

Teacher Evaluation of Resources Designed for Adapting Mathematics for Students With Significant Cognitive Disabilities

Research and Practice for Persons
with Severe Disabilities
2016, Vol. 41(2) 132–137
© The Author(s) 2016
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/1540796916634099
rps.sagepub.com



Angel Lee¹, Diane M. Browder¹, Claudia Flowers¹, and Shawnee Wakeman¹

Abstract

Although educators of students who take alternate assessments based on alternate achievement standards are charged with providing access to grade-level mathematics to help their students prepare for this requirement, almost no models exist to provide guidance for how to adapt mathematics content for this population of students. This study asked educators to evaluate resource materials for adapting grade-aligned mathematics. One hundred twenty-five participants completed a survey to appraise two resources developed specifically for teaching mathematics to students with significant cognitive disabilities. One of the resources was designed to build mathematics content knowledge and the second to provide guidance for designing mathematics instruction aligned to academic content standards. The resources received positive reviews from a large majority of respondents who agreed they provided educators with needed models for teaching specific mathematics content.

Keywords

access to the general curriculum, mathematics, curriculum adaptations, intellectual disability, severe disabilities

A clear intent that students with significant cognitive disabilities should have access to their state's general education curriculum and standards can be found in legislation (Individuals With Disabilities Education Act [IDEA], 2004; No Child Left Behind [NCLB], 2001) and in research (Browder, Spooner, Wakeman, Trela, & Baker, 2006; Courtade, Spooner, & Browder, 2007). Since the reauthorization of IDEA 2004, educators have worked to increase access to the general curriculum for students with significant cognitive disabilities in part through the development and understanding of effective instructional strategies. All states now have academic standards for all students including those with significant cognitive disabilities. Many states have either adopted the Common Core State Standards (CCSS) or created their own version for language arts and mathematics (Bidwell, 2014). Although previous legislation has set the stage for continued access to the general curriculum, providing access to curriculum aligned with the current state standards raises the academic bar for students with disabilities, and has become an increasingly complex task for educators charged with providing academic instruction (Smith, Robb, West, & Tyler, 2010).

¹University of North Carolina at Charlotte, USA

Corresponding Author:

Angel Lee

Email: oneangelmarie84@gmail.com

Numerous resources designed to support implementation of curriculum aligned with state standards have been developed, both in online formats (e.g., <http://www.ascd.org/common-core-state-standards/common-core.aspx#ascd>) and as newly developed curriculum (e.g., envision MATH® Common Core). Because these resources were designed for general educators, they assume a level of content knowledge that special educators may lack. In addition, the resources do not offer guidance related to students with significant cognitive disabilities. Special educators require resources that not only increase their academic content knowledge but also provide guidance for providing academic instruction to students with a varying range of abilities. Students with significant cognitive disabilities enter the academic content at different ability levels (e.g., working on prerequisite skills, able to complete basic computation) and require an array of supports to achieve success. Special educators do not currently have models for applying these practices to the range or the rigor of the academic content represented in current state standards such as CCSS (Karvonen, Flowers, & Wakeman, 2013).

The purpose of this research was to examine the usefulness of two resources designed to assist teachers in adapting grade-level mathematics content (i.e., perimeter, area, surface area, and volume). The first resource was designed to increase mathematical content knowledge while giving examples of its relevance for students with significant cognitive disabilities. The second resource was designed to give special educators a model for providing access to grade-level mathematics through the use of evidence-based practices. The research questions were as follows:

Research Question 1: How do teachers evaluate the usefulness of an online mathematics content module?

Research Question 2: How do teachers evaluate the usefulness of the resource called Math Activities with Scripted Systematic Instruction (MASSI)?

Method

Participants

Participants in this study included a convenience sample of 125 special education teachers from two eastern states in the United States who attended a 1-day workshop. Inclusion criteria required participants to be currently teaching students who participated in the alternate assessments based on alternate achievement standards (AA-AAS). Fifty-eight percent of the participants had more than 10 years of experience. Forty-two percent held a special education teaching license; 50% of the participants held a dual license (i.e., a special education license plus a second academic license). Sixty-seven percent of participants taught at the secondary level (i.e., 6-12). In addition, 70% of the participants indicated they taught in a self-contained setting. Participants were given five categories of students and asked to indicate the category(s) of students who they were currently teaching. Of the special educators participating in this survey, 76% taught students with autism, 71% taught students with severe intellectual disabilities, 69% taught students with multiple disabilities, 54% taught students with moderate intellectual disabilities, and 36% taught students with visual impairments. Eighty-two percent selected two or more categories of students.

Materials

A comprehensive set of Curriculum and Instruction (C&I) resources related to English language arts and mathematics were developed through the National Center and State Collaborative (NCSC). These resources were designed to assist special educators in planning and providing grade-aligned academic instruction for students with significant cognitive disabilities who take the AA-AAS. The complete set of C&I resources can be viewed at <https://wiki.ncscpartners.org/>. Although an overview of all C&I resources related to mathematics were reviewed with participants, survey questions were designed to gather feedback on only two of the resources: (a) the perimeter, area, and volume content module, and (b) the measurement and geometry MASSI.

The content modules are a set of topic-based (e.g., perimeter, area, volume) resources that were developed in collaboration with a mathematics content expert to address possible deficits in mathematic knowledge for special education teachers or any teacher not highly qualified in mathematics. The content modules

promote understanding of mathematical concepts so that a teacher can begin to plan instruction. For the purposes of this study, participants reviewed the perimeter, area, and volume module. To view this module, see https://wiki.ncscpartners.org/index.php/Perimeter,_Area_and_Volume_Content_Module.

The MASSIs are a set of resources designed to provide a model of how to apply systematic instruction to specific mathematics standards for students with significant cognitive disabilities. The MASSIs model the use of systematic instruction with grade-aligned content like that targeted by rigorous state standards, and are scripted to ensure consistency, accuracy of mathematical language, and ease of teacher implementation. MASSIs were developed by grade band (i.e., elementary, middle, and high school). When completing the survey, teachers were asked to refer to the Measurement and Geometry MASSI that was appropriate for the grade band they were currently teaching. To view the Measurement and Geometry MASSI, see https://wiki.ncscpartners.org/index.php/Mathematics_Activities_for_Scripted_Systematic_Instruction.

Procedures

State-level administrators working in states who were members of the NCSC were contacted by the researcher and offered a 1-day training on the NCSC Mathematics C&I Resources. The state-level administrators selected training dates and recruited teachers. Each state was asked to recruit 100 special educators to attend the training. Participants spent the morning engaged in an interactive overview of the NCSC C&I resources. The density and newness of these resources made the overview a necessity. For each resource, participants were shown how to access the resources via a wiki page. Participants had opportunities to ask clarifying questions about all resources during the training. Participants attending the training were asked to bring laptop computers or tablets, allowing them to access the wiki page and view the resources on their own screen. During the afternoon, participants reviewed the perimeter, area, and volume module and the Measurement and Geometry MASSI. Participants were then asked to complete the survey. Surveys were completed in hard copy and were returned to the researcher with no identifying information included. A copy of the survey may be obtained from the first author.

Questionnaire and Data Analysis

A 28-item questionnaire was designed to elicit responses that related directly to the research questions. For this report, a subset of 10 items that evaluated the quality of the resources was analyzed. Questions analyzed for this report were close ended and consisted of both nominal and ordinal scale responses. Frequencies and percentages were used to examine the two research questions.

Results

One hundred twenty-five special educators attended a 1-day training related to providing access to grade-level mathematics content for students with significant cognitive disabilities. Survey methodology was used to collect feedback regarding the usefulness of sample teacher resources reviewed during the training. Descriptive statistics were used to address the research questions. This section presents the results of a subset of the research questions, specifically those pertaining to the evaluation of resources.

Research Question 1: How Do Teachers Evaluate the Usefulness of an Online Mathematics Content Module?

The majority of respondents (84%, $n = 103$) found the information in the content module to be helpful in increasing content knowledge related to perimeter, area, and volume. Some respondents (12%, $n = 14$) indicated no changes because they already knew the information, and 4% ($n = 5$) indicated the module did not increase their understanding. A follow-up question provided specific ways in which the information in the module would be useful. Respondents selected yes or no for each use. The top three uses of the module were (a) *embedding academics into functional activities*, (b) *planning academic instruction for a few students*, and (c) *planning instruction for students with multiple disabilities*. See Table 1 for complete results.

Table 1. Participants' Agreement With the Uses for the Content Module.

Uses for content module	<i>n</i>	%
Embedding academics into functional activities	118	96.7
Planning academic instruction for a few students	112	94.9
Planning instruction for students with multiple disabilities	112	93.3
Planning academic instruction for the class	109	90.8
Increases the likelihood of teaching the content	106	89.1
Improves on the content I currently teach	106	88.3
Improves learning in an inclusive setting	85	73.3
Improves collaboration with general education teachers	63	55.3

Note. Some participants did not answer the question and are excluded from these analyses.

Research Question 2: How Do Teachers Evaluate the Usefulness of the Resource Called MASSI?

Respondents were asked to rate the likelihood of using the MASSI to teach grade-aligned mathematics. Three percent ($n = 4$) indicated they were *not likely*, 14% ($n = 17$) indicated *somewhat likely*, 43% ($n = 51$) indicated they were *likely*, and 40% ($n = 47$) indicated they were *very likely* to use the MASSI. Participants were asked to select the reasons that they may not use the MASSI. The reason selected most often was that *the content was considered too complex for their students* (65%, $n = 42$).

When asked how the MASSI affected understanding of systematic instruction, 46% of respondents reported that the MASSI *gave ideas on how to apply strategies to other content areas*. Several items examined the application of the MASSI. When participants were asked to select ways in which the MASSI may be useful in a general education setting, more than half of the respondents reported the MASSI could be useful when (a) pre-teaching content prior to instruction in the general education setting, (b) planning parallel activities with a peer tutor in the general education setting, and (c) setting up instructional centers that all students may use. A second question asked how the MASSI might be useful when teaching students with a range of ability levels. Seventy-eight percent of respondents indicated that the students they teach do not have the prerequisite skills to benefit from instruction using the MASSI, and 77% indicated that more resources are needed. See Table 2 for full results. Finally, participants were also asked how confident they were that they could develop their own MASSI. Fifty-nine percent ($n = 71$) of respondents reported they were somewhat confident, 17% ($n = 20$) indicated they were confident, and 8% ($n = 10$) indicated they were very confident that they could create their own MASSI.

Discussion

The purpose of the current study was to evaluate the usefulness of two resources designed to assist special educators in planning and delivering grade-aligned mathematics instruction. In this study, the respondents were able to base their opinion on two highly specific models. The content module and the MASSI provided the respondents with resources that exemplified how to make the content accessible for students with a range of ability levels. Respondents were positive about these models. They reported that the content module would increase the likelihood of teaching the content and that seeing the MASSI helped them understand how they could apply the strategies used to other mathematics content.

In this study, after reviewing a module on skills related to perimeter, area, and volume, only 12% indicated they already knew this specific content. One purpose of the content module was to provide special educators with a resource to build their own personal knowledge of the content. For example, a special educator might have forgotten how to compute perimeter versus area. After reviewing the module, the majority of respondents indicated that the module was helpful in increasing their knowledge of perimeter, area, and volume.

The MASSI was well received, with the majority (97%) of respondents indicating that they were at least somewhat likely to use the MASSI to teach grade-aligned mathematics content. These results are encouraging given the literature that has shown that this population of students can learn academics when provided

Table 2. Participant's Perceptions of the Effects and Applications for MASSI.

Effects and applications	<i>n</i>	%
Effect of MASSI on understanding of systematic instruction		
Gave me ideas on how to apply strategies to other content areas	54	45.8
Helped me apply the strategies to math content	41	34.7
No changes—I already use these practices	41	34.7
I use other strategies to teach mathematics content	4	3.4
Evidence-based practices were not clear	2	1.7
Application of the MASSI to a general education setting		
Pre-teaching content prior to instruction in general education setting	77	65.8
Planning parallel activities with a peer tutor in the general education setting	73	62.4
Setting up instructional centers that all students may use	61	52.1
Not applicable to general education setting	3	2.6
Application of the MASSI to a range of students		
Some students do not have prerequisites needed to benefit from the MASSI	93	77.5
More resources needed for students with multiple disabilities	92	77.3
Some students would not benefit from using the MASSI	58	48.7
For some students, skills in the MASSI are too abstract	44	37.3
For some students, skills in the MASSI are too easy	24	19.8

Note. MASSI = math activities with scripted systematic instruction.

with quality instruction that includes the use of evidence-based strategies (e.g., Browder, Ahlgrim-Delzell, Spooner, Mims, & Baker, 2009; Jimenez, Browder, & Courtade, 2008).

Although the MASSIs are a good start, they are only meant to provide a model for how to provide instruction on a limited number of mathematics standards. To provide access to mathematics content that is more comprehensive, the majority of special educators who participated in this study indicated that additional resources are needed. In addition, the majority of special educators indicated that they have students who do not have the prerequisites needed to benefit from instruction using the MASSI. Purposeful resource development that is responsive to participants' concerns is needed to demonstrate how grade-aligned mathematics can be made meaningful for the range of students who take alternate assessments.

There were several limitations to the current study. Respondents in this study were from only two states; there was not an opportunity for special educators from other states to participate. Additionally, the number of respondents from the two states was not comparable, with 87% of respondents being from one state and 13% being from the second, possibly skewing the results. Future research should attempt to include a potentially more representative sample of special educators within the United States. This could be achieved by including special educators from multiple states and districts with varying demographics.

Another limitation, common in survey studies, is the lack of information on whether teachers' practice matched their self-report. Although most participants responded that they would use the MASSI and could develop additional lessons using this as a model, additional research is needed to see whether the resources resulted in changes in practice. It also would be especially useful to see whether teachers followed up by trying a MASSI in inclusive contexts as many of the participants indicated they may be useful in general education.

One of the most important findings of the current study was the majority of respondents welcomed resources on how to teach grade-aligned mathematics. Most special educators are willing to try new resources for teaching academics. They are open to the possibility that students with significant cognitive disabilities can learn and should have the opportunity to learn. However, adequate resources are not currently available and teachers do not have the time needed to create the resources on their own. Special educators teach a wide range of students, most of whom require individualized planning, but sample lessons offer a starting point for these adaptations. Results of this study show that teachers are willing to use resources provided to them. Therefore, efforts need to be put into creating resources that are evidence based, teacher friendly, and can easily be adapted for use with a range of students.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

- Bidwell, A. (2014, August). Common core support in free fall. *U.S. News & World Report*. Retrieved from <http://www.usnews.com/news/articles/2014/08/20/common-core-support-waning-most-now-oppose-standards-national-surveys-show>
- Browder, D. M., Ahlgrim-DeLzell, L., Spooner, F., Mims, P. J., & Baker, J. (2009). Using time delay to teach literacy to students with severe developmental disabilities. *Exceptional Children, 75*, 342-364.
- Browder, D. M., Spooner, F., Wakeman, S., Trela, K., & Baker, J. (2006). Aligning instruction with academic content standards: Finding the link. *Research and Practice for Persons With Severe Disabilities, 31*, 309-321.
- Courtade, G., Spooner, F., & Browder, D. (2007). A review of studies with students with significant cognitive disabilities that link to science standards. *Research and Practice for Persons With Severe Disabilities, 32*, 43-49.
- Individuals With Disabilities Education Improvement Act of 2004, PL 108-466, 20 U.S.C. §1400, H.R. 1350.
- Jimenez, B. A., Browder, D. M., & Courtade, G. R. (2008). Teaching an algebraic equation to high school students with moderate developmental disabilities. *Education and Training in Autism and Developmental Disabilities, 43*, 266-274.
- Karvonen, M., Flowers, C., & Wakeman, S. Y. (2013). Factors associated with access to the general curriculum for students with intellectual disability. *Current Issues in Education, 16*(3), 1-20.
- No Child Left Behind Act of 2001, Pub. L. No. 107-110, 115 Stat.1425 (2002).
- Smith, D. D., Robb, S. M., West, J., & Tyler, N. C. (2010). The changing educational landscape: How special education leadership preparation can make a difference for teachers and their students with disabilities. *Teacher Education and Special Education, 33*, 25-43.

Author Biographies

Angel Lee, PhD, is the director of curriculum development at Attainment Company Inc. Her research interests include access to the general curriculum for students with severe disabilities, especially students with multiple and complex disabilities.

Diane M. Browder, PhD, is the Lake and Edward Snyder distinguished professor of special education at the University of North Carolina at Charlotte. Her research and writing focuses on improving academic outcomes for students with severe disabilities.

Claudia Flowers, PhD, is a professor of educational research, measurement, and evaluation at UNC Charlotte. Her research interests include assessment of students with disabilities.

Shawnee Wakeman, PhD, is a clinical associate professor in the Department of Special Education and Child Development at UNC Charlotte. Her research interests include access to the general curriculum and how it is enacted for students with significant cognitive disabilities, alternate assessment, and alignment of the educational system for students with significant cognitive disabilities.

Received: June 18, 2015

Final Acceptance: December 8, 2015

Editor in Charge: John McDonnell

Copyright of *Research & Practice for Persons with Severe Disabilities* is the property of Sage Publications Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.