
Co-Teaching Structure of Parallel Teaching.						2.90	4.17
Pre:	Excellent 11.9%	Good 21.8	Fair 30.7	Poor 15.8	Nonexistent 19.8%		
Post:	Excellent 46.5%	Good 33.6	Fair 12.9	Poor 4.0	Nonexistent 3.0%		
Co-Teaching Structure of Alternative Teaching.						2.93	4.48
Pre:	Excellent 3.0%	Good 32.6	Fair 34.7	Poor 13.9	Nonexistent 15.8%		
Post:	Excellent 32.6%	Good 49.5	Fair 12.9	Poor 3.0	Nonexistent 2.0%		
Co-Teaching Structure of Classic Co-Teaching.						2.82	4.37
Pre:	Excellent 4.0%	Good 27.7	Fair 31.7	Poor 19.8	Nonexistent 16.8%		
Post:	Excellent 52.5%	Good 36.6	Fair 7.9	Poor 1.0	Nonexistent 2.0%		
Co-Teaching Structure of One Teach, One Support.						3.28	4.51
Pre:	Excellent 14.9%	Good 36.6	Fair 24.8	Poor 9.9	Nonexistent 13.9%		
Post:	Excellent 63.3%	Good 29.7	Fair 4.0	Poor 1.0	Nonexistent 2.0%		

Note: n = 101; Mean scale: 1-5 (nonexistent to excellent)

Table 4

*Co-Teaching and Meeting Student Needs*

Student Needs in Co-Teaching						Pre-Mean	Post-Mean
My classroom management in a co-taught space.						3.01	3.98
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	7.9%	33.6	24.8	18.8	14.9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	27.7%	48.5	19.8	2.0	2.0%		
Shared philosophy of teaching and learning for co-teachers.						2.99	3.98
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	7.9%	29.7	30.7	16.8	14.9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	24.8%	54.5	16.7	2.0	2.0%		
Teaching to meet all student needs in a co-taught classroom.						3.32	4.27
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	5.0%	46.5	31.7	8.9	7.9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	40.6%	50.5	5.9	1.0	2.0%		
Addressing student with attention needs in a co-taught classroom.						3.16	4.06
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	6.9%	30.7	40.6	14.9	6.9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	32.6%	48.5	13.9	2.0	3.0%		
Meeting the diversity of student learning levels in a co-taught classroom.						3.09	3.96
Pre:	Excellent	Good	Fair	Poor	Nonexistent		
	6.9%	30.7	35.6	17.8	9%		
Post:	Excellent	Good	Fair	Poor	Nonexistent		
	22.8%	54.5	19.7	2.0	1.0%		

Note: n = 101; Mean scale: 1-5 (nonexistent to excellent)

setting desire to implement co-teaching. The results indicated a consistent pre- and –post-perception of disagreement among participants on the presence of these components in their school setting, with means of 2.70 and 2.58, respectively; essentially a “don’t know to disagree” perception. At the beginning of the course, an average of 25% of the course participants reported an “agree or strongly agree” perception on the six above areas representing a school setting vision for co-teaching in their school setting. This reduced to an

average of 19% agree/strongly agree at the post-course.

*Administrator and Teacher Support for Co-Teaching.* Seven items in the survey related to administrators’ and teachers’ support for co-teaching. The administrative and teacher support items for co-teaching consisted of (a) effective shared leadership, (b) general education teachers’ support, (c) other special education teachers’ support, (d) administrative leadership support, (e) general education teachers’

knowledge about co-teaching, (f) special education teachers' knowledge about co-teaching, and (g) administrators who are knowledgeable about co-teaching. The results indicated an average pre-course mean of 2.49 (disagree) compared to a post-course average mean of 2.58 (don't know). At the beginning of the course, an average of 25% of the course participants reported an "agree or strongly agree" perception on the seven above areas in terms of administrator and teacher support for co-teaching in their school setting. This reduced to an average of 18% at the post-course.

#### *Parents and Community Support for Co-Teaching.*

Four items in the survey related to school setting parent and community support for co-teaching. The parent and community support items consisted of (a) supportive surrounding community for co-teaching, (b) supportive and active families for co-teaching, (c) parents of general education students wanting co-teaching, and (d) parents of special education students wanting co-teaching. The results indicated an average pre- and post-course perception of "don't know," with mean of 2.79 and 2.72, respectively. At the beginning of the course, an average of 26% of the course participants reported an "agree or strongly agree" perception on the four above areas representing parent and community support for co-teaching in their school setting. This reduced to an average of 20% at the post-course.

Highlighted in this section is qualitative data representing the impact of course instruction in co-teaching on the special education teacher education candidates. The descriptive results are taken from participants' input in an end-of-course co-teaching reflection that was integrated into a course portfolio activity provided. A random representation of the portfolio reflections is presented. Overall, course participants reflected positively about co-teaching in regards to learning impact on students with disabilities and they were interested in trying the various structures. The participants were happy about the knowledge and skill changes they see in themselves. They expressed interest in cooperating with general education teaching colleagues and their need to learn co-teaching skills.

#### Participant 121

Now, as the course is coming to a halt, I can see a lot of changes within myself. Today, I am a better teacher than I used to be. The course was wonderful to me. I liked the way you taught and practiced co-teaching in the class. I learned that teachers could achieve a lot through cooperation. After the completion of this course

I plan to use co-teaching with my colleague who is also teaching English at the same school I am.

#### Participant 137

I would like to apply co-teaching, specifically the type called one teach, one support. This teaching strategy I will apply in my classroom in the way that when I'm teaching, then I can inform my fellow to walk to check the students.

#### Participant 113

I learned how to use co-teaching in inclusive classes. Co-teaching is the best strategy especially when it conducted with teachers that will be committed and competent. The co-teaching is very useful in that teacher can learn and help student in more confidently and cooperatively.

#### Participant 82

I learned from the instructors, interactive communication, and with regarding of the students' needs in the classroom. Here the need of commitment and commitment and competence is important things in co-teaching. Teachers should be cooperative and collaborative in order to meet the students' needs during learning process.

#### Participant 66

I am interested in planning to teach by using co-teaching, particularly parallel teaching concepts, where I can plan to share teaching with any volunteer teacher by dividing a heterogeneous class in half and each teacher teaching half the class.

#### Participant 14

I hope when I finish up my learning here I will apply these methods of teaching to schools of my country (Tanzania). I will try to my level best to insure that this new knowledge being used in schools in Tanzania. Parallel co-teaching methods I expect to involve/ use it in teaching process and share with another teacher for teaching and learning process.

#### Participant 56

I real enjoyed the way the two teachers practiced co-teaching. From the course I got different things that I may go share out of this college at my school where I go teach. I will mainly practice co-teaching in my teaching

process under two processes, which are parallel teaching and alternative teaching activities.

#### Participant 90

The favorite learning experience in the lesson is the classic co-teaching. It is the best model because both teachers share experiences not only for teacher to forget an important point; for the learners to enable them to remember important points.

#### Participant 67

When going back to teach I will use co-teaching strategy/methods specifically I will use parallel teaching. Parallel teaching is a method of teaching that involves dividing the heterogeneous class in half and each teacher will be teaching half of the class teaching different concepts.

#### Participant 53

What is learned from the instruction during co-teaching it needs sharing of responsibilities in the class participation of the instructors and interactive communication. This way it is a good way of teaching learners with different needs in same class, what is needed in teacher or instructors is commitment and competence.

#### Participant 44

The concept of co-teaching is new. Tanzania is lacking enough teachers for inclusion. This will take time to have enough teachers. Also Tanzania is lacking teaching materials. The layout of schools and classroom cannot support inclusion. Being a poor country Tanzania cannot manage to handle co-teaching effectively without help from others. The concept of co-teaching is very much applicable in helping students with disabilities. The method is very good because it involves more than one teacher in the teaching process. The co-teaching components are essential concepts in the process of teaching and learning, particularly in inclusive schools.

#### Participant 48

My favorite learning was about co-teaching. I was much interested in it. It is my favorite time to observe two teachers conducting single session in the same time. Two teachers working together are healthier for student's achievement.

#### Participant 36

I thought it was impossible to implement inclusive classes in our country and my previous belief is that you can't accommodate learners with disability and no disability in same setting. Now, I believe that inclusion setting is applicable in our country. Through different methods of teaching like classic co-teaching, one teach one support, station teaching, alternative teaching, and parallel teaching which were done practically makes me to be able to teach inclusive classes which was not before.

### **Discussion**

Winzer and Mazurek (2009) stated that the treatment and inclusion of individuals with disabilities is part of a global agenda. By its nature, inclusion welcomes and celebrates diversities resulting from culture, gender, race, ethnicity, language, and/or disability. When nations agree that those with disabilities have a natural and rightful place in society, then the schools should mirror this broader commitment (Winzer & Mazurek, 2009).

The SEKOMU administration requested that the investigators teach a course on classroom management that would integrate co-teaching content and also use co-teaching for instructional delivery. The investigators offered a process to educate and assess the special education teacher candidates' understanding of the concepts of co-teaching, inclusion, and inclusion practices relevant to the field of special education in Tanzania. This descriptive research project was highly beneficial and results indicate that the course content had a positive impact on participants' knowledge of co-teaching as a structure for inclusive practices for students with disabilities. They enhanced their knowledge about the interactive communication and collaboration of co-teachers, including awareness of conflict resolution and developing trust.

While they were positive about the future use of co-teaching and collaboration in their schools, special education teacher candidates had very little to no understanding about their local school site support and readiness for co-teaching. They did not see the presence of a curriculum for co-teaching, adequate materials, or technology resources for co-teaching in their school settings at either the beginning or the end of the course. Similarly, the special education teacher candidates did not have any increased understanding of a school vision and planning for co-teaching in their school setting.

### *Limitations of the Study*

At the time of this investigation, special education was a relatively new concept in Tanzania and SEKOMU was offering the first university-level special education teacher preparation program in this country. The course participants in this investigation were part of the first class to receive this education in the history of Tanzania. This would also suggest that co-teaching was also relatively new in Tanzania. Specific and direct application of co-teaching content for students with disabilities in their local school setting was not a component in the course nor integrated into the research investigation. The special education teacher candidates were not expected to have direct involvement in their local school districts in terms of understanding the level of support or vision for co-teaching. The developed and disseminated survey did not include items that collected special education teacher candidates' perception of what disability co-teaching may work best with. The study implemented the use of a convenience sample of SEKOMU course participants and therefore, it is difficult to fully generalize these results to special education teacher education candidates in all parts of the Tanzania.

### *Implications for Future Practice*

The co-teaching content and co-teaching structures used to teach within this investigation were helpful in developing special education teacher candidates' initial capabilities to organize a classroom for effective learning, including approaches that enhance inclusive education for students with disabilities. However, it is not enough for long-term success. Obiakor and Afolayan (2012) explained that education is a social construct and a deliberately created social institution brought about by the human members of the society. They reported that by all standards, special education in most African countries has floundered in mediocrity and lacks in quality as defined by models of best practice. To join progressive countries in the acknowledgment of the rights of persons with disabilities, Obiakor and Afolayan indicated that a new paradigm is needed. Inclusion is not something that materializes through the advocacy of particular policies or the dissemination of supposedly best practice (Winzer & Mazurek, 2009). They advocated that inclusion, equity, and access have to find their manifestations in the specific structures of their individual national and cultural contexts. Further, they clarified that not all schools can mold to a single

solution and the choice depends on the context of the community and what engages teachers and students.

Sebastian Kolowa Memorial University has three overarching institution goals, one of which is expansion of the quality and accessibility of educational services for individuals with special needs in the Tanga Region. The focus by the school administration to integrate inclusive education models such as co-teaching in their special education teacher preparation program is relevant. It is essential to implement evidence-based practice as a starting point for curriculum development (Stone-MacDonald, 2012). However, in locations like rural Tanzania, one has to focus on the needs of the local community because children learn first and best from their families and their environments. The SEKOMO administration can engage in community and local school outreach to develop partnerships for the purpose of increasing understanding and implementation of school, parents, and community support for co-teaching and collaborative structures that will enhance the educational programming for students with disabilities in the Tanga Region. Additional research and consistent review of teacher education program practices can enhance quality and extend accessibility of educational services across Tanzania.

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# A Pilot Study for Standardizing Curriculum-Based Measurement Oral Reading Fluency (CBM ORF) in Arabic

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## Abstract

*This study examined the psychometric proprieties of the Arabic version of the Curriculum-Based Measurement Oral Reading Fluency (CBM ORF) for Jordanian students. A sample of 200 students (six to eight years old) was recruited from four public primary schools in Jordan. Results indicated that the CBM ORF had adequate reliability and validity indicators. In addition, CBM ORF was a good predictor of Arabic language Grade Point Average. Moreover, students who were struggling with reading scored significantly lower on CBM ORF probes than their peers without disabilities. Results suggest that the CBM ORF measures may be applicable to evaluating reading performance in Arabic.*

One of the primary challenges facing public schools is that many children have difficulties learning to read (Abu-Hamour, 2014; Mather & Goldstein, 2008). Despite tremendous efforts to help all students, including students with disabilities (e.g., No Child Left Behind [NCLB]), a large number of students have consistently experienced serious reading difficulties (Oudeans, 2003). According to the report released in 2007 by the National Assessment for Educational Progress (NAEP) in reading, 43% of fourth graders cannot read at the basic literacy level (for review see: <http://nces.ed.gov/nationsreportcard/>). Over the past three decades, an overwhelming body of evidence has indicated that early identification and intervention allows many children to become competent and successful readers (Calhoun, 2005; Denton, Fletcher, Anthony, & Francis, 2006; Snow, Burns, & Griffin, 1998). Thus, it is imperative that children at risk of reading failure be identified early and receive appropriately tailored intervention prior to the establishment of serious reading difficulties (Busch & Reschly, 2007). Researchers have recommended curriculum-based measurements (CBM) as a reliable and valid assessment for identifying students with Specific Learning Disability (SLD) and guiding the selection of interventions (Abu-Hamour, 2013a, 2013b; Abu-Hamour, Urso, & Mather, 2013; Deno, 2003; Hosp, Hosp, & Howell, 2007; Mather & Abu-Hamour, 2013).

CBM is a set of standardized and well-researched procedures for assessing and monitoring students' progress in reading, math, spelling, and writing (Abu-Hamour, 2013a, 2013b; Abu-Hamour & Mattar, 2013; Al Hmouz, 2013; Fuchs & Deno, 1991; Shinn, 1998; Tindal & Marston, 1990). Reading CBM provides a reliable and valid way to (a) identify students who are at risk for reading failure, (b) identify which students

are not making adequate progress given the instruction they are receiving, (c) identify students' instructional levels, and (d) identify which students need additional diagnostic evaluations (Hosp et al., 2007). Reading CBM consists of Oral Reading Fluency (ORF) (i.e., reading aloud from a passage for one minute) and maze passage reading (i.e., reading a passage silently and restoring every seventh word that has been deleted with one of three word choices). Each of these assessments reflects the student's accuracy and fluency on the task. However, ORF is recommended to be used from grades one to three and mazes' tasks for grades four and above (Fuchs & Fuchs, 2004).

Hudson, Lane, and Pullen (2005) define reading fluency as comprising three primary elements. These include not only accuracy and rate, but also prosody. Prosody describes the expressiveness of oral text reading as it is related to intonation, stress patterns, and phrasing (see Allington, 1983; NRP, 2000). Others, such as Mathson, Allington, and Solic (2005), suggest that accuracy, automaticity, and prosody are all equally important components of fluency. Still other researchers have noted that "while rate and accuracy of oral reading are relatively straightforward characteristics both to observe and measure, it has proven more difficult to capture and measure the fluency, or 'ease,' with which children read texts" (Daane, Campbell, Grigg, Goodman, & Oranje, 2005, p. 27). For the purposes of the present study, the researcher defines oral reading fluency as accuracy and rate in connected text, or correct words per minute.

On the basis of scientifically-based research (see Chard, Vaughn, & Tyler, 2002), No Child Left Behind, Reading First, and the National Reading Panel have all identified fluency as a critical component of an effective reading program (NCLB, 2001, NICHD,

2000). The construct of reading fluency itself has been under a spotlight (e.g., Rasinski, 2006; Samuels & Farstrup, 2006) since being highlighted as one of the five components of reading instruction included in the National Reading Panel's report (NRP, 2000) (i.e., summary of research findings on reading instruction that guides Reading First). Researchers have indicated that in order to read a passage of text aloud quickly and accurately, you need to use a variety of different literacy skills, including decoding, vocabulary, and comprehension (particularly accessing prior knowledge). This is what makes ORF a good predictor of future reading performance (NICHD, 2000).

There is substantial evidence of the validity and reliability of curriculum-based measures in assessing oral reading fluency (e.g., Deno, Mirkin, & Chiang, 1982; Fuchs & Fuchs, 1992; Fuchs, Fuchs, Hosp, & Jenkins, 2001). In addition to the substantial empirical base supporting CBM use in general, there is also a growing body of evidence from technical reports supporting Dynamic Indicators of Basic Early Literacy Skills (DIBELS) ORF as a progress monitoring assessment. Correlations of .65–.80 were found between DIBELS ORF and several state assessments of reading (Barger, 2003; Buck & Torgesen, 2003; Vander Meer, Lentz, & Stollar, 2005). Reliability and validity also have been studied for second grade ORF passages (Good, Kaminski, Smith, & Bratten, 2001), with median alternate form reliability of .95 and concurrent validity with the Test of Oral Reading Fluency of .92–.96 (Children's Educational Services, 1987). However, with all previous documented research that supported the psychometric prosperities of CBM ORF, no research has been conducted to explore this test in Arabic. Given the sophisticated orthographic issues of Arabic language, it is a necessity to investigate the use of new measures for progress monitoring and establishing benchmarks for reading fluency performance.

Several graphical features of the Arabic language create certain difficulties in learning and teaching reading skills. First, Arabic is an alphabet language with 28 letters, written in a joined fashion from right to left (Abu Rabia & Siegel, 2002). All letters are consonants except three long vowels. Another three short vowels (diacritics) do exist in the form of separate diacriticals, not as independent graphemes. When any of these diacritics appear on certain letters, it gives the letter a completely different sound; for example, the letter *k* could have any one of the sounds “ka”, “ki”, or “ku”. If the same letter *k* comes in a word where it does not need a vowel, its sound will be “ek”. Therefore, when these diacritics or short vowels appear in the script Arabic shows a high degree of

regularity and the students can read by predicting the sound of the letters. In this line of research, Abu-Hamour, Al Hmouz, and Kenana (2013) recently conducted a study that facilitates the use of CBM to investigate the effect of short vowels on ORF and silent reading comprehension in Arabic orthography. A total sample of 131 fifth-grade students (89 skilled readers and 42 poor readers) participated in the study. Two kinds of CBM probes were administered: CBM ORF and CBM Maze. Nine texts of each kind were presented in three reading conditions: fully vowelized, partially vowelized and unvowelized. Results indicated that vowels were a good facilitator of ORF and silent reading comprehension for both types of readers. However, in most modern and printed Arabic text (grade three and above) vowel signs are not given, therefore reading relies more on the context rather than spelling and Arabic script becomes more irregular (Abu Rabia, 2002; Abu Rabia & Siegel, 2002). Second, Arabic script is written in a cursive fashion while each individual letter has multiple forms or shapes according to its position within the word. Furthermore, many letters have similar graphemes but their phonemes are completely different. The Arabic alphabet consists of letters with almost twenty of the letter having grapheme similarity with at least one or two letters (Breznitz, 2004). Third, a greater influence of orthographic processing over-and-above phonological processing could be related to diglossia in Arabic. Saiegh-Haddad (2007) has argued that differences between the spoken form of Arabic experienced by the pre-school child (e.g., a local dialect) and the standard form of Arabic used in education and writing disrupts the construction of phonological representations of Arabic. Fourth, the glottal stop in Arabic, referred to as the Hamza, although a fully functioning consonant, is treated as a diacritical mark and is written in many different ways depending on its position in the word resulting in various complex spelling and reading conventions (Elbeheri, Everatt, Mahfoudhi, Abu Al Diyar, & Taibah, 2011).

With all previous challenges of teaching and learning Arabic language, it is necessary to explore valid and reliable measures that can be used for progress monitoring, predict reading, and identify students with reading difficulties in the Arab world. This study is intended to investigate CBM ORF applicability in Arabic language.

### **Significance of the Study**

Although CBM procedures may be more racially and culturally neutral than traditional norm-referenced

tests (Galagan, 1985; Shinn, 1989), no studies in Arab countries have been conducted to examine the validity of CBM procedures when used to assess ORF in Arabic. Despite the extensive study of CBM and its widespread use, published research on the use of CBM in languages other than English is limited. CBM ORF has been used as one of the tools that can provide efficient and reliable data for this purpose with English speaking students; however, it is necessary to determine if CBM ORF is valid in this role with students who speak other languages.

The difficulty and complexity of the orthography of Arabic language may explain the need to validate a screening and progress monitoring tool such as CBM ORF test in Arabic to predict reading skills in the early stages of school. Educational systems in Arab countries lack valid and reliable assessment tools that can be used to identify students who are at risk of developing reading difficulties (Al-Mannai & Everatt, 2005; Elbeheri et al., 2011). For example, researchers in Jordan have stated that the Jordanian educational system is in need of valid assessment tools to identify students with reading disabilities and provide them with appropriate interventions (Abu-Hamour & Al Hmouz, 2013; Al-Khateeb, 2008; Al-Natour, 2008). In Jordan, despite the tremendous work of the directorate of special education in providing remedial and special education services to students with special needs, this directorate still faces various challenges including: lack of screening and diagnostic tests, and lack of standardized measures to identify students with reading disabilities and follow their progress (Al-Khateeb, 2007).

Developing a formal assessment tool that can be used to identify students with reading difficulties and to follow their progress is a necessity in Jordan as well as other Arab countries. Students who have special needs in the Arab world are usually expelled or drop out from public schools because early adequate service and assessment are not provided to help them succeed. Accordingly, there is a necessity to develop a screening and progress monitoring instrument for the purpose of identifying at-risk children at time of school entry and providing identified children with systematic interventions (Al-Khateeb, 2007, 2008; Al-Natour, 2008; McBride, 2007). When a child's problems are recognized early, school failure can be prevented or reduced by a large extent (Raikes et al., 2006). With regard to Arabic children, studies that have examined measures of early reading skills in Arabic schools are sparse. To the author's knowledge, no studies have been conducted to investigate the applicability, reliability, and validity of CBM ORF measure to Arabic speaking children. Standardizing a

reliable, valid, and cost-effective test like the CBM ORF measure should be one priority for Arabic speaking countries.

### **Purposes of the Study**

The purposes of this study were to explore the CBM ORF applicability, reliability and validity with Jordanian students who speak Arabic language. This study addressed the following questions:

1. To what extent will Arabic CBM ORF be a reliable measure of speed of reading?
2. To what extent does Arabic CBM ORF distinguish reading ability among different ages or grades?
3. What is the relationship between the Arabic CBM ORF and Arabic Language Grade Point Average?
4. Is the Arabic CBM ORF test identifying children with reading disabilities from children with average reading abilities?

### **Method**

#### *Participants*

A total sample of 200 children (150 without reading difficulties and 50 with specific learning disability in reading) between the ages of six and eight years participated in the study. Arabic speaking participants were recruited from four public primary schools in the southern region of Jordan. The first sample covered first, second, and third grades with 50 average reading participants for each one. These students had to have an Arabic Grade Point Average (Arabic GPA) of 67 and above. Another sample comprised of 50 third grade students with SLD was recruited to answer the fourth question of the study. Students with reading disability can be easily found in grade three and above because Arabic orthography starts to shift from being regular (direct correspondence between the letters and sounds and vowel signs are given in all cases) to being irregular (vowel signs are not given, therefore reading relies more on the context). The second sample of students was identified by resource room teachers. Due to lack of standardized assessment in Jordan, these teachers rely heavily on teacher-made tests of academic achievement and some other checklist rating scales and observations of reading disability to make eligibility decisions. In addition, for the purpose of this study, an Arabic Grand Point Average (GPA) of 66

Table 1

*The Sample's Characteristics*

Age in Years	Age Range in Months	Grade	Gender		Students with SLD	Total Number of Students
			Female	Male		
6	75-82	1	25	25		50
7	88-94	2	24	26		50
8	100-107	3	50	50	50	100
						200

and below was used as a cutoff point to include students with SLD in the study.

All participants were chosen randomly and consent forms were sent to parents seeking their agreement to participate. Three hundred parents who agreed to let their children participate in the study were requested to complete a short questionnaire that addressed the inclusion criteria of this study. The participants were selected from a larger set of students who were assessed to meet the requirements for inclusion in the study: intelligence within the average range, native speakers of Arabic, no noted emotional or behavioral disorders, no noted attention disorders, and no sensory impairments. The sample's characteristics with regard to age, grade, gender, and students with SLD in reading are presented in Table 1.

*Procedure*

The sample used to prepare the Arabic CBM ORF norms was assessed in the fall semester of the 2012 academic year. Data collection was completed by the researcher and two trained teachers with degrees in special education and childhood education. During the data collection, the researcher had daily updates and discussions among the team of examiners to address the crucial points in the CBM ORF administration and provide feedback. The measures of the study, the Arabic CBM ORF instructions translation, and reliabilities are described in the following sections.

*Arabic Language GPA.* The Arabic GPA reflects student ability on three basic Arabic skills: reading (word reading and reading comprehension), writing, and spelling in the accredited Arabic curriculum in Jordan. The Arabic GPA is a numeric average of all grades achieved in classes at a given school semester. The purpose of the GPA is to provide a barometer as to overall performance of a student in his or her classes, as well as create a system that allows for comparisons between students, and a class ranking system. In the Jordanian educational system, students are ordered and assigned a numerical rank against their

peers based on their GPA, starting with number 100 for the student with the highest GPA and 0 for students with the lowest GPA. The rubric for Arabic GPA is excellent (90-100), very good (80-89), good (70-79), satisfactory (60-69), minimal pass (50-59), and failure (< 50). In the spring semester of 2012 the mean Arabic GPA of the average reader was 79.9 with a range of 67 to 98 and standard deviation of 9.6. For students with SLD, the mean was 52.4 with a range of 40 to 66 and standard deviation of 6.8.

*Translating the CBM ORF Instructions into Arabic language.* The researcher utilized appropriate translation procedures (Brislin, 1986) prior to administering CBM ORF to a sample of Jordanian students. First, two native speakers of Arabic, who were also fluent in English, independently translated the CBM ORF instructions into Arabic. Secondly, a back translation of the Arabic version into English by a bilingual resident of the United States who is fluent in both English and Arabic languages was conducted. Thirdly, all translators reached a reconciliation of the forward-backward translations. Finally, a pre-test was conducted with a convenience sample of 15 children (6-8 years) to assess ease of comprehension, possible ambiguities, and alternative wording.

*CBM ORF Probes.* The passages for grades 1-3 were selected from several literature-based reading series used in the educational system in Jordan as supplementary materials to the accredited curriculum of each grade. This action was taken to exclude the practice effect from the actual ORF ability. Using a table of random numbers to select page numbers within books, potential passages were examined and excluded if they contained excessive dialogues, poetry, plays or many unusual or foreign names. Then a pool of probes was selected by the author and Arabic curriculum specialist who works in the curriculum department in the Ministry of Education in Jordan. Each probe included 200 words. Researchers attempted to reduce variability in individual students' data due to passage difficulty by using readability formulas to measure text difficulty (Griffiths,

VanDerHeyden, Skokut, & Lilles, 2009). In this study, the researcher used the Spache formula to reduce the variance of the scores on the Arabic CBM ORF (Good & Kaminski, 2002). This formula considers difficulty of vocabulary and sentence length. In addition, all probes were given to university instructors and teachers in the field to judge the difficulty of grammar and word order. Their suggestions were taken into consideration to make the final version of the probes.

To save set-up time and obtain a more accurate score, for each grade three equivalent probes of the CBM ORF materials were administered to the student in one testing session. The median score of these three probes was used to provide the valid data point on the student's performance. For the CBM ORF probes' administration, students are given a reading passage at their grade or instructional level and asked to read the passage aloud for one minute. The examiner and the student sat across the table from each other. The examiner handed the student the unnumbered copy of the CBM reading passage. Then, the examiner took the numbered copy of the passage, shielding it from the student's view. Next, the examiner began the stopwatch when the student said the first word. If the student did not say the initial word within three seconds, the examiner said the word and started the stopwatch. As the student read along in the text, the examiner recorded any errors by marking a slash (/) through the incorrectly read word. If the student hesitated for three seconds on any word, the examiner said the word and marked it as an error. At the end of one minute, the examiner said, "stop" and marked the student's concluding place in the text with a bracket ( ] ). Their performance was then based on the number of words read correctly (Hosp et al., 2007). To establish test-retest reliability, other three equivalent probes of the Arabic CBM ORF materials were administered to the same group of students in the second day and the median scores were used to represent their performance.

*Procedural, Inter-Rater, and Test-Retest Reliabilities.* To ensure consistency of testing administration across Arabic CBM ORF probes, the researchers read from scripts and used timers. The fidelity of testing administration was tested by using a detailed checklist to ensure each test was administered as it was intended and described in the manuals of CBM testing (Hosp et al., 2007). Procedural reliability was obtained during 100% of testing sessions, with an average reliability of 100 percent. The teachers scored each CBM ORF probe and entered the data into an excel sheet. The researcher randomly checked 30% of the scoring sheets. The average inter-rater reliability of scoring fidelity data was 99% (range 98%-100%). In

addition, two examiners scored 30% of the Arabic CBM ORF independently in the same testing sessions. The correlation between the two examiners yielded a relational index of agreement. The results of these scorings were correlated and the coefficient ranged from .98 to .99. In terms of data entry reliability, all of the excel data (100%) were checked against the paper scores and all discrepancies were resolved by examining the original protocols. Finally, the median baseline scores of the students' performance in the two consecutive days were correlated to establish test-retest reliability. The resulting coefficients, which ranged from .90 to .94, were large enough to demonstrate that the pilot normative evaluation had acceptable test-retest reliability.

## Results

### *Preliminary Data Analysis*

The Kolmogorov-Smirnov statistic was performed to test the hypothesis that the data were normally distributed for average readers (Field, 2009). This test compares the set of scores to a normally-distributed set of scores with the same mean and standard deviation. Therefore, if the test is not significant ( $p > 0.05$ ), it means that the distribution is not significantly different from a normal distribution. If, however, the test is significant ( $p < 0.05$ ) then the distribution in question is significantly different from a normal distribution.

The data displayed normal distributions for each grade group *D* (50). The statistics ranged from .11 to .19; all statistics were not significant ( $p > 0.05$ ). Slightly lower performances (positively skewed distributions) were detected in the distributions. To improve the shape of the distributions, the responses of outliers whose scores were  $\pm 2$  *SD* or more from the group mean were replaced by a value equal to the next highest non-outlier-score plus one unit of measurement (Tabachnick & Fidell, 2001). This process is known as winsorization; winsorization preserves the rank of the outlier's score within the distribution without disturbing the distribution either by deleting the score or by retaining it in its original form.

Table 2 presents the Arabic CBM ORF percentiles for each grade. Percentiles are probably the most commonly used test score in education. A percentile is a score that indicates the rank of the student compared to others (same age or same grade), using a hypothetical group of 100 students. Then the reliability and validity results were presented in the following sections.

Table 2

*Percentiles for CBM ORF: Words Read Correctly (WRC) per Minute*

Grade	Percentile	WRC
First	90%	78
	75%	52
	50%	30
	25%	20
	10%	9
Second	90%	121
	75%	95
	50%	77
	25%	58
	10%	31
Third	90%	139
	75%	110
	50%	96
	25%	71
	10%	40

Table 3

*Test-Retest Reliability for the Arabic CBM ORF*

Grade Level of Sample	First Testing		Second Testing		<i>r</i>	SEMs
	M	SD	M	SD		
First Grade (n = 50)	36.16	22.27	39.22	21.18	.91	7
Second Grade (n = 50)	77.68	24.26	77.40	25.96	.92	7
Third Grade (n = 50)	93.22	25.99	94.30	24.73	.90	8
All Grades (n = 150)	69.02	31.69	70.31	32.33	.94	8

*Note.* M=Mean, SD=Standard Deviation, *r*=Correlation Coefficient, SEMs= Standard Errors of Measurement.

Table 4

*The Correlations between Arabic CBM ORF, Age, and Arabic GPA*

Age/ Grade Level	CBM ORF and Age	CBM ORF and Arabic GPA
6 (First Grade)	.55	.51
7 (Second Grade)	.58	.57
8 (Third Grade)	.50	.54
All Ages/Grades	.59	.44

Note. CBM ORF=Curriculum Based Measurement Oral Reading Fluency, GPA=Grade Point Average, all correlations coefficients are significant at the  $p < .01$  level.

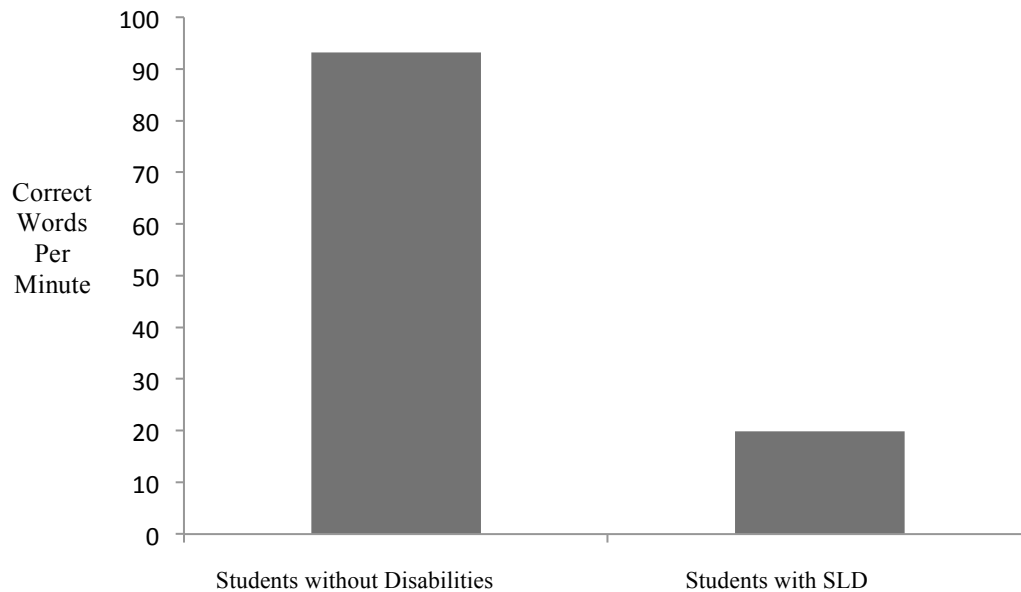


Figure 1. The Average CBM ORF Difference between Third Grade Students with SLD and Average Readers from the Same Grade

*The Arabic CBM ORF Reliability*

As was presented in the method section, the coefficients provided strong evidence supporting the Arabic CBM ORF reliability. In addition, the Standard Error of Measurements (SEMs), reported in Table 3, can be used to estimate the confidence interval that surround a particular ORF score. The SEM is based on the formula  $SEM = SD \text{ square root } 1-r$ ; ( $SD$ -Standard Deviation and  $R$ - reliability) and establishes a zone within which an individual's true score probably lies. The smaller the SEM, the more confidence one can

have in the test's results. Arabic CBM ORF had small SEMs (range from 7 to 8); examiners could use it with confidence.

*The Arabic CBM ORF Validity*

*Age Differentiation.* The raw score means and standard deviations for the CBM ORF at three age intervals are presented in Table 3 under the first testing columns. Means become larger as the participants grow older (i.e., as they grow older, children read more correct words per minute). In addition, the



content of the Table 4 demonstrated that the Arabic CBM ORF probes were related to age. This observation was verified by the coefficient found in the second column of the Table 4, which showed the relationship of age to Arabic ORF probes performance.

*Relationship of CBM ORF probes to Arabic GPA.* The CBM ORF scores were correlated with Arabic GPA for average readers. All of the coefficients were statistically significant; they ranged in magnitude from moderate (for all ages) to large (for each individual age). As expected, the Arabic CBM ORF test appeared to be a good predictor of Arabic GPA. These results confirmed that Arabic CBM ORF is a good predictor of Arabic language skills.

*Distinguishing Good Readers From Poor Readers.* Another way to demonstrate a test's validity is to show that its scores discriminate between relevant groups. In the case of the Arabic CBM ORF, it would be important to show that the test scores clearly delineated groups of children with average reading abilities from groups of children with identified SLD or reading delays or any other conditions that might cause them to do poorly on CBM ORF probes. On average, students with SLD read fewer correct words per minute ( $M = 19.92$ ,  $SD = 7.61$ ) than average readers from the same grade (third grade) ( $M = 93.22$ ,  $SD = 25.99$ ). Figure 1 displays the difference between the two groups in terms of their reading rate per minute.

## Discussion

The purpose of this study was to explore the Arabic CBM ORF applicability, reliability and validity with Jordanian students who speak Arabic. Very rigorous steps were performed to assure the accurate translation of the CBM ORF instructions. In addition, procedures were taken to assure that all CBM ORF probes were equivalent in difficulty. With regard to reliability, Arabic CBM ORF reliability was investigated by procedural, inter-rater, and test-retest reliabilities. The resulting coefficients were very high (above .90), which is in line with the findings of Marston (1989). Similar to a study conducted by Christ and Silbergliitt (2007), small SEMs (7-8 CWPM) were detected in this study which leads to the conclusion that the Arabic CBM ORF scores are consistent across a short period of time and across different examiners.

Several indicators of CBM ORF validity were found. First, Arabic CBM ORF scores distinguished participants from different ages or grades and within the same age or grade. Older participants read more correct words per minute than younger ones. These

findings support the hypothesis about the relationship between the Arabic CBM ORF scores and the participants' chronological age. However, compared to the ORF norms from Hasbrouck and Tindal (2006), Jordanian students read less number of correct words. This can be attributed to the fact that speedy reading within one minute is a new practice for them. In addition, some characteristics of the Arabic system may result in great difficulty for children learning to read in Arabic. Most of these factors or characteristics are related to the orthographic features of Arabic language.

Arabic CBM ORF was also a good predictor of Arabic GPA. The Jordanian Arabic curriculum focus mainly on three basic skills: reading comprehension, writing, and spelling. All these skills are highly related since the Arabic language has high correspondence between the letters and sounds (shallow orthography) in the primary stages of learning. Arabic is an alphabetic language with a primarily consonantal system. Vowels in Arabic are mostly depicted by diacritical marks presented below, above, or inside the consonants. Thus, the Arabic language consists of two orthographies: a shallow voweled orthography, when the diacritical marks are present, and a deep unvoweled orthography, when short vowel diacritics are not presented. The voweled is used in literary texts and in beginning reading materials (the marks appear fully in first-, second-, and third-grade reading curriculum). This in turn makes reading very straightforward and automatic. These results support other researchers' assertions that an important relationship exists between academic language proficiency and reading skill acquisition (e.g., Thomas & Collier, 2002).

This finding is consistent with emerging evidence that points to the importance of ORF in predicting reading comprehension (Shinn, Good, Knutson, Tilly, & Collins, 1992). When word decoding becomes effortless and rapid, rather than slow and laborious, attention is reallocated to the higher-order syntactic and semantic processes that allow the construction of text meaning (LaBerge & Samuels, 1974). Moreover, oral reading fluency indicates, albeit indirectly, efficient word level processing and a measure of the vocabulary base (Fuchs et al., 2001). Finally, as was expected from other research studies (e.g., Deno, 2003), the third-grade students with SLD read fewer words correctly than average readers per minute. Results of this study indicated that Arabic CBM ORF can discriminate between those students with and without reading problems.

### *Limitations, Implications, and Future Research*

Although results of this study are promising and suggest a potential new tool to examine reading in Arabic, the study has several limitations. The findings still need to be replicated in a new larger sample to further validate the results. Although results of this study support the technical soundness of Arabic CBM ORF, maze reading tasks need to be investigated as well. As indicated earlier, the study's findings should be viewed only as preliminary, and, before firm conclusions are drawn, must be replicated in studies designed to overcome the study's limitations. Despite the limitations, the outcomes of this study have substantial implications for future practice and research of assessment of reading in Arabic.

This study was intended to be preliminary, providing a framework for future research. Next steps in this line of investigation should: (a) include a larger sample; (b) focus on students with SLD; and (c) include more frequent administrations of CBM over a longer time period to create estimations of reading growth, national reading norms, and benchmarks. Jordanian national CBM ORF norms can serve as an important tool to assist educators in developing, implementing, and evaluating effective instructional programs to help every student become a skilled, lifelong reader and learner.

As was indicated in the introduction, the educational systems in the Arab world currently lacks a standardized empirically-based tool to assess reading performance that can be used by both elementary school teachers and school psychologists. Results of the current study offer an established methodology for evaluating reading performance that includes ease of development and administration, low cost, and short administration times.

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# How a SURFing Social Skills Curriculum can Impact Children with Autism Spectrum Disorders

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## Abstract

*An average of one in 88 children in the United States are diagnosed with autism spectrum disorder (ASD) (Centers for Disease Control and Prevention, 2012). Individuals with ASD demonstrate poor social interaction, poor social competence, and lowered self-esteem. Early intervention treatment can improve social development. In recent years more non-traditional therapies, like therapeutic surfing, have emerged. This study measured the outcome of a SURF camp social skills curriculum for 11 campers with ASD aged between 10 and 16 years, 18 parents, and 26 surf camp staff. Data were collected one week prior to camp, at the completion of camp, and then again two weeks following camp. Quantitative analysis revealed assertion, responsibility, and engagement as statistically significant in the social skills domain.*

An average of one in 88 children in the United States are diagnosed with autism spectrum disorder (ASD), and the diagnosis is five times more common among boys than girls (Centers for Disease Control and Prevention, 2012). In addition to impairments in social interaction, including peer relationships, children with ASD demonstrate poor social competence and lowered self-esteem (Williamson, Craig, & Slinger, 2008). Previous research studies have been conducted on various types of social skills intervention for children with ASD (Reichow & Volkmar, 2009; Walker, Barry, & Bader, 2010). Most of these studies used parent or teacher surveys and questionnaires (Walker et al., 2010) or a qualitative design (Oriel, George, & Blatt, 2008; White, Keonig, Scahill, 2007) to assess intervention effectiveness. Few studies involved children diagnosed with ASD in any significant way.

The most prevalent deficits for children with ASD are known to be in the area of social interaction (Denning, 2007). Individuals diagnosed with ASD have difficulty communicating with others, generating and maintaining social relationships, and adjusting to new environments (Bellini, Peters, Benner, & Hopf, 2007). Social competence, social skills, and self-concept are factors influencing children with ASD. Increased success and independence are gained through identification and intervention for social skill deficits. Educators, administrators, support personnel, and parents agree these deficits must be a focus of instruction (Stichter, Randolph, Gage, & Schmidt, 2007). Effective social skill interventions are critical to

the successful development of social, emotional, and cognitive development of children.

Early intervention treatment can improve one's academic and social development. For example, once diagnosed, individuals with ASD can receive school-based interventions such as speech and language therapy, social skill instruction, and/or music therapy. In addition to these traditional interventions, some non-traditional therapies are emerging (Denning, 2007). Non-traditional therapies include hippotherapy, dolphin therapy, aquatic therapy, and therapeutic surfing. These therapies have become increasingly popular in recent years with documented participant improvement in both physical and social domains of learning. Specifically, social skills, self-esteem, language skills, and overall confidence have shown improvement as a result of these therapies (Hayhurst, 2008). These newer, non-traditional therapy interventions typically used anecdotal, qualitative data to demonstrate their success. Therefore, a critical need exists to provide more quantitative evidence-based data to support these interventions.

When teaching social skills to children with ASD, self-monitoring is a key component that has been shown to increase maintenance and generalization of the newly taught skills. Self-monitoring is helpful to increase performance of the desired behavior both short and long term, as the individual is required to pay attention to his or her own behavior (Loftin, Odom, & Lantz, 2008).

Therapeutic surfing is a relatively new intervention where individuals are exposed to the experience of surfing. Through surfing, children report both physical

and psychological changes. Behavior is also improved for individuals with autism through this therapy (Marks, 2005). Surf camps like Surfers Healing and iMatter Surf Camp do not report the use of a specified curriculum (Surfers Healing, 2010). Individuals with ASD simply arrive at the camps and surf with a professional surfer sharing a surfboard, or independently. The surf camps have many positive outcomes which are reported online, in magazines, as well as in newspapers and television networks. No other surf camp for individuals with autism have provided research evidence to demonstrate their effectiveness or are able to indicate which component of these surf camps generate these positive outcomes. The creator of Surfers Healing, Izzy Paskowitz, said the following about his son: "He was out in the water, his bad behavior got a little better...I know that it balances the kids out. I know it's more than just a fun and extreme sport" (Mask, 2008, p. 1). However, no empirical research exists at this time. Therapeutic surfing can be conducted using a one-to-one or two-to-one volunteer-to-child ratio (Santich, 2009; Surfers Healing, 2010).

Due to the limited objective research supporting the effects of therapeutic surfing, there is need to determine evidence-based outcomes. The purpose of this study was to determine the benefits and outcomes of a two-day surf camp curriculum on social competence, social skills, and self-concept of students with ASD.

## Method

### *Participants*

Prior to the selection of participants, the investigator obtained approval from superintendents of two separate school districts (SD1 and SD2) in order to use their students in a research study. SD1 is located in a rural city in North Texas, and SD2 is located 20 miles south of SD1. Two surf camp directors also granted permission to conduct the study. Subsequent Institutional Review Board (IRB) approval, through Texas Woman's University IRB in Denton, Texas (US), was also obtained.

The participating campers were recruited through the advertisement of a two-day surf camp for students with ASD in two school districts. The selection criteria required that campers have a diagnosis of ASD and be enrolled in either SD1 or SD2. Participants from SD1 included 6 campers ( $n = 1$  female, 5 males) between ages 10-16 years ( $M = 13.2$ ,  $SD = 2.2$ ). Participants from SD2 included 5 campers ( $n = 1$  female, 4 males) between ages 11-15 years ( $M = 12.6$ ,  $SD = 1.8$ ).

Participating parents in this study were those of the campers attending the surf camp. To participate in this research, parents were required to attend two family socials, an orientation session, and the two days of surf camp with their child. A total of eight parents from SD1 ( $n = 6$  females, 2 males,  $M = 46$ ,  $SD = 5.9$ ), and 10 parents from SD2 ( $n = 5$  females, 5 males,  $M = 45.8$ ,  $SD = 8.9$ ) participated in this study.

Volunteers at the surf camp included occupational, physical, and speech therapists, teachers, and university students who either worked in the attending school districts or had affiliation with the school districts through work assignments or university courses. The surf camp curriculum design required two volunteers per camper. This 2:1 ratio allowed for proper safety supervision, adequate surf skill instruction, and improved surf camp experience. In addition to being paired with a camper, some volunteers were also in charge of a surf camp activity. There were a total of 24 volunteers paired with campers, two volunteers in charge of surf camp activity instruction, and two volunteers who assessed program implementation integrity/fidelity of the surf camp curriculum.

## Curriculum

The surf camp curriculum used in this study was entitled *Learning through Sun, Sand, and SURF*. The curriculum included four components: the surf camp family social, a classroom camper orientation, during which campers learn the SURF Camp Social Skills for Group Activities, the two-day surf camp that consists of surfing and group activities, and a follow-up surf camp family social.

Surf camp family socials for SD1 and SD2 occurred on two separate afternoons/evenings at a local lake one month prior to the two-day surf camp. All campers and their parents were required to attend. The surf camp directors reviewed water safety rules, followed by yoga stretching, and a preliminary surf paddling lesson. The main goal for this surf lesson was for campers to feel comfortable and confident in the lake water, which is a calmer environment than the ocean water where campers surfed during the actual two-day surf camp.

The second component of the curriculum was the SURF Camp Social Skills for Group Activities. These social skills were taught one week prior to surf camp at each SD1 and SD2 campus. The SURF Camp Social Skills for Group Activities is an instructional routine modified from *The SCORE Skills: Social Skills for*

Table 1

*Components of the Two-Day Surf Camp*

Day 1	Day 2
Meet & Greet with Pictures	Review Beach & Water Safety Rules
Beach & Water Safety Rules	Yoga on the Beach
Yoga on the Beach	On-Land Surfing Lesson
On-Land Surfing Lesson	Surfing for 2 Hours
Surfing for 2 Hours	LUNCH (1 Hour)
LUNCH (1 Hour)	Arts & Crafts*
Arts & Crafts*	Surfing for 1.5 Hours
Surfing for 1.5 Hours	T-Shirt Signing*
Paddle Relay*	Complete Post Camp Surveys
BREAK (2.5 hours)	
Sandcastle Building* & Bonfire Cookout	

\*Activities during which campers used the SURF Skills checklist

*Cooperative Groups* (Vernon, Schumaker, & Deshler, 1996). The skills were previously determined by the surf camp directors and other staff/volunteers because they were deemed to be important for campers to learn in order to be successful during camp activities.

The acronym, ‘SURF,’ comprised the first letters of each skill in order to help campers remember them. The SURF Skills are: Stay in the group; Use my SEE steps (sound, expression, and eye contact), Remember to ask questions; and, Form a friendship. The SURF skills provided a structure for campers to interact with their peers at surf camp.

Similar to Charlop and Milstein (1989), video modeling was used to teach campers each social skill. Actors, similar to the ages of campers, were used to demonstrate each SURF skill. Actors first provided a non-example of each skill followed by a correct example. The non-example depicted the incorrect way to use the skill, while the example showed the correct performance of the skill. Specifically, to demonstrate the non-example of Stay in the group, the first video scene showed a camper walking off during a yoga activity. The next clip then showed the camper remaining in the group during the same yoga scene. Campers filled out a Surf Skills Checklist as they watched video clips of each skill. Campers marked “yes” on the checklist if they observed the actor perform an example of the skill and “no” if they observed the non-example (see Figure 1).

Did I:	Yes	Sometimes	No
Stay in the group?			
Use my SEE steps?			
. Sound just right?			
. Have a friendly expression?			
. Look at the person (eye contact)?			
Remember to give compliments?			
Find a friend to talk to?			

Figure 1. SURF Skills Checklist

*Surf Camp Volunteer Staff Orientation.* Volunteer staff orientation for SD1 and SD2 occurred on the morning prior to the first surf camp. All volunteer staff members were required to attend this training session. The first part of the training occurred at the beach where the two-day surf camp occurred. Volunteers were instructed on the activities that would be occurring during the surf camp as well as how to properly push and receive campers while surfing. During orientation, volunteers were shown the PowerPoint presentation on the SURF Camp Social Skills for Group Activities that was used during the camper classroom orientation to learn the SURF Skills. Each camper was paired with two volunteers for the duration of surf camp.

*Two-Day Surf Camp.* The two-day surf camp was held at a semi-private ocean beach in South Texas. Table 1 lists the events and activities of the two-day surf camp. Both SD1 and SD2 followed the same curriculum as depicted in Table 1.

*Follow-Up Surf Camp Family Social.* This event occurred on two separate afternoons/evenings at SD1 or SD2 two weeks following the completion of the surf camp. Once all families had arrived, the 2010 surf camp DVD was shown. The DVD consisted of pictures taken throughout the first family social and the two-day surf camp. Prior to coming to surf camp, the surf camp directors asked parents to sign a photo/video release form. The video was approximately 10 minutes in length. Campers were presented with a copy of the DVD, their picture frame they created at surf camp, and a surf camp trophy. The individual trophies, which had a surfer figurine on them, were donated by a volunteer staff member of the surf camp. These were presented to campers as a keepsake of the 2010 surf camp. Each camper had his/her name, the name of the camp, *Learning Through Sun, Sand, and SURF*, and the year attended on his/her trophy.

*Surf Camp Activities.* Throughout surf camp there were five activities where the campers were required to reflect on the use of their SURF Skills. These activities included: (1) arts and crafts, where campers paint a picture frame on the first day of camp; (2) then on the second day they decorate their frame; (3) a paddle relay, where campers work with other campers while using their SURF Skills when asking one another what color the volunteer in the relay told them; (4) sandcastle building, where campers built their own sandcastle, which was part of the larger group sandcastle; and (5) T-shirt signing, where campers use their SURF Skills while asking for signatures of other campers and/or surf camp volunteer staff. Prior to surf camp, staff/volunteers of these activities were provided with a lesson protocol to follow as they led each activity. Lesson protocols were used to ensure identical curriculum delivery across both surf camps. To verify proper delivery of the five surf camp activities, two volunteers used an activity observation checklist to monitor instructional delivery across both camps and activities.

Campers were required to complete a SURF Skills Checklist at the completion of each activity. Each camper's staff/volunteers were also present during each activity, and completed the same checklist to evaluate the camper's social skills.

Five instruments were used to measure outcomes of the two-day surf camp curriculum. They included: the Social Skills Improvement System (Gresham & Elliott, 2008), the second edition of the Piers-Harris Children's Self Concept Scale (Piers & Herzberg, 2002), the Parent Perceptions of the Surf Camp Curriculum (Cavanaugh, 2010), the SURF Skills Checklist, and the SURF Camp Curriculum Activity Observation Checklist (Cavanaugh, 2010).

*Social Skills Improvement System (SSIS).* The SSIS, recently revised from the original Social Skills Rating System (SSRS), is a tool used to evaluate social skills and problem behaviors. This instrument was chosen due to the fact that it is readily used in both school districts that participated in the surf camp and is targeted for students ages three to 18. The social skills constructs measured include: communication, cooperation, assertion, responsibility empathy, engagement, and self-control. The forms take 10-25 minutes to complete and items are rated on a 4-point scale: not true, a little true, a lot true, and very true (Gresham & Elliott, 2008).

*Piers-Harris Children's Self-Concept Scale, 2<sup>nd</sup> Edition (PH2).* Similar to the SSIS, the PH2 was chosen because it was used by the psychologist in both SD1 and SD2. This scale is used to measure the following six domains: physical appearance and attributes, intellectual and school status, happiness and satisfaction, freedom from anxiety, behavioral adjustment, and popularity. Time required to complete the 60-item self-report questionnaire prompting yes/no answers is approximately 10-15 minutes (Piers & Herzberg, 2002).

*Parent Perceptions of the Surf Camp Curriculum (PPSCC).* The PPSCC questionnaire was designed specifically for this study by the developers of the SURF social skills curriculum (Cavanaugh, 2010). It was created to further measure parent perceptions of their child's social competence, social skills, and self-concept in relation to the surf camp curriculum. Specifically, a 5-point Likert scale measure in the PPSCC was used to determine parent perceptions of their child's social competence, SURF camp social skills, and self-concept. Parents responded to each question by circling the appropriate level of agreement as shown on the following 5-point scale: 1= strongly disagree, 2= disagree, 3= neither agree nor disagree, 4= agree, 5= strongly agree. The survey was divided into five sections. The first page was a demographics section. The second section began with a definition of social competence, followed by 12 statements that directly related to the domains and subdomains on the



SSIS. The third section began with a list and purpose of the five surf camp curriculum activities where campers were to practice their SURF Skills. Then, a definition of surf camp social skills was provided, followed by five statements that related to each of the five surf camp activities.

The fourth section of the PPSCC began with a definition of self-concept, followed by six statements that directly related to the domains on the PH2. Finally, parents were asked to write responses to three open-ended questions. These were: 1) How do you believe the surf camp curriculum will impact your child's overall social competence? 2) How do you believe the surf camp curriculum will impact your child's overall social skills? and 3) How do you believe the surf camp curriculum will impact your child's overall self-concept?

*The SURF Skills Checklist.* The SURF Skills Checklist was created by a creator of the surf camp curriculum to measure camper and volunteer perceptions of the campers' use of each social skill that had previously been taught at the classroom orientation session. The SURF Skills Checklist was provided to each camper at the completion of the five activities. The checklist was comprised of seven questions, addressing each component of the SURF Skills. Questions included the following: Did I ... (1) = Stay in the group? (2) = Use my SEE Steps? [(3) = Sound, (4) = Expression, (5) = Eye Contact] (6) = Remember to Ask Questions? and (7) = Form a Friendship? Campers rated themselves on a 3-point scale, where 1 = Yes, 2 = Sometimes, and 3 = No, to determine the extent to which they felt the SURF Skills outcome was met throughout the activity. In addition to the campers completing their own checklist, the two surf camp volunteers assigned to each camper also completed the checklist based on their camper's performance.

*SURF Camp Curriculum Activity Observation Checklist.* The SURF Camp Curriculum Activity Observation Checklist was created as part of the surf camp curriculum to monitor implementation of the five surf camp activities during which campers and volunteers rated campers' use of the SURF Skills. These monitored activities occurred when the camper and their volunteers completed their SURF Skills Checklist. The activity checklists included between nine and 12 questions ( $M = 10.8$ ) to represent each step of a lesson protocol provided to the instructor of each activity. Two volunteers completed the activity observation checklists to ensure reliability.

## Data Collection

Data were collected one week prior to surf camp (pre), at the completion of surf camp (post), then again two weeks following surf camp (retention). On all occasions, the same psychologist administered the SSIS, PH2, and PPSCC instruments. Subsequently, the completed instruments were submitted to the researcher in a sealed envelope. The SURF Skills Checklist was provided at the completion of each designated surf camp activity. Each instrument administered, and the timeline in which it was completed by different participants is presented in Table 1.

## Data Analysis

Quantitative data from the SSIS, PH2, and PPSCC instruments were analyzed using an SPSS 17.0 statistical software program. The three open ended questions on the PPSCC were analyzed using NVivo 8 qualitative software package. The two surf camp checklists were analyzed using Excel.

*SSIS, PH2, and PPSCC.* A one-way repeated measures ANOVA at Time 1 (one week prior to surf camp), Time 2 (directly following surf camp), and Time 3 (two weeks following surf camp) were used to analyze data obtained from the SSIS, PH2, and all statements excluding the open-ended questions on the PPSCC instrument. The Wilks' Lambda Multivariate Test and Greenhouse-Geisser were used to determine significance, and Scheffé's Pairwise Comparisons were used to determine significance between the three different time periods. For all pairwise comparisons, the significance of the mean difference was set at the .05 level, and Bonferroni was used for the adjustments for multiple comparisons. Inductive analysis was performed to analyze the three open-ended questions of the PPSCC. NVivo 8, a qualitative software package was used to assist the researcher in developing the various themes and categories derived from the qualitative data.

*The SURF Skills Checklist.* The SURF Skills Checklists were calculated in Excel. First, camper performances of the individual SURF Skills were calculated. Total scores on each skill were calculated to obtain mean and standard deviation values. Secondly, each activity was analyzed to determine which activity resulted in the greater use of social skills by campers. The SURF Skills were averaged for each activity for both the campers and their volunteers. Comparisons between each activity were done through mean and percentile differences of the SURF Skills values.

*SURF Camp Curriculum Activity Observation Checklist.* Total scores for each activity in the “yes” or “no” column were summed in Excel. Overall percentages of “yes” and “no” responses were calculated for each activity and compared between the two observers. Results of the first camp were then compared to those obtained in the second camp through comparisons of percentage agreement and compliance results within both camps for each activity.

## Results

### *Social Skills Improvement System Student Results*

One-way repeated measures ANOVA was conducted to compare Assertion scores at Time 1 (one week prior to surf camp), Time 2 (directly following surf camp), and Time 3 (two weeks following surf camp). There was a significant effect for time in the Assertion subscale [Wilks' lambda = .010,  $F(2, 9) = 7.959$ ,  $p = .010$ , multivariate  $\eta_p^2 = .639$ ]. Scheffé's pairwise comparisons of empathy were significant pre to retention (.013). There was also a significant effect for time in the Responsibility subscale category [Wilks' lambda = .023,  $F(2, 9) = 5.935$ ,  $p = .023$ , multivariate  $\eta_p^2 = .569$ ]. Pairwise comparisons of Responsibility were significant pre to post (.023), and pre to retention (.015).

Lastly, a significant effect for time in the Engagement subscale category [Wilks' lambda = .016,  $F(2, 9) = 6.831$ ,  $p = .016$ , multivariate  $\eta_p^2 = .603$ ]. Scheffé's pairwise comparisons were significant pre to retention (.010). For all pairwise comparisons, the mean difference significance was set at the .05 level, and Bonferroni correction was used for the adjustments for multiple comparisons (Field, 2008). Although only three of the thirteen subscales produced significant changes, both domain scales, and all subscales were positively affected pre to retention.

### *Social Skills Improvement System Parent Results*

Similar to the mean results obtained in the student version of the SSIS, most subscales generated mean positive changes pre to retention in the parent version. All but empathy and assertion produced positive mean changes pre to post, and then increased to produce positive scores pre to retention.

### *Piers-Harris Children's Self Concept Scale, 2nd Edition Results*

There were no significant effects on any of the sub-domain scales over time. Although none of these sub-domain scales produced significant results, all mean results were positively affected pre to retention.

### *SURF Skill Analysis*

The SURF Skills with the largest discrepancy was that of 'Eye Contact.' Campers perceived they maintained more eye contact throughout the five activities in comparison to what their volunteers observed. Mean camper rating for Eye Contact (looking into the other person's eyes) was 98.3% ( $M = 2.9$ ) of the time; while the mean volunteer rating was 88% ( $M = 2.6$ ) of the time; resulting in a difference of 0.31, or 10.3%.

The category most similar to campers and volunteers was Sound. Campers self-rated themselves believing they sounded 'just right' (not too loud or too soft) on average 99.3% ( $M = 2.98$ ) of the time; whereas, volunteers thought on average their campers sounded 'just right' 94.3% ( $M = 2.8$ ) of the time.

Camper results change in overall social skills pre to post camp was an 8% increase from 23 the first arts and crafts activity ( $M = 2.7$ ) to the T-shirt signing activity ( $M = 2.9$ ). In contrast, pre/post volunteer results show a .67% decrease from the first to the last activity ( $M = 2.7$  to 2.6). There is an increase in social skills reported for each activity by the campers. The greatest increase in social skills occurred between the paddle relay and the sandcastle activity with a 4.34% increase.

Volunteer results fluctuated between and within each activity when comparing scores to that of the campers. The most similar scores between the volunteers and campers were recorded in the first arts and crafts activity. There was only a 2.3% difference between mean outcomes reported by the campers and their volunteers. The greatest difference in scores was in the T-shirt activity. Campers rated themselves as having 11% greater social skills ( $M = 2.9$ ) than was perceived by their volunteers ( $M = 2.6$ ).

### *Parent Perceptions of the Surf Camp Curriculum Quantitative Results*

A one-way repeated measures ANOVA was used to compare scores on the parent perceptions of their child's social skills in the Paddle Relay activity at Time 1 (one week prior to surf camp), Time 2 (directly following surf camp), and Time 3 (two weeks

following surf camp). There was a significant effect for the Paddle Relay activity [Wilks' lambda = .015,  $F(2, 14) = 5.710$ ,  $p = .015$ , multivariate  $\eta_p^2 = .449$ ]. Pairwise comparisons of the Paddle Relay were significant pre-post (.033), and pre-retention (.010). Paddle Relay was not significant post-retention.

A one-way repeated measures ANOVA was also conducted to compare scores on the parent perceptions of their child's social skills in the Sandcastle Activity at Time 1 (one week prior to surf camp), Time 2 (directly following surf camp), and Time 3 (two weeks following surf camp). There was a significant effect for the Sandcastle Activity [Greenhouse-Geisser = .001,  $F(1.197) = 5.741$ ,  $p = .98$ , multivariate  $\eta_p^2 = .481$ ]. Pairwise comparisons were significant pre-post (.004), and pre-retention (.001). The Sandcastle Activity was not significant post-retention.

### *Surf Camp Curriculum Observation Checklist*

Both volunteers produced 100% agreement for each activity component the surf camp curriculum, as well as agreement of the curriculum execution by the activity instructors. All but one activity instructor followed their designated activity protocol. Volunteers monitoring the curriculum indicated a "no" response to one question on the sandcastle checklist. The curriculum was followed 100% of the time in the first camp, and 98.2% of the time in the second camp.

## **Discussion**

This study demonstrated positive outcomes on social competence, social skills, and self-concept changes of campers with ASD following the participation in the two-day *Learning Through Sun, Sand, and SURF* camp curriculum. Surfing might not be a cure for autism, but experiences are benefiting children over and over again. The question, therefore, is 'What aspects does a surf camp affect?' Although this is difficult to answer, the *Learning through Sun, Sand, and SURF* curriculum attempted to answer this question through various social skill impairments affected by those diagnosed with ASD. Rather than teaching campers discrete skills, the SURF Skills were used to teach campers critical skills that could lead to new skill development. Proper execution of the SURF Skills could also lead to increased social opportunity in inclusionary educational settings (Olley, 1999).

The social skills curriculum was designed to address three foci. These foci included social competence, social skills, and self-concept. The SSIS was used to assess social competence. Camper results

of the SSIS revealed assertion (pre-retention,  $p = .010$ ), responsibility (pre-post,  $p = .023$ ), and engagement (pre-retention,  $p = .016$ ) as being statistically significant in the social skills domain.

Completion of the parent version of the SSIS produced no differences in either the social skills of problem behavior domains. Following data collection, a few parents approached the principal investigator and surf camp directors with concern in completing the SSIS. When relating the questions presented on the SSIS to their children with autism, there was no definitive response. No two situations are the same when it comes to their child's social skills and social competence; therefore, they did not believe true indications could be met when responding to the questions on the SSIS. This could lend support to the lack of statistical significance in the parent version of the SSIS. Van Horn, Atkins-Burnett, Karlin, Ramey and Snyder (2007) also found that the SSRS (the previous version of the SSIS) should be refined. Van Horn and colleagues (2007) note that scores are differentially affected by ethnicity. In the case of the present study, a person's diagnosis, age, and gender could also be a factor in influencing the scores generated.

For purposes of this surf camp curriculum, the SURF Skills Checklist was created to evaluate the degree to which campers were using the social skills previously taught as part of the curriculum. Campers were aware that at the end of each activity they would be required to self-monitor their performance. Morrison and Blackburn (2008) stated that students learned to take responsibility of their own behavior if they were aware of their requirements for self-monitoring. Self-monitoring allows campers to have an ownership of their behavior. Through completion of the checklist following each activity, campers felt they, 'looked into the other person's eyes' 98.3% of the time, while their volunteers felt that campers only did this 88% of the time. This difference could be due to individuals with autism not being able to distinguish between how they are acting and what is really occurring. A study on self-awareness by Williams (2010) concluded that individuals with ASD have impairments in recognizing their own mental states.

Self-concept was the last criteria to be examined, and the PH2 was administered to campers to analyze this outcome measure. Similar to Oriel and colleagues, (2008), the present study did not find any statistical significance on the PH2.

### *Delimitation and Limitations*

The study's findings are limited in generalizability since camper participants with ASD only included those enrolled in school districts in Texas. Two school districts were purposively selected and received permission to attend the two-day surf camp; thus, limiting the number of campers, parents, teachers, and surf camp staff that participated in the two-day surf camp. Participant sampling was determined based on those already enrolled in the two-day surf camp. Consequently, this limits the generalizability of findings to other children with ASD. Scores produced by each assessment may not be an accurate reflection of participants' true social competence and self-concept functioning, but can be viewed as a general indicator.

Both the PH2 and the SSIS were administered to campers in a single session. Similar to McAndrew (1999), providing campers with both assessments in one session may have produced a loss of concentration. One parent even told the directors that she was not sure how her child would score on the assessments because it looked like he was falling asleep, due to being exhausted from surfing most of the day. Lastly, the overall length of the intervention was short in duration. An intervention longer in duration with more participants could possibly produce more social skill change among the campers.

### *Recommendations for Future Research*

Future research should include the use of other standardized measures to determine change in social skills, social concept, and self-esteem. A larger sample size should also be included to increase power and validity of the results. This larger sample size will also allow for division between or among the groups (i.e., age, gender, ASD diagnosis).

Parent demographics should also be considered. In this study, all parents were considered equal. The number of years the parent has known the child should be considered. Some parents remarried and may not have known the child for as long as other parents have. There should also be additional questions to determine whether the parents are employed or whether one parent spends more time with the child than the other parent. These questions could influence the results obtained as well as provide further insight in analysis and interpretation of the findings.

In order to obtain further results, the use of qualitative methods (i.e., interview, observation, open-ended questions) should be explored to determine the effectiveness of the curriculum. This will also allow

the participants to describe any other results not described in the surveys. Survey administration, atmosphere, and time of the day should also be considered. The survey should be provided in the same room with emphasis on individual pacing. Parents and volunteer staff reported to the surf camp directors that they felt the campers were too tired to concentrate while completing the SSIS and the PH2 post camp. Snacks and small breaks should be provided to ensure adequate completion of the instruments. In addition, researchers should attempt to provide the surveys at the same time of day to increase the likelihood of a homogeneous atmosphere.

Lastly, the use of experimental/control groups to measure the effects of the surf camp curriculum should be considered. This could be divided in four separate groups. Group 1: receives surf camp curriculum and attends surf camp; Group 2: receives surf camp curriculum and does not attend surf camp; Group 3: does not receive the surf camp curriculum and attends surf camp; and, Group 4: does not receive the surf camp curriculum and does not attend surf camp.

### **Conclusion**

Although no statistical significance was apparent in the overall outcome scores of the standardized measurement tools selected for analysis, observable change was significant in specific sub-domains within the instruments. These sub-domains included assertion, responsibility, engagement, interaction, and confidence. Although campers and their surf camp volunteers did not agree on the degree of social skills applied to each activity, breakdown of the SURF Skills allows for future analysis of the components necessary for observation and instruction when teaching children proper social skills. To date, there has been no previous empirical research on the effects of a surf camp curriculum for social skills improvement. The findings of this study have been promising, and as a result, social skills curriculum applied to this surf camp will continue to be researched.

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# A Meta-Analysis of Algebra Interventions for Learners with Disabilities and Struggling Learners

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## Abstract

*The need for global competence in mathematics is apparent. Algebra is considered a gateway course to prepare students for the demands of a competitive global market. Many students demonstrate low performance in algebra; this is especially true for students with disabilities. Effective algebra instruction is essential to increase algebra achievement of struggling learners. This meta-analysis analyzes interventions aimed at improving algebra performance of students with disabilities and those who are considered at-risk for a mathematics disability. Individual and weighted effect sizes are reported. Findings indicate schema/model-based interventions and concrete-representational-abstract sequence had the largest effect sizes. Implications and need for future research are discussed.*

There is widespread international recognition that mathematics achievement is important. Global competence in mathematics is essential for progress and global competition. Yet recent trends indicate that mathematics achievements of students fall short of international expectations, as the majority of countries who participated in the 2011 Trends in International Mathematics Science Study ([TIMSS], Provasnik, Kastberg, Ferraro, Lemanski, Roey, & Jenkins, 2012) had less than half of 8<sup>th</sup>-grade students reaching high or advanced benchmarks, and over half of the countries reported less than half of their students produced intermediate scores or better. According to the international comparison reported for the most recent TIMSS, only 3% of 8<sup>th</sup>-grade students yielded advanced scores (Provasnik et al., 2012). Comparative statistics across nations support growing concern about the competitive edge that current educational systems are providing for our students. Discrepancies across countries exist, as some countries produced upward trends of performance, and others produced declining trends between the assessment years of 2007 and 2011. These comparisons suggest that students across the globe may lack mathematics skills necessary to

compete in an ever-changing and advancing international market, where many jobs require competency in mathematics and algebra skills.

Excelling in mathematics, specifically algebra, is essential to graduation, college entrance, as well as college and career success in the United States ([US], Vogel, 2008). According to the US Department of Labor and the US Bureau of Labor Statistics (2013), jobs in computer and mathematics related fields are projected to grow by 18% in the next 10 years; this growth rate is larger than the projected 11% average growth for all occupations. Students with disabilities who do not have the necessary mathematic job skills may miss opportunities to enter or advance in ever-growing mathematics related careers. The National Longitudinal Transition Study- 2 found that only 46% of students with disabilities had regularly paid employment within two years of leaving school (Wagner, Newman, Cameto, Levine, & Garza, 2006). Meanwhile, growth in science, technology, engineering, and mathematics (STEM) related jobs have expanded to three times that of non-STEM careers (Murray, 2013). Sadly though, secondary

students with disabilities score significantly below grade level in mathematics (Cortiella, 2011).

### *Calls to Action*

Our international educational landscape reflects growing need for improved mathematical performance through instruction and a call to action. The call to action is not new and is evidenced by various initiatives within the US over the past decades. Since 1999 there have been four major expert reports on mathematics education and mathematics achievement within the US alone. National Commission on Mathematics and Science Teaching for the 21st Century (2000) cautioned about the potential negative impact of inadequate mathematics and emphasized the need for more mathematics courses, higher-quality instruction, and need to attract competitive professionals to the field of education. The Committee on Mathematics Learning expanded this emphasis by identifying five pivotal strands to learning of mathematics (i.e., conceptual understanding, procedural fluency, strategic competency, adaptive reasoning, and productive disposition) (Kilpatrick et al., 2001). Additionally, the RAND Mathematics Study Panel (2003) called for development of student mathematical problem solving, proficiency in algebra, and the importance of comprehensive and competent instruction.

More recently, the National Mathematics Advisory Panel (NMAP, 2008) published a comprehensive analysis of research and suggested several key recommendations. According to the NMAP, there are six areas of need for mathematics improvement: (a) curricular content, (b) learning processes, (c) teacher and teacher education, (d) instructional practices, (e) instructional materials, and (f) assessment. A major component of the report included recommendations for teaching mathematics with a goal of student proficiency in algebra. The NMAP emphasized aptitude in algebra as a gateway to success in higher mathematics courses. Each panel of experts provides unique perspectives that collectively emphasize improving student performance through comprehensive curriculum and effective instructional practices.

### *Performance of Students with Disabilities*

Underachievement in mathematics is a systemic problem for many students; however, lack of success in algebra disproportionately affects students with disabilities and those at-risk for a disability. Over 80% of 12<sup>th</sup>-grade students with disabilities in the US

perform below basic in mathematics (National Center for Educational Statistics, 2009). The outcomes are even less optimistic for students with more severe disabilities, who often have limited access to standards-based secondary mathematics courses, such as algebra (Browder, Jimenez, & Trela, 2012), potentially due to limited models of successful implementation of such courses (Browder, Trela, Courtade, Jimenez, Knight, & Flowers, 2010), or teachers favoring instruction on basic mathematics skills to higher skills such as algebra (Maccini & Gagnon, 2002). A growing body of research addresses these issues, but more information is needed about evidence-based interventions aimed to improve the algebra performance for students with disabilities.

### *Previous Meta-analyses for Algebra*

Researchers have previously addressed the need to analyze and synthesize mathematics research through various reviews and analyses. Rakes, Valentine, McGatha, and Ronau (2010) conducted a systematic review and meta-analysis investigating algebra instruction for students published between the years of 1962 and 2008. Their review located 82 studies, including published and unpublished (e.g., dissertation, thesis) documents. Their findings yielded five major areas for instructional improvement including technology curricula, nontechnology curricula, instructional strategies, manipulatives, and technology tools with an emphasis on conceptual understanding. Haas (2005) analyzed algebra teaching methods for secondary students. Haas located 35 published and unpublished sources published between the years 1980 and 2002 and found that direct instruction had the largest impact for students who were considered to be high-ability and low-ability, alike. Students who struggle with mathematics, but are not identified with a disability, often manifest similar difficulties with mathematics as those identified with a disability. While both of these reviews included students with varying ability levels, neither one specifically included students with identified disabilities.

Previously, researchers have synthesized mathematics research for students with disabilities (e.g., Browder, Spooner, Ahlgrim-Delzell, Harris, & Wakeman, 2008; Gersten, Chard, Jayanthi, Baker, Morphy, & Flojo, 2009) which may include algebra studies (e.g., Browder et al., 2008;  $n=2$ ); however, few have specifically addressed algebra instruction and impact on achievement for students with varying disabilities. Maccini, McNaughton, and Ruhl (1999) conducted a review of literature that analyzed the

effects of instructional interventions on algebra or pre-algebra achievement of students with specific learning disabilities (SLD). Although their search parameter included studies published between 1970 and 1996, the 26-year span only yielded six studies that met complete inclusionary criteria. Their findings indicated elements of instruction that contributed to improved student achievement including: conspicuous review, orientation to the strategy to be learned, modeling by the teacher, guided practice, feedback and reinforcement, mastery learning, opportunities for independent practice, assessment, and cumulative review and closure. More recently, Steele and Steele (2003) conducted a summary of literature to teach algebra for students with SLD. Their findings suggest that students with SLD struggle in algebra because of their difficulties with processing, memory, and language. They also found a lack of research-supported interventions. However, they suggest interventions to correct past misconceptions using teacher-directed instruction, self-monitoring, stepwise approaches, mnemonics, and the visual representations. Although these are sound strategies, their summary lacked systematic analysis of available research data. Impeccoven-Lind and Foegen (2010) summarized three interventions for students with SLD; however, these studies lack statistical comparisons, such as those found in a meta-analysis.

Given the foundation of research provided by the previous meta-analyses and limited research that addresses teaching algebra to students with disabilities, the findings from this current meta-analysis are both timely and relevant to educational researchers and practitioners as they share findings on a topic that is ripe for analysis. It should be noted that this analysis is uniquely different from Rakes and colleagues' (2010) and Haas' (2005) as this study focuses on interventions and achievement for students with disabilities and students who are considered to be at-risk of having a disability as opposed to interventions aimed at a general education student population. This analysis recognizes the unique challenges faced by students who chronically struggle with mathematics and may lack prerequisite skills to be successful in algebra. Similarly, this review is uniquely different from Maccini and colleagues' (1999) literature review as it (a) extends their findings by including research from the last decade, (b) reports effect sizes (ES) from included research, and (c) analyzed the effectiveness of the studies through a statistical meta-analysis. In an effort to further the literature regarding algebra and students with disabilities, we sought to answer the following questions: (a) Does targeted instruction or intervention in algebra improve algebra performance

for students with disabilities or those who are at-risk of a disability, with the follow-up questions, (b) what are the effects of focused algebra interventions on algebra performance for students with disabilities or those who are at-risk of a disability, (c) what were the most effective algebra interventions for students with disabilities or those who are at-risk of a disability, and (d) what are the effects for instruction based on grade level?

## Method

Electronic and print resources were searched to locate articles that would be included in the review. The researchers conducted a systematic search of major databases (i.e., ERIC, PSYCinfo, Academic Search Elite) using combinations of key terms (e.g., algebra, learning disabilities, at-risk, intervention, disabilities). The table of contents for major special education journals, such as *Exceptional Children*, *Learning Disabilities Research to Practice*, and *Remedial and Special Education* were manually searched for additional articles of interest. The initial search yielded 168 articles from peer-reviewed and non-peer reviewed sources (e.g., dissertations). After establishing our initial list, we cross-examined reference lists, including the reference lists of previous meta-analyses and systematic reviews, and conducted a search by author's names of included articles to identify any additional resources that were not located in the previous search. No additional articles of interest were located.

### *Inclusion Criteria*

Titles and abstracts were read to search for inclusion criteria. We included studies that (a) implemented experimental or quasi-experimental designs, reported on academic outcomes and ES or had sufficient information to determine ES, and were published in peer-reviewed journals or as dissertations that (b) included students at-risk and those with disabilities, and (c) were published between the years of 1983 and 2013. The decision was made to include quasi-experimental, as true experimental studies in the field of special education are less available and the quality of quasi-experimental as it pertains to special populations, such as those with disabilities, is both reputable and reliable. Fifty articles were reviewed further and 30 articles were read in greater detail to determine if they met inclusion criteria. Due to the potential for publication bias, it was determined that dissertations would be included in the meta-analysis, as done by Browder and colleagues (2008). Seven



dissertations were located. One dissertation did not meet inclusion criteria and was immediately excluded. One dissertation was located and met the inclusion criteria. We searched (to no avail) through Internet search engines (e.g., Google scholar) to locate authors of six remaining dissertations that appeared in the list, but were not available as an electronic text or through the Inter Library Loan system. Dissertations that we were not able to locate were not included in the analysis. This precedent follows Browder and colleagues (2008), who made similar attempts to contact authors of dissertations for their meta-analysis. This process resulted in one dissertation being included in the meta-analysis.

Interventions had to include academic dependent variables. Studies were excluded if they only measured non-academic variables such as motivation or if the dependent variables measured teacher performance or attitudes. We elected not to use Gersten, Fuchs, Compton, Coyne, Greenwood, and Innocenti's (2005) quality indicators for group research designs in special education as criteria for inclusion of studies. Browder and colleagues (2008) demonstrated that following Gersten and colleagues' design leaves few, and in their case for group design, no, articles that satisfied "all" or even "most" quality indicators. Instead we are following the model set forth by Rake and colleagues (2010), Maccini and colleagues (1999), and Haas (2005) to include all articles with sufficiently provided information in the analysis with weighted ES. Therefore, only studies that had enough information to determine an ES, or had ES described by the author, were included in the analysis and only the articles with sufficient information to determine a weighted ES were used to answer the third research question.

Only research studies that stated the inclusion of students with disabilities (e.g., SLD) and students who were identified at-risk of low performance were included in the analysis. The decision to include students identified at-risk was made because students who chronically struggle with mathematics often demonstrate similar mathematics behaviors to those identified with disabilities in mathematics and all students are included in end-of-year accountability assessments.

Applicable articles were identified and confirmed for appropriateness (meeting the three criteria) for inclusion in the meta-analysis. The first author and a graduate student read all articles to determine if they met the three criteria. There were no disagreements. Articles were eliminated if they did not meet the search criteria for inclusion in the analysis. Eventually, 12 articles, containing findings from 13 research studies from 1986 to present pertaining to algebra

interventions for struggling learners, including students with disabilities were included in the analysis. While all 12 articles were included in the initial statistics to answer research question one, only eight of these articles included sufficient information to be included in the weighted analysis, used to answer research question two. All 12 articles are shared in this study, as their inclusion in the study contributes to the overall scope and understanding of current algebra interventions; however, some of these articles did not share sufficient information to be included in statistical analysis of weighted ES. Articles were coded for descriptive information (e.g., number of participants, type of study, grade levels of participants, disability categories included, location of study), dependent and independent variables (e.g., intervention, assessments), ES (i.e., author-given ES), or information to determine ES (e.g., means, standard deviations). Two authors read each of the included articles and inter-rater agreement for coding ranged from 93% to 99%, with an overall agreement of about 97%.

#### *Description of Included Studies*

Of the 12 publications, three included elementary students as participants (Fuchs et al., 2009; Looi & Lim, 2009; Xin et al., 2011), while nine included secondary students as participants (Bokhove & Drijvers, 2012; Corlu, Capraro, & Corlu, 2011; Hannafin & Foshay, 2008; Hoffman, Badgett, & Parker, 2008; Hutchinson, 1993; Ives, 2007; Whisted, 2012; Witzel, 2005; Witzel, Mercer, & Miller, 2003). Students included in the study may have been identified as having an unspecified disability (Fuchs et al., 2009) or be identified with a specific classification, such as SLD (Ives, 2007; Hutchinson, 1993; Whisted, 2012; Witzel, 2005; Xin et al., 2011), attention deficit hyperactivity disorder (ADHD) or other health impairment ([OHI] Ives, 2007; Whisted, 2012; Xin et al., 2011), speech and language impairments (Ives, 2007; Xin et al., 2011), orthopedic impairment (OI) and mild intellectual disabilities (Xin et al., 2011). Other authors included students who were considered at-risk, or those that would require an intervention (Bokhove & Drijvers, 2012; Corlu et al., 2011; Hannafin & Foshay, 2008; Hoffman et al., 2008; Looi & Lim, 2009; Witzel et al., 2003; Xin et al., 2011). Fuchs and colleagues (2009) also used more general terminology as they identified participants as having a math difficulty and reading difficulty, or math difficulty alone, which included but was not limited to students who were classified as special education (no specific designation given). Ten articles were published within the past 10 years, since 2004

(Bokhove & Drijvers, 2012; Corlu et al., 2011; Fuchs et al., 2009; Hallahan & Foshay, 2008; Hoffman et al., 2008; Ives, 2007; Looi & Lim, 2009; Whisted, 2012; Witzel, 2005; Xin et al., 2011) and two were published over a decade ago (Hutchinson, 1993; Witzel et al., 2003). Studies conducted outside of the US report research from the Netherlands (Bokhove & Drijvers, 2012), Singapore (Looi & Lim, 2009), and Turkey (Corlu et al., 2011). Only one dissertation was located and included in the analysis (Whisted, 2012).

Studies were categorized by the type of intervention described by the authors. Six categories emerged. While there was natural variation among the interventions, each category that consisted of more than one study shared common characteristics.

*Cognitive/Model-based Interventions.* Studies that were included in the cognitive/model-based interventions described interventions that implemented systematic and explicit instruction on problem solving strategies in which students address real-world or word problems as they conceptualize and solve the algebraic equations. Four studies were included in this category. Topics addressed in these studies included exponentials, additive equations, multiplicative equations and model expressions, and relational, proportion, and two-variable two-equations, respectfully (Corlu et al., 2011; Fuchs et al., 2009; Xin et al., 2011; Hutchinson, 1993).

*Co-teaching.* Co-teaching was described as instruction that is delivered to students with and without disabilities in an inclusive setting by (at least) one general education teacher and one special education teacher. Only one study, the sole dissertation, analyzed this intervention (Whisted, 2012). The study took place while students were enrolled in an algebra course and covered unspecified topics in algebra.

*CRA.* The two studies that analyzed the effects of CRA sequences on algebra addressed transformation equations (Witzel et al., 2003) and linear functions (Witzel, 2005). Both interventions followed systematic and explicit sequence where students (a) learn to solve equations using hands-on manipulatives, then (b) solved the equations with picture representations of the manipulatives, and finally (c) solved the equations using abstract numbers and symbols.

*Graphic Organizers.* One publication included results from two separate studies that looked at the use of graphic organizers to aid in solving linear algebraic equations (Ives, 2007).

*Single-sex Instruction.* One study analyzed the effects of same-sex instruction on students' algebra achievement in an algebra course (Hoffman et al., 2008). In this study, students were grouped

homogeneously, by gender, where boys were taught in one class and girls were taught in a different class. The comparison group was taught in heterogeneous, mixed-gender classes.

*Technology.* Across the three studies that used technology to deliver instruction, students were taught to solve algebraic equations through interactive computer programs. The algebra topics taught during the instruction included linear equations (Bokhove & Drijvers, 2012; Looi & Lim, 2009) and unspecified topics assessed on state of Massachusetts' mathematics assessment.

## Results

To calculate the weighted mean effect sizes (ES), we obtained the ES reported in each article. In cases where the ES was not reported, we computed the ES within each study, and then created a set of independent ES, which are reported in Table 1.

Table 1 includes research articles both with and without complete information (e.g., means and standard deviation), which are necessary for calculating weighted ES. Although these studies are not statistically included in ES calculations, including these articles in this table provides a picture of the different areas of algebra intervention (i.e., graphic organizers, single-sex instructions, and technology).

After the computation of the independent ES, the weighted mean and variance of ES were computed using the three formulae below. Please note that even though only the calculations for the first article are shown, the formulae were applied to all the articles.

$$ES_{sm} = \frac{9.28 \quad 8.69}{0.95} = 0.62 \quad (2)$$

$$SE_{sm} = \sqrt{\frac{150}{75*75} + \frac{(0.62)^2}{2(150)}} = \sqrt{0.03+0.0312} = 0.18 \quad (3)$$

$$W_i = \frac{1}{(0.18)^2} = 30.86$$

The steps above yielded information reported in Table 2, which was used to compute the weighted ES for instructional intervention and targeted grade levels of articles. In Table 2,  $ES_{sm}$  is the standardized mean difference,  $SE_{sm}$  is the standard error of the mean difference, and  $W_i$  is the weighting factor. We used weighted means for ES because each ES has a different variance that depends on the study's sample size and ES value. The analyses were weighted by the inverse of the ES variance ( $W_i$ ).

The ES for cognitive/ model-based interventions (n = 4) ranged from 0.37 to 0.74. The standard error ranged from 0.18 to 0.47. The ES variance ranged

Table 1

*Independent Effect Sizes*

Study	Algebraic Topic	Experimental			Control			Effect size
		<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	
<b>Cognitive/ Model Based</b>								
Corlu et al. (2011)	Exponentials	9.28	0.91	75	8.69	.98	75	.62
Fuchs et al. (2009)	Additive equations	.21	.84	42	-.15	1.10	47	.37
Xin et al. (2011)	Multiplicative equations and model expressions	83.57	19.21	14	67.93	31.42	13	.60
Hutchinson (1993)	Relational, proportion, and two-variable two-equation	18.90	2.64	12	15.64	6.28	8	.74
<b>Co-teaching</b>								
Whisted (2012)	Algebra course- unspecified	398.41	28.17	27	404.00	23.94	31	.35
<b>CRA</b>								
Witzel et al. (2003)	Transformation equations	7.32	5.48	34	3.06	4.37	34	.86
Witzel (2005)	Linear functions	8.26	7.65	108	5.36	5.75	123	.43
<b>Graphic Organizers</b>								
*Ives (2007)a	Linear equations	14.7	-	14	14.3	-	10	.22
*Ives (2007)b	Linear equations	31.0	-	10	29.0	-	10	.12
<b>Single Sex Instruction</b>								
*Hoffman et al. (2008)	Algebra course- unspecified	-	-	329	-	-	329	-1.3
<b>Technology</b>								
*Bokhove & Drijvers (2012)	Linear equations	78.71	15.17	286	51.55	21.094	-	1.48
*Hannafin & Foshay (2008)	MCAS Algebra- unspecified	-	-	87	-	-	39	1.27
Looi & Lim (2009)	Linear equations	50.35	19.77	34	30.82	16.712	34	1.07

\*Not used in computing weighted ES due to insufficient information.

Table 2

*Standardized Mean Difference, Standard Error and Weighting Factors*

Study	$ES_{sm}$	$SE_{sm}$	$W_i$
<b>Cognitive/ Model-based interventions</b>			
Corlu et al. (2011)	0.62	0.18	30.86
Fuchs et al. (2009)	0.37	0.21	22.68
Xin et al. (2011)	0.60	0.16	39.06
Hutchinson (1993)	0.74	0.47	4.55
<b>CRA studies</b>			
Witzel et al. (2003)	0.86	0.87	14.29
Witzel (2005)	0.43	0.43	55.56
<b>Elementary school studies</b>			
Fuchs et al. (2009)	0.37	0.21	22.68
Xin et al. (2011)	0.60	0.16	39.06
Looi & Lim (2009)	1.07	1.07	14.93
<b>Secondary(middle and high school)</b>			
Hutchinson (1993)	0.74	0.47	4.55
Witzel et al. (2003)	0.86	0.87	14.29
Witzel (2005)	0.43	0.43	55.56
Whisted (2012)	0.35	-0.22	14.41

Table 3

*Weighted Mean Effect Size, Standard Error of the Weighted Mean Effect Size and 95% CI of the Weighted Mean Effect Size*

Study	$n$	$\overline{ES}$	$SE_{\overline{ES}}$	95% CI
Overall weighted ES	711	0.62	0.07	[0.48, 0.76]*
Cognitive/ model-based interventions	286	0.68	0.10	[0.48, 0.88]*
CRA	299	0.52	0.12	[0.28, 0.76]*
Elementary school	184	0.62	0.10	[0.42, 0.82]*
Secondary (middle and high school)	377	0.64	0.10	[0.44, 0.84]*

\*Significant at the 0.05 level

$$\bar{ES} = \frac{\sum_{i=1}^k W_i ES_i}{\sum_{i=1}^k W_i} = \frac{30.86(0.62) + 22.68(0.37) + 39.06(0.60) + 4.50(0.74)}{100.84} = \frac{54.29}{100.84} = 0.68 \quad (4)$$

$$SE_{\bar{ES}} = \sqrt{\frac{1}{k \sum_{i=1}^k W_i}} = \sqrt{\frac{1}{100.84}} = 0.10 \quad (5)$$

from 4.55 to 39.06. The ES for the CRA interventions ( $n = 2$ ) were 0.43 and 0.86. The standard error were 0.43 and 0.86 and the ES variance was 14.29 and 55.56. Studies conducted at the elementary level ( $n = 3$ ) yielded ESs that ranged from 0.37 to 1.07 while those at the secondary level range from 0.35 to 0.86. Per the grade level calculations, one cognitive study was included in the elementary level calculations and the two CRA studies were included in the secondary level ES.

Following the calculations of the standardized mean difference, the standard error of the mean difference, and the weighting factor for each article, the weighted mean ES and standard error of the weighted mean ES were then calculated for each group of articles, respectively using equations 4 and 5. For the purpose of providing an example, please note that the calculations shown are those for the cognitive/model-based intervention. The same formula (equations 4 and 5) was applied to the CRA interventions, which also had sufficient information to conduct weighted effect.

Finally, to determine the statistical significance of the weighted mean ES, confidence intervals (CI) were calculated using the following equations:

$$\bar{ES}_L = \bar{ES} - z_{(\alpha/2)}(SE_{\bar{ES}}) \quad (6)$$

$$\bar{ES}_U = \bar{ES} + z_{(\alpha/2)}(SE_{\bar{ES}}) \quad (7)$$

Using these formulae, 95% CI for the weighted mean ES were calculated and are reported in Table 3. The results show a medium ES (0.62) across all the eight studies analyzed. Cognitive/model-based interventions had the largest ES (0.68), with CRA studies yielding a marginally smaller ES (0.52).

## Discussion

### *Effects of Interventions*

Findings from this study provided insights into algebra interventions for students with disabilities and students who are at-risk. The research posed an overarching question about potential impact on student learning followed by three more specific research questions. Specifically, the first question sought to determine if targeted instruction or intervention in

algebra improved mathematics achievement for students with disabilities. First, we were able to conclude that students with disabilities benefit from instruction targeted at improving their achievement in algebra. All but one study reported positive ES, albeit some may be considered small ( $n = 2$ ) or small to medium ( $n = 3$ ) according to standards set forth by Cohen, where 0.2 is considered to have a small effect, 0.5 suggests a medium effect, and 0.8 and above suggest a large effect (1988).

Next, we wanted to know the effects of algebra interventions aimed at increasing achievement of students with disabilities and those who may be at-risk of having a disability. The studies included in the analysis yielded a medium ES, suggesting that interventions aimed at increasing algebra performance are effective for students with disabilities and those at-risk of having a disability. Through a thorough search of literature, articles were located that documented the effectiveness of various interventions. Findings from the research included in this analysis yielded a spectrum of ES, including small or insignificant effects (e.g., Ives, 2007), moderate effects (e.g., Xin et al., 2011), large effects (e.g., Looi & Lim, 2009), and even a negative effect (Hoffman et al., 2008). Across all of the articles, positive ES ranged from 0.12 (Ives, 2007) to 1.48 (Bokhove & Drijvers, 2012) with a medial of 0.68. The overall findings suggest that instruction that is targeted to improve algebra outcomes for students with disabilities or those at-risk of having a disability may improve student achievement. These general findings are important in light of the current emphasis on algebra as a gateway to higher-level mathematics, competency, and competitiveness in the global market.

To address the third research question, we wanted to determine most effective algebra interventions for students with disabilities or those who are at-risk of a disability. The interventions were grouped according to category of intervention, as discussed by the authors. While there was some natural variation within the categories, all interventions in a group shared similar characteristics. Studies that shared interventions containing cognitive or model-based interventions had the highest weighted ES. In some cases, the categories of treatments were mixed. For

example, the cognitive approach used by Xin and colleagues (2011) included representations, similar to those used in CRA, to help students implement a problem-solving strategy.

The categorical identification of cognitive/ model-based interventions was broad due to the variability across studies of how cognitive/ model-based interventions were implemented. The cognitive/ model-based interventions included elements of student problem solving in that students had to solve real-life situations or associated word problems that helped students conceptualize the algebraic equations. Within the problem solving scenarios, the unknown variables would change in placement to engage students in thinking about why and how to solve the problem, rather than just motion through the steps of an algorithm. A fundamental similarity within the studies was that they used systematic and explicit instruction that emphasizes conceptual understanding of the nature of the problem. The support of explicit and systematic instruction within the cognitive/ model-based interventions compliments the findings of Haas (2005), who concluded that explicit instruction had the largest impact for students with disabilities.

CRA interventions yielded a moderate weighted ES. Although both CRA studies located were conducted by the same author, the findings here are consistent with findings assessing the effects of CRA sequenced instruction in other areas of mathematics, such as subtraction (Flores, 2009), multiplication (Morin & Miller, 1998), and problem solving (Cass, Cates, Smith, & Jackson, 2003). Using manipulatives is recognized by the NMAP as a promising practice with evidence of support. The CRA sequence is systematic and explicitly teaches students the new skills, bridging learning through a sequence of working with concrete manipulatives to more abstract numbers and symbols. In the CRA sequence, students were first taught the concepts by using concrete manipulatives to solve the equations. Using these manipulatives required the students to interact with the learned material. After the desired degree of proficiency was met, students were taught to solve the same types of equations using picture representations that are visually similar to the manipulatives used during the concrete phase. Upon proficiency, students were then taught to solve the equation using abstract numbers and symbols. The three phrases of instruction allow for multiple opportunities to respond and connect conceptual to procedural understanding through multimodal instruction. Similar to cognitive/ model-based interventions, at the core of CRA sequenced instruction is clear, systematic, and explicit instruction.

While technology-based interventions boasted the largest independent ES, as each of the three studies included indicated large independent ESs, there was insufficient information to determine a weighted effect and variation among interventions. The common characteristic among these studies was the use of computer programs to supplement student learning. However, because of the growing use and application of technology-infused interventions with algebra, educators should be aware of research being published and critically evaluate the findings prior to implementing an intervention.

Lastly, we looked at the overall effects for instruction based on grade level category. Algebra interventions were found to be effective for students with disabilities at both the elementary (e.g., Fuchs et al., 2009) and secondary educational levels (e.g., Witzel et al., 2003). The sequential nature of mathematics, coupled with recent trends to introduce pre-algebraic concepts in earlier grades (e.g., Common Core State Standards Initiative, 2010), emphasize practical implication to the field of education.

#### *Limitations*

Due to the relatively small number of studies included in the analysis, the results should be taken as a contribution to an ever-expanding empirical base. The researchers recognize that sample size and implementation of the intervention contribute to the ES reported in the research and the results may change as new research is added to the field. While previous studies have limited their sample population to individuals with specific disabilities, we included studies that included various disabilities, including SLD, ADHD and OHI, and mild intellectual disabilities. Furthermore, since there is not a universally accepted definition for students who are at-risk, researchers have some liberties in the criteria they use to identify students who are considered to be at-risk. Consequently, we recognize that there may be some variation among identifiers across the studies that included struggling learners who may be considered at-risk.

The quality indicators for published group experimental and quasi-experimental special education research proposed by Gersten and colleagues (2005) are relatively new. While their publication increased the awareness to include sufficient information in publications, such as ESs, some of the studies included in this analysis were published near or before the quality indicators were published and not all of the articles located provided sufficient information to include in the calculations for weighted ES. The lack

of access to ES naturally reduced the number of studies included in the analysis to answer the research question about the effects of different types of interventions. As more research is conducted and published in special education, perhaps this will change and future analyses may not encounter the same limitation. As a result of the limited information available, even though some ES were published by the authors, not all categories (i.e., co-teaching, graphic organizers, single-sex instruction, technology) had enough publication of findings to include in weighted analyses, thereby limiting conclusions to be drawn across settings and populations.

### *Future Research Needs and Implications*

The small number of studies located pertaining to teaching algebra skills to students with disabilities and at-risk students poignantly demonstrates the need for more high-quality research to be conducted in this area. As the importance for students to have access to algebra and higher-order mathematics is increasingly being recognized, more research is needed to determine the most effective strategies to meet the educational and learning needs of students with disabilities. The essential question that remains is how to improve the academic performance of students, including those with disabilities and those at-risk, to reach this competency level with challenging algebraic tasks.

Findings from this current meta-analysis are consistent with findings from previous research (e.g., Browder et al., 2008; Gersten et al., 2009) conducted in the general field of teaching mathematics to students with disabilities, although that research did not focus specifically on algebra content. Prior research found students with disabilities benefit from explicit instruction including teacher modeling and demonstration for specific problem types, systematically teaching students strategies for solving problems, providing visual representations, allowing for cumulative practice, and utilizing ongoing progress monitoring (e.g., Gersten et al., 2009; Kroesbergen & Van Luit, 2003; Maccini et al., 1999).

Findings from this study support the use of cognitive/ modeled-based interventions and CRA to teach algebra to students with disabilities. As evident from both the individual and weighted ESs, these interventions have a history of success to improve the algebra achievement of students with disabilities and those who are at-risk. Results of the statistical analyses suggest that educators may consider implementing either one of these intervention to improve the academic outcomes of their students with disabilities

or those who are at-risk. As with all evidence-supported practices, we recommend that educators monitor students for effectiveness of the intervention. Evidence-supported strategies have a history of success and a likelihood of future success, but not all interventions meet the needs of all students. Educators need to consider the unique needs of their students, implement interventions with fidelity, and monitor student performance during an intervention to ensure effectiveness. Embedded within both of these strategies is systematic and explicit instruction (e.g., Fuchs et al., 2009; Witzel, 2005). These conclusions contribute to growing bodies of evidence to support evidence-based practices in mathematics.

Results shared here provide individual and weighted ESs of interventions across various studies. Providing direct comparisons of instructional practices could assist educators in determining the most effective evidence-based practices for teaching algebra to students with disabilities. As quality indicators for group research designs (Gersten et al., 2005) are relatively new to the field of special education research, future research should attempt to include as many indicators as possible when designing and reporting research to ensure high-quality, replicable research.

Providing effective instruction is central to improving the algebra achievement of students with disabilities and those who are at-risk. Within educational systems, educators and educational leaders make instructional decisions about when and how to implement evidence-based practices to target growth in student achievement. Results from this meta-analysis support cognitive or model-based instruction and CRA sequenced instruction as likely beneficial instructional practices for teaching algebra to students with disabilities and those who are at-risk.

### **Conclusion**

Results of this meta-analysis can be used by teacher educators to share effective instruction and intervention strategies to their pre-service and in-service teachers, by teachers to select and implement the strategies with student who struggle with algebra, by researchers to identify need for future research, and by educational stakeholders who value the importance of global competence in mathematics. Continued research in this area is needed to determine and disseminate knowledge of the most effective instructional practices for this population of students in order to ensure future success with challenges that may be encountered with implementation of global expectations and standards, and efforts to reduce the

achievement gap of international students. It appears as though cognitive/ model-based interventions and CRA instruction are promising instructional practices to move all students towards greater competency with complex algebraic skills.

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# Enhancing Literacy Skills of Students with Congenital and Profound Hearing Impairment in Nigeria Using Babudoh's Comprehension Therapy

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## Abstract

*This study reports the effect of a treatment tool called 'Babudoh's comprehension therapy' in enhancing the comprehension and writing skills of 10 junior secondary school students with congenital and profound hearing impairment in Plateau State, Nigeria. The study adopted the single group pretest-posttest quasi-experimental research design where the students were subjected to a pretest which was made up of five different tests, a treatment (the Babudoh's Comprehension Therapy), and a post treatment. The students were exposed to twelve weeks of treatment using story books, which entailed reading, vocabulary development, retellings (written and in sign language), comprehension exercises, drama, and the production of specific activities. Total communication was the medium of instruction, and the data collected were analyzed using simple percentages, means and the t-test for dependent samples. The study revealed that the students' sight vocabulary and comprehension improved considerably after treatment. The student's writing skills were also enhanced.*

## Background of the Study

Most students born with profound hearing impairment (congenitally deaf) in Nigeria perform below expectation in reading comprehension, and in nearly all language-related subjects. This is because reading comprehension which is the understanding of written texts, is in the language format of the hearing, which they know very little about. Besides, school records showed that most of the students were born of hearing parents so they were not exposed to sign language early in life. Furthermore, research (Chamberlain & Mayberry, 2001; Goldin-Meadow & Mayberry, 2001) suggests that deaf children born to deaf parents are likely to be exposed to sign language from birth, which becomes their first language upon which they map the language of their reading text – English. Consequently, the students with congenital hearing impairment who have hearing parents find it difficult to express themselves in writing to the understanding of the teachers who grade their papers. They therefore, perform poorly in nearly all the subjects and are judged to be academically backward.

Several intervention methods have been used by different researchers (Andzayi & Nengel, 2005; Gasa, 1990; Eleweke, 1990; Babudoh, 2009) to ameliorate the reading problems of children with profound hearing impairment in Nigeria. The results showed appreciable success/progress made by the participants, except those with congenital conditions. As a follow-up, Babudoh (2012) developed a special treatment program called the "Babudoh's Comprehension

Therapy (BCT)" for this group of children with hearing impairment with the aim of enhancing their literacy skills. Babudoh worked with thirty-two students in Plateau State, Nigeria, using the therapy and their reading and writing skills were considerably enhanced. The BCT entailed reading of story books, retellings and writing sessions, comprehension exercises, drama, as well as creative activities. It was based on the outcome of that study that the BCT was adopted in this study to remediate the literacy skills of the students with congenital and profound hearing impairment at the Plateau School for the Deaf Bassa, Nigeria.

Literacy in broad terms refers to the ability of an individual to read and write. According to Applebee (2000), reading is a key to literacy which entails a progression of skills that begin with the ability to understand spoken words (phonology). Other aspects of reading in writing include the ability to understand the pattern of word formation (morphology), word meaning (semantics), spelling patterns (orthography), and the ability to understand the nature of the grammar (syntax) of the language used. When these rudiments of reading are adequately acquired, the individual would be enhanced to approach printed materials with ease, synthesize and make inferences if need be, as well as be able to write accurately and coherently.

Writing is described by Applebee (2000) as a reflection of an individual's speaking and thinking habits put down to be read and understood by others. It is a craft which needs to be learned and practiced. It entails the understanding that writing is

communication of messages, which have to be understood by the readers. The writer must understand the need for mastering the writing of shapes of letters, recognize the need for space between words, appreciate the need for good punctuation, and master the skill of writing freely anything the writer wants to write (Medina, 2006; Trupe, 2001). In summary, the nature of the writing process entails the ability to shape the letters of the alphabet correctly (lithography), the ability to express one's self using a particular approach or pattern of writing (style), and the ability to clearly convey the information the writer wants to pass across (communication). The purpose of this study was to determine the extent to which the BCT would improve the sight vocabulary, reading comprehension and the writing skills of students with congenital and profound hearing impairment. The BCT is a tool specifically designed to enhance the comprehension and writing skills of students with congenital and profound hearing impairment. It is a method of helping children to learn language through active participation in reading story books where the children are made to learn language through the reading of texts, which enables them to express themselves effectively in sign language and in writing.

The focus of this study is more on the communicative aspect of writing because of the unique needs of the students under study. Deaf students are individuals with profound hearing impairment, who cannot hear speech sound at all except with good amplification devices (White, 2007). The organ of hearing of these individuals is impaired to an extent that precludes the perception of speech sound without amplification for ordinary purposes of life (Yoshinaga-Itano, Sedey, Coulter & Mehl, 1998). When an individual is born with such a condition, they are said to have a congenital and profound hearing impairment.

According to Mayer (2007), Traxler (2000) as well as Marschark, Lang and Albertini (2000), most students born with profound hearing impairment perform below expectation in reading comprehension and literacy skills; they perform poorly in all language related subjects. This is partially because reading comprehension (which is the understanding of the meaning of written text), is in the format of the language of the hearing which they know very little about. They equally cannot express themselves adequately in writing because they are expected to be good in writing skills, which include: correct capitalizations, correct spellings, correct sentence formation, correct punctuation, the ability to link sentences and the ability to use appropriate discourse markers to indicate main points.

The development of writing skills requires a complete integration of the individual into their family and the society so that they would always have something to talk about (Babudoh 2012). Unfortunately, children who are congenitally deaf hardly have the opportunity to be integrated because members of their immediate families do very little to explain things and events happening around them (Meadow, 2005). The students therefore, have limited verbal language and experiential background, which they need in order to comprehend other people's opinions put down in writing, and which they also need in their own expressions (Stewart & Clarke, 2003).

While it is true that children with profound hearing loss can have their hearing enhanced through the use of good amplification devices such as cochlear implantation, it is also true that cochlear implantation and other improved types of hearing aids are expensive and unaffordable by most parents of children with congenital and profound hearing impairment particularly, in developing countries such as Nigeria. Besides, research indicates that even with amplification devices, most children with congenital and profound hearing loss do not achieve the kind of proficiency in spoken language that children with typical hearing have (White 2004, 2007). Children born with profound hearing impairment therefore, need to be attended to by special needs teachers and parents using special methods to assist them in acquiring literacy skills.

Previous studies (e.g., Bess, 1985; Bess, Dodd-Murphy, Parker, Oyler, Oyler, & Matkin, 1988; Yoshinaga-Itano, Sedey, Coulter, & Mehl, 1998), in the area of deaf education revealed that students with congenital and profound hearing impairment do not progress in reading achievement according to their grade level expectations. In fact, Ojile (2006) opined that such individuals hardly go beyond primary level four because they lack the ability to communicate in print. Their inability to communicate in print has serious impact on their lives. For instance, most students with congenital deafness in Nigeria cannot express themselves in writing to the understanding of the teachers who grade their papers as they lack cohesive language (Babudoh, 2012). Similarly, they hardly can make meaning out of written texts (such as text books and hand-outs) because of their poor language background (Stewart & Clarke, 2003). They therefore, perform poorly in nearly all the subjects that require the use of language; consequently, they are judged as being academically backward. In Nigeria, this category of students equally performs badly in external examinations. For instance, a scrutiny of the

Table 1

*Student Performance on the WAEC and NECO Examinations by Year*

Type of Examination	Year	Total Enrolment	PASS <i>n</i> (%)	CREDIT <i>n</i> (%)	FAIL <i>n</i> (%)
WAEC/NECO	2004	22	2(9.09)	0	20(90.90)
	2005	33	0	0	33(100)
	2006	28	2(7.14)	0	26(92.85)
	2007	34	1(2.94)	0	33(97)
	2008	21	2(9.52)	0	19(90.48)
<b>TOTAL</b>		136	7(5.2)	0	129(94.8)

Source: Ministry of Education, Plateau State (2010)

performance of the students in English, (at the Plateau School for the Deaf Bassa) showed that between 2004 and 2008 in West African Examination Council (WAEC), General Certificate of Education (GCE), and the National Examination Council (NECO) examinations, the students performed poorly (State Ministry of Education, 2010). See Table 1 for the results.

The implication is that only seven of the students who graduated from that school (Plateau School for the Deaf, Bassa) between 2004 and 2008 would have furthered their education if a pass was accepted by any institution of higher learning in the country. Where a credit in English language was required for admission, then, none of the students who graduated from that school between 2004 and 2008 would have furthered their educational career. This confirms the views of Reis and McCoach (2000) as well as Schultz (2000) that educational wastage and academic underachievement are likely to occur among potentially capable students, unless reading problems are effectively identified and remedied. It was based on this premise that this researcher undertook to identify, effectively teach, and attempt to ameliorate the reading and writing problems of the students who are deaf through the use of the BCT.

An analysis of the empirical studies carried out in the area of deaf education so far indicate that much has been done in finding out the performance level of children with profound hearing impairment (Babudoh, 2012; Chuku, 2001). What remains to be done is research on intervention methods that will enhance the students' ability in writing and reading comprehension. The purpose of this study was

therefore, to determine the extent to which BCT would improve the sight vocabulary, reading comprehension, and the writing skills of students with congenital and profound hearing impairment. The researcher sought to answer the following research questions:

1. To what extent will the sight vocabulary of the students with congenital and profound hearing impairment improve after being taught using BCT?
2. To what extent will the reading comprehension of the students with congenital and profound hearing impairment improve after intervention with the BCT?
3. To what extent will the students' writing skills improve after intervention with the BCT?

### Method

The research design used in this study was the single group pretest-posttest quasi-experimental design. Shadish, Cook and Campbell (2002) opine that quasi-experimental designs are used when randomization is impracticable. Quasi-experimental design was used in this study because of the nature of the participants involved as the demands of the study did not permit the assignment of participants to groups randomly. The participants were selected based on their degree of hearing loss, age of onset of hearing impairment, chronological age, and gender.

In line with McMillan's (2000) view, the students in this study were given a pretest; thereafter, they received treatment followed by a posttest. The results

were determined by comparing the pretest and posttest scores. All the 35 students in Junior Secondary School level two (JSS 2) born with profound hearing impairment at the Plateau School for the Deaf constituted the population of the study. Out of this number, 10 were selected as the sample based on demographic variables such as degree of hearing loss, age at onset of hearing problem, chronological age, performance, and gender.

### *Sample and Procedure*

A multistage sampling technique was used to get the sample for the study through a reduction process involving five stages as follows: Stage 1 - Audiological assessment, Stage 2 - Assessment for age at onset, Stage 3 - Performance in English, Mathematics, Social Studies, Stage 4 - Chronological age, and Stage 5 - gender of the students. In the first stage, audiological assessment was done after which the students with profound (90dB and above) hearing loss were separated from those with moderate or severe (below 90dB) hearing loss. Next, age at onset of hearing loss was then determined by separating (from among those with profound hearing impairment) the individuals that were born with the hearing problem from those who acquired their hearing impairment later in life.

In the third stage, only the students with congenital profound hearing impairment were subjected to the performance test. Their Mathematics, English and Social Studies scores for three terms were scrutinized and only the students who fell within the average category (because their mean scores fell within the range of 45% - 65%) were selected; the students whose mean scores were either below 45% or above 65% were dropped at this stage. The criterion of chronological age was applied at the fourth stage where only students whose ages fell within the age bracket of 14 to 20 years were selected. This gave a derived population of students with congenital and profound hearing impairment, whose academic performance was considered to be average and whose chronological age fell between 14 and 20 years.

The fifth and final stage was the application of the gender criterion. Though the researcher was interested in having equal numbers of males and females only three male students got to this stage therefore, random sampling was used to get seven girls from the eleven girls available at this stage. The sample used for the study was therefore, made up of three male students and seven female students.

The instruments used for data collection were five assessments, and the students' dossiers (SD). The

assessments were the Audiological Assessment Test ((AAT), Word Recognition Test (WRT), Reading Comprehension Test (RCT), Formative Assessment Test (FAT), and Continuous Writing Ability Test (CWAT). The students' dossiers were school records containing the scores of the students for three terms in English, Mathematics, and Social Studies.

The intervention was the BCT, which was made up of five reading sessions, three writing sessions, two retelling sessions, one comprehension exercise, one drama session, an activity, and the collective production of a book for each of the story books used. The researcher wrote out all the names of characters and unfamiliar words on the blackboard and taught the meaning of the words. The signs for the words were also taught and practiced. Signs were invented with the help of the students for names of people, places and things which did not have standard signs. All the new words were used in sentences in sign language and in writing. After that, the teacher cleaned the board and pasted one flash card at a time, of the new words the students just learned.

The students were asked to give the words, by signing the meaning of each of the words. When the teacher finished displaying all the flash cards on the blackboard, the students were asked to identify different words of their interest in the story books, notifying the researcher each time they found one. After this exercise, the story was read in sign language several times. Each story was discussed and re-told manually and in writing. In re-telling the stories, the students took turns so that every student had an opportunity to express themselves manually in the class. They were then given comprehension questions which they answered in sign language and in writing. At this juncture, the researcher gave the students formative assessment tests such as the Cloze and the Maze procedures. The results obtained intimated the researcher of the areas of need of each student, which were addressed accordingly.

After the Cloze and Maze exercises, the students were asked to re-read the stories. Next, was the production of an activity which was selected by the students. For example, the students selected the making of "Nene's fire place" after reading "The Talking Calabash". The essence of engaging the students in an activity such as this was to teach the skills of observation, sequencing, and description using simple sentences. The materials needed were brought to the class and the students were encouraged to sign and describe the uses of each of the items. Using clay, they molded a simple cooking pot each and discussed the various steps in the process of making a local fireplace which the teacher videotaped.

Table 2

*Total Number of Words Recognized by Each Student at Pre and Post Treatment*

S/N	STUDENTS	Pre-BCT TNOWR (%)	Post-BCT TNOWR (%)	Difference (TNOWL) (%)
1	Ifeoma	26.5	39.2	12.6
2	Tessy	37.8	61.21	23.39
3	Paul	43.81	72.54	28.72
4	Tunde	59.81	79.03	19.21
5	James	28.42	35.09	6.66
6	Gold	38.78	52.24	13.45
7	Ureera	40.30	57.78	17.27
8	Janet	61.69	82	20.30
9	Sally	47.93	70.30	22.36
10	Ramata	50.54	68.78	18.24
Mean scores		43.55	61.81	18.22
Std Deviations		11.77	15.89	6.22

Note: TNOW is Total Number of Words in the Tests; TNOWL is Total Number of Words Learned; TNOWR is Total Number of Words Recognized.

At the end, each student was asked to describe the process of making a local fire place, the aim of which was to encourage them to make simple and correct sentences, linking ideas and events. In the process of this exercise, wrong sentences were corrected. At the end the students were asked to write the experience of making a fire place individually, naming all the materials needed as they wrote their experiences. After practically molding the simple clay pot and making the fire place, the students were asked to draw the items, label, and color them.

The next major activity was the making of the big book, which was a collective responsibility of the entire group. Students were asked to draw any part of the story they liked using speak-out balloons (☺). In the balloons, students were assisted to place appropriate write ups. With the help of the teacher, folded cardboard papers were cut and stapled in the middle to form a frame of the big book whose pages

were numbered. After that, the students were asked to bring forth their drawings, one after the other, which were placed on the pages of the big book being made, making sure that the correct sequence of the story was followed. The teacher and the students then went through the book from page to page, after which attention was drawn to the cover page which was designed and painted according to the students' preferences. The book was then kept on display for all interested members' admiration. On the back page, all the students who contributed pages were asked to write their names. After this exercise, the students read the entire story again as a way of revision and they were made to answer questions derived from the stories.

Next, was dramatization of the story. The students at this stage were familiar with the story so they were asked to choose a role and they were organized to act the drama. During their acting, they were filmed so that after the final production of the drama, the film was played to enable them watch, appreciate, and criticize the quality of their presentations. Based on their performance, modifications were made for various students as a way of improvement. Thereafter, the students re-read the story books and retold them for the last time in sign language one after the other.

It should be noted that the exercises described in this sub-section of the work were carried out for all the three story books read during the intervention procedure. Three story books (The Talking Calabash, Ama's Bowl of Food, and The Roasted Baby) were successfully read by the students in this study. Data collected for the three research questions were analyzed using simple percentages and the arithmetic mean.

## Results

Results of this study were based on the improved performance of the students in the different areas measured namely, sight vocabulary development, reading comprehension performance, and improved writing skills.

### *Sight Vocabulary Development*

The results showed that after treatment, the least number of words additionally recognized by the students was 110, while 474 was the highest number of words additionally recognized by the students after treatment. Table 2 gives the details of the performance (total number of words recognized by each of the students) at the pre and post treatment stages. The last column (TNOWL) gives the actual gain made by each

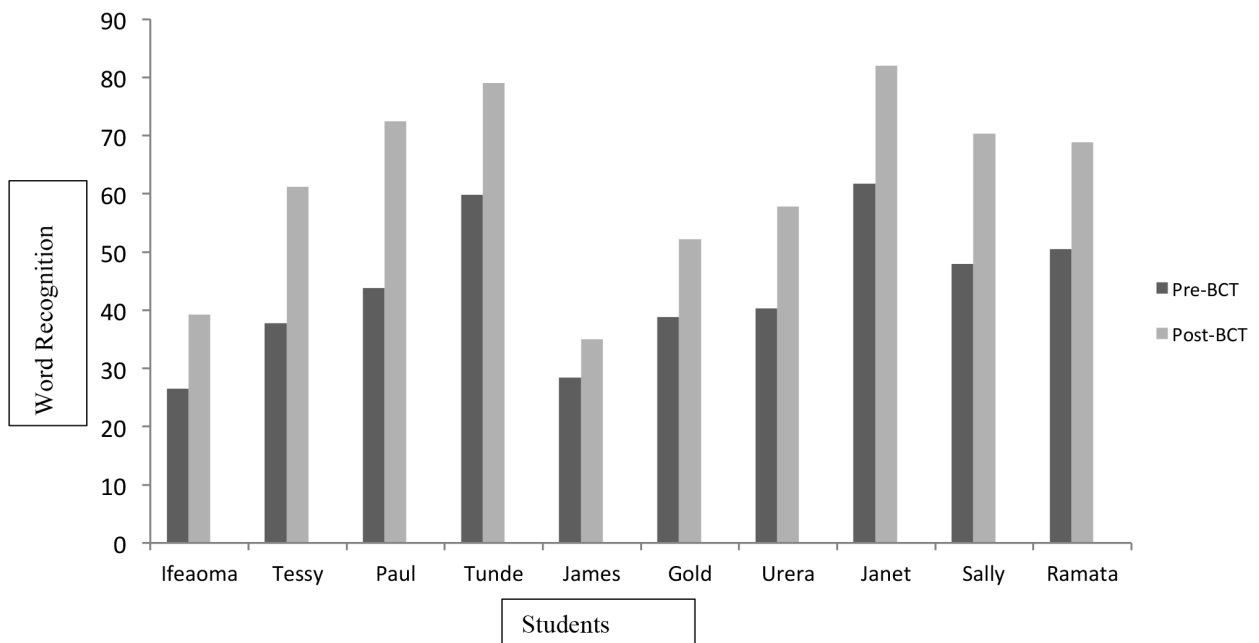


Figure 1. Performance of Students in Word Recognition

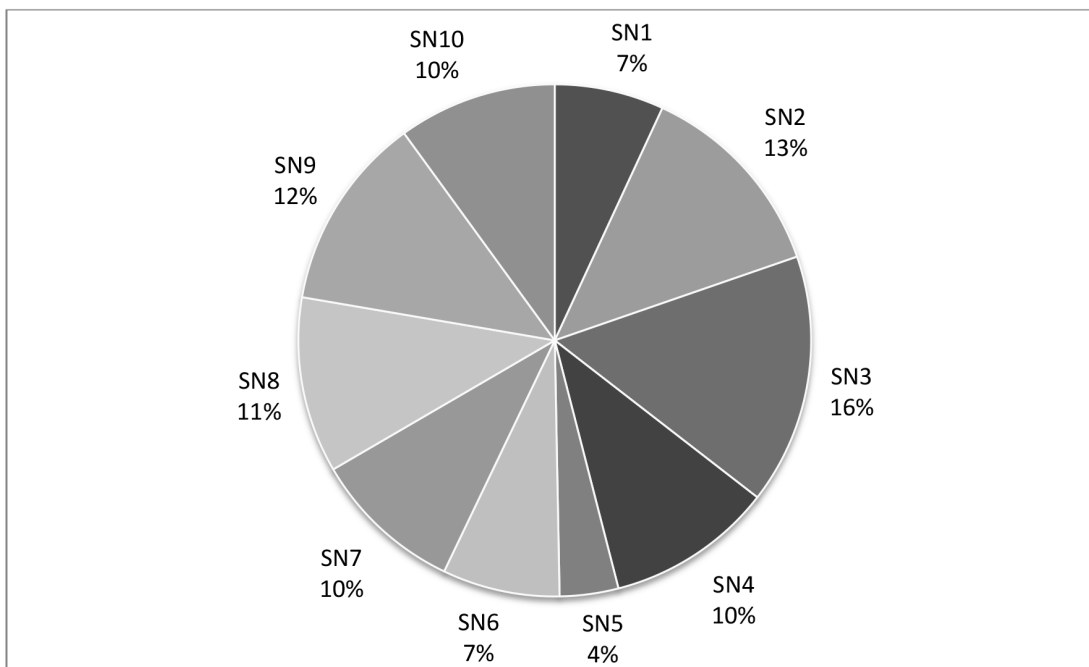


Figure 2. A Comparison of Each Student's Performance with the Performance of other Members of the Group

student. The Table indicates that James (SN5) had the least number of words learned after treatment while Paul (SN3) had the highest number of words (gain) learned. The pre-treatment mean score was 43.55% while the mean score for the post treatment was 61.81% as shown on Table 3. In corroboration, the calculated  $t=9.29$ , while the critical  $t=2.26$ . Since

$t=9.29$  ( $p=0.05$ )  $>$   $t$  critical value of 2.26 this means that BCT improved the sight vocabulary of the students because of the significant mean difference in the sight vocabulary scores of each of the students after treatment.

Figure 1 indicates the performance of the individual students in word recognition. The number

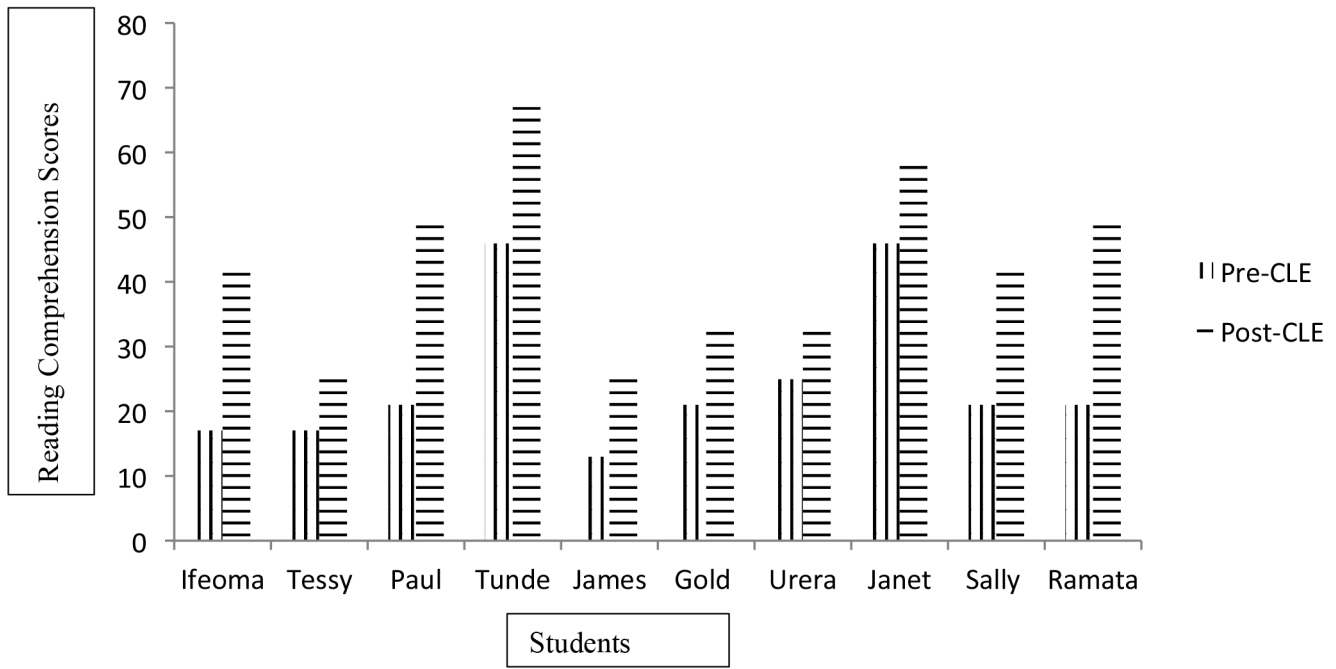


Figure 3. Performance of Students in Reading Comprehension at Pre and Post Treatment Stages

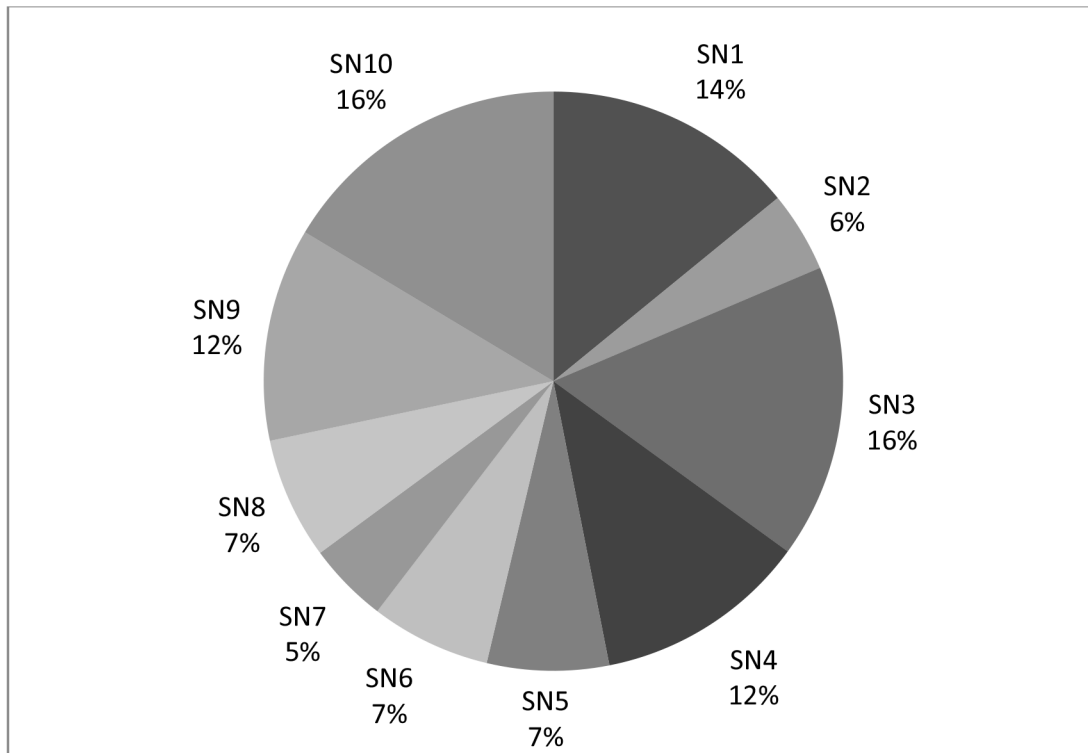


Figure 4. Performance of Each Student in Comprehension in Relation to the other Participants



of words recognized by each student at the pre and post treatment stages of the study is indicated, giving a clear picture of the progress made. The percentage scores given in Table 1 are the calculated percentages earned by each student based on the total number of words contained in all the tests which was 1650. Figure 2 illustrates the extent of the new words recognized (learned) by each student vis-à-vis the performance of the other members of the group. From the analysis in Table 1, James (SN5) had the least difference (110 words) which is represented on the pie-chart (Figure 1) as occupying the least segment of the circle (13.2<sup>0</sup>). In the same vain, Paul (SN3) recorded the highest difference made (474); hence, he occupies the largest portion (56.7<sup>0</sup>) of the pie-chart.

### *Reading Comprehension Performance*

Reading comprehension performance was analyzed using the second research question. Performance on reading comprehension was judged using the scores earned at the pre and post BCT stages on 12 passages in the Umolu Informal Reading Inventory (UIRI). The analysis showed that the difference in gain ranged between 8% and 29% as shown on Figure 3.

Figure 4 gives a pictorial view of the performance of each student in comprehension in relation to all the other participants in the study. Hence, for instance, the chart shows that the 25% for Ifeoma (SN1) represents 14.1% of the performance of all the students whose proportion on the pie-chart is 50.8<sup>0</sup>. On observation, the chart shows that SN3 (Paul) and SN10 (Ramata) had the highest mean difference of 29 (58.98<sup>0</sup>) while SN2 (Tessy) and SN7 (Urera) had the least mean difference of eight whose proportion on the chart is just 16.27<sup>0</sup>.

According to the *t*-test the pre-treatment mean score was 24.49%, and the post-treatment mean score was 42.49%. The calculated *t* value was 7.06 while the critical *t* was 2.26. This meant the treatment had a positive impact on the reading comprehension performance of the students.

### *Improvement of Writing Skills*

Improvement of writing skills was evaluated based on research question three. The gains achieved by the students were based on the accuracy of the words and the accuracy of the sentences used. The specific variables were the number of words used in the sentences, the number of words legibly written, the number of words spelt correctly, the number of words correctly capitalized, the number of sentences used, and the number of sentences in correct sequence of words. The summary of the range of gains on accuracy

of words was between 11 and 236 words while the range of gains on accuracy of sentences was between one and seven sentences. The result of the *t*-test showed the critical *t* was 2.26 for all the areas measured while the calculated *t* was as follows: number of words used was 5.54, number of words legibly written was 5.17, number of words spelt correctly was 5.20, number of words correctly capitalized was 5.26, number of sentences used was 3.46, while the *t*-calculated for number of sentences written in correct sequence was 5.59. This meant that the treatment had a positive impact on the writing ability of the students.

### **Discussion**

The study indicated that the lowest number of words learned after BCT was 110, and the highest number of new words learned was 474. The achievement of the students may have resulted from the fact that many of the new words learned repeated themselves in many pages of the different stories the students were made to read. This confirms the findings of Kukur (2011) that the retelling technique enhances children's reading and writing skills because words which they knew their meanings but did not know how to write or spell them would be learned unconsciously as the students used them frequently in repeated reading and retelling exercises. The study also revealed that the reading comprehension skills of the JSS 2 students with congenital and profound hearing impairment improved after treatment. Specifically, the study revealed that two participants had a difference of 8%, three had a difference of 12%, two students had 21% difference, one had 25% difference and two students had 29% difference between their pre-BCT and post-BCT comprehension test scores. Though the analysis of the performance of the students in comprehension showed an improvement after BCT, the study showed that a few of the students merely read or signed the comprehension questions when they were asked to write the answers to the questions, while others merely copied the guidelines given to assist them. These students exhibited what Carney and Moeller (1998) called reading comprehension disorders where children can identify individual words quite adequately, but have difficulty making inferences or evaluating what has been read.

The study further indicated that the writing skills of the JSS 2 students with congenital and profound hearing impairment improved after treatment. Most of the students wrote more sentences at the post-BCT when they were asked to write a simple story because they tried to write (re-tell) the stories they read from the BCT books. This meant that BCT gave the

students an experiential background which aided them in their discussions and write-ups.

A scrutiny of the performance however showed that some of the students, in writing their compositions, merely copied the guidelines given to assist them. Others wrote disjointed sentences, hence their poor scores in the number of sentences written in correct sequence. This supports the findings of Stewart and Clarke (2003) that children with profound hearing impairment may have all the correct sentence frame nodes but may assemble them incorrectly.

Readers should note that this study is not without limitations. Though the researcher-made tests used in this study (Word Recognition Test, Reading Comprehension Test, Formative Assessment Test, and Continuous Assessment Test) were scrutinized and validated by professionals in Learning Disabilities and Reading, their psychometric properties were not determined. The results should therefore, be interpreted with caution bearing this limitation in mind.

### Conclusion and Recommendations

In summary, the sight vocabulary, reading comprehension, and writing skills of the JSS 2 students with congenital and profound hearing impairment improved after they were taught using the BCT method. From the analysis of the research questions formulated to guide the study, it was observed that the BCT was a good method of teaching reading comprehension and continuous writing to students with congenital and profound hearing impairment. This was because of the repeated reading, acting, retelling, and writing exercises in the BCT process. From the analysis of the results, it is reasonable to hypothesize that given longer periods of exposure to the BCT process the students would improve beyond primary four level in reading achievement.

Based on the findings of the study, it is recommended that teachers of children with congenital and profound hearing impairment should ensure that they give the children a rich experiential background (so that they would have something to talk about) and provide enough opportunities for them to use the experiences while discussing events of similar occurrences and expressing their feelings in language, drama, and dance. Furthermore, students should be encouraged to always write simple sentences of the things they read and say in discussions. This will give them practice on how to express themselves in writing so that inclusive education for children with congenital and profound hearing impairment would be successful.

Teachers should consider adopting the BCT procedure described in this study for students with congenital and profound hearing impairment. They should encourage the use of complete sentences each time the students have something to say. Finally, teachers should note the specific problems of each student and address them promptly. For example, in this study some students were found to be fond of writing capital letters between small letters in words such as 'arouNd'.

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# ACE: A Collaborative School Consultation Program for Secondary School Teachers

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## Abstract

*This article presents a description of ACE (Accompagnement collaboratif des enseignants (Collaborative teacher accompaniment)), a new program designed to guide secondary school teachers in integrating students with behavioral problems in their classrooms. ACE proposes collaborative accompaniment inspired by behavioral and mental health consultation models. In this program, a specially trained professional meets either individually or in small groups with teachers, six times during a school year to address difficulties encountered in managing some behaviors by offering support through a problem solving process. A study combining qualitative and quantitative methodology was designed to evaluate the effectiveness of ACE with 85 teachers who participated in the program in the treatment group and 44 in a comparison group. Full results of this study are accessible elsewhere (Massé, Couture, Lévesque, & Bégin, accepted). The summary of results presented here indicated that teachers appreciated the program and recognized its utility in helping solving behavior problems in a positive manner and that ACE had positive impact on teachers' stress.*

Inclusive education is a generally recommended practice for pupils with special educational needs (Lindsay, 2007). In Quebec, Canada, as in other countries, mainstreaming practices to maintain pupils in the least restrictive settings are advocated for by school authorities. However, integrating students with emotional and behavioral disorders (EBD) is a challenging task for teachers, particularly at intermediate or high school levels (Avradimis & Norwich, 2002). Pupils with EBD present a particular challenge to their peers and teachers because of their disruptive behaviors and their important needs in instructional and educational areas, often illustrated by associated learning disorders. Students' misbehaviors affect teachers' stress, well-being, and confidence, and also impact negatively on student learning time and academic achievement (Poulou & Norwich, 2000). It appears that difficulty establishing and maintaining valuable classroom behavior management is one of the main reasons why teachers leave the profession; it is also a significant factor in student disengagement (Beaman & Wheldall, 2000; Bibou-Nakou, Stogiannidou, & Kiosseoglou, 1999). Research indicates that successful integration of students with EBD is largely influenced by the practices used by teachers and especially the ability to differentiate their teaching according to student needs (Lehr & McComas, 2004).

Research suggests that lack of training and lack of support for understanding disruptive behaviors and choosing the best strategies to deal with them, may

lead teachers to use more negative strategies, like reprimands, punishment, treats, and expulsion, instead of proactive or positive strategies like effective command or praise (Clunies-Ross, Little, & Kienhuis, 2008; Morrison & D'Incau, 2000). However, the use of predominantly reactive management strategies has a significant relationship with elevated teacher stress and decreased student on-task behavior (Clunies-Ross et al., 2008). To reduce difficult situations and facilitate the integration of students with EBD into regular classes, experts in education think that supporting teachers and supplying them with appropriate tools, through consultation, are promising strategies (Pavri & Luftig, 2000). This article describes a program of collaborative school consultation that can be offered in two modalities to teachers (individual consultation and small group consultation) both aiming at facilitating integration of students with EBD in high schools' mainstream classes.

## Theoretical Background

School consultation has been defined, in general, as an indirect service in which parents, teachers, and other professionals participate in a collaborative problem solving process to improve the academic, emotional, behavioral, and/or medical needs of school-aged children (Reddy, Files, Barboza-Whitehead, & Rubel, 2000). According to Salzman (2008), most models of consultation stress the use of problem

solving as the mechanism through which interventions are generated, and the triadic relationship of consultant-consultee-client. Various consultation models can be found, but two major models emerge for consultation with teachers: behavioral and mental health consultation (Kampwirth, 2006).

Behavioral consultation applies social learning principles to understanding how certain environmental contingencies influence consultee and client behavior. It generally involves objectively specifying client problems, making a functional behavioral assessment, devising and implementing a behavior change plan to solve them, and monitoring and evaluating plan effectiveness. Mental health consultation, most often identified with the Caplan model (2004), focuses on the importance of intrapsychic factors such as consultees' feelings, attitudes, perceptions, and beliefs, in order to improve work-related interactions with present or future clients. The primary goal is to increase the skills and effectiveness of the consultee in working with the client and other clients with similar issues. Consultant interventions include instructing, modeling, questioning, observing, supporting, and relationship building. Despite the enormous interest in school consultation, few outcome studies (e.g., Nadeau, Normandeau, & Massé, 2012; Stoiber & Gettinger, 2011) have been carried out on the subject, especially in regards to consultation with secondary school teachers, and methodological rigor is often lacking in these investigations, particularly because of the absence of comparison groups in the studies' designs.

In a meta-analysis of 35 consultation outcome studies with children and adolescents, Reddy and colleagues (2000) found that behavioral consultation produced large positive effects on clients (students), and consultees (i.e., parents, teachers), while mental health consultation produced medium effects at the consultee level exclusively. Both types of consultation, in the meta-analysis, show particularly important effects for clients with externalized behavior problems. At the consultee level, a large effect was found for learning of new skills. Consultation produced moderate effects on enhancing the consultee's knowledge and changing perceptions and/or attitudes. At the systemic level, change is most noted for the increased use of psychological services and the reduction of referrals for psychoeducational assessments. A small positive effect was found for decreasing the number of special education placements. Results apply mostly to primary school, as 99 % of the client sample consisted of primary school children, and 99.5 % were primary school teachers.

More recent studies on behavioral consultation

obtained positive results on students' behaviors (Boyajian, DuPaul, Wartel-Handler, Eckert & McGoey, 2001; Hoza, Kaiser, & Hurt, 2008; Nadeau et al., 2012; Stoiber & Gettinger, 2011; Wilkinson, 2005) and academic performance (DuPaul, Jitendra, Volpe, Tresco, Lutz, Junod et al., 2006; Miranda, Presentacion, & Soriano, 2002; Nadeau et al., 2012). Some have also shown improvement in teachers' use of recommended practices for students with EBD (Nadeau et al., 2012; Stoiber & Gettinger, 2011; Zentall & Javorsky, 2007) and higher teachers' self-efficacy (Nadeau et al., 2012).

A recent review on mental health consultation in early-childhood settings (Perry, Allen, Brennan, & Bradley, 2010) revealed that early-childhood mental health consultation services were consistently associated with reductions in teacher-reported externalizing behaviors. No recent study has been found on the application of the model with secondary school teachers.

A new approach emerging is the use of consultation groups. Consultation groups are designed to facilitate professional dialogue and problem solving among teachers in a constructive setting (Babinski, Knotek, & Rodgers, 2004). Several authors including Durn (2010) as well as Knotek, Babinsky, and Rogers (2002) reported positive results for beginning teachers, particularly on self-efficacy. In a pilot evaluation of group consultation approach (Evans 2005), teachers felt the sessions were practically relevant, and the new system of service delivery was supporting the development of efficient and effective practices. Massé, Lanaris, Dumouchel, and Tessier (2008) found that participating in consultation groups has many advantages. Among them are the possibility to trade and share ideas without feeling judged; the optimism that emerges since there is "always a solution"; and the change in attitudes toward these students: see the student first, not the EBD.

William (2000) stresses that it is when the consultant adopts a collaborative approach (in opposition to an "expert" approach) of consulting that the most enduring changes in teachers' practices would be brought about. Indeed, since responsibility of the problem, in a collaborative approach, is shared equally between teachers and consultant, teachers are better enabled to solve problems they encounter. This type of approach will focus on developing teachers' skills to solve problems, communicate with peers, and transform the environment, so that they can have greater control over their work environment and thus, develop a greater sense of security in the long run (Lafortune & Deaudelin, 2001).

As part of a research project funded by the concerted action of the Quebec Ministry of Education and the *Fonds de recherche Société et Culture du Québec* (2009-2012), we developed a consulting program (*ACE: Accompagnement collaboratif des enseignants*) drawing on the approaches suggested above, that can be applied following individual meetings or subgroup meetings. The purpose of this article is to describe this program and to present principal results emerging from a first experimentation. For more information on study design and results, readers are invited to refer to Massé and Couture (2012).

### **Description of ACE**

This consulting model is intended to provide training and support for secondary school teachers with at least one student with behavioral difficulties integrated in the mainstream groups. The two modalities we discuss in this paper share the same objectives: to 1) assist teachers in better understanding the nature of their students' behavior problems and their underlying needs; 2) help teachers become aware of their current practices and their effectiveness; 3) help teachers identify interventions they should change and those they should keep; 4) assist teachers in establishing a positive relationship with their students; 5) train teachers to use a simple functional assessment process when they face inappropriate behaviors (problem-solving approach); 6) support them in the design of an appropriate action plan that focuses on proactive and positive strategies, and 7) give teachers support in the implementation of the plan.

Furthermore, in designing this consulting model, we wanted to propose standardized material and a framework that could either be used in an individual or small group process. This is why both modalities of consultation presented here have a lot in common. Indeed, besides sharing the same objectives, they are based on the same theoretical background and propose the same tools to teachers. These tools are based on evidence-based knowledge about improving student behavior in class (e.g., Akin-Little, Little, Bray & Kehle, 2009; Massé, Desbiens & Lanaris, 2014), including behavioral strategies, cognitive behavioral interventions and the hierarchical model of interventions proposed by Webster-Stratton (1999).

### **Modalities Descriptions**

Both modalities of consultation share common features, including the number of meetings, the use of

functional behavioral assessment, the problem solving process, activities proposed, and consultants training.

#### *Number of Meetings*

The first common feature is the number of meetings between teachers and consultant during a school year. Since the realistic aspect of the model was of primary importance, we decided to propose five to six meetings in a school year, even though previous evidence suggests that the more often the consultant and the teacher meet, the greater the impact on student's behavior and achievement. Indeed, after having implemented the program in many schools over a two year period, it became evident that it may not be realistic to ask for more meetings in a regular school setting where everyone's agenda is already packed. However, we noted that many teachers were delighted to have the help and support they received during their first year in the program as they asked to continue the consultation the following year. It is a relevant and desirable request because it is known that changes in teachers' practices are more likely to continue over the long term if they appear slowly and are revisited from year to year, so that new practices can gradually become natural and regular (Tillema, 1995). We therefore encouraged consultants to continue with the process of supporting teachers in subsequent years, by reinvesting the supplied material and continuing the problem solving process.

#### *Use of Functional Behavioral Assessment*

A second common feature of both modalities is the use of a problem solving procedure through a standardized functional assessment process, which allows hypothesis on the motivation of behavior, rather than designing intervention based only on behavior perspective. The steps of the problem solving procedure are illustrated in Figure 1. First, the teacher briefly shares the problems he/she has encountered with one or more students in his/her groups. The consultant then asks the teacher to complete the form presented in Figure 2 before attending the meeting so that he/she can immediately share with him/her (and other teachers in small groups) many essential facts enabling better understanding of the behavior and its context. This form is adapted from the *Functional assessment checklist for teachers and staff* by Crone, Hawken and Horner (2010). If the form is not initially completed as directed, the teacher is asked to complete it throughout the problem solving-process with the help of the consultant (or other group members). The functional assessment allows identifying the functions of the disruptive behavior and its contingencies.

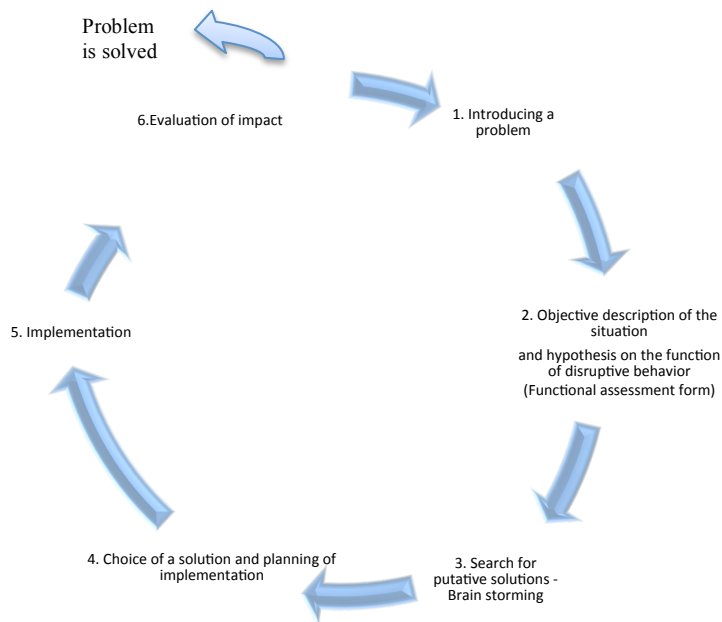


Figure 1. Steps of the problem solving procedure

**A) Operational description of the targeted problem behavior**

1. What does the problem behavior look like? (Action, inaction, facts, gestures, words, etc.)
2. How often does the problem behavior occur?
3. How long does the problem behavior last when it occurs?
4. What is the impact of the problematic behavior on the functioning of the student in class or on his academic and social adaptation? What is the impact on the functioning of the group or the classroom climate?

**B) Description of antecedents and consequences of the targeted problem behavior**

**1. What are the antecedents of the problem behavior? (Elements of the environment, activities, people involved, emotional states, etc.)**

- a) What situations seem to trigger the problem behavior? (Circumstances, environment, instructions, activities, etc.)
- b) When is the problem behavior most likely to appear? (Time of day and day of the week, bystanders, etc.)
- c) When is the problem behavior least likely to appear? (Time of day and day of the week, bystanders, etc.)
- d) Does the frequency or duration of this behavior vary depending on the situation (activity, persons present, time of day, etc.)?

**2. What are the consequences that are likely to maintain the problem behavior?**

- a) What happens usually after the onset of the problem behavior?
- b) What is the impact of the consequences on the problem behavior? (Stopping, improving, worsening)
- c) Which interventions already being implemented were unsuccessful or appear to have worsened the situation?
- d) Have you ever tried something that worked out well?

**C) Why the student acting this way? (Possible explanations)**

**1. Provide a summary of the behavioral sequence.**

- a) Predictor Events / Contexts
- b) Consequences that maintain the behavior
- c) Possible function of the behavior

**2. How confident are you about the accuracy of the summary explaining the problem behavior?**

3. Briefly describe the student's state of consciousness of the target behavior. Is he indifferent or does he suffer?

**D) What is your action plan to improve the situation?**

Figure 2. Content of Functional Assessment Form

### *The Problem Solving Process*

The problem solving process is inspired by the approach developed by Caplan (2004). The consultant uses the following structure to guide the problem-solving discussion at the meetings:

- 1) After the presenter has described the problem to solve, the consultant (and the group members in small groups) help the presenter gain a clearer conception of the problem and generate alternative explanations by asking questions and pushing for clarification and further refinement of the definition of the problem in order to complete the functional assessment of the situation. If in the group modality, the consultant then encourages other members of the group to formulate hypotheses about the source of the problem, by putting emphasis on functional assessment and their expertise.
- 2) When the problem has been well defined and some hypotheses on the function of the behaviors are stated, the team that is composed of the teacher and the consultant (and other teachers in small groups) searches for realistic solutions to the situation. Everyone is invited to share his/her ideas in the brainstorming. It is important that the teacher actively participates in the search for solutions. In a collaborative process like this one, it is the role of the consultant to facilitate and encourage the participation of the teacher. The consultant should avoid positioning himself as an expert who provides the best solutions, since the teacher's input in searching for and selecting solutions is an essential component of the empowerment process.
- 3) When several solutions have been proposed, the teacher chooses one that is convenient for him/her and that has a good probability to give results. The consultant's role at this step is to guide the teachers' choice, by discussing with him/her the pros and the cons of each proposed solution for the student, the teacher, and other students in the group.
- 4) When a strategy is chosen, the consultant and teacher develop a plan to determine how it will be implemented in day to day school life. This plan must be realistic and acceptable for the teacher, and should specify when, where and, how the strategy is to be used.
- 5) The consultant offers support for its implementation.

In the beginning, a new strategy is usually implemented gradually from a smaller scale (e.g. one period during the day) before moving to a larger scale

as the teacher becomes more and more familiar and secure with the approach. It is also important for the consultant to remain available in order to provide support to the teacher between their meetings, should he/she encounter any difficulties with the plan's implementation, feels isolated, or needs feedback. At the next meeting, the team recaps on positive and negative outcomes, and according to results, repeats the problem solving process for the same or any other problematic situations.

Throughout the consultation meetings, various topics are discussed with teachers in addition to problem resolution. At each meeting, the consultant presents a theoretical capsule that offers information on different contents. Following Webster-Stratton's (1999) teacher pyramid of intervention, emphasis is first put on building positive relationships between teachers and students and on preventing behavior disorders by improving classroom management. Teachers also learn how to compensate for different deficits that some students may have (e.g., attention deficit, impulsivity, learning difficulties). They are then tutored on the best ways to give directives to students, on the purposeful use of attention, on positive discipline, and on strategies for reducing inappropriate behaviors. For each of these themes, they discuss with the consultant and they receive documents explaining why, when, and how to use each strategy. It is important that themes discussed between teacher and consultant are relevant for the former. This is why over 30 solution plans, targeting the most common problems that may be encountered in high schools, are included in the companion guide. The consultant may choose from these plans to discuss specific topics that are important for the teacher at a particular moment and linked with the problems he/she wants to solve with him/her. Themes of the solution plans, inspired by the work of Sprick and Howard (1998), are presented in Table 1.

#### *Learning Diary and Reflective Practice Activities*

In both modalities, between the meetings, teachers are asked to pursue their learning by filling out different documents which are given to them by the consultant. A learning diary enables the teacher to reflect upon a given situation that he/she has previously encountered with a student and on his/her own reaction to it. This time of reflection helps teachers develop critical self-appraisal strategies toward their interventions. Reflexive writing activities are specific exercises related to the topics chosen at each meeting. These activities help teachers revise pertinent theoretical elements and also help them think of ways to implement them in their teaching. For



Table 1

*Themes of Action Plans*

Specific plans
Absenteeism
Anxiety, nervousness, stress
Apathy
Beginning class, getting students ready
Bullying (victim)
Bullying (aggressor)
Chaos, group out of control
Chatting, excessive noise (for a group or an individual)
Cheating
Day dreaming
Difficult parents
Disrespectful behaviors
Disruptive behaviors
Distractability, poor sustained attention
Drug issues
Forgetting material
Homework issues
Hyperactivity
Insufficient participation in class
Late assignments
Late for class
Low frustration tolerance
Moderate disturbing behaviors
Opposition – Argues with teacher
Opposition- Passive resistance
Opposition- Refusal to comply and follow instructions
Problems with transitions
Procrastination
Work completion
General plans
Behavior modification
Cognitive restructuring
Guiding students in solving personal problems
Implementing classroom plan
Implementing individual plan
Meeting with parents
Preventing and managing crisis
Technological aids useful for reading
Technological aids useful in writing

example, certain activities are conducted on the following themes: 1) How do I create a relation with a student? 2) Am I a good motivator?

*Consultants Training*

Another feature shared by both modalities is the training offered to the consultant. It is suggested that this role be played by a school psychologist or a school counselor, or another professional who has acquired thorough training in behavioral difficulties.

Moreover, before developing this type of support in a school, it is better that consultants be trained in the accompanying process. This training must be designed to help them adopt a collaborative posture and understand the resistance they could receive from teachers, as well as how to properly deal with them. We also recommend that, in the first year of the program, they be supervised on a regular basis. In the two-year implementation of the program, all consultants were trained professionals (resource teachers, psychologists, or specialists in behavior management, called psychoeducators in Quebec). They all completed a two-day training program before the beginning of the consultation meetings, and they participated in five supervision seminars during the school year.

To help with this task, the consultant is given a standardized companion guide (Massé & Couture, 2009) offering theoretical capsules, functional assessment tools, and reflective activities for teachers as well as proposition of action plans for different behavioral difficulties encountered in class.

*Features That Differ in Each Modality*

The duration of each of the six meetings differs for each modality. Individual consultations last from 60 to 75 minutes, whereas small group consultations last between 120 to 150 minutes. Of course, the planning of individual consultation meetings is easier since only two diaries need to be considered, compared to four or six in small groups. Moreover, in a school day, it is often easier to book one hour than two hours for a meeting, which is another advantage of individual consultations. Another feature of the individual modality is the ability it gives to the consultant-teacher duo to thoroughly analyze one or two problems relevant for the teacher at each meeting.

For its part, small group modality allows helping up to five teachers at each meeting, an efficacy feature that may be very important when the school's needs are great, and consultant's availability is limited. However, one must take into consideration that if five teachers are grouped together, it may not be possible to address everyone's concerns at each meeting. Usually, resolution of one to three problems is undertaken at each meeting. However, the possibility to share ideas with colleagues and to listen to others' difficulties and solutions seems to have a positive impact on all participating teachers who feel a sense of mutual support among participants. Another feature that is specific to the small group modality is the collaboration that can be generated between participating teachers of a school. Hence, if a teacher

encounters some difficulty with a situation between the meetings, and the consultant is not available to help him/her right away, it is possible for him/her to ask one of the colleagues who were present at the last meeting to give his/her idea or to help him/her with the situation. This mutual support between teachers may have a positive impact on team collaboration in school, as well as enhancing teachers' motivation to change their practices (Massé et al., 2008).

### **Brief summary of the Results**

An evaluative study was conducted in order to evaluate effects of ACE on various teachers' characteristics. Readers are invited to consult Massé and colleagues (accepted) for more details. A quasi-experimental research design was used, combined with a qualitative assessment. One hundred and twenty-nine teachers (88 women and 41 men) participated in the project divided into two treatment groups (individual consultation,  $n = 30$ ; small-group consultation,  $n = 55$ ), and one comparison group ( $n = 44$ ). The most important impact of the program is the significant improvement on teachers' stress for the treatment group as compared to the comparison group, particularly on self-doubt/needs support, but no significant differences were observed between the two modalities of treatment (Massé & Couture, 2012). Teachers with more teaching experience demonstrated greater improvement.

Qualitative results were obtained by semi-structured interview of the participants in the first year of the project (42 teachers, 11 school consultants, and 8 head teachers). For more information on qualitative results see Massé, and colleagues (accepted). All teachers appreciated the consultation services received and would recommend them to other teachers, especially new teachers. All actors (teachers, school consultant, managers) recognized the utility of both modalities to help teachers solve behavior problems in a positive manner. Moreover, 57% of teachers reported that they gained a better understanding of disruptive behaviors and that they would take more time in analyzing problematic situations and understanding the meaning of these behaviors before intervening.

Eighty-eight percent of teachers also reported that they learned new strategies in intervening with students with EBD. However, 55% noted that not all developed strategies were that new, and that the program permitted a useful review that better enabled them to implement these strategies in real life. Head teachers and school consultants reported that teachers intervened in a more proactive and positive manner, and less in a reactive manner. Teachers also stressed

that they now saw it as more important to build good relationships with students with EBD and to use positive reinforcement. In other words, they modified their attitudes toward students with EBD. For them, these changes were not only to the benefit of students with EBD, but to that of the whole class. In order to reflect on their own practices, teachers in both modalities stressed the importance of obtaining feedback and of the opportunity to exchange views about students. This helped them better understand why certain strategies will work out and others will not, and to open up new ways of intervening and teaching with students. Both models were appreciated by the stakeholders and almost no differences were observed between the two modalities in the discourses of teachers regarding observed changes or utility of the meetings. However the group modality is the one which elicited the most adhesion in all groups for the opportunity to discuss a greater variety of behavior problems, to exchange with other teachers, and to profit from their experiences.

### **Conclusion**

ACE is a school consultation program which offers tools and a structured approach intended for school professionals who wish to support secondary school teachers working with students coping with behavioral difficulties. It is a flexible program since it can be either employed to accompany a teacher on an individual basis or to accompany a small group of teachers sharing similar challenges in dealing with their students' behavioral difficulties. Proposed tools enable school professionals to help teachers develop their autonomy in applying the problem solving process to their own classroom situations. Teachers that benefited from the supplementary support provided by the ACE program stated that they did not perceive their students difficulties as negatively as before and that they discovered new ways to interact and intervene with their students who experience behavioral difficulties. ACE may constitute a coherent and effective approach in helping schools better integrate students demonstrating behavior difficulties in regular school classroom settings. It offers a fairly simple way to train teachers to manage much of the behavior problems that occur in their classrooms themselves. For all these reasons, the program may be of particular interest in settings where resources are limited and where the behavior difficulties of students are complex.

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## Saudi Arabian Teachers' Knowledge and Beliefs about ADHD

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### Abstract

*Attention Deficit Hyperactivity Disorder (ADHD) is considered one of the most frequently diagnosed psychiatric childhood disorders. It affects 3–7% of school-aged children, interfering with their academic performance and social interactions. This study explored the knowledge and beliefs of teachers in Saudi Arabia about children with ADHD. The Knowledge about Attention Deficit Disorder Questionnaire (KADD-Q) was administered to a sample of teachers, followed by interviews with a subset of the total respondents. The results indicated that the teachers knew more about the characteristics of ADHD than they knew about its related causes and treatment. Overall, the findings indicated that these teachers had some knowledge about general characteristics of ADHD, but they had little understanding of causes and possible interventions. These results suggest an important need for more formal teacher training regarding all aspects of ADHD in school-age children.*

Attention Deficit Hyperactivity Disorder (ADHD) can be described as a neurobiological, developmental, or neurodevelopmental disorder, which manifests as developmentally unsuitable inattentiveness and/or impulsivity and hyperactivity (American Psychiatric Association, 2000). It is a commonly diagnosed disorder in children with prevalence rates of between 3% and 7% (American Psychiatric Association, 2000). Children with ADHD experience many challenges in daily life, from learning disabilities to lower perceptions of self-worth, frustration, and depression; thus, they need support in several areas throughout their lives (Goldstein, Goldstein, Braswell, & Sheridan, 1998). ADHD symptoms have the potential to lead to considerable problems for the children with ADHD, their families, and the people they interact with at school (Barkley, 2006). The core symptoms of ADHD have considerable negative effects on child development in social, emotional, and cognitive skills (National Institute for Clinical Excellence, 2003), and pose considerable financial strain for healthcare and education systems (Barkley, 2006). Teachers are likely to be the first to detect any signs of ADHD within the classrooms, and as such, are expected to make the necessary referrals if they suspect that a student might

have ADHD (Snider, Busch, & Arrowood, 2003). Vereb and DiPerna (2004) believe that teachers' knowledge of ADHD and their practical experiences with students with ADHD are related.

This study is an initial attempt to investigate the knowledge and beliefs of teachers in Saudi Arabia about ADHD. There is no current research in Saudi Arabia on school-age children with ADHD, especially in terms of school-teachers' knowledge and beliefs about the condition. Although there are several studies (e.g., Faraone, Sergeant, Gillberg & Biederman, 2003; Polanczyk, Horta, Biederman & Rohde, 2007) that examine cultural differences concerning ADHD, little is known about how knowledge and beliefs are affected by the way the disorder is conceptualized due to cultural factors (Ghanizadeh, Bahredar, & Moeini, 2006). By providing a cultural dimension, the study adds to the broader international research based on the knowledge and beliefs of parents and teachers of children with ADHD.

### *Teachers' Knowledge and Beliefs about ADHD*

A review of current research on ADHD regarding the knowledge of teachers indicates that there are

many misconceptions about the condition. Jerome, Gordon, and Hustler (1994) examined the general ADHD knowledge of a sample of American and Canadian primary school teachers and found that they had a good general ADHD awareness (78% for Canadians; 77% for Americans). Similarly, Barbaresi and Olsen (1998) corroborated these results with an overall knowledge rate of 77% for elementary school teachers in North America; however, the teachers were poorly informed on existing interventions for ADHD among children. Sciutto, Terjesen, and Frank (2000) conducted a study with 149 primary school teachers in the state of New York, USA, using the Knowledge of Attention Deficit Disorders Scale (KADDS). The teachers in that study scored a significantly lower rate of 48% of correct answers regarding what they knew about ADHD. Sciutto and colleagues (2000) stated that although teachers were largely knowledgeable about the main characteristics of ADHD, they were much less knowledgeable about the causes, interventions, and prognosis. Sciutto and colleagues (2000) and Anderson, Watt, Noble, and Shanley (2012) found that teachers with previous teaching experience with children with ADHD had, to a great extent, a better understanding of the condition in contrast to teachers with little or no experience. Arcia, Frank, Sanchez-LaCay, and Fernandez (2000) used the Teachers Rating Scale developed by Connors (1997) through semi-structured telephone interviews with 21 primary school teachers across three states in the USA. The teachers responded to questions concerning a child who met the complete diagnostic criteria for the disorder. Results of the study indicated that the teachers had a lack of understanding of ADHD behavioral profiles and were not knowledgeable of the principles of behavior management crucial for the planning and implementation of successful referrals and interventions. Sciutto and colleagues (2000) concluded that given these results, in-service training for teachers, about ADHD, should concentrate on behavior management.

Utilizing a somewhat modified version of the Jerome, Washington, Laine, and Segal (1999) questionnaire, Bekle (2004) presented information in relation to teachers and undergraduate pupils' knowledge and attitudes about ADHD. Thirty teachers and 40 primary school undergraduates participated in Jerome and colleagues' (1994) study. Jerome and colleagues' (1994) findings indicated that, while both the teachers and undergraduate pupils had similar perceptions regarding ADHD, the former were a little more precise in their answers. The results also showed a lack of knowledge. Although Bekle (2004) concluded that the results confirmed the need for

further teacher training, which directly addresses pupils with ADHD needs, readers are cautioned against over-generalizing the outcomes given the size of the sample. Based on these studies, there is evidence to suggest that teachers are not very knowledgeable about ADHD, with misconceptions apparently widespread among them. The fact that the knowledge of teachers has a direct impact on the classroom, subsequently affects students with ADHD in terms of performance and emphasizes the value of teachers having accurate knowledge about the condition (West, Taylor, Houghton & Hudyma, 2005). Specific suggestions for teachers working jointly with parents of such children are considered vital to determine parents' knowledge levels.

Kos, Richdale and Jackson (2004) conducted a study with 120 Australian elementary teachers and found a total knowledge score of 60.7%. Similarly, the Bekle (2004) study conducted with 30 teachers in Perth, Australia showed a total rate of 83%. West and colleagues (2005) administered a modified version of the KADDS to teachers in primary and secondary schools in Perth, Australia, and found that 53.9% of the teachers were knowledgeable about ADHD. In a more recent examination, with 140 elementary school teachers from Melbourne, Australia, concerning teachers' knowledge about ADHD, Ohan, Cormier, Hepp, Visser and Strain (2008) reported that the teachers answered correctly to 76.34% of the knowledge of ADHD items; however, they scored lower on knowledge of causes and interventions.

In Saudi Arabia, inadequate attention has been paid to teachers' experiences and the social implications of ADHD, such that a child is frequently viewed as being a problem. The gap in terms of ADHD understanding is placed in the broader social context understanding. Given this background, this current research explored the perceptions of the social consequences of unsuitable behavior. It is not the aim of this research to negate the existence of ADHD, but rather to suggest an alternative approach associated with thinking concerning the behavioral symptoms of ADHD. Therefore, this current study was designed to examine the knowledge and beliefs about ADHD as held by teachers of children with ADHD in a sample set of schools in the city of Jeddah, Saudi Arabia.

## **Method**

### *Design*

This research used a mixed-methods research design, comprising two distinct stages where quantitative and qualitative data were collected and

analyzed. The justification for this design is that quantitative data provides a general understanding of the research problem, (Creswell, 2003) while qualitative data and analysis refines and elucidates the quantitative outcomes by examining the views of the participants in greater depth. The initial data collection was through an Arabic translation of the Knowledge about Attention Deficit Disorder Questionnaire (KADD-Q) (West et al., 2005). The three main domains for ADHD inquiry were ADHD characteristics, causes, and interventions. A small sample of interviews was also conducted and the information gathered from them was included in the general analyses.

### *Participants*

This study took place in the city of Jeddah, Saudi Arabia. Elementary school directors from all four quarters of Jeddah were enlisted to ensure demographic, geographic, social class, and religious diversity. The teachers were selected according to the Directorate General of Special Education's (2006) definition, which states that teachers of children with learning disabilities are responsible for children with ADHD. A stratified sampling approach was utilized in order to determine a sample of teachers since such individuals vary in different quarters of the city of Jeddah. In Saudi Arabia, all educational facilities are gender segregated both for children and the teachers. Among the participating public schools, 21 schools were for girls and 32 schools were for boys. A total of 73 questionnaires were distributed and 54 (74%) completed questionnaires were returned. Twenty-six female teachers and 28 male teachers returned completed questionnaires. The questionnaires were distributed and collected by the researcher. The questionnaires asked whether or not the participants were interested in participating in the interviews. From the 54 participants who completed the questionnaire, only ten responded positively from which only eight interviews were actually conducted; two participants were not available to be interviewed because they were busy with their academic assessments.

### *Instrumentation*

The questionnaire used was the Knowledge about Attention Deficit Disorder Questionnaire (KADD-Q) (West et al., 2005). It comprises 67 rating scale items, all of which have been modelled after the KADDS (Knowledge of Attention Deficit Disorders Scale), which includes 20 items (Sciutto et al., 2000). Each item of the KADD-Q is phrased as a statement with a

response format of "True," "False," or "Don't Know," which allows participants to indicate what they believe they do or do not know concerning ADHD (Sciutto et al., 2000). The three main domains for ADHD inquiry in this study were ADHD characteristics, causes, and interventions.

As the decision of translation has a direct influence on the research and its validity, three methods were adopted in order to eliminate potential drawbacks: back-translation, consultation combined with collaboration, and piloting. Both the study tools and reported results were back-translated; both original and translated English copies were contrasted. No fundamental dissimilarities were identified. Translators were also consulted in order to develop and contrast versions, while piloting with some teachers assisted in developing study tools, which similarly aided in the language of Arabic as the tools were utilized in Arabic.

### *Procedure*

The school directors from four quarters of Jeddah were contacted to ensure demographic and geographical diversity. Prior to the research implementation, permission, and collaboration were sought and received from the Jeddah Local Education Authorities for all participating schools. In the Kingdom of Saudi Arabia, for cultural and religious reasons, girls and boys attend gender segregated schools. Moreover, only males are permitted to visit boys' schools, and if necessary, women can telephone the boys' schools, and vice versa. Because the researchers in this study were all male, it was difficult to include female teachers in the study. However, some of the researchers' female relatives who work in schools provided assistance distributing questionnaires and conducting interviews with female teachers.

A small sample of semi-structured, more in-depth interviews were conducted either in person or over the telephone. Telephonic interviews helped to gain information from participants who were not easy to contact in person because of location constraints. It has been revealed by Sturges and Hanrahan (2004) that when comparing transcripts of personal and telephone interviews, there are no considerable dissimilarities in terms of interview validity.

## **Results**

### *Questionnaires*

The 54 teachers who participated in the study had an average number of years of experience of 5.28

Table 1

*Analysis of Teachers' Knowledge by School Type (Questions 1–67) (N = 54)*

Type of school	No. of Participants	Minimum Individual Scores	Maximum Individual Scores	Mean of Individual Scores
Public	42	17	44	30.71
Private	12	23	48	35.33

Table 2

*Demographic Information of the Teachers (N = 8)*

	Gender	School Type	School Location	Training	Info. and Skills
<b>T1</b>	Female	Private	North	Yes	Yes
<b>T2</b>	Female	Public	North	No	No
<b>T3</b>	Female	Private	East	No	No
<b>T4</b>	Female	Public	East	No	Yes
<b>T5</b>	Female	Public	East	Yes	Yes
<b>T6</b>	Male	Public	South	No	Yes
<b>T7</b>	Male	Public	North	No	Yes
<b>T8</b>	Female	Public	West	Yes	Yes

Table 3

*Summary of Teachers' Sources of ADHD Information*

Sources	T1(F)	T2(F)	T3(F)	T4(F)	T5(F)	T6(M)	T7(M)	T8(F)
University Studies	√	√	√	√	√	√	√	√
Courses and Conferences	√	√	√		√	√		√
Books	√					√		√
Experience	√	√	√	√	√		√	√
TV Programs							√	
Internet		√		√				
School Supervisors			√					
Parents of Children with ADHD	√		√					



years ( $SD = 4.058$  years). Although the teachers' general qualifications ranged from secondary education to Ph.D., a majority ( $n = 47$ , i.e., 87%) held a bachelor's degree. Twenty eight (52%) of the participants were male and 26 (48%) were female. Forty two (78%) worked in public schools, 12 (22%) worked in private settings, and 48 (89%) taught at least one child with ADHD. Although only 11 (20%) teachers reported having ADHD specific training, 34 (63%) teachers answered "yes" that they had information and skills related to children with ADHD. The results from the teachers' questionnaires indicated that they answered correctly at a rate of 47% (range = 25%–72%). Of the three main domains included in this research, the teachers were found to be most knowledgeable about the general characteristics of ADHD and least knowledgeable about ADHD treatment. Results of a Kruskal Wallis Test showed statically significant differences between the three tested domains, that is characteristics, causes, and interventions ( $p < 0.001$ ). A within-subject contrast applying the Mann-Whitney framework indicated that the scores on the characteristics subscale (68%) were significantly higher than either the causes subscale (37%) or the treatment subscale (33%)  $p < 0.001$ . As indicated in Table 1, private school teachers had higher scores than public schools teachers ( $p < 0.05$ ) ( $t$ -test).

Figure 1 shows teachers' knowledge of ADHD, indicating what they knew, their misconceptions, and what they acknowledged they did not know.

### Interviews

Table 2 provides details concerning the characteristics of the eight teachers who participated in the interviews. All of the eight respondents held a bachelor's degree and taught at least one child with ADHD.

#### Interviewee Sources of ADHD Information

Teachers revealed that they learned and gathered information about ADHD from sources ranging from personal experience to self-education and the media. See Table 3 for the teachers' sources of information about ADHD.

Table 3 shows that these eight teachers listed *University Studies* as their foremost source of information regarding ADHD. Seven of the eight teachers said that *Experience* (teaching children with ADHD) was their second most common source of information.

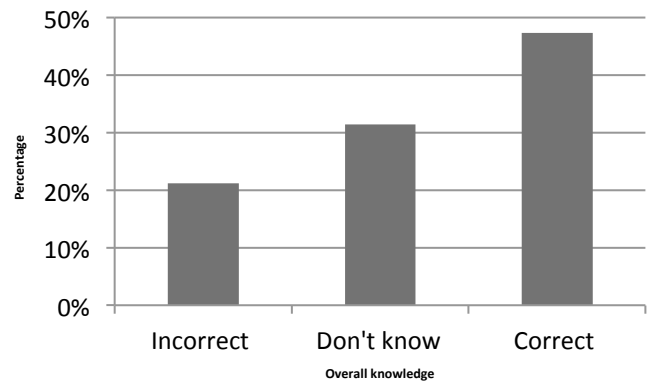


Figure 1: Teachers' Overall Knowledge of ADHD

Furthermore, regarding the availability and easy accessibility of sources of information for teachers, one female participant (T3) stated that:

There are not many sessions and lectures about the subject, which explains parents' ignorance about the subject and their children.

This statement was reiterated by seven out of the eight teachers (T1; T3; T4; T5; T6; T7; T8). The female teacher (T2) who disagreed said that:

There are many resources that talk about this problem and explain how to deal with it. Some centers offer training on the subject and invite the mother and the child. Also, some internet forums are formed by the mothers of these children, and also the teachers.

However, one male interviewee (T7) expressed his belief that there was:

...not enough advertisement about courses.

In their views, these teachers emphasized that correct knowledge and beliefs could be disseminated through a number of different educationally-orientated ways to increase awareness, as indicated in Table 4. As indicated in the table, teachers listed *Courses* as the most effective method of disseminating correct knowledge and beliefs, while *School psychologists* came last. Most teachers believed that the *Media* (television programs advertising awareness, radio programs, and newspapers) was a good means to provide correct knowledge, followed by *Brochures*, involving the parents, and a monthly newsletter. Half of them considered *Spread awareness*, *Parents*, and *Specialist Teachers* as sources of disseminating correct knowledge and beliefs.

Table 4

*Summary of Suggested Modes of Information Dissemination*

Mode of Information	T1(F)	T2(F)	T3(F)	T4(F)	T5(F)	T6(M)	T7(M)	T8(F)
Spread awareness (books, pamphlets, brochures, CDs, internet, 'Imam' of the mosques, malls, and fun fairs)			√	√	√		√	
Media (television programs, advertising awareness, radio programs, and newspapers)		√	√	√	√	√	√	√
Courses	√	√	√	√	√	√	√	√
Parents (direct the community)	√	√	√					√
Doctors (organize events)			√		√			√
Schools (school day, mothers' council, brochures, involving the parents, and a monthly newsletter)	√			√	√	√	√	
Specialist teachers	√		√				√	√
School psychologists							√	

**Discussion**

Findings of this study agree with the results of Jerome and colleagues (1994), Jerome and colleagues (1999), and Bekle (2004). Saudi teachers exhibit definite gaps and misconceptions in their knowledge of causes and interventions of ADHD, including the impact of diet, ADHD persistence, and general myths surrounding ADHD. As shown by Kos (2008), Saudi teachers agreed that ADHD is a medically valid diagnosis, an obstacle to educational success for ADHD children, and that managing behavior of ADHD students was problematic.

The teachers strongly disagreed with the misconception that the misbehavior of children with ADHD was due to being naughty. These findings suggest that teachers were, to some extent, knowledgeable about ADHD characteristics, but notably less informed about causes and treatment.

There has been some discrepancy in findings concerning whether or not years of teaching experience had an influence on teachers' knowledge of ADHD. Jerome and colleagues (1994) found a significant correlation between years of teaching experience and higher scores on knowledge of ADHD for teachers from Canada; however, the correlation did not hold for American teachers. In agreement with the Scituito (2000) study, this current study found that teachers' educational levels and their professional

development concerning ADHD were unconnected to their knowledge about ADHD. However, a statistically significant factor in the Scituito (2000) study was the connection between the number of students with ADHD the teachers had taught and ADHD knowledge. This result was not revealed in the present research; teaching children with ADHD and years of experience did not correlate with knowledge about ADHD. Little is known concerning the effects of diverse demographic information and teachers' knowledge. For example, the number of students who are presently on medication for ADHD and the knowledge of teachers regarding such medication, teacher type, and knowledge of ADHD would be interesting topics to examine in further studies.

Results of this current study suggest that the capability of teachers to identify likely causes of ADHD and suitable interventions does not increase with experience. One probable justification is that ADHD has only recently become well-studied and widely recognized as a childhood disorder (Niznik, 2004). Consequently, contemporary training programs might be better equipped to instruct teachers today. Another probable justification is that teachers who are more recently out of college could be more accepting of studies supporting the existence of ADHD.

Regarding classroom strategies, teachers believed that sustaining classroom organization and curriculum were critical skills that provided positive advantages

associated with the emotional support and reinforcement of children (Kos, 2008). In this study, most teachers believed that the diagnosis and medication of ADHD were positive for children. Proper medication helps children with ADHD to concentrate on their class work, stay focused on tasks, reduce disruptive behavior, and therefore, enhance their academic performance without distracting their classmates (Jensen et al., 2001).

The significance of related professional development for teachers has been highlighted in this current study, because teachers who attended courses about ADHD were more knowledgeable about it. The value of professional development is underlined by the results of Jerome and colleagues' (1994) study, which indicated that 90% of potential teachers had inadequate opportunities at university to be trained about ADHD. Therefore, we recommend that teachers ought to be given pre-service and in-service training in relation to behavioral and academic interventions pertaining to children with ADHD.

In Saudi Arabia, teachers do not have specific training about ADHD; rather, they have complete modules on educating special needs children as one element of their bachelor's degree in Special Educational Needs. Although the teachers are involved in professional development that occasionally address issues such as ADHD, their practices are predominantly formed from direct classroom interaction with students with ADHD. The importance of the courses and the form they should take are aspects that were discussed by some participants because they believed that they were not qualified to meet the needs of children with special needs.

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# Application of Universal Design for Learning (Udl1) and Living (Udl2) in Virtual Dolphin-Assisted Intervention (Vdai) for Children with Autism

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## Abstract

*In Singapore, the Special Education for Autism (SEA) calls for a more focused, systematically structured framework to cater to the needs of children with autism in schools. As autism is a syndrome with co-morbid subtypes and different degrees of severity, a universal design for both learning and living becomes necessary to meet all the various needs and demands of the children. Adapted from the Response to Intervention (RTI) initiative first introduced under the IDEA 2004, the SEA framework is divided into three intervention levels: Level 1 covers all core autism intervention practices; Level 2 includes supplemental autism interventions; and Level 3 concerns individually customized autism interventions. This paper focuses on one virtual reality (VR) based autism intervention using artificial agents (3D virtual dolphins) in a 3D virtual dolphinarium developed and conducted at the Institute for Media Innovation, Singapore. The authors explored the possible application of universal design in this VR-based intervention within the framework of contextual teaching and learning (CTL) for children with autism.*

Today more than ever in Singapore, special education is being called on to educate and provide meaningful outcomes for all students with autism in three special education schools – Pathlight School, Eden School and St Andrew’s Autism School – being established in the first decade of the 21<sup>st</sup> century to cater to their needs. With an alarming increase in diagnosed autism cases worldwide (Lawrence & Karen, 2009) as well as in Singapore (Kee & Loh, 2009) that “could be attributed to higher awareness and better screening procedure” (Chia, 2011, p. 38), the number of vacancies in these special education schools are quickly filled up and their waiting lists have begun to grow longer. Other non-autism special education schools such as Grace Orchard School and Metta School have also been approached to take in children with autism.

Autism is a spectrum disorder with its various co-morbid subtypes (e.g., Timothy’s syndrome, Asperger’s syndrome and Rett’s syndrome) and different degrees of severity ranging from mild to profound. Its common traits include impairments in social interaction and communication, manifestation of stereotyped behavior, anguish for disrupted daily routines, belated echolalia, hyper-sensitivity to certain stimuli, limitations in spontaneous activity, and several others (Kanner, 1943). More research studies have been done to understand the enigma of autism (Jeste &

Neslon III, 2009). Chia (2008) and Chia, Kee and Shaifudin (2010) have reviewed existing definitions of autism found in literature and proposed the following definition:

A neuro-developmental syndrome of constitutional origin (genetic) *and whose cause could also be epigenetic*, and its onset is usually around first three years of birth, with empathizing or mentalizing deficits that result in a triad of impairments in communication, social interaction, and imagination (or presence of stereotyped behaviors), but may, on the other hand, display (especially by autistic savants) or hide (especially by crypto-savants) a strong systemizing drive that accounts for a distinct triad of strengths in good attention to detail, deep narrow interests, and islets of ability. (p. 8)

## Special Education for Autism (SEA)

With better understanding of autism, special education for such children has to be fine-tuned to meet their needs, which differ from others with non-autistic disorders. These authors define Special Education for Autism (SEA) as a specially designed curriculum that provides appropriate adaptive or differentiated instruction or training to students with

autism of various co-morbid subtypes and different degrees of severity to cope and/or manage their mental and developmental challenges, which limit or impair their learning and behavior, so that their individual needs are met and their potential is maximized.

Adapted from the Response to Intervention (RTI), initiative SEA should be seen as a means to achieving high-quality intervention for all students with autism. Like the RTI structure, there are three levels of intervention in the SEA framework (see Figure 1).

*Level 1.* This primary intervention concerns the core autism intervention practices, such as structured instruction and learning environment (e.g., TEACCH program) and behavior modification (e.g., Applied Behavior Analysis). This level of autism intervention depends on “the use of a solid core of scientifically based or research-based instruction for academics and behavior” (Basham, Israel, Graden, Poth, & Winston, 2010, p. 246).

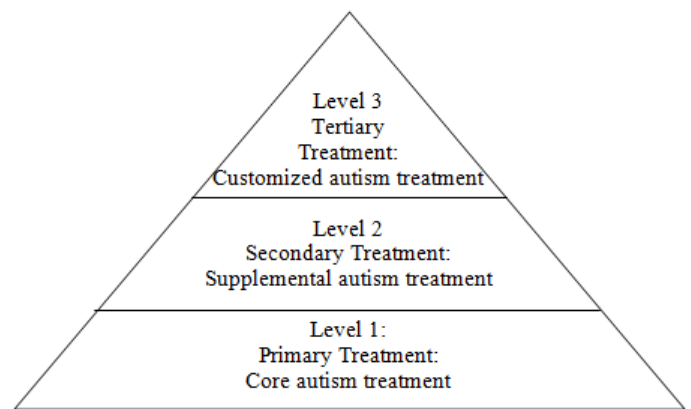
*Level 2.* This secondary intervention includes supplemental autism interventions such as special diet and animal-assisted therapy. The application of this second level intervention “is for targeted, research-based interventions, delivered in a rapid response to students in need of supplemental intervention” (Basham et al., 2010, p. 246).

*Level 3.* This tertiary intervention concerns a customized autism intervention that is designed to meet the specific needs of, say, a non-verbal student who suffers from epilepsy in addition to autism. It is the most intensive form of intervention and may involve a trans-disciplinary team of professionals such as a psychiatrist, a psychologist and therapists from different fields of specialization (e.g., occupational therapist and educational therapist).

In this paper, we have chosen to focus on the virtual reality (VR) application in autism intervention using artificial agents (3D virtual dolphins) in a 3D virtual dolphinarium environment (Cai, Chia, Thalman, Kee, Zheng, & Thalman, 2013).

### **Virtual Dolphin-Assisted Intervention (VDAI)**

Interest in VR technology within the domain of special education community has been growing rapidly. This may be due to the knowledge that people with autism have “intact and even superior skill in systematizing” (Baron-Cohen, 2008, p. 62), empowering their learning and comprehension of predictable artifacts involved in playing the VR games (Kee & Chia, 2011). VR games and all computer and video games are essentially computer programs based



*Figure 1:* Framework of Special Education for Autism

on logic, which makes use of cause and effect construct or causality. This construct allows people with good systematizing ability to discover and make sense of the logic and thus comprehend the game. This could possibly explain their interest (Goodwin, 2008) in working with computer or digital environments and also their effectiveness learning in such environments (e.g., Billard, Robins, Dautenhahn, & Nadel, 2006; Dautenhahn & Werry, 2004). Moreover, the common and repeated movements and sequences of game play, allow a gradual building up of perception and understanding of the construct of game (Kee, 2010).

In VDAI, the participant wears stereoscopic lightweight 3-D glasses and stands in an immersive room, measuring 10 meters by 10 meters, with a curved projection screen wall that stretches almost 360 degrees all around. Kinect is used to track positions and movements of the participant. As such, the rich immersive experience of participating interactively within the virtual dolphinarium generates enthusiasm to explore and interact with the virtual dolphins. Our trans-disciplinary research team developed 3D virtual dolphins that swim, interact and perform acrobatic acts in a virtual dolphinarium (Cai et al., 2013). It includes VR games to teach basic language concepts and skills to children with autism. A tutorial is provided for beginners to learn the games. The participants use gestures which are tracked with Kinect technology to control the virtual dolphins. For every right response, a reward in the form of virtual dolphin performing a certain trick is given or the participant can collect stars. The VDAI games are designed with three difficulty levels that allow monitoring of the participant’s progress to a higher level. A final score will be computed to determine how well and how far the participant has achieved.

The success of VDAI as an autism intervention concerns two aspects that are important to children with autism: learning and living. The accessibility of

VDAI “can be accomplished through the use of proactive instructional design, instructional strategies, and technology to support multiple means of knowledge representation, engagement, and expression of understanding” (Basham et al., 2010, p. 245). This has been termed as Universal Design for Learning (UDL1). VDAI may provide the rich immersive experience with high fidelity of diverse sensory information, environmental context and procedural sequences and experiential knowledge necessary to adapt and address needs of children with autism for independent and fulfilling lives when they enter adulthood. This has been termed as Universal Design for Living (UDL2), whose goal puts a high value on both diversity and inclusivity (Burgstahler, 2009). Its definition has been expanded to cover products, services and environments to meet the needs of all people with a wide variety of characteristics. Disability, which can be a result of developmental and/or mental impairments in cognition, conation, affect and/or sensation, is just one of many characteristics that one might possess and it also includes autism, as well as other disorders.

### *Balancing Reality, Meaning and Play*

Harteveld’s (2011) triadic game design criteria were considered during development which provides principles to balance the tension between reality, meaning and play. Children with autism need predictability, order, and familiarity in the working environment (Mesibov, Shea, & Schopler, 2004). They are also generally visual and global analytic learners with the need for the activity to be meaningful and fun. We attempted, through trial and error, to balance the triad of reality, meaning and play with needs of children with autism.

### **Universal Design for VDAI**

Universal design is a paradigm where individuals of all abilities are included in the intended population of users of an application, i.e., a product, service, or environment (Joines, 2009). This approach has been known by other terms such as inclusive design (Clarkson, 2007), barrier-free design (Herwig, 2008) and lifespan design (Beran, 2007). Universal design literature extends into three core areas: information design (education and Internet), product design (consumer and transportation), and place design (interior, exterior/landscapes, and structure) (Joines, 2009).

In designing a universal or barrier-free VR-based autism intervention such as VDAI, there is need to

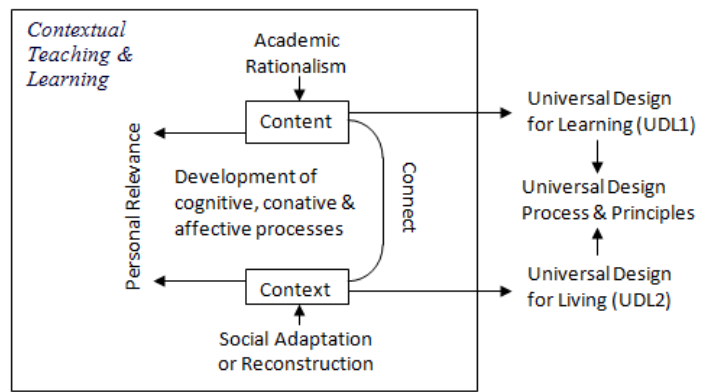


Figure 2: UDL1 and UDL2 within the CTL Framework

consider carefully many factors to ensure that it is accessible to all children with autism of different comorbid subtypes and varying degrees of severity. In addition, VDAI can be a product (e.g., the VR games using virtual dolphins), a service (i.e., the VR-assisted intervention it provides), and an environment (i.e., the virtual dolphinarium). It must be mentioned here that VDAI is a unique example of its own kind because it can be product, service and/or environment. VDAI involves the process and principles of Universal Design for Learning (UDL1) and Living (UDL2) placed within the framework of contextual teaching and learning (CTL) (Berns & Erickson, 2001) embedded in four curriculum orientations: academic rationalism, development of cognitive skills (with modification of including conative and affective processes (Chia, Kee, & Shaifudin, 2010), personal relevance, and social adaptation/reconstruction (Chiarelott, 2006) (see Figure 2).

### *Contextual Teaching and Learning in VDAI*

The term contextual teaching and learning (CTL) assumes that, by definition, teaching and learning are context driven (Howey, 1998) and views the learning environment, where teaching and learning take place, as existing both within and outside of the school setting. According to Berns and Erickson (2001), CTL is defined as “a conception of teaching and learning that helps teachers relate subject matter content to real world situations and motivates students to make connections between knowledge and its applications to their lives as family members, citizens, and workers” (para.3).

When CTL via VDAI is related to working with children with autism, the following characteristics must be taken into consideration in order that this VR application is useful to them as an educational tool: firstly, it is to connect content to the experiences of



these children with autism; secondly, it is to engage children with autism in active learning; thirdly, it is to enable children with autism to have some opportunities to direct their own learning as and when they are ready or opportunities become available; fourthly, it is to encourage the construction of personal meanings from an individual child with autism and collective experiences if possible; fifthly, it is to assess the attainment of outcomes within an authentic situation and allowing for the interpretation of multiple meanings from a single experience, which has to be structured for the child with autism; and lastly, it is to identify contexts that are appropriate developmentally to the child with autism and this includes the application of Universal Design for Learning (UDL1) and Living (UDL2).

Moreover, there is need to know and understand the four core educational orientations to the CTL framework that is incorporated into VDAI to make it a viable educational tool for treating children with autism. These four core educational orientations are (1) academic rationalism, (2) development of cognitive, conative and affective processes, (3) personal relevance, and (4) social adaptation/reconstruction. Each of these orientations with their respective main questions will be briefly described next.

*Orientation #1: Academic Rationalism.* This concerns what the kind of content knowledge and skills that are essentially needed by a child with autism. In VDAI, the main focus has been on basic language concepts and skills needed for the purpose of communicating with the virtual dolphins through gestures in the context of a virtual dolphinarium in the immersive room.

*Orientation #2: Development of Cognitive, Conative, and Affective Processes.* This concerns the total development of the mind of a child with autism through the processes of thinking and learning (cognition), performing (conation), and feeling (affect) interlinked by sensation (Chia, Kee, & Shaifudin, 2010). However, sensation (sensory process and skills) (see Chia, Kee, & Shaifudin, 2010, for detail) is notably absent in or excluded from the development. Kolbe (2004) has provided a comprehensive description of the development of the three processes (see Figure 3).

The main focus is to develop the cognitive, conative, and affective processes in children with autism, not forgetting that these children have a faulty theory of mind (hence, the lack of empathizing ability) and they also exhibit stereotyped behavior. Moreover, their ability to communicate and interact socially is impaired, too. With these developmental challenges in

	Cognitive	Conative	Affective
1	Knowledge	Instincts	Values
2	Analysis	Attempt	Attitudes
3	Evaluation	Commitment	Conviction
4	Persuasion	Purpose	Passion
5	Vision	Mission	Compassion

Figure 3: Kolbe's (2004) Model of Mind that Encompasses Cognition, Conation, and Affect

mind, the gesture-based interaction system has been incorporated into the VDAI to capture the child's movements or gestures, which are then projected in real-time into the virtual environment to facilitate interactions between the child and the virtual dolphins.

*Orientation #3: Personal Relevance.* In this third orientation, the needs of a child with autism tend to dominate over societal or knowledge/content needs.

Advocates of the personal relevance orientation argue that students who constantly struggle to make meaning from their experiences, construct knowledge from the meanings they've created, and then socially negotiate their personal meanings and knowledge with others will inevitably become informed, active citizens. (Chiarelott, 2006, p. 22)

Both parents and teachers working with children with autism are often concerned about what is most relevant to such children in terms of content knowledge and skills that they need to acquire in order to enable them to conduct their daily living activities if they are to lead an independent life. Current VR application studies involving autism have covered more on teaching joint attention and communication skills (Bauminger, Kupersmitt, Weiss, Gal, Pianesi, & Yifat, 2007), social understanding (Mitchell, Parsons, & Leonard, 2007), and counterfactual imagination (Herrera, Alcantud, Jordan, Blanquer, Labajo, & Depablo, 2008). There is still more that can be done to empower the lives of individuals with autism by making such VR applications relevant to their daily practical needs.

*Orientation #4: Societal Adaptation/Reconstruction.* This last orientation suggests experiences to enable children with autism to fit into society successfully. Change must be taken into consideration so that it can be modified and updated to adapt to the changing needs of these children whose patterns of autism also change as they grow older or mature (Seltzer, Krauss, Shattuck, Orsmond, Swe, & Lord, 2003).



Each of these four core orientations contributes to the CTL design. On the one hand, for the content, in turn, to be fully appreciated by children with autism, there is need to consider the Universal Design for Learning (UDL1) so that appropriate pedagogy and resources are used. On the other hand, for the context to be barrier-free and accessible, the Universal Design for Living (UDL2) comes into picture. To understand the application of UDL1 and UDL2 in VDAI, there is need to know both the process and principles of UD in VDAI.

### *Process of Universal Design in VDAI*

The process of Universal Design involves the following sequence of operational steps: identify the application (i.e., product, service and/or environment) and in this case, it is VDAI → define the population of VDAI users → involve all VDAI users with diverse traits → adopt guidelines or standards within the field of the specific application (i.e., VDAI) → plan for accommodations from individual VDAI users for whom the design of VDAI does not automatically provide access → train and support VDAI users and other stakeholders → evaluate VDAI based on feedback from VDAI users.

### *UD for Learning (UDL1) in VDAI*

The term UDL1 refers to:

a scientifically valid framework for guiding educational practice that (A) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and (B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient. (Higher Education Opportunity Act, 2008, 122 STAT.3088).

In UDL1 for VDAI, it is necessary to note that the ability of a child with autism to learn directly through experience depends on the range and complexity of the experiences that are offered. In the SEA context, these experiences may be restricted due to the limited number of real-world artifacts that can be provided in a classroom setting, and there are also certain cognitive, conative and affective problems or difficulties faced by children with autism when they

are taken out of their classroom or school in search of richer learning environments.

Below is an illustration of how the seven principles of UDL1 with their respective reflective questions can be applied on VDAI users (i.e., children with autism):

*Principle #1: Equitable Use.* Understanding the enigma of autism and its wide range of anomalies is essential for those who are using UDL1 to design an appropriate curriculum of VDAI for such individuals. Reflective question: Is VDAI useful to people with autism in acquiring essential concepts and social skills?

*Principle #2: Flexible in Use.* The pattern of autistic behavior is multi-faceted and it changes over time. Hence, it is important to create a room of flexibility for VDAI to change along the way in order to meet the changing needs of individual users with autism. Reflective question: Does VDAI accommodate a wide range of learning styles, preferences for certain activities, and varied abilities of people with autism?

*Principle #3: Simple and Intuitive to Use.* Studies (e.g., Alers & Barakova, 2009; Billard et al., 2006; Dautenhahn & Werry, 2004) have suggested that people with autism tend to be techno-savvy and they like technological gadgets. VDAI offers just that and it is easy to manage for these users. Reflective question: Is VDAI easy to understand and apply in learning concepts and/or acquiring social skills regardless of the user's experience, intellect, knowledge, language skills, or current concentration level?

*Principle #4: Perceptible Information.* Most individuals with autism do manifest sensory processing challenges, i.e., being hyper-sensitive or hypo-sensitive to different sensory stimuli. Hence, their individual sensory profiles are needed to create an appropriate virtual environment that does not interfere with their sensory problems. Reflective question: Does VDAI provide the essential information for learning concepts and social skills effectively to the user regardless of his/her ambient conditions or sensory abilities?

*Principle #5: Tolerance for Error.* This fifth principle is of paramount importance to young individuals with autism as many of them do suffer meltdown if they become too anxious when they fail to perform given tasks. Reflective question: Does VDAI allow error to happen as a result of accidental or unintended wrong use so as to reduce hazards and the adverse consequences of the actions during learning of concepts or social skills?

*Principle #6: Least Physical and/or Mental Effort Required.* Although most individuals with autism can remain on-task for a long time, they do display a

certain level of threshold, in terms of sensory hyper-responsivity or hypo-responsivity, for tasks involving multi-sensory stimuli as in the case of VR-based games that VDAI offers. Reflective question: Can VDAI be used efficiently, comfortably, and with a minimum of physical and/or mental fatigue during learning of concepts and social skills?

*Principle #7: Size and Space for Use.* Since VDAI is carried out in the immersive room which is spacious enough to accommodate five children, it would not pose a challenging issue. However, it must be noted that not all children with autism can work together as a group. Many of them can work better if alone or in pairs so that it is also easier for the teacher or therapist to manage them, should any child display off-task behavior. Reflective question: Does VDAI provide size and space for the user regardless of the user's body size, posture, or mobility during the learning activities?

#### *UD for Living (UDL2) in VDAI*

The term UDL2 refers to the design approach that incorporates products and building features which, to the greatest extent possible, can be used by everyone to meet the daily living needs of the maximum possible number of users (Lawton, 2001).

In UDL2 for VDAI, application of basic language concepts and social skills acquired in daily living routine should allow users with autism to practice in different virtual learning environments (e.g., buying food at the school canteen), experience things that they are normally unaware, transfer to real places of different situations, and interact with virtual people as well as real people (Cromby, Standen, & Brown, 1996).

In addition, UDL2 for users with autism also needs to take into consideration the living environment for these users to remain stable and predictable in that these users as well as their teachers, therapists, and other participants can expect an environment that supports the desired living habits and activities.

Below is an illustration of how the seven principles of UD2 with their respective reflective questions can be applied on VDAI users (i.e., children with autism):

*Principle #1: Equitable Use.* Basic language concepts and social skills learned during the VDAI should be practical for meaningful application in daily living activities. More importantly, the intervention should avoid segregating or stigmatizing any individual with autism, making VDAI appealing to all users with autism of all co-morbid subtypes and varying degrees of severity (Connell, Jones, Mace,

Mueller, Mullick, Ostroff et al., 1997). Reflective question: Is VDAI useful in meeting the daily living needs of users?

*Principle #2: Flexible in Use.* The Center for Applied Special Technology (1999) has formulated three principles to capture essential aspects of this principle: (1) multiple means of representing concepts, ideas, data, and information to allow individuals with autism to more readily comprehend the essential concepts presented by the representations; (2) multiple means of expression that provide such individuals with a variety of ways to express themselves with respect to communicating, reporting, assessment, and evaluation; and (3) multiple means of engagement that enable people with different interests and learning styles to be more readily motivated to pursue and maintain on-task with the material used in VDAI. Reflective question: Does VDAI accommodate a wide range of daily living needs based on individualized preferences and varied abilities of users?

*Principle #3: Simple and Intuitive to Use.* The task structure of VDAI should be appropriate to the task – neither too wide nor too deep. The material must support different unique learning styles and human intelligences (Forrester, 2001). Reflective question: Is VDAI easy to apply and practical enough to meet the daily living needs regardless of the user's experience, intellect, knowledge, language skills, or current concentration level?

*Principle #4: Perceptible Information.* This fourth principle suggests that VDAI should utilize redundant modes of information presentation (e.g., verbal, iconic, pictorial, tactile). It should also maximize legibility by provision of adequate contrast: between the information and its surrounds (Erlandson, 2002). Reflective question: Does VDAI provide or communicate the essential information on practical applications (e.g., provision of audio instruction and pictorial cues to complete a task) effectively to the user regardless of his/her ambient conditions or sensory abilities?

*Principle #5: Tolerance for Error.* This fifth principle is of paramount importance to young individuals with autism who are easily confused and become anxious when they do not know how to transfer what they have learned in the VDAI to their daily living activities. They may suffer a meltdown if they are overwhelmed by a given task or unable to perform it. Reflective question: Does VDAI allow error to happen as a result of accidental or unintended wrong use so as to reduce hazards and the adverse consequences of the actions encountered in daily living routine (e.g., took the wrong bus to school and knows what to do next)?

*Principle #6: Least Physical and/or Mental Effort Required.* This sixth principle suggests that the intervention should be ergonomically sound. The physical and/or mental demands of VDAI must be within acceptable cognitive, conative, affective and sensory limits for a wide range of users. Reflective question: Can the basic language concepts and social skills acquired from VDAI be applied efficiently and comfortably with minimum physical and/or mental fatigue in daily living routine?

*Principle #7: Size and Space for Use.* In this case, basic language concepts and social skills acquired from VDAI in the immersive room are transferred to other places (e.g., home, school or workplace) to put into practice. Reflective question: Does VDAI take into consideration size and space for the user, regardless of the user's body size, posture, or mobility when what has been learned is transferred to apply in other places of different experiential situations?

### Conclusion

The use of VR technology in SEA is still at its infancy phase. However, there are a rising number of papers presented at international conferences and published in journals on VR-based interventions that have been designed specifically for people with autism. Perhaps, many researchers have discovered their natural interest and strength to be able to make sense and work meaningfully within digital environments. Digital environments operate within the framework of logic used in computer programs. People with autism can harness their natural systematizing strengths to discover and learn the logic within VDAI. The current paper explicates our conceived theoretical structure of UDL1 and UDL2 as applied to children with autism in the CTL framework of VDAI incorporating four core educational orientations (i.e., academic rationalism, development of cognitive skills, conative and affective processes, personal relevance, and societal adaptation/reconstruction). The thinking and the principles behind the requirements, issues and tensions are discussed with our proposal of the need to reach an effective balance that is to be derived from practical use with the spectrum of diverse needs evident in individuals with autism.

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# Special Education Programs for Students with Intellectual Disability in Saudi Arabia: Issues and Recommendations

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## Abstract

*Special education services in Saudi Arabia have received much attention over the past 15 years. This increased attention has been reflected in the increasing amount of such services offered, including services aimed at students with intellectual disability. However, the enormous expansion of special education services was not followed by development of the necessary related services to implement these programs effectively or by provision of a range of appropriate educational placements. The main purpose of this study was to explore the current situation of special education services for students with intellectual disability in Saudi Arabia in order to identify weaknesses and ways to improve upon the services. A descriptive non-experimental mixed method research design was used. Findings of this study concluded that four main issues must be addressed to advance the inclusion of students with intellectual disability and these are: programs that promote the segregation of students with intellectual disability and their teachers should be countered with more inclusive programs; individualized educational plan practices must be properly implemented; proper assessments and diagnoses must be made; and a proper official curriculum for special education programs must be designed. Future implications of this study are discussed.*

Saudi Arabia is the largest Arabian country in Asia in terms of geographic land area and has a population of approximately 29 million people. Economically, Saudi Arabia relies heavily on oil production. The rise in oil prices in recent years has helped the government find revenue to finance new projects in various fields, including investment in education. The increased revenue has had a positive effect on the development of special education programs in the country.

The provision of special education services in Saudi Arabia has changed significantly over the past 15 years (Alnahdi, 2013); this development is evident in the enormous change in the amount of special education services offered and the accessibility of such services for students with disabilities. Five types of disabilities have been covered in the recent expansion of the provision of services and they are: visual impairment, hearing impairment, intellectual disability, autism, and multiple disabilities. There are two educational placements for students with disabilities in Saudi Arabia. First, there are special education institutes for students with moderate to severe disabilities and these schools focus on specific types of disabilities, such as schools for students with visual impairment, schools for students with hearing impairment, and schools for students with intellectual disability (Al-Mousa, 2010). Secondly, there are

special education programs for students with mild disabilities that are included in regular schools, including self-contained classroom programs, resource room programs, itinerant teacher programs, teacher-consultant programs, and follow-up programs (Al-Mousa, 2010). Notably, self-contained classrooms and resource rooms are the only placement options available in this area.

In Saudi Arabia, the term 'special education teachers' is used to refer to teachers who work in special education programs or institutes. Most special education teachers hold a bachelor's degree in special education. The terms 'general teachers' or 'general education teachers' are used with respect to teachers who majored in subjects other than special education and work in schools that have special education programs but who are not involved with these programs.

### *Special Education: A Historical Perspective*

The first special education initiatives in Saudi Arabia were implemented at the end of the 1950s. These initiatives began with individual efforts in which a number of people with visual impairment established evening classes to teach the Braille system

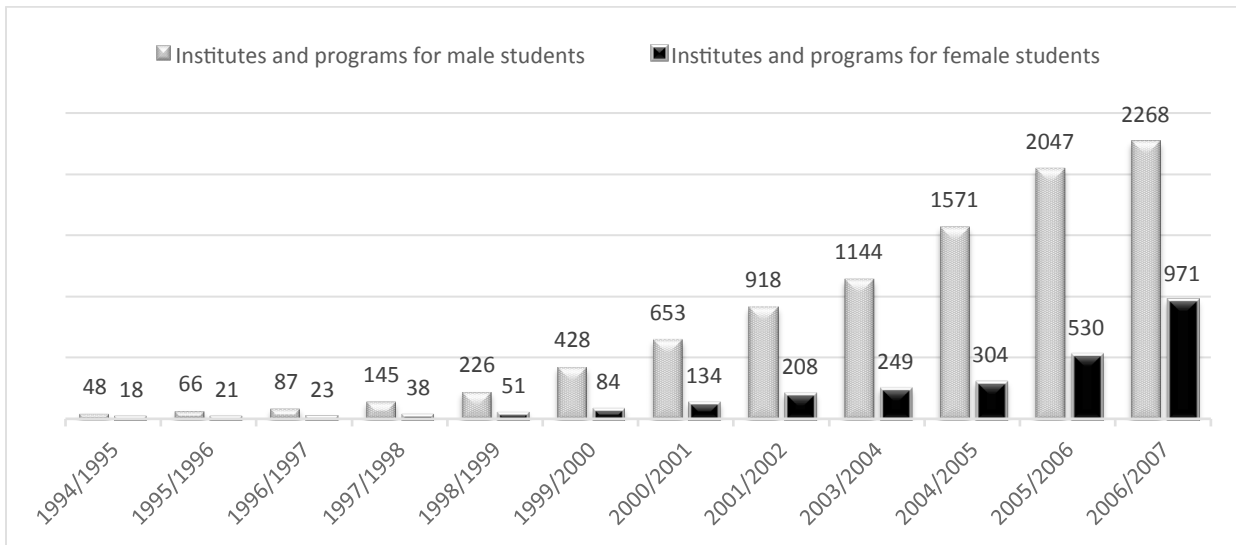


Figure 1: Quantitative Growth of Special Education Institutes and Special Education Programs in Saudi Arabia during the Period from 1994-1995 to 2006-2007. Source: Al-Mousa, (2010).

Table 1.

*Numbers of Special Education Programs and Institutes by Type of Disability*

	Gender	Visual Impairment	Hearing Impairment	Intellectual Disability	Autism	Multiple Disabilities	Total
Institutes	Male	5	341	704	40	46	1,136
	Female	71	171	286	19	20	567
Classes (in regular schools)	Male	54	963	2,311	135	92	3,555
	Female	181	497	999	61	58	1,796

for reading and writing (Althabet, 2002). Officially, special education in Saudi Arabia began in the 1960s when the Ministry of Education opened the first school for students with visual impairment in Riyadh (Althabet, 2002). Since then, special education has received increased attention from the government. As a result, the Ministry of Education established a General Directorate for Special Education (DGSE) in 1974, which was responsible for planning and improving special education programs in the country (Al-Ajmi, 2006).

One of the turning points in the history of special education in Saudi Arabia occurred in the late 1990s, when the Ministry of Education began integrating students with disabilities into regular schools by designating certain classes in a number of schools to be used for students with disabilities. Since then, the number of schools with special education classes has

increased rapidly. For instance, the number of special education programs for male students increased from 38 programs and institutes serving 5,208 students in 1994-1995 to 2,047 programs and institutes serving 46,514 students in 2004-2005 (Al-Mousa, 2007). This growth indicates that the number of programs and institutes serving male students with disabilities increased almost 53 times, and the number of male students with disabilities who received special educational services increased almost nine times over 11 years. In addition, the number of special education programs for female students increased from 18 programs and institutes serving 2,517 students in 1994-1995 to 530 programs and institutes serving 10,651 students in 2004-2005 (Al-Mousa, 2007), which indicates that the number of programs and institutes for female students with disabilities increased almost 29 times, and the number of female

students who received special educational services increased four times over a period of 11 years (see Figure 1).

The most recent statistics announced by the Ministry of Education (2011) demonstrate that there are almost twice as many programs and institutes for male students than for female students (see Table 1). There are no explanations by the Ministry of Education regarding the substantial difference between these two figures. These results might be due to the presumption that the Ministry of Education, like other ministries in Saudi Arabia, typically offers new services (or services whose effectiveness is being tested) to males first. These programs and institutes cover five types of disabilities including visual impairment, hearing impairment, intellectual disability, autism, and multiple disabilities.

In addition, statistics from the Ministry of Education (2011) also indicate that more than 18,000 students with intellectual disability received special education services from approximately 4,500 special education teachers across the country. Thus, the teacher-student ratio is one to four. However, in many cases, class sizes can reach 13 students to one teacher. Some special education teachers believe that this one to four ratio might change if administrative positions were accounted for, which are not included as part of this ratio.

Of all special education programs, 62% are for students with intellectual disability in regular schools. Institutes for students with intellectual disability represent 58% of all special education institutes for all types of disabilities. Thus, special education services for students with intellectual disability comprise between 50% and 60% of all special education services in Saudi Arabia (this statistic excludes services for students with learning disabilities because these types of disabilities were not reported in the Ministry of Education statistics).

Al-Mousa (2007) affirms that Saudi Arabia plays a leading role in the Arab world in integrating students with disabilities into regular schools; more than 90% of male students and 65% of female students with disabilities in Saudi Arabia have been integrated into regular schools (Al-Mousa, 2007). However, despite the remarkable increase in services provided for students with disabilities in recent years, others believe that a high percentage still lack educational services (Althabet, 2002) and that "special education is still in its early stages, in general, and the practice of the education of students with mental retardation is also in its early stages, in particular" (Al-Ajmi, 2006, p. 4). Although the availability of special education services has increased dramatically in the last 15 years, it

remains clear that the quality of these services has not improved significantly and the outcomes associated with these services have not changed.

### *Education of Children with Intellectual Disability in Saudi Arabia*

The first institute for students with intellectual disability in Saudi Arabia was opened in the early 1970s, approximately ten years after special education services were launched in the country (Althabet, 2002). In the late 1990s, when the Ministry of Education began integrating students with disabilities into regular schools, students with intellectual disability comprised the majority of students who benefited from this change compared to students with other types of disabilities (Al-Ajmi, 2006). After special education services for students with intellectual disability were introduced in the early 1970s, 100 students enrolled in the institutes that offered such services. Fifteen years later, by the mid-1980s, there were 827 students in the entire country enrolled in institutes for students with intellectual disability (Directorate General of Special Education [DGSE], 1981, as cited in Althabet, 2002). By 2008, there were 11 institutes and 718 programs for students with intellectual disability throughout the country, with 1,244 students studying in 170 classes in different institutes; by contrast, 11,805 students with intellectual disability were studying in 2,307 classes in regular schools during the same period (Directorate General of Special Education in Saudi Arabia [DGSE], 2008). At the same time, 2,272 teachers worked in programs or institutes for students with intellectual disability (DGSE, 2008).

### *Educational Placements for Students with Intellectual Disability in Saudi Arabia*

Saudi Arabia offers two types of educational placements for students with intellectual disability, which are institutions and mainstreamed schooling (Al-Mousa, 2010). In institutional schools, students with intellectual disability study in specialized institutes based on their disabilities. Students in this type of placement are separated from students who have no intellectual disability. Currently, this option is the last choice for students with intellectual disability and is primarily for students with severe disabilities, multiple disabilities, or autism. The other schooling option is 'mainstreaming programs', which is a term that Al-Mousa (2010) uses to refer to special education programs in regular education schools in Saudi Arabia. According to Al-Mousa, these programs include self-

contained classroom programs, resource room programs, itinerant teacher programs, teacher-consultant programs, and follow-up programs. For students with intellectual disability, only self-contained classroom programs are available in mainstreaming programs, which are referred to as 'special education programs'.

The main purpose of this study was to explore the current situation of special education services for students with intellectual disability in Saudi Arabia in order to identify weaknesses and ways to improve upon the services. It is anticipated that findings of this study will facilitate improvement of the quality of special education services in the country.

### **Method**

Based on the research objectives, a descriptive non-experimental mixed methods research design was used to collect data. Quantitative and qualitative data were collected from several sources. Statistics from the Ministry of Education were accessed for information regarding the number of special education programs and institutes. In addition, the curriculum on special-education programs was obtained from the Ministry of Education's official letters to schools. It is the only document that organizes the number of required classes for each skill in the weekly plan for special education programs. Observations were made at approximately 25 programs for students with intellectual disability and the observational data collected were subsequently verified by interviews with teachers working in special education programs for students with intellectual disability. Finally, the Regulations of Special Education Institutes and Programs (RSEIP) (2001) was also used as one of the main sources in this study.

#### *Participants and Sampling Procedure*

For the interviews, a convenience sample of eight special education teachers were interviewed to discuss the main issues that emerged from the different sources in this study. These teachers worked in three special education programs for students with intellectual disability in Riyadh. Four of them were in their first year of teaching. The rest had more than ten years of teaching experience. All participants held a bachelor's degree in special education.

#### *Data Analysis*

Quantitative data were descriptively analyzed (percentages and ratios). Data related to the number of

required classes for each skill in the weekly plan were grouped into five categories by identifying classes where a certain skill was taught and calculating how much of the overall time was devoted to teaching the skill. The five main categories were: (a) academic skills, (b) vocational skills, (c) social skills, (d) sport and art, and (e) others.

Because observations can lead to deeper understanding than interviews alone, the researcher used data collected from observations during his visits to many special education programs and in supervising pre-service special education teachers who were conducting their internship in these programs. Thus, collecting data from different sources to identify the emergence of similar themes allowed for triangulation (Glesne & Peshkin, 1992; O'Donoghue & Punch, 2004).

### **Results**

#### *Issues and Concerns*

Although special education programs represent a quantitative development in the field of special education services for students with intellectual disability, there are certain issues that must be addressed. Several themes emerged from the collected data. Four of these themes summarize the main issues and are discussed in this paper because of their direct relationship to the inclusion of students with intellectual disability in regular schools. The four themes are assessment and diagnosis, partially included, individualized education plan (IEP) practices, and curricular issues.

*Assessment and Diagnosis.* The Ministry of Education in Saudi Arabia has adopted the American Association on Intellectual and Developmental Disabilities (AAIDD) definition of intellectual disability, that is "a disability characterized by significant limitations both in intellectual functioning and in adaptive behavior, which covers many everyday social and practical skills. This disability originates before the age of 18" (American Association of Intellectual and Developmental Disabilities [AAIDD], 2010, p. 1). Although the AAIDD definition emphasizes the existence of significant limitations in adaptive behavior, 73% of special education programs and institutes rely solely on intelligence tests for the diagnosis of intellectual disability (Alnahdi, 2007). Alnahdi (2007) found that the intelligence tests in use were not suitable for the Saudi Arabian context. Two intelligence tests were available in special education programs, the Wechsler Intelligence test and the Stanford-Binet Intelligence test. The adopted Arabic



versions of both tests have been questioned by many educators with respect to their suitability for Saudi Arabian students because some of the scales that were used in Saudi Arabia had been adapted for Egyptian and/or Jordanian students (Alnahdi, 2007). Therefore, the fact that these scales are available in Arabic format is not sufficient to ensure their validity for Saudi Arabian students.

Although the RSEIP stress that a multidisciplinary team must complete the process of assessment and diagnosis, this procedure is not generally undertaken in practice (Alnahdi, 2007). Instead, a psychologist typically completes the procedure and the interpretation of the results in order to determine eligibility for special education services. For this reason, Alwabli (2006) concluded that special education programs in general—and those for students with intellectual disability in particular—must follow more scientific procedures to determine students' eligibility for special education services.

There are approximately 1,000 programs and institutes throughout the country for students with intellectual disability, which makes it difficult for the Ministry of Education to ensure the validity and supervision of the diagnostic process, particularly with the shortage of specialists in many important areas. To change the practice of relying on one specialist to conduct assessments and make eligibility decisions, Alnahdi (2007) recommended that the Ministry of Education establish centers to make diagnoses and assessments of eligibility for special education services. Thus, the Ministry of Education might be able to ensure the presence of a multidisciplinary team for determinations of eligibility.

*Partially Included.* Based on current procedures in which students with intellectual disability are included in special education programs, these students are included in public schools but are not integrated into activities with other students. All students with intellectual disability in these programs spend the school day in separate classes (self-contained classrooms). One special education teacher said:

What is happening in these schools is not inclusion.

Another special education teacher noted:

Even in the breaks [when students have their breakfast].... Our students [students with intellectual disability] stay together without any interaction with others.

From the researcher's experience as a special education teacher in Saudi Arabia for nine years, one

of the main difficulties of integrating and including students with intellectual disability into groups of students without disabilities is that general teachers frequently do not welcome initiatives that mix students with intellectual disability with other students. General education teachers usually emphasize that special education teachers are paid 30% more than other teachers and therefore, claim that students with disabilities are the responsibility of special education teachers only.

Article 39 of the RSEIP states that one of the tasks of general education teachers is "to accept the exceptional student in the class and take care of him as the normal students" (p. 28). However, one special education teacher working in special education programs in elementary school stated:

Most of the teachers in my school [general teachers] would not allow my students to be included in their classes, even for a short time.

Another teacher said:

General education teachers need to be forced to stay with our students for a couple of school periods to know how demanding it is to be a special education teacher and how justifiable it is to get paid more.

In addition, a special education teacher said:

Since I started teaching in the special education program, the school is full of negative attitudes towards us from other teachers.

Another teacher stated:

There are four advantages that we have that generate this unhealthy relationship with other teachers from their side; extra payment, fewer periods of teaching, smaller class sizes, and shorter schooldays compared with other teachers.

In sum, special education teachers often express that there are barriers to beginning a collaborative relationship with other teachers. They also realize and confirm the importance of building a strong and collaborative relationship with other teachers for the success of inclusion.

*Individualized Education Plan (IEP) Practices.* Article 84 of the RSEIP indicates that one of the IEP goals is to "determine the quality and quantity of educational services required to support the needs of each individual student" (p. 42). However, IEP

**SPE** = Special education

**SPEC** = A certificate in special education  
(one year program)

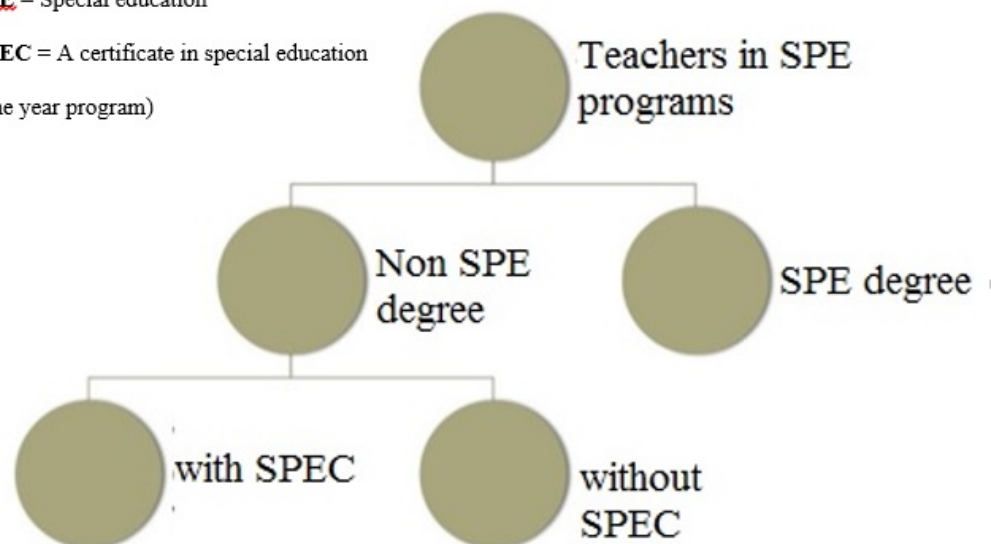


Figure 2: Teachers' Educational Background in Special Education Programs for Students with Intellectual Disability

practices for special education programs are completely different than those for other programs. Self-contained classrooms typically contain eight to 15 students. Due to complaints that teachers face difficulties in creating approximately ten IEPs for a classroom of students, students are divided into two levels based on their abilities, and two IEPs are made for the entire class, of which one is assigned to each student. This practice shows that there are misconceptions regarding the concept behind the IEP because when copies of one IEP are made for other students, it is no longer an IEP. The teachers who were interviewed indicated that this method was the only way that IEPs could be completed and that teachers should not be blamed for this practice. However, teachers in special education programs for students with intellectual disability must develop an IEP for each student.

The teachers in this study believed that the Ministry of Education should address this problem by reducing the number of students in each class or providing assistant teachers to work with special education teachers. One teacher said:

I have 12 students...how can I work with them individually on their IEP?

Assistant teacher professionals can be helpful to address some of these special education teachers' complaints. Article 6 of the RSEIP defines the requirements for assistant teachers and stipulates that they must have finished high school with a diploma or a training course for no less than a full semester in special education with a focus on intellectual

disability. However, there were no assistant teacher jobs announced by the Ministry of Education at the time this study was conducted.

Although there is growing attention in the literature focused on the importance of including transition plans as a critical part of the IEP (Knott & Asselin, 1999), there is no legal obligation for special education teachers to have transition plans for students of a certain age. Al-Ajmai (2006) stated that the current special education system should require the inclusion of transition plans for students 14 years and older in their IEP. Moreover, such transition plans should be required for students in high schools first and then gradually expanded to students in middle schools. In addition, special education teachers should be trained to plan and conduct transition plan (Alnahdi, in press).

*Special Education Teachers and General Education Teachers.* A majority of teachers in special education programs hold a bachelor's degree in special education. Teachers who majored in other areas, particularly teachers with physical education and art specialties, can also work in special education programs. Teachers with no special education major are divided into two groups; the first group continues to study for an additional year while working toward a special education certificate (SPC), whereas the rest continue without certification in addition to their educational degree (see Figure 2).

Schools consist of teachers in different fields who work, interact, and cooperate with others from different educational backgrounds. The nature of teachers' relationships is important in creating an ideal educational environment. However, there is an issue with regard to special education teachers' relationships

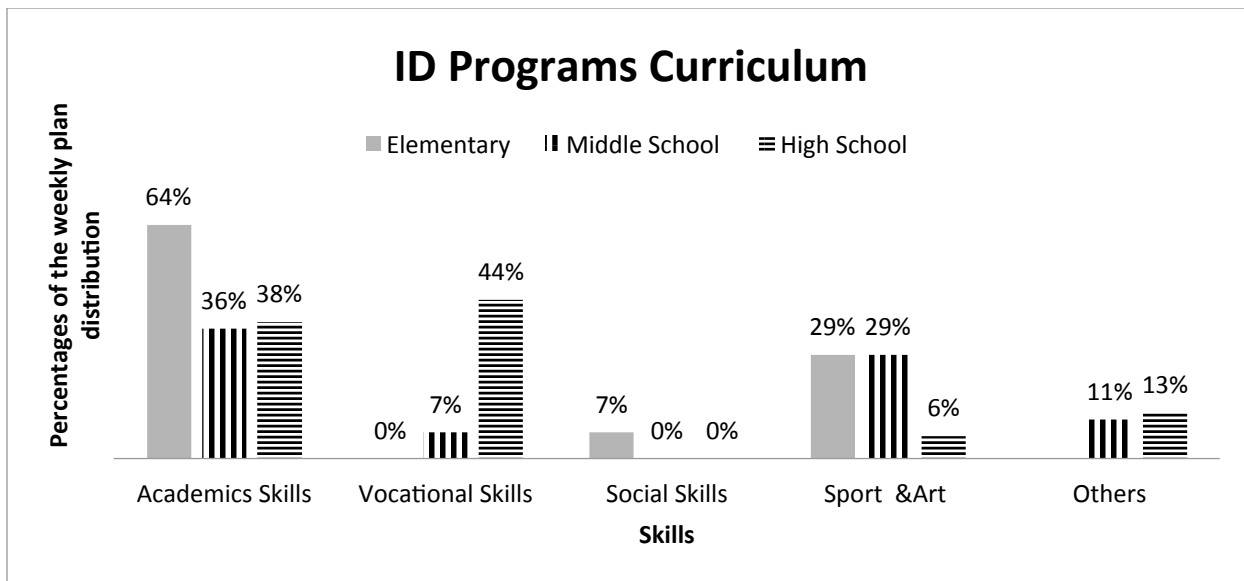


Figure 3: Formal Weekly Plan Distribution by Skills

with general education teachers. In all the programs visited, special education teachers' offices were located separately from those of other teachers, and special education teachers did not share rest areas with other teachers. This type of practice, which creates a distinct sub-group of special education teachers, emphasizes segregation more than inclusion.

*Curricular Issues.* Although IEPs are required by RSEIP for all students in special education programs, there are also formal curriculum textbooks that must be followed by teachers in these programs. In addition, a fixed plan that dictates courses throughout the week must be followed; this plan lists the number of weekly courses that must be given in every topic. In this type of plan for elementary schools, 64% of the time is dedicated to academic skills for students with intellectual disability. Academic skill courses constitute more than 35% of the time in middle and high schools. Conversely, only approximately 6% of school time for high-school students with intellectual disability is dedicated to sports and art (See Figure 3).

Academic skills include reading, writing, Islamic studies, math, and science. One of the positive aspects of this curriculum is that it provides vocational skills, which constitute 44% of the total time in high school. However, the teachers interviewed reported that no vocational training has yet occurred in the schools.

The curriculum for middle and high school programs for students with intellectual disability lacks transitional services (Almuaqel, 2008; Alnahdi, 2013); this is one of the main challenges in middle and high school programs. Middle and high schools continue the practice, started in elementary schools, of segregating students with disabilities into special

classes, which prevents them from communicating and interacting with other students. Almuaqel (2008) contended that these programs should focus more on the life skills that are necessary for adulthood rather than spending 60% of school time on academic skills. In sum, independence and adulthood skills are not addressed sufficiently in special education programs for students with intellectual disability (Almuaqel, 2008).

### Recommendations and Conclusion

Special education services have received a great deal of attention in Saudi Arabia over the past 15 years. This attention is reflected in the increasing number of special education services offered in the country in recent years, including services provided to students with intellectual disability as part of special education services. However, this expansion in special education services has not been evaluated in terms of its applications, output quality, and continued development. Thus, special education programs lack necessary related services and have limited educational placements. Self-contained classrooms are the only option for students with mild to moderate intellectual disability. This study concluded that four main issues must be considered to move closer to the inclusion of students with intellectual disability: (a) programs that promote the segregation of students and teachers, (b) IEP practices, (c) assessment and diagnosis, and (d) the official curriculum in special education programs.

*Programs that Promote the Segregation of Students and Teachers.* Special education programs for students

with intellectual disability that were developed in the late 1990s promote and encourage segregation instead of integrating students with intellectual disability with their peers without disabilities. This segregation also applies to special education teachers and their peers who are general education teachers. This unhealthy environment requires the Ministry of Education to take clear actions (Alnahdi, 2014) that clarify the relationship between teachers in general education and students with disabilities in regular schools with children without disabilities. In addition, the Ministry of Education must reform the relationships between special education teachers and other teachers, such as by requiring shared activities that integrate teachers from different fields. In addition, more inclusive educational placement could be offered in addition to self-contained classrooms in order to integrate students and teachers.

One of the main changes that must occur is to link the 30% additional payment in salary with the specialty (special education degree) instead of considering it as a reward for working with students with disabilities. For instance, if a special education teacher works in any other administrative position, they should continue to receive the 30% increase as a special education specialist. This change might encourage general education teachers to assist students with intellectual disability when they are required to because they understand that the extra payment is due to the specialization and not merely related to working with students with disabilities. Otherwise, schools' administrators will find difficulties assigning tasks to general education teachers who are not getting the extra payment related to students with disabilities.

Additionally, the Ministry of Education must make it clear that students with intellectual disability are the responsibility of all teachers in the school and that general education teachers must help make the school environment a supportive place for inclusion. This objective can be accomplished through clear regulations that insist on the role of general education teachers in special education programs. In addition, the new regulations must clearly state that one objective of the regulations is to promote collaboration across regular schools and special education programs. Otherwise, general education teachers will see themselves as exempt from any regulation that applies to special education programs. This type of regulation will help move special education programs to the next level, in which students with intellectual disability might have the opportunity to be in a general education classroom, especially if the general education classroom is their best educational placement option.

*IEP Practices.* Two main issues were identified regarding IEP practices. The first issue is the use of one IEP for a number of students. Officials of the Ministry of Education must be aware of the main concept behind IEP, which is negated by the practice of one IEP for multiple students. An IEP is intended to address the unique needs of an individual student and to plan specific goals for that student. Therefore, after Ministry of Education officials acknowledge the idea behind the IEP, assistant teachers should be provided to reduce the pressure on special education teachers and to help create and develop IEPs in a more effective manner. The second issue is that there are no transition plans from the IEP. The Ministry of Education must establish regulations that set a certain age for required transition plans in special education programs, such as in the United States, where schools are required to have transition plans for all students with disabilities who are 16 years old (Johnson, 2005). This practice will help to develop a clear picture regarding the future destination for students after school, in which efforts might be directed toward the next stage of this plan.

*Assessment and Diagnostic Issues.* Special education programs for students with intellectual disability rely on psychologists alone to implement the assessment and diagnostic process and to make eligibility decisions for special education services. To more properly address this process, the Ministry of Education should establish centers for the diagnosis and assessment of eligibility for special education services. In this way, the availability of multidisciplinary teams will be assured, and all necessary procedures for eligibility decisions will be followed. These centers should begin to raise awareness about the important standards for assessment and diagnosis procedures. These centers should be expanded throughout the country, and large schools in various regions should be equipped to support the centers after the Ministry of Education establishes the model to be followed.

*Curriculum in Special Education Programs.* There are three points regarding the current curriculum in special education programs for students with intellectual disability. First, there is a fixed set of courses that must be followed for all students. Second, a large portion of school time is spent on academic skills. Third, there is a noticeable absence of vocational training in middle and high school programs. To address these issues, the Ministry of Education must give special education teachers more freedom in allocating school time based on their students' needs. Functional skills should be an essential component of special education programs for

students with intellectual disability, particularly in middle and high schools, in which vocational training centers might be established.

In conclusion, the Ministry of Education must redefine the relationship between special education teachers and other teachers. Schools should include special education teachers before attempting to achieve the ultimate goal of integrating students with disabilities into classes with their peers without learning disabilities. After completing this first and most important step to achieve a healthy educational environment, the next step is to ensure that the RSEIP and the applicable standards are followed, particularly regarding the assessment and diagnosis of students with intellectual disability and eligibility decisions. In addition, IEP practices must be reformed to adhere to RSEIP's articles related to IEP. Transition plans for students are an essential part of IEPs that must be insured. Finally, flexibility must be provided for special education teachers to plan and distribute courses throughout the week according to their students' abilities and needs.

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## Sharing Special Education Strategies in Rural Kenya

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As a former special education teacher at the elementary, middle and high school levels, many unique and complex learning situations were encountered. However, as a junior faculty member on my initial trip to Kenya, I experienced a very challenging, yet rewarding, learning opportunity with teachers gathered in a community located in rural Kenya, not too far from Nairobi. The administration of a small community school had invited teachers from surrounding regions to join their teachers for a conference while the students were out of school during the winter season. I was humbled by the invitation to share teaching strategies with the teachers in Kenya and looked forward to learning from them about their culture in general and special education in particular (Battaglino, 2007). The topics that were requested included how to teach students with learning difficulties or disabilities. Therefore, my major task during the visit was to provide training to teachers regarding students with different learning styles and/or learning disabilities. Although I am similar to the Kenyan teachers in appearance, our educational and cultural backgrounds were worlds apart. Thus, coming up with a plan for creating and presenting four professional development workshops was daunting. Another huge problem was the lack of resources available to the teachers (Battaglino, 2007). There was no computer or projector for showing a PowerPoint presentation as I was accustomed to when conducting professional development trainings in the United States. I knew I needed a plan that would help me present the material in a way that the teachers would understand and remember so they in turn could use it with students in their own classrooms. Therefore, I selected strategies to present, model, and help the Kenyan teachers to practice their skills. Just as with my former students with disabilities and my current preservice teachers, instruction and student learning were facilitated in a focused and engaging manner.

Most educators would agree that all students can learn. However, students who struggle, especially those who have learning disabilities, are often characterized as learning at a slower rate than their peers without disabilities (Bley & Thornton, 2001; Gersten, Jordan, & Flojo, 2005). Factors within the learner and/or the learning environment also may

contribute to the lack of student progress. This article will discuss one of the strategies shared with teachers in rural Kenya to help make their instruction more productive in an effort to improve student learning.

### Instruction with MuSLE

The teaching strategy presented here is used by educational researchers like Moats and Farrell (2005) to strengthen students' ability to remember and recall what they learn by simultaneously incorporating two or more senses (vision, hearing, movement, and touch). Moats and Farrell (2005) emphasize the importance of teaching basic language skills which also support reading by using a multisensory approach. Similar ideas have been around since the early 1900s and have been practiced by pioneers in the field of education (Moats and Farrell, 2005; [ldonline.org](http://ldonline.org), 1995; Grossman, 1981). Despite the popularity of a multisensory instructional approach in the United States and abroad, there has not been conclusive evidence supporting it as an intervention for students with learning disabilities regarding reading instruction (Battaglino, 2007; Moats & Farrell, 2005; Thorpe & Sommer Borden, 1985). Multisensory instruction has been brought to the forefront of education again (with continued skepticism from some) with recent increased attention to the brain and how it relates to learning (McCall, 2012; Willingham, 2008). Particularly, students with disabilities struggle during the learning process if they have memory problems (Bley & Thornton, 2001; Moats & Farrell, 2005). Additionally, researchers suggest that other factors such as lack of attending and off-task behavior are addressed by this approach which results in improved learning (Thorpe & Sommer Borden, 1985).

My own work as a former special education teacher, and my current position as teacher preparation faculty have provided opportunities to use this approach with some positive results. I use the acronym "MuSLE" to remind teacher candidates and veteran teachers to add multisensory components to their students' learning experiences. It stands for Multi-Sensory Learning Experiences. When multiple senses are engaged during instruction, lessons are more likely to "stick" or be remembered. Multisensory learning experiences strengthen student learning by

giving the brain several pathways, or triggers, to remember information that has been learned (Jensen, 2003; Ildonline.org, 1995; Diamond, 1988). This strategy was modeled in several ways.

One example of a multisensory learning experience (MuSLE) modeled for the Kenyan teachers involved a song that the teachers actively engaged in. One of the first things I observed during my visit was that singing is central to many activities in the home and community. African music scholar, Dumisani Maraire, expressed that “African music is an integral part of daily life” (Maraire, 1984). Thus, using a song was a fitting way to model MuSLE. It involved a simple rhythm, repetition, rhyming words, hand-clapping, and it served as a review of the main points of one of our sessions. First, the main point to be reviewed and remembered was identified and presented in a few short sentences. These were repeated several times in an energetic manner. Next, clapping out the rhythm of a simple song that I made up was modeled and practiced by all. After that, the song lyrics were added, which were the words of the main learning point. Finally, the whole learning experience culminated in everyone singing and clapping as a form of review of the main learning point. When asked in subsequent sessions, the teachers could remember and discuss the main point.

Another example of MuSLE involved showing the teachers how to write letters or spell short words on different surfaces. They compared writing letters on the back of their hand with their finger with doing the same in the palm of their hand. They stood and used their whole arm like a stiff paint brush to make giant letters in the air. Then we went outside and practiced spelling short words by tracing the letters on different surface textures like tree trunks and sand on the ground (Moats & Farrell, 2005). Other multisensory strategies that can be used to support language and reading development might include the following activities:

- modeling and discussing placement of the tongue, teeth and lips to form certain sounds and letters
- using a mirror to see the parts of the face involved with saying letters and making their sounds
- taking steps, clapping hands, or tapping fingers to count syllables
- manipulating letters on paper or blocks to identify letters, sounds, and words.

Although not exhaustive, this list offers additional ways teachers can engage student senses.

These strategies can by no means address all of the complex problems unique to different classrooms around the world. However, they are general approaches that may help teachers and students in different locations with varying instructional resources to address some of the common issues associated with students with learning disabilities. Sharing strategies that require no special materials may be just the boost some teachers need to gain a different perspective on supporting their students in the quest for improved learning outcomes.

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## **Improving Response Rates Among Students with Orthopedic and Multiple Disabilities**

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One challenge teachers of students with orthopedic and multiple disabilities face is providing sufficient time and opportunity to communicate. This challenge is universal across countries, schools, and settings: teachers want students to communicate because communication lies at the core of what makes us human. Yet students with orthopedic and multiple disabilities often communicate laboriously, investing great effort or using extensive class time to communicate their views. When verbal or written expression is difficult or communication devices become frustrating, even the best-intentioned teachers may fill wait time with words or avoid student response altogether.

At some profoundly practical level, teachers all feel pressures rooted in time, of which there is not an unlimited supply. Bells ring, attention and energy fade, yet urgency to cover material remains. Teachers have limited days each year, along with goals for learning each day. These are real and ongoing pressures. Yet one thing that can consume extensive class time – sustained and frequent student response – remains a fundamental component of learning, of evaluation, and of the larger goals of education.

This article presents four ways to help teachers manage, if not entirely solve, the challenges of limited time and the need for extended, rich responses among students with orthopedic and multiple disabilities. The techniques described in this article were developed and refined at Henry Viscardi School (hereafter ‘Viscardi’) – a specialized school for students with orthopedic and multiple disabilities in the United States, just outside of New York City. These techniques are adaptable to the individual needs of students, are useful across grade and subject areas, and should prove useful across school systems and contexts. Below, they are organized from in-class to out-of-class techniques. The goal of all of these techniques is to improve student communication; readers should plan to differentiate and adjust each as the needs of their individual students require.

### **Step-By-Step Instructions**

1. Write with students in class

Independent writing ranks among the most challenging response tasks for many students with



orthopedic and multiple disabilities because it requires students to navigate intellectual and physical challenges simultaneously. However, there is no substitute for time spent writing. If students with physical disabilities can write, they should do so.

But what if fine or gross motor abilities do not include moving pencils or reliable keyboarding? Some students can successfully use transcription software (e.g., Dragon Naturally Speaking or Microsoft Speech Recognition) to produce text. Yet the software remains imperfect, schools are often noisy, have dynamic environments, and it takes time and learning for students to be able to dictate their thoughts well. There are also students who, despite their best efforts and teacher supports, are not able to physically write or speak intelligibly, and will always need to express themselves in another way. When students require human support (e.g., scribes), schools and teachers should provide them. But they should do so cautiously; human-mediated writing comes with serious long-term risks. Scribes typically use correct spelling, grammar, and punctuation, and may edit what students say as they transcribe. Training scribes in a school setting is hugely important: writing without punctuation or capitals as students speak goes against basic learning and is difficult for most adults. Yet this natural editing obscures what students can actually do, leaving teachers without reliable information about what students have actually learned. Worse still, a reliance on scribes compromises student independence and creates an uncertain future when students leave school. Despite the challenges, teachers at Viscardi believe that time spent on writing is critical.

Importantly, writing, transcribing, and dictating are not equivalent. Teachers must define specific writing goals for students. One goal might be manual writing. Another might be getting ideas in written form on a computer. The goal will drive the time investment; if students want to be able to write independently when they leave school, they must start learning to write as soon as possible.

It is important to note here that student stamina clearly matters, as it impacts how long and how much students can write. If fatigue constrains writing, word prediction software such as *Co:Writer* or transcription software such as *Write Out Loud* can be useful in support of the overall goal of extended class time spent writing. There are no hard and fast rules, but students need extended time to practice writing. For sound writing ideas and resources, see Copeland and Keefe (2007), Downing (2005), or Smith, DeMarco, and Worley, Eds. (2009).

#### The grid template

Complete the template to indicate which body parts are covered by which article(s) of clothing.

	C	L	O	T	H	I	N	G
B	Ropa/ (clothing)	Calcetines (socks)	Guantes (gloves)	Sombrero (hat)	Zapatos (shoes)	Camiseta (t-shirt)	Abrigo (coat)	
O	Cabeza/ (head)			XX				
D								
Y								
P	Pies/ (feet)	XX			XX			
A								
R	Hombros/ (shoulders)					XX	XX	
T								
S	Piernas/ Legs							XX
	Manos/ (hands)		XX					

Figure 1. 4x4 Response Grid for a Spanish Class.

## 2. Plan for, and use, response grids in class

Another approach to increase response rates is to generate and use response grids. These grids, which can be located on augmentative communication devices, keypads, or printed sheets, can be used in place of many simple and practical bimodal response systems that are often defaults for students who have orthopedic and multiple disabilities: yes/no, T/F, head nods, *etc.* A response grid works like multiple-choice response systems, which are often used on tests or with electronic clickers, but is not nearly as predetermined nor does it need to be specific to a particular question. Generally, such grids are loaded with vocabulary, numbers, or mathematics symbols appropriate to the unit at hand, and may mimic the structure of some augmentative communication device layouts. Figure 1 presents an example of a 4x4 response grid for a Spanish class learning vocabulary about clothing and body parts (English translations are added for benefit of non-fluent readers; these translations would typically not be included for students).

What's the advantage of a grid? One clear problem with relying on yes/no responses (or any bimodal response system, for example, one blink versus two blinks, look left versus look right, *etc.*) is a 50% communication failure rate, since half the time the student simply guesses the right answer, which makes conclusions about student knowledge uncertain. Grids

can massively expand response precision (*e.g.*, a 3x3 grid provides 9 response options, while a 4x4 grid provides 16). Grids are simple to construct and can be designed to require minimal physical or verbal dexterity. Grids can also be re-used throughout a unit and can be adapted for students whose response systems are bimodal (yes/no) via a sequence of horizontal then vertical movements – like plotting grid points (see Beukelman & Mirenda, 2012; Downing, 2005).

The work of using grids requires a) creating them prior to class, and b) asking questions that lend themselves to the choices on the grid. Such work involves a sufficient amount of planning: teachers need to consider the content they will cover in a given time and consider the kinds of questions they may ask.

### 3. Require frequent response-oriented homework

There are a variety of purposes for assigning homework in school, including the promotion of positive work habits, reinforcement, enrichment, and remediation – though we should mention that some theorists would rather teachers give less homework as a general rule (Bennett & Kalish, 2007; Kohn, 2007). All may be justifiable. Teachers at Viscardi advocate requiring homework that requires students to actively respond, especially at greater length than is possible during class. Response-oriented homework accomplishes the goal of providing consistent evidence about student knowledge and skills. To meet such a goal, the homework should:

- a) Be assigned with lead time; students often have busy home lives (including therapies and unpredictable fatigue), and advance planning can help immensely.
- b) Be completed by students – not parents or others.
- c) Require responses that are modeled, but perhaps not used frequently in class (*e.g.*, use of evidence).
- d) Be assigned regularly, ideally 4-5 times per week.

Requiring frequent response-oriented homework may be the most important adjustment a time-strapped teacher can make for students with orthopedic and multiple disabilities (Council for Exceptional Children, 2010; Dukes, Koorland & Scott, 2009). While classes always come to an end, the time students spend on content at home can be a great deal more flexible.

### 4. Assign simple or repetitive work and assessments to out-of-class times or online

At Viscardi, we have found that teachers can effectively manage limited in-class time by pushing some work and many assessments to out-of-class time (*e.g.*, during resource room) or online, where feasible. Assignments requiring memorization or practice can be successfully placed online because they typically involve individual student effort and require little teacher support. Online work is particularly useful because response formats can be incredibly adaptive – from multiple choice to essay, or interactive games to captured audio. One advantage of online assignments is a flexible timeline: students can continue work that they began in class during support periods later in the school day, from home, or can simply have requirements and deadlines adjusted as needed (Crow, 2008; UDI Online Project, 2010; Tanners & Roa, 2008). The most successful online work requires minimal teacher or parent support, is tailored to the unique needs of students, and promotes the overall goal of student response.

Assigning simple or repetitive work during out-of-class times (such as during a support period) can also work because the learning arc typically includes a certain amount of time inefficiency. Students progress from awareness to understanding, to practice and reinforcement, and eventually to mastery. Once students have engaged the new content, they usually must then enter a phase of practice and reinforcement. Any low-efficiency task, where teachers find themselves watching students work independently, may be conducted outside of class or placed online. Task done elsewhere or online mean efficiency gains: more time in class for other, more critical work, such as writing.

Assigning work beyond class time comes with at least two serious costs. The first cost is teacher time and energy. Teachers must prepare tasks to be done elsewhere, monitor student progress, and learn over time what works and what does not. This requires professional development, technology integration, and adult learning. Another risk is that students will get confused or need help, but will not have a teacher present. We acknowledge both of these costs, and have not completely solved them among faculty at Viscardi. One solution is to become skilled at differentiation. When assignments are tailored to the needs and skills of each student, the risks of students needing extended support while outside of class are reduced. Certainly differentiation is no small task, but we should point out that spending class time supervising student reading, practicing, or quizzing, comes with a clear

(and heavy) cost as well: running out of time for content. There is a balance here that may look different for all teachers.

### Conclusion

Student response is a critical aspect of classroom instruction for teachers of students with orthopedic and multiple disabilities. Yet the promotion of response can be time-consuming. And time is the one variable across classrooms that is both pre-determined and in short supply. This article briefly outlined four specific techniques to promote student response that were developed and refined at Henry Viscardi School in order to make efficient use of time. Teachers have found the use of these techniques helpful across grade levels and subjects, and have found benefits for teachers in in-class time gains for work with students promoting extended student response.

As with all guidance about what teachers ought to be doing, our own experiences may not precisely overlap with those of teachers everywhere. It is the particulars of students and classrooms that properly drive decisions about whether and when to use the techniques described in this article. Yet it seems likely to us that all efforts to promote student response and make good use of class time are good efforts; that spending time in class in writing is never wasted; and that homework can be a good and necessary thing. We believe the challenges of promoting student response are worth it, and the solutions represent some of our best possible work.

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