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Factors Associated with Access to the General Curriculum for Students with Intellectual Disability

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Beginning in 1997, federal legislation required schools provide access to academic curricula to students with intellectual disability. The extent of such access for students with significant intellectual disability currently is not known. This study examined access (defined by scope and intensity of content instruction and depth of knowledge) provided to students with significant intellectual disability, and relationship between curriculum access and a set of teacher and student characteristics. A survey of 644 teachers from nine states found that these students, on average, were exposed to 17 out of 27 English language arts strands and 10 out of 16 math strands. Canonical correlation analyses suggested that students' symbolic communication level had the strongest association with students' access. Cluster analysis suggested students experience three types of access to English language arts and four types of access to math instruction, and the cluster groups significantly differed by teacher and student variables. These findings suggest several policy and practice actions to better support meaningful participation in the general education curriculum among students with intellectual disabilities.

Keywords: curriculum, instruction, intellectual disability, general curriculum access

Access to the general curriculum for students with disabilities was first mandated in the 1997 amendments to Individuals with Disabilities Education Act (IDEA; PL 105-17). Prior to this legislation, public schools primarily taught functional life skills or developmental curricula to students with intellectual disability (Browder et al., 2003). With subsequent federal legislation (No Child Left Behind [NCLB] 2002, PL 107-110; IDEA 2004, PL 108-446) reinforcing the requirement for academic instruction, students with intellectual disability are now expected to learn academic content linked to their chronologically-appropriate grade level. These students are no longer excluded from accountability systems; instead, they are expected to learn and to demonstrate what they know and can do in academic subjects. Within large-scale assessment systems, their learning is measured by alternate assessments based on alternate achievement standards (AA-AAS).

Despite the potential that general curriculum access provides, challenges in designing and delivering meaningful academic instruction to students with intellectual disability exist. One identified challenge is the relatively limited foundation of research-based strategies for teaching a wide range of academic content (Browder, Spooner, Ahlgrim-Delzell, Harris, & Wakeman, 2008; Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006). Specifically, much of the research utilized a systematic approach to addressing discrete skills in a repeated trial format. In addition, the research identified in these studies illuminated a very narrow range of academic content as the focus of most empirical study (e.g., sight words, money, and time).

A second challenge is that instruction in a state's academic content standards must also be combined with, or taught in addition to, other individual curricular priorities in students' Individualized Education Programs (IEPs). Although instruction in academic standards may be integrated with functional priorities, the information on how to accomplish this goal is still emerging. Evidence suggests that self-determination strategies (Agran, Cavin, Wehmeyer, & Palmer, 2006) and support from peers without disabilities (Carter & Kennedy, 2006; Carter, Moss, Hoffman, Chung, & Sisco, 2011) can promote access to the general curriculum, and that self-determination can support student attainment of educational goals aligned with academic content standards (Agran, Wehmeyer, Cavin, & Palmer, 2010). However, these strategies may not yet be in widespread use by all teachers.

Finally, even more than a decade after IDEA called for access to the general curriculum, not all teachers feel adequately prepared to teach academics to students with intellectual disabilities (Ruppar, Dymond, & Gaffney, 2011). First-year special and general education teachers report significantly different self-perceptions of how well prepared they are to teach the assigned subject matter (Boe, Shin, & Cook, 2007), and they hold different views regarding what access to the general curriculum looks like for this population (Dymond, Renzaglia, Gilson, & Slagor, 2007). Challenges regarding preparation to teach academics exist even for teachers of students without intellectual disability. For example, Pogrund and Wibbenmeyer (2008) wrote that even though teachers of students with visual impairments should teach using the core curriculum, special educators training to teach that population of students do not have expertise to do so.

To help overcome these challenges, the field has generated numerous resources to help teachers provide access to the general curriculum (e.g., Clayton, Burdge, Denham, Kleinert, & Kearns, 2006; Kleinert & Kearns, 2010). Textbooks have been written or revised to expand coverage of academics (e.g., Browder & Spooner, 2011; Ryndak & Alper, 2003; Snell & Brown, 2006). In addition, several federally funded research and technical assistance projects are developing resources and methods for teachers (see examples at http://www.cast.org/research/projects/ncac.html, http://www.hdi.uky.edu/ilssa/, http://education.uncc.edu/access/). The multi-state consortia developing new alternate assessments (http://dynamiclearningmaps.org/, http://www.ncscpartners.org/) are also producing new materials and professional development to support teachers in teaching the academic content that will be assessed. Even with these resources, teachers need opportunities to translate these concepts into specific, individualized instruction.

For the most part, special educators who are now responsible for teaching academics to students with intellectual disability learn about academic content standards and effective instructional strategies through in-service professional development. Very few teachers of students with intellectual disability have licensure in academic subjects (Karvonen, Wakeman, Browder, Rogers, & Flowers, 2011), and pre-service education curricula have relatively little influence on their teaching of academics (Karvonen, Wakeman, Flowers, & Browder, 2007a). Some evidence suggests that effective professional development can improve teachers' ability to design academic instruction for this population (Browder, Karvonen, Davis, Fallin, & Courtade-Little, 2005; Jimenez, Mims, & Browder, 2012). Outside of structured professional development, special educators may rely on informal supports and policy messages to guide their instructional choices. For example, they may view their general education counterparts as resources for understanding grade-level material. They may also internalize messages from building and district-level administrators about what is valued in the curriculum for this population.

Access to academic content enhances the quality of education for students with intellectual disability by increasing expectations for learning, promoting positive adult outcomes, enhancing educational equity, and promoting self-determination (Browder et al., 2007). If students with intellectual disability are to have access to academic content, teachers must be skilled in adapting grade-level content to their specialized needs. Access to grade-level content may be more difficult at upper grades than at lower ones, as the extensions and adaptations stretch further to bridge the gap between grade level and students' current level of performance.

Students who take AA-AAS vary considerably in their use of expressive and receptive communication, sensory functioning, augmentative communication, and levels of engagement (Towles-Reeves, Kearns, Kleinert, & Kleinert, 2009). Thus, teachers must be creative in finding ways to adapt content based on students' communication systems. Students who already have abstract symbolic communication systems may require fewer adaptations than those who work with concrete symbols or those who have not yet developed symbolic communication systems (Browder, Flowers, & Wakeman, 2008). Teachers must also consider students' physical and sensory issues when designing instruction (Hedeen & Ayres, 2002). Five different students working toward a reading comprehension goal may require five different response modes, and use different forms of assistive technology to show what they know.

Much of the research on access to the general curriculum has focused on the nature of instruction, including instructional settings and groupings (Matzen, Ryndak, & Nakao, 2010; Soukup, Wehmeyer, Bashinski, & Bovaird, 2007), or outcomes of interventions designed to promote learning in the general curriculum (Agran et al., 2010). Some of this research acknowledges the complexity of the interactions of teachers, students, and environments in creating meaningful opportunities for students to access the general curriculum (Copeland & Cosbey, 2008-2009; Lee, Wehmeyer, Soukup, & Palmer, 2010). This body of research furthers the collective understanding of "access" but does not define the scope of the "curriculum" in general curriculum access.

A recent investigation of the enacted curriculum for students in five states who take AA-AAS indicated that performance expectations tend to be lower than anticipated given the large percent of students who have some use of symbols for communication (Karvonen et al., 2011). Whether certain subgroups of students who take AA-AAS have access to a wider range of academic content or are held to higher expectations for performance of academic skills in daily instruction is not yet known. Further, if special educators are going to effectively help all students—even those with the most significant intellectual disability—access a broad range of academic curriculum, the field needs to know more about what factors are associated with the degree of access to grade-level content students with intellectual disability have. Information about coverage and gaps in access may guide future research on targeted areas of academic skill instruction, as well as the development of targeted materials to help teachers strengthen the enacted curriculum for this population.

This study described general curriculum access for students with intellectual disability and examined factors associated with access. The following research questions were addressed:

1. What is the scope and intensity of academic content coverage for students with intellectual disability?
2. What is the relationship between access to the general curriculum and teacher and student characteristics?
3. Do certain subgroups of students have access to a wider range of academic content?
4. What factors are associated with the extent of academic instruction students receive?

Methods

For this exploratory research design, we opted to use teacher descriptions collected through a researcher-designed survey instrument referred to as Curriculum Indicators Survey (CIS). From these data we produced simple descriptive and multivariate statistical analyses that answered our research questions.

Instrument

The Curriculum Indicators Survey (CIS; Karvonen, Wakeman, Flowers, & Browder, 2008) measures the enacted curriculum for students with intellectual disability who participate in AA-AAS. The CIS is structured in five parts that include inventories of content within English language arts (ELA), math and science, and questions regarding teacher background, instructional resources and professional development.

Part 1 of CIS contains 84 items and asks for background information on the responding teacher (e.g., educational experience, characteristics of case load, instructional influences in each subject area). In Part 2, teachers provide information about the types of students on their case load, based on students' levels of symbolic communication. The respondents also select a single student on their case load who will serve as the "target student" for the remaining three parts of the survey.

Parts 3-5 measure the English language arts, math, and science curriculum taught to the target student during the current academic year. Data in the current study are based on short forms of the CIS, which contain 27 content items in ELA, and 16 in math. Results from the science section are not included in this study. For each academic skill taught (i.e., each item), teachers rate two pieces of information: (a) the intensity of coverage of the content, and (b) the highest performance expectation (depth of knowledge, DOK) of the student on the item. Intensity of coverage is rated on a scale from 1 (none) to 5 (systematic and intensive, such as daily or nearly daily for the entire year). DOK is rated on a six-point scale adapted from Bloom's taxonomy to extend downward for greater sensitivity to the cognitive demand typical of instruction for students with intellectual disability. This DOK scale ranges from 1 (attend, vocalize, gesture) to 6 (analyze, synthesize, evaluate). A diagram that illustrates the kind of information rated at the item level on Parts 3-5 is provided in Figure 1. For each topic in CIS Parts 3-5, respondents also indicated the grade level or band from which they adapted activities, materials, and contexts for the target student.

The CIS has been subjected to initial pilot testing, expert reviews, and full field tests (Karvonen, Wakeman, Flowers, & Browder, 2007b). Past studies have provided some validity evidence based on relationships with external curriculum measures (criterion-related) and cognitive interviews (response processes; Karvonen, Wakeman, Flowers, & Browder, 2007c).

Setting and Sample

An online survey (described below) was administered to a regionally diverse sample of teachers representing states with varied approaches to AA-AAS. The selected states participated in one of two federally-funded projects on AA-AAS. Two of the nine states were northwestern, two Midwestern, one western, two

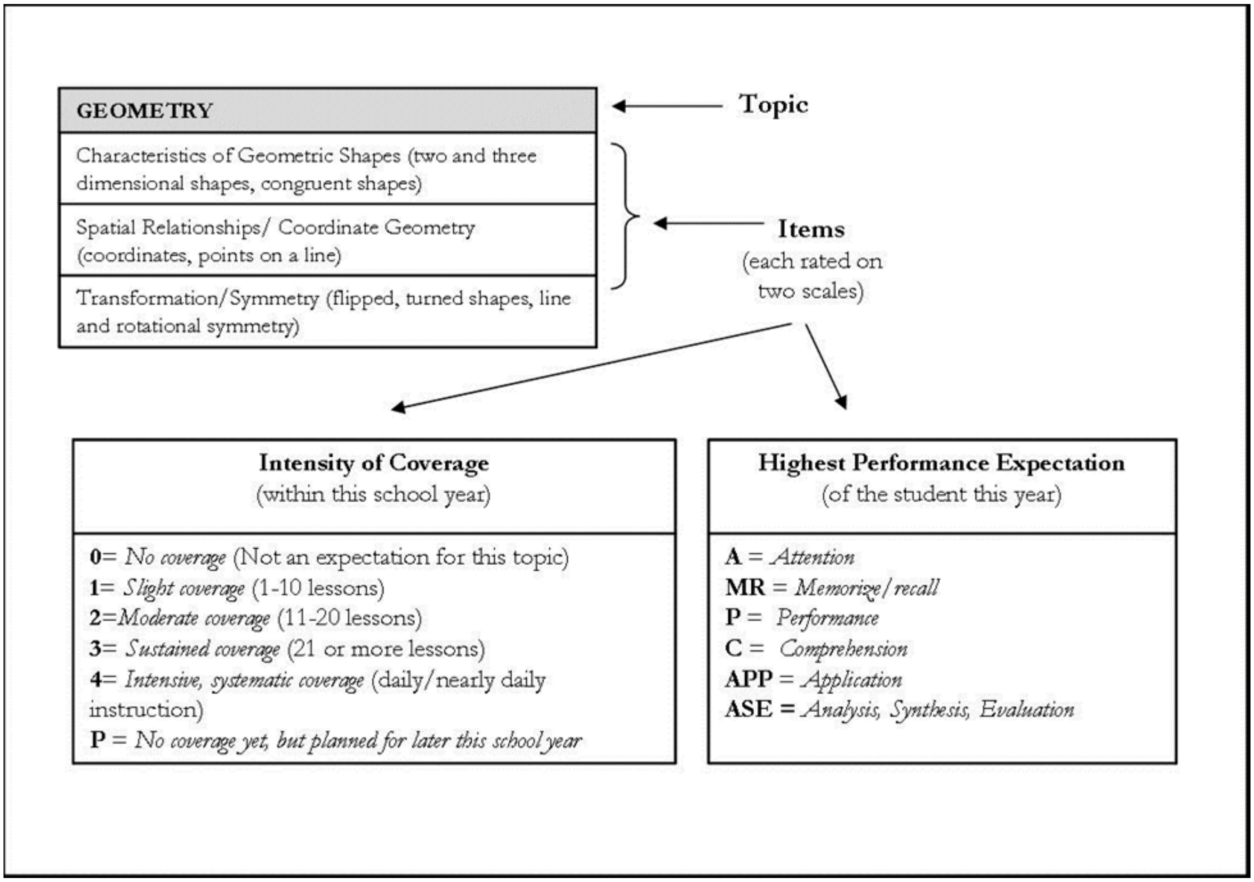

Figure 1. Content and rating expectation for academic skills in CIS Parts 3-5.

northeastern, and two southeast. Five states used a performance-based format; two a portfolio format; one a combination of portfolio and performance-based formats; and one a checklist with a body of evidence format. Four states identified assessment benchmarks or targets and five states had written extended standards (i.e., prioritized and potentially transformed standards based upon the general education standards within each state). Precise procedures for recruiting teachers varied by state, but in most cases recruitment and informed consent information was distributed via email to distribution lists that included eligible teachers. The sampling frame in each state consisted of teachers who administered AA-AAS. The lists of teacher names were generated in different ways depending on each state's recordkeeping and methods of communicating with teachers. In eight of nine states, gift cards with small monetary value were provided as an incentive for teachers to complete all parts of the survey. The ninth state, which did not allow incentives, had a response rate that was similar to the other states.

Summarized in Table 1 are responding teacher characteristics, including years of teaching experience in the content area and with the population, hours in professional development on the academic subject in the past 12 months, and content area licensure status. More than half the sample (58%) had been teaching students with intellectual disability for 10 years or less. Nearly one-fourth (24%) held licensure in ELA and 17% were licensed in math. In both subjects, the vast majority reported receiving 10 or fewer hours of professional development in the content area within the past year (ELA = 71%, math = 83%).

Student-level variables were available for 543 target students. Nearly one-third of these students were from grades 3-5, 36% were from grades 6-8, and 23% were enrolled in high school (grades 9-12). Although 9% of the sample was enrolled in grades preK-2 and in theory would not eligible for AA-AAS in most states, these students were chronologically old enough to participate in the assessment and were therefore retained in the sample. Roughly two-thirds (66%) of target students reportedly had abstract symbolic communication systems (i.e., use written words, sign language, Braille), while 15% had use concrete symbolic communication (i.e., use pictoral or photograph representations such as Boardmaker or line drawn pictures), and 17% used presymbolic

Table 1
Descriptive Statistics for Teacher and Student Variables

Variable	ELA *N*	ELA % of *n*	Math *n*	Math % of *n*
Years teaching content				
0-3	121	24.1	146	24.3
4-10	159	31.6	194	32.3
11-20	134	26.6	160	26.7
21-30	67	13.3	77	12.8
31 or more	22	4.4	23	3.8
Years teaching students with intellectual disability				
0-3	103	20.5	-	-
4-10	186	37.0	-	-
11-20	128	25.4	-	-
21-30	65	12.9	-	-
31 or more	21	4.2	-	-
Professional development hours in content				
0-3	201	40.0	334	55.7
4-10	154	30.6	161	26.8
11-20	69	13.7	51	8.5
21-30	30	6.0	23	3.8
31 or more	49	9.7	31	5.2
Content area license				
Yes	113	24.1	89	16.5
No	356	75.9	451	83.5

Variable	ELA		Math	
	N	% of *n*	*n*	% of *n*
Performance assessment on demand				
Not at all	26	5.2	29	4.8
<1/month	29	5.8	24	4.0
1-4/months	108	21.7	124	20.7
1-4/weeks	171	34.4	219	36.5
>4/weeks	163	32.8	204	34.0
Communication level				
Presymbolic	87	17.6	93	17.5
Concrete symbolic	73	14.8	81	15.3
Abstract symbolic	334	67.6	357	67.2
Grade band				
preK-2	46	9.2	49	9.2
3-5	155	31.1	169	31.6
6-8	181	36.3	192	35.9
9-12	116	23.3	125	23.4
Grade band match				
0 strands	187	45.2	204	52.4
1 or more strands	227	54.8	185	47.6

communication (i.e., use object or concrete representations such as a cup for drink). Compared with the general population of students eligible to take AA-AAS, target students in this sample slightly underrepresented the concrete symbolic level and overrepresented the presymbolic level (Towles-Reeves et al., 2009).

Although disability labels are not useful for interpreting student access, they may be helpful descriptors for readers wanting to compare the data with other study samples. For this study, disability labels for the target students were as follows: mental retardation (*n* = 366, 67%), speech/language impairment (*n* = 180, 33%), autism (*n* = 134, 25%), multiple disabilities (n = 111, 20%), other health impairment (*n* = 61, 11%), orthopedic impairment (*n* = 54, 10%), visual impairment (*n* = 32, 6%), learning disability (*n* = 31, 6%), traumatic brain injury (*n* = 15, 3%), hearing impairment (*n* = 13, 2%), severe emotional disturbance (*n* = 10, 2%), and deaf-blind (*n* = 5, 1%).

Data Collection Procedures

The CIS was conveniently administered in the context of the AA-AAS alignment study for each participating state. Each study used the Links for Academic Learning (LAL) alignment procedure (Flowers, Wakeman, Browder, & Karvonen, 2009). In those studies, the CIS was used to evaluate alignment of curriculum to the assessment content. All studies were conducted after university Institutional Review Board approval and teachers received informed consent

Table 2
Access Variables

Variable	Scale and Definition
Scope - content	Number of items across strands taught with at least "slight" coverage. Range = 0-27 in ELA, 0-16 in math.
Depth of Knowledge (DOK) - content	Average DOK of all items taught in the subject (ELA, math). Range = 1-6 (Normalized for canonical correlations)
Intensity - content	Average rating for intensity of instruction, across items within strand. Range = 1-5. (Note: Strand-level scores used in cluster analysis; average across all items and all strands used in canonical correlations)

information before completing the CIS.

Surveys were made available to eligible teachers in each state for approximately 2-3 weeks. The first state participated in December 2006 and the last state's completion window was in June 2008. Respondents viewed two online training videos prior to completing the surveys. One video provided an orientation to the instrument and how to take it online, while the other provided detailed training examples to help teachers calibrate their understanding of the three rating scales (intensity, performance expectation, and grade level). Surveys were administered online and all data were automatically stored in a database. Follow-up messages were sent to non-respondents and partial respondents at intervals preferred by each state—typically one and two weeks following the initial invitation.

A total of 644 teachers responded, with the number per state ranging from 7 in the least populous state to 194 in a more populous state. Although response rates could not be calculated in all states because of the recruitment methods used, lower bound estimated response rates ranged from 2% to 40% of eligible teachers. Since the survey was administered in five sections, response rates varied slightly for each section of the survey. Based on complete responses to survey sections that were then matched via unique identifier, 509 usable records in ELA and 613 in math were included in our analyses and results.

Data Analysis Procedures

Simple descriptive statistics represented the scope and intensity of access to the general curriculum as defined in Parts 3-4 of the CIS. Teacher and student characteristics from Parts 1-2 of the CIS defined variables potentially associated with the extent of access to academic content.

Defining access variables. Descriptions of variables that represented curriculum access are summarized in Table 2. Two variables represented different aspects of content coverage: scope and intensity. *Scope* represented the range of content within the subject area regardless of intensity of instruction, and intensity captured the average *intensity* rating (range of lessons per year, within strands and across all items). Average DOK across items represented the performance expectation for the student in that subject.

Defining predictor variables. Variables potentially associated with general curriculum access are summarized in Table 3. Teacher-level variables included teaching experience and licensure; recent professional development in the subject area; the extent to which several external factors influenced their instructional choices; and the extent to which they used a variety of materials, settings and human resources to teach academic content.

Potential student-level variables included current communicative status, assigned grade level, and quality of match (or discrepancy) between assigned grade level and grade band of instructional materials and activities. For this research, we used symbolic communication level rather than disability label because disability categories are not precise and finite enough to accurately describe how a student accesses information in the practical terms needed for planning instruction. For example, accurately pinpointing how a student who has been given the label of autism would interact with academic content would be difficult because of the heterogeneous abilities of students who qualify for special education services under that disability label. Teachers' ability to accurately classify their students according to level of symbolic communication use has been validated by Browder et al. (2008b) and also supported by Towels-Reeves et al. (2009).

Question 1: Descriptive statistics. Simple descriptions developed from three access variables characterized the scope and intensity of academic content coverage for students with intellectual disability. Table 2

Table 3
Predictor Variables

Variable	Scale and Definition
Teacher Variables	
Years teaching students with intellectual disability	Years of experience teaching students with intellectual disability, rated on 5-point scale reflecting ranges of years (0-3, 4-10, 11-20, 21-30, 31 or more)
Years teaching content (math or ELA)	Years of experience teaching the academic content (ELA or math), rated on 5-point scale reflecting ranges of years (0-3, 4-10, 11-20, 21-30, 31 or more)
Licensure in the content area (math or ELA)	0 = no, 1 = yes
Professional development	Time spent in professional development on instructional strategies in the academic subject, in the past year. Rated on 5-point scale reflecting range of number of hours in past 12 months (0-3, 4-10, 11-20, 21-30, 31 or more)
Performance assessment	Frequency of use of performance assessment to monitor student progress in instruction. Range = 1-5 (Categories: not at all, <1/month, 1-4/month, 1-4/week, >4/week)
General curriculum influences	Scale representing frequency with which teachers reported several academic items to be moderate or strong influences on their teaching in the content area. Total score ranged 0-5 based on combination of these items: state content standards; alternate assessment requirements; previous alternate assessment results; national standards in the content area; and content, materials, and activities used by general education teachers at their school. $\alpha_{ELA} = .79$, $\alpha_{MATH} = .80$
Subject area resources	Total number of materials, settings, and people the teacher reported using to teach the subject. Scale = 0-19
Student Variables	
Symbolic communication level	1-3; Student's level of symbol use in communication. Rated as presymbolic (i.e., relying primarily on nonsymbolic communication although they should be receiving ongoing instruction with symbols), concrete symbolic (i.e., needing symbols to have immediate referents such as pictorial symbols or words used to refer to everyday objects), or abstract symbolic (i.e., communicating with signs and symbols that do not need an immediate referent including some written text).

Variable	Scale and Definition
Grade band	Grade band that included the target student's chronologically-appropriate assigned grade level. Four categories (pK-2, 3-5, 6-8, 9-12)
Grade band match	Comparison between student's assigned grade band and the grade band(s) from which teachers adapted materials, activities, and contexts to teach the content. 0 = all content taught with materials below the chronologically-appropriate grade band, 1 = 1 or more strands taught with adaptations from grade band-appropriate materials

details these variables and the scale used to measure them.

Question 2: Canonical correlation analyses (CCA). A CCA examined the relationship between a set of variables that represented general curriculum access and a set that represented predictor variables (i.e., teacher and student characteristics). Before conducting the CCA, we screened the data for outliers, linearity, and normality; no outliers were evident and the univariate distributions appeared normal. We also assessed nonlinearity and multicollinearity. All the statistical assumptions appeared tenable; all bivariate scatterplots appeared linear; and assumptions regarding within-set multicollinearity were met.

Question 3: Cluster analyses. Cluster analyses identified homogeneous subgroups of teachers based on their access variables (i.e., scope, depth of knowledge, and intensity) in each strand. A k-means cluster procedure in SPSS was the clustering method, wherein 2, 3, and 4 cluster solutions were evaluated. We selected a three-cluster solution for ELA based on conceptual interpretation of the final cluster centers for each access variable. We selected a four-cluster solution for math. We evaluated the quality of each solution using a one-way ANOVA on the final cluster groups and visual inspection of the distribution of distances of cases from their group's center.

Question 4: ANOVA, Tukey and Chi-square analyses. Using the final cluster solutions, we explored group differences for the teacher and student characteristic variables identified in Question 1. We used one-way ANOVAs to examine cluster group differences on the two quantitative predictor variables (general curriculum influences, total resources) in each content area. Tukey post-hoc tests identified significant differences among specific groups. Chi-square analyses identified differences for the categorical variables, including student grade band, grade band match, and symbolic communication level; and teacher experience teaching students with disabilities, teaching the content, professional development in instructional strategies, and licensure in the academic area. We did not conduct Chi-square tests for those predictor variables that violated assumptions of the test (e.g., use of performance assessment to monitor progress in math).

Results

Question 1: Scope and Intensity of Academic Content

In Table 4, we report the means and standard deviations for scope, intensity, and DOK. Students were exposed to an average of 17 out of 27 English language arts (ELA) strands and an average of 10 out of 16 math strands. The average intensity of ELA and math instruction, based on a 5-point intensity scale, was 2.5 and 2.4, respectively. The instructional DOK, as measured with a 6-point scale, tended to be low, with an average of 2.4 for ELA and 2.6 for math.

Table 4
Descriptive Statistics for Curriculum Access Variables

	ELA		Math	
Variable	***M***	***SD***	***M***	***SD***
Scope – Content	16.9	7.95	9.90	4.20
Intensity – Content	2.47	.83	2.42	.75
DOK – Content	2.42	.99	2.62	1.08

Question 2: Relationship between Access and Teacher and Student Characteristics

The results of the two CCA suggest relationships between the set of variables that measure access to ELA or access to math and the set of predictor variables (i.e., student and teacher characteristics). Not all surveyed teachers completed both ELA and math parts of the survey, therefore the sample sizes for these two CCAs differ (ELA n = 351; math n = 315).

ELA. The ELA CCA was based on a sample of 351 respondents. The first canonical correlation was .615 (38% overlapping variance). The remaining two canonical correlations were either effectively zero or were not interpretable and thus are not discussed in the results. With all three canonical correlations included, χ^2 (50) = 228.30, $p < .001$.

Table 5 reports the results as standardized canonical coefficients, structure coefficients (r_s), squared structure coefficients (r_s^2), canonical correlations (R), and squared canonical correlations (R^2) for the significant function. Using a cutoff correlation (r_s) of the absolute value .30, all the access variables (i.e., scope, intensity, and DOK) correlated with the first canonical variate. Among the set of predictor variables, professional development (.30), general curriculum influences, (.48) and student communication level (.87) correlated with the first canonical variate. Teachers that reported more professional development and greater general curriculum influences demonstrated greater access. Students with higher communication levels tended to have greater access. The following predictor variables were not related to access: (a) years teaching ELA, (b) years teaching students with intellectual disability, (c) ELA licensure, (d) use of performance assessment, (e) ELA resources, (f) student grade band, and (g) grade band match.

Math. The Math CCA was based on a sample of 315 respondents. The first canonical correlation was .508 (26% overlapping variance). The remaining canonical correlations were effectively zero and thus are not discussed in the results. With all three canonical correlations included, χ^2 (30) = 136.52, $p < .001$. The last three columns in Table 5 report the results from the statistically significant canonical function in math.

Using a cutoff correlation (r_s) of the absolute value .30, all the access variables correlated with the first canonical variate. Among the set of predictor variables, professional development (.35), performance assessment (.31), general curriculum influence (.49), student communication level (.82), and student's grade band (.30) correlated with the first canonical variate. Teachers with more professional development, greater general curriculum influences, and more frequent use of performance assessment demonstrated greater access. Students with higher communication levels, and those enrolled in higher grade bands tended to have greater access. The following predictor variables were not related to access: (a) years teaching math, (b) years teaching students with intellectual disability, (c) math licensure, (d) math resources, and (e) grade band match.

Question 3: Access if Subgroups of Students to Wider Range of Academic Content

ELA. The cluster analysis for ELA included a total of 509 target students. The three-cluster solution grouped students into meaningful subgroups. The means for each access variable, by cluster, are reported in Table 6. Results from eight one-way ANOVAs indicated statistically significant differences (p < .001) between groups on all eight access variables. After evaluating final cluster centers for each variable, we created cluster names that reflected the characteristics that differentiated the groups. The students in the group with *limited* access had relatively low intensity of instruction across strands, with the highest being in the language strand (M = 1.79). Average DOK was also quite low for students in this group (M = 1.61). A group of students with *moderate* access covered a broader scope at a slightly higher DOK than the limited group. Students in the *intensive* group had considerably higher mean scores for intensity variables (M = 2.13 to 3.72 on 4-point scale) and higher average DOK compared with the students in the other two groups (M = 2.88).

Math. The cluster analysis for Math included 485 target students. We found that the four-cluster solution adequately minimized within group variability and maximized between group variability for this content area. The mean values for each access variable by cluster are reported in Table 7. After evaluating final cluster centers for each variable, we created cluster names that reflected the characteristics that differentiated the groups. The first group showed a pattern of *Limited* access. For those students, scope and DOK were very low; the relative intensity of instruction was low across all five strands, with slightly higher emphasis on numbers and operations (M = 2.02) relative to the other strands. The *Targeted – Low* group consisted of students who received targeted instruction that emphasized numbers and operations (M = 3.37) and measurement (M = 2.48) more so than other strands, with higher average DOK (M = 2.59) than the limited group. The *Targeted – High* group received instruction with a wider scope and higher average DOK than students in all other groups, but with a similar relative emphasis across strands as was seen in the Targeted – Low group. Finally, a fourth group of students received instruction in a *Broad* range of topics, as evidenced by more similar means across intensity ratings for the strands but with average DOK similar to Targeted – Low group (M = 2.51).

Table 5
ELA and Math Results for Canonical Correlation Analyses

	ELA Function I				Math Function I			
Variable	**Coefficient**	r_s	r_s^2		**Coefficient**	r_s	r_s^2	
Access variables								
Scope	.661	.927	.859	*	.501	.766	.587	*
DOK	.417	.782	.612	*	.670	.862	.743	*
Intensity	.068	.900	.810	*	.049	.781	.610	*
Predictor variables								
Years teaching content	.145	.148	.022		.234	.285	.081	
Years teaching students with intellectual disability	.050	.064	.004		-.007	.179	.032	
License in content	.005	.122	.015		.103	.013	.000	
Professional development	.105	.302	.091	*	.142	.349	.122	*
Perform assessment	.038	.029	.001		.202	.305	.093	*
General curriculum influence	.277	.479	.229	*	.319	.491	.241	*
Content resources	.094	.171	.029		.035	.235	.055	
Student communication	.786	.870	.757	*	.693	.820	.672	*
Grade band	.196	.260	.068		.257	.300	.090	*
Grade band match	.240	.279	.078		.113	.102	.010	
Canonical R			.615				.508	
R Squared			.378				.258	

Table 6
Final Cluster Centers for ELA Access Variables

Variable	Limited	Moderate	Intensive
Scope	5.12	14.59	24.15
DOK average	1.61	2.28	2.88
Language intensity	1.79	2.81	3.72
Reading/Literacy intensity	1.37	2.06	3.06
Composition intensity	1.24	2.12	3.19
Media intensity	1.09	1.38	2.13

Note: Limited n = 104; Moderate n = 170; Intensive n = 235; Total n = 509

Table 7
Final Cluster Centers for Math Access Variables

Variable	Limited	Targeted – Low	Targeted – High	Broad
Scope	3.61	7.55	15.18	11.46
DOK average	1.93	2.59	3.21	2.51
Numbers and operations intensity	2.02	3.37	4.34	3.90
Algebra intensity	1.33	1.78	3.08	2.20
Geometry intensity	1.24	1.52	2.89	2.05
Measurement intensity	1.58	2.48	3.54	2.86
Data analysis intensity	1.29	1.50	2.72	2.07

Note: Very Limited *n* = 83; Targeted-low *n* = 148; Targeted – high *n* = 127; Broad *n* = 127; Total *n* = 485.

Question 4: Factors Associated with Extent of Access

ELA. Omnibus tests for cluster group differences on most teacher and student predictor variables were statistically significant (see Table 8). We observed significant group differences in average general curriculum influence score, $F(2, 463) = 42.94$, $p < .001$, $\eta^2 = .16$, and total ELA resources, $F(2, 495) = 6.47$, $p < .001$, $\eta^2 = .03$. All pairwise comparisons were statistically significant for the general curriculum influences variable ($p = .042$ for Moderate; Intensive, $p < .001$ for other comparisons). Members of the Intensive group had significantly higher mean total ELA resource score than the Limited group ($M_I = 12.05$, $M_L = 10.55$, p = .002). On both dependent variables, the Limited access group had the lowest mean, followed by Moderate and then Intensive.

Among the categorical student variables, there were statistically significant group differences for students' symbolic communication level, χ^2 (4, $N = 489$) = 110.31, $p < .001$, grade band, χ^2 (6, $N = 493$) = 19.93, $p = .003$, and grade band match, χ^2 (2, $N = 412$) = 10.48, $p = .005$. There were higher percentages of students with abstract symbolic communication systems in the Intensive (85%) and Moderate (70%) groups than in the Limited (28%) group. The highest rate of instruction using grade level materials that matched students' chronologically-appropriate grade was reported for the Intensive (62%) group. Among the teacher predictor variables, years of experience teaching students with intellectual disability, χ^2 (8, $N = 498$) = 22.65, $p = .004$, and hours of professional development in ELA instruction in the past year, χ^2 (8, $N = 498$) = 19.92, $p = .011$, were statistically significantly related to access group. Teachers in the Limited access group tended to have fewer years of experience teaching ELA and fewer hours of professional development on ELA instructional strategies in the past year compared with the other groups. There were no statistically significant differences between cluster groups on the basis of teachers' ELA or reading licensure, χ^2 (2, $N = 464$) = 3.58, $p = .167$, or years of experience teaching ELA, χ^2 (8, $N = 498$) = 10.98, $p = .20$.

Math. Omnibus tests for cluster group differences on most teacher and student variables were statistically significant (see Table 9). There were significant group differences in average general curriculum influence score, $F(3, 452) = 21.85$, $p < .001$, $\eta^2 = .13$, and total math resources, $F(3, 468) = 7.66$, $p < .001$, $\eta^2 = .05$. All group means were significantly different from one another on the general curriculum access variable ($p < .001$ to $p = .047$). For total math resources, the Limited access group had a lower mean than the Targeted – High ($p < .001$) and Broad ($p = .021$) groups. The Targeted – Low group had a significantly lower mean than the Targeted – High ($p < .002$) group.

Among the categorical variables, there were significant group differences for students' symbolic communication level, χ^2 (6, $N = 462$) = 59.50, $p < .001$, students' assigned grade band, χ^2 (9, N = 468) = 21.77, $p = .010$, and teachers' years of experience teaching students with intellectual disability, χ^2 (12, N = 472) = 24.52, $p = .017$. There were more teachers with extensive (11 or more years) experience in the Limited access group. There were higher percentages of students with abstract symbolic communication systems in the Targeted – High (84%), Broad (75%), and Targeted – Low (67%) groups than in the Limited access group (34%).

Table 8
Access Group Differences for ELA Predictor Variables

Variable	Limited	Moderate	Intensive
General curriculum influences	11.31	12.35	14.69
	(3.52)	(3.19)	(3.26)
Total ELA resources	10.55	11.19	12.05
	(4.03)	(3.61)	(3.61)
Years teaching ELA			
0-3	29%	24%	21%
4-10	32%	31%	33%
11-20	16%	28%	31%
21-30	17%	13%	11%
31 or more	6%	4%	4%
Years teaching students with intellectual disability			
0-3	27%	16%	21%
4-10	34%	41%	35%
11-20	14%	25%	31%
21-30	18%	15%	9%
31 or more	8%	2%	4%
Professional development hours in ELA			
0-3	47%	46%	33%
4-10	33%	30%	30%
11-20	7%	12%	18%
21-30	3%	4%	9%
31 or more	10%	9%	10%
ELA/Reading license			
Yes	18%	24%	28%
No	82%	76%	72%
Communication level			
Presymbolic	45%	15%	6%
Concrete symbolic	28%	15%	9%
Abstract symbolic	28%	70%	85%
Grade band			
preK-2	16%	13%	4%
3-5	31%	33%	30%
6-8	32%	31%	41%
9-12	21%	23%	25%

Variable	Limited	Moderate	Intensive
Grade band match			
0 strands	58%	50%	38%
1 or more strands	42%	50%	62%

Table 9
Access Group Differences for Math Predictor Variables

Variable	Limited	Targeted – Low	Targeted – High	Broad
General curriculum influences	11.13	12.43	14.87	13.71
	(3.87)	(3.61)	(3.01)	(3.32)
Total math resources	10.41	10.90	12.49	11.87
	(4.22)	(3.56)	(3.25)	(3.03)
Years teaching math				
0-3	30%	23%	19%	21%
4-10	33%	36%	25%	35%
11-20	15%	25%	37%	29%
21-30	17%	11%	15%	13%
31 or more	5%	6%	4%	2%
Years teaching students with intellectual disability				
0-3	22%	22%	17%	21%
4-10	33%	41%	32%	39%
11-20	14%	23%	36%	27%
21-30	22%	11%	11%	11%
31 or more	9%	4%	5%	2%
Professional development hours in math				
0-3	58%	59%	45%	61%
4-10	25%	27%	28%	27%
11-20	7%	10%	14%	6%
21-30	5%	1%	5%	4%
31 or more	5%	3%	8%	2%
Math license				
Yes	13%	18%	16%	18%
No	87%	82%	85%	82%
Communication level				
Presymbolic	38%	16%	8%	12%
Concrete symbolic	28%	17%	8%	14%
Abstract symbolic	34%	67%	84%	75%

Variable	Limited	Targeted – Low	Targeted – High	Broad
Grade band				
preK-2	21%	12%	4%	7%
3-5	28%	35%	32%	31%
6-8	33%	31%	43%	35%
9-12	18%	23%	21%	28%
Grade band match				
0 strands	59%	58%	44%	51%
1 or more strands	41%	42%	56%	49%

There were no statistically significant differences between cluster groups on the basis of teachers' years of experience teaching math, χ^2 (12, N = 472) = 18.07, p = .114, hours of professional development in math instruction in the past year, χ^2 (12, N = 472) = 17.01, p = .149, or math licensure, χ^2 (3, N = 427) = 1.37, p = .71, or the match between grade level materials and students' assigned grade, χ^2 (3, N = 384) = 5.59, p = .134.

Discussion

Our descriptive examination of access to the general curriculum among students with intellectual disability and exploration of variables associated with access to ELA and math curricula for these students offer three important findings. First, we found that the scope and intensity of academic coverage suggested that students are exposed to a variety of academic content, but the DOK results indicated that the content was reduced in the level of complexity.

Second, in canonical correlation analyses, we found the set of variables used to define access were strongly interrelated for both ELA and math, which suggested that a combination of range and intensity of content coverage and depth of knowledge can operationally define "access" to the general curriculum in a broad sense. Our study defined general curriculum access as the academic curriculum – regardless of setting (i.e., resource, inclusion, self-contained). Specific instructional strategies used to deliver the curriculum were also outside the scope of this analysis. This study does not allow for inferences based on all seven criteria Browder et al. (2007) established for linking instruction and assessment to grade-level content, including achievement expectations, differentiation across grade levels, and the way in which content is extended from grade-level standards.

Third, the cluster analyses indicate groups of students with intellectual disability have different levels of access to the general curriculum— three levels of access to ELA and four levels of access to math. As with the adoption of any innovation (Rogers, 2003), it is not surprising that some teachers have made more progress than others in developing academic instruction for this population of students. The groups that emerged may reflect a combination of (a) teacher adoption of general curriculum access as an innovation and (b) student characteristics.

Several considerations for educational policy and practice emerge from these findings. For instance, if the foundation of academic instruction for this population is in functional academics, the progress teachers make in building on this foundation may lead them to intensify the instruction in familiar areas before branching out into new areas. Functional math curriculum is largely based in numbers and operations and measurement, with topics such as money and time. Between the Limited and Broad access groups, we found two Targeted groups with stronger emphases on those two historically functional strands. The Broad group was taught a wider range of content but with lower DOK. In other words, some teachers may have chosen to push students further in familiar areas that have functional value, while others may have chosen to broaden access to more strands but with lower performance expectations. Functional ELA has typically included oral language (expressive and receptive communication), reading (e.g., sight words), and writing (e.g., stamping or writing one's name). Because of the broader range of functional ELA content, we found just one rather than two groups between the extremes. The observed relationships between access group and teacher characteristics such as professional development (ELA) and years of experience teaching students with intellectual disability (ELA and math) confirm the importance of teacher preparation to design and deliver effective academic instruction. However, the small canonical coefficients for years of experience teaching the content and teaching the students imply that simply accruing years of experience does not sufficiently prepare teachers to provide access. This study also echoes findings from general education, in which other at-risk populations are served by teachers with the least experience and with fewer professional development opportunities (Lankford, Loeb, & Wyckoff, 2002; Shen & Poppink, 2003).

Besides teacher acceptance and preparation, access groups may also be explained by students' communication levels. While the relationship is not perfectly linear, there were far more students who had not yet developed concrete symbolic communication systems (i.e., those labeled as presymbolic) in the Limited access groups in both subjects, while the Intensive and Broad groups were almost exclusively made up of students with abstract symbolic communication systems. It is possible that the Intensive and Broad groups included some students who had been incorrectly assigned by the IEP team to the AA-AAS but were more appropriately assessed by an alternate assessment based on modified achievement standards or grade level achievement standards with appropriate accommodations. Regardless, the outcomes illustrate that the population of students who participate in AA-AAS is very diverse. Teachers who design instruction and administer the AA-AAS need to consider student communication systems in their planning. Browder, Wakeman, and Flowers (2009) suggested teachers use a "Work it Up" and "Work it Across" approach to ensure a match between student characteristics and aligned academic instruction and assessment. Also, taking steps to help students without symbolic communication systems develop communicative competence may enhance their ability to make progress in academic content (Kleinert, Kearns, & Kleinert, 2010).

The findings from this study extend Karvonen, Wakeman, Browder, Rogers, and Flowers' (2011) initial descriptions of the extent to which academics are being taught ten years after IDEA 1997 and other studies on general curriculum access. For instance, Roach and Elliott (2006) found a weak, inverse relationship between grade level and curriculum access. In the current study, there were larger percentages of middle and high school students in the Intensive ELA group than the Limited ELA group. There were also larger percentages of students in middle and secondary grades than upper elementary grades in the Broad and Targeted – High math groups. It is worth exploring how teachers help students access the curriculum even at higher grades, where the discrepancy between grade-level expectations and alternate achievement expectations is larger. There is a growing literature base demonstrating that students with intellectual disability at the secondary level can learn academic content linked to appropriate grade level standards. For example, Browder et al. (2006) summarized studies in middle school literature, algebra, and science that documented that teachers could use a task analytic method to address multiple standards for secondary students and that students could independently respond correctly during academic instruction.

Limitations and Future Research

The analyses presented in this paper are exploratory. There are certainly limitations to our findings. It is difficult to measure the enacted curriculum in general education (Mayer, 1999), and even more challenging when describing the curriculum for students who require such individualized approaches to teaching and learning. Teacher self-report is an imperfect measure, but it allowed us to maximize sample size without requiring major resource demands needed for direct observation. This multi-state sample offers a cross-section of curriculum and instructional approaches not bound by a single state's system. However, this sample may not fully represent the extent of general curriculum access among all students with intellectual disability. Since teachers had flexibility in choosing the target student whose curriculum was described on the survey, they may have chosen on the basis of who had the "densest" academic curriculum or who made the best progress during the year. The target students in this sample did differ from the typical population who take AA-AAS on the basis of symbolic communication level in that there were a higher percentage with presymbolic communication and lower percentage with concrete symbol systems (Towles-Reeves et al., 2009).

Conclusion

This study offered a unique opportunity to examine large-scale data for a very small population. However, since this study yielded a preliminary exploration of patterns, more research is warranted. There are certainly limitations associated with canonical correlation analysis and cluster analysis methods, and it is not surprising that the final clusters yielded statistically significant differences on the access variables. The statistically significant group differences on the basis of teacher and student characteristics provide some evidence that these groups are different in substantive ways. Within this data set, the correlational findings will be used to guide development of models that better explain general curriculum access. Future research may also explore the relationship between curriculum access, student characteristics not captured by the CIS, and AA-AAS performance in order to evaluate opportunity to learn for subgroups of students. Since group differences were found in the extent of general curriculum access, it is also likely that subgroups of students have different opportunities to learn the kind of content that is measured by AA-AAS.

If patterns identified in this study are supported by further research, there are implications for policy, professional development, and practice as well. State and local education agencies may devote additional attention to policies and supports that help teachers translate the federal requirement into effective practices for the full range of students with intellectual disability. Results could help researchers and technical assistance providers develop materials that target learning opportunities in identified areas of need. If teachers vary in their buy-in to teaching academics and can be classified according to the groups described in research question 2, professional development may be tailored to their stage of learning and implementation to help them build toward greater access. Building, district, and state level administrators and curriculum specialists also need to set expectations that teachers will use resources, such as state and national content standards and AA-AAS results and requirements, to guide instructional choices. The current study supports such efforts to allow all students to participate meaningfully in the general education curriculum.

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