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Characteristics of Students Who Take Dynamic Learning Maps® Alternate Assessments

Technical Report #20-01

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Executive Summary

The reauthorization of the Elementary and Secondary Education Act as the Every Student Succeeds Act (ESSA) in 2015 outlined the requirement that students with the most significant cognitive disabilities take alternate assessments based on alternate achievement standards (AA-AAS). Furthermore, ESSA established a participation threshold that limits the percentage of students that a state may assess with an AA-AAS to no more than one percent of all students in the grades assessed in a state. As states have begun to implement policy changes geared toward meeting this requirement, the population of students taking AA-AAS has begun to shift. The purpose of this report is to describe characteristics of this student population, specifically the students with the most significant cognitive disabilities who take Dynamic Learning Maps® (DLM®) alternate assessments in 19 states and a Bureau of Indian Education school. The report summarizes findings in areas of educational placement; communication; accessibility supports; and academic knowledge, skills, and understandings in the areas of reading, writing, mathematics, and science for students who participated in the DLM alternate assessment during the 2018–2019 academic year.

- Sixty-seven percent of students are identified as having autism, an intellectual disability, or multiple disabilities.
- Twenty-five percent of students are taught in a separate school.
- Seventy-six percent of students use speech expressively to communicate.
- Sixty percent of students who use speech to communicate combine three or more spoken words according to grammatical rules.
- Thirty-eight percent of students respond appropriately in any modality to phrases and sentences that are spoken or signed.
- Ninety-one percent of students use a computer either independently or with human support.
- Sixty-nine percent of students read at or below a first-grade reading level.
- Seventeen percent of students write words or simple phrases without copying.
- Twenty-two percent of students consistently add or subtract using numerals.
- Sixteen percent of students consistently identify similarities and differences.

Overall, these results demonstrate the population of students who take the DLM alternate assessment are highly variable across disability categories, classroom placement, and communication and academic skills.

I: Overview

The Every Student Succeeds Act (ESSA) of 2015 placed renewed attention on students with the most significant disabilities, due to the inclusion of more specific guidelines for who should participate in alternate assessments based on alternate achievement standards (AA-AAS). The regulations established requirements that states who adopt alternate achievement standards must follow when determining who qualifies to take alternate assessments, including defining students with the most significant disabilities and establishing a 1% threshold on the number of students who may take AA-AAS. In response to the legislation, states began providing districts with guidance for meeting the 1% threshold (Oklahoma State Department of Education, 2019; United States Department of Education, 2018; Wisconsin Department of Public Instruction, n.d.). As the number of students taking AA-AAS decreases to comply with the 1% threshold, the characteristics of students who take AA-AAS are also shifting.

Purpose

Given the requirements established by ESSA, this report summarizes characteristics of students who took the Dynamic Learning Maps® (DLM®) alternate assessment in the 2018–2019 academic year. The report provides information on students' descriptive characteristics, expressive and receptive communication skills, computer access and usage, academic skills, and engagement with and attention to both teacher and computer-based instruction.

Students with Significant Cognitive Disabilities

Much of the literature describes students with the most significant cognitive disabilities as those eligible to take AA-AAS (Kearns et al., 2011; Kleinert et al., 2015). Though the expectation is that only 1% of students with disabilities should take AA-AAS, students' communication skills, learning challenges, and support needs within this 1% are quite diverse, adding to the difficulty in adequately defining students with significant cognitive disabilities. Historically, students who are categorized as having an intellectual disability, autism, or multiple disabilities have comprised the majority of students who take AA-AAS (Kleinert et al., 2015; Nash et al., 2016; Towles-Reeves, et al., 2009). Additionally, Kearns et al. (2011) determined approximately 10% of the students within the AA-AAS population were those whose expressive and receptive communication were at the presymbolic level and were also most likely to experience a sensory impairment, low levels of social engagement, deficient motor skills, and health related issues, leading to more complex support needs across all school settings.

When setting eligibility guidelines for who takes AA-AAS, the most often cited characteristics states use to make the determinations are low intellectual and adaptive functioning, a need for intensive individualized instruction and supports, and the use of

an alternate curriculum (Thurlow et al., 2017). Additional considerations some states use include parental consent to take the alternate assessment, a students' lack of ability to show what they know on a regular assessment, and significant communication deficits (Thurlow et al., 2017).

DLM Alternate Assessment System

The DLM Alternate Assessment System is designed to serve the small and heterogeneous population of students with the most significant cognitive disabilities for whom general statewide assessments are not appropriate, even with accommodations. These students show what they know and can do through academic content that is aligned to grade-level content standards, but at reduced depth, breadth, and complexity. For DLM assessments, alternate content standards, called Essential Elements, were derived from college and career readiness standards and represent the learning targets for DLM assessments for grades 3–12 in English language arts and mathematics. Essential Elements for science were derived from the Framework for K-12 Science Education for grades 3-5, middle and high school.

There are three general eligibility guidelines for participation in the DLM alternate assessment (DLM Consortium, 2013). First, the student must have a significant cognitive disability that significantly impacts both intellectual functioning and adaptive behavior. Second, the student is primarily instructed using the DLM Essential Elements as content standards, with Individualized Education Program (IEP) goals and instruction that address knowledge and skills that are appropriate and challenging. Third, the student requires extensive direct individualized instruction and supports, including substantially adapted materials and individualized methods of accessing information, to make measurable progress in the grade-level curriculum (DLM Consortium, 2016).

DLM test delivery is computer-based, and the delivery platform considers students' accessibility needs. Computer-delivered assessments are designed to allow students to interact independently with the computer, emphasizing student interaction with content, while allowing assistive technology such as alternate keyboards, touch screen, or switches as needed. Teacher-administered testlets allow the teacher to administer the assessment outside the system, with the test administrator recording student responses. Students who are blind or have visual impairments have access to alternate forms to allow them to access assessment content (DLM Consortium, 2016). Test developers also use knowledge of the variability of students' needs and academic capabilities to develop test content that is appropriate for all students within the population (Bechard et al., 2019). Prior to administering assessments, teachers complete or annually update the First Contact survey, which is a survey of learner characteristics. Information is collected on student demographics, expressive and receptive communication skills, communication systems used, special education placement, sensory perception, mobility, computer usage, first language, academic skills, and engagement with and attention to instruction. A subset of

items measuring academics are used to assign each student to a subject-specific complexity band that is used in the test assignment process.

II: Student Demographics

During the 2018–2019 academic year, 92,080 students took DLM assessments in grades 3–12, as shown in Table 1. Students who take DLM assessments are similarly distributed across grades 3–8, with varied participation among students in grades 9–12, according to individual state guidelines that determine which grades in high school students participate in statewide assessments.

Table 1. Students Participating by Grade Level (N = 92,080)

Grade Level	*n*	*%*
Grade 3	10,767	11.69
Grade 4	11,461	12.45
Grade 5	12,322	13.38
Grade 6	11,598	12.60
Grade 7	11,595	12.59
Grade 8	12,249	13.30
Grade 9	7,718	8.38
Grade 10	5,172	5.62
Grade 11	8,850	9.61
Grade 12	348	0.38

Sixty percent of the students were white, 20% were African-American, and 11% were two or more races. Twenty-one percent of the students were Hispanic, and nearly 67% were male. Just over 16% of students had a health issue, such as a fragile medical condition or seizures that interfered with instruction or assessment.

Disability Category

Students with the most significant cognitive disabilities have a range of primary disability categories concomitant with significant support needs. They may be classified as having autism, a developmental disability, or multiple disabilities, and require intensive and ongoing support across all academic and daily living domains (Taub et al., 2017). While this is a heterogeneous population with a variety of support needs, when summarizing Individuals with Disabilities Education Improvement Act (IDEA) disability categories of students who take the DLM alternate assessment, the majority of students fall into three disability categories. Close to 70% of students are classified as having either autism (26.4%), an intellectual disability (25.3%), or multiple disabilities (15.4%). Past studies have identified these as the three most prevalent disability categories in AA-AAS (Kleinert et al., 2015; Nash et al., 2016; Towles-Reeves et al., 2009). Table 2 provides the distribution

of disability categories for students taking DLM assessments. Some states do not collect a specific disability code, thus "eligible individual" (19.6%) and "documented disability" (1.9%) are used.

Table 2. Disability Category (N = 92,080)

Primary Disability Category	*n*	%
Autism	24,323	26.42
Deaf-Blindness	57	0.06
Developmental Delay	934	1.01
Emotional Disturbance	421	0.46
Hearing Impairment	234	0.25
Intellectual Disability	23,271	25.27
Multiple Disabilities	14,160	15.38
Orthopedic Impairment	298	0.32
Other Health Impaired	4,550	4.94
Specific Learning Disability	1,345	1.46
Speech or Language Impairment	1,684	1.83
Traumatic Brain Injury	455	0.49
Visual Impairment	207	0.22
Eligible Individual	18,029	19.58
Documented Disability	1,736	1.89
Decline to Answer	297	0.32
No Disability	79	0.09

Students Who Are English Learners

A small subset of students with significant cognitive disabilities are also English learners (ELs). This group of students has received increased attention since the passage of ESSA (2015) specified states must provide alternate English language proficiency assessments to students for whom the general English language proficiency assessment is not appropriate, even with accommodations. These students have complex language and communication needs related to their disability and because they are multilingual (Christensen et al., 2018). Additionally, they may face greater challenges when using English at school and another language away from school (Christensen & Mitchell, 2018). Currently, there is no federal definition used to identify these students, making identification difficult. Karvonen and Clark (2019) determined discrepancies between EL prevalence estimates based on EL program participation data and teacher-reported primary language information, and they showed how adequately identifying this group of students can be difficult. Table 3 describes the EL program participation status of students who took DLM assessments, as collected during enrollment to the system. Just under 6% of students received or were eligible for EL funding and/or services.

Table 3. EL Program Participation (N = 92,080)

EL Participation Type	*n*	*%*
Neither an EL-eligible student nor an EL-monitored student	86,854	94.32
Title III funded	3,304	3.59
State EL/bilingual funded	271	0.29
Both Title III and state EL/bilingual funded	689	0.75
Monitored EL student	181	0.20
Eligible but not currently receiving services	256	0.28
Receives EL services but not Title III or state funded	525	0.57

Note. EL = English learner.

Teachers respond to items about the student's primary language in the First Contact survey prior to administering DLM assessments. Table 4 shows the three primary language questions teachers answered. Fifteen percent of students taking DLM assessments primarily speak a language other than English in the home, which indicates a discrepancy between students who are eligible for or participate in EL services and those who do not but may need and benefit from additional language services and supports.

Table 4. Students' Primary Language (N = 89,677)

Primary Language	*n*	*%*
Is English the student's primary language?	6,917	7.71
Is English the primary language spoken in the student's home?	13,448	15.00
Is English the primary language used for the student's instruction?	589	0.66

Note. Counts Indicate "No" Responses.

Approximately 67% of students with significant cognitive disabilities who are also EL were categorized as having intellectual disabilities, autism, or multiple disabilities, which is similar to the distribution of all students who take DLM assessments.

Educational Placement

Another important demographic to consider when describing students with the most significant cognitive disabilities is where they receive their instruction. These students have been characterized as needing consistent and repetitive extensive individualized instruction and support (Kurth et al., 2019; Taub et al., 2017), yet schools are also mandated to provide access and participation in the general curriculum to all students (IDEA, 2004). The least restrictive environment requirement in the IDEA states that students should only be removed from the general education classroom when the severity

of their disability inhibits them from having their needs met in the general education class (IDEA, 2004).

Most students who take DLM assessments (55%; *n* = 50,519) spend less than 40% of their instructional day in a general education classroom, 15% spend between 40% and 79% of their day in a general education classroom, and 25% are served in a separate school. Only 4% of students spend the majority of their day with their general education peers.

III. Student Characteristics

Students who take DLM alternate assessments possess a variety of unique characteristics related to communication, attention to computer and teacher-direction learning, and their hearing and vision that may impact their learning.

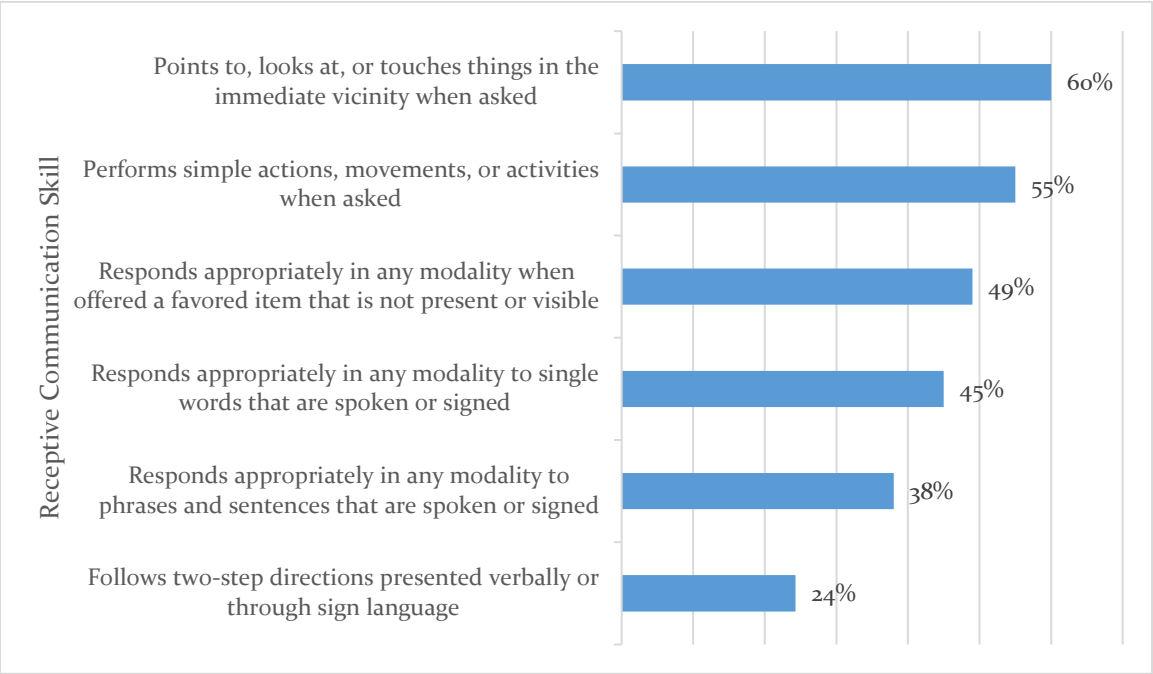
Communication

Understanding students' communication skills is necessary when developing and implementing an IEP, so that students have the necessary aids and services to demonstrate what they know and can do during both instruction and assessment. Within the DLM assessment system, information about a student's expressive communication informs the student's complexity band, which is used in the assessment assignment process.

Receptive Communication

Students demonstrate understanding of spoken or signed language in many ways. Figure 1 summarizes the percentage of students who DLM assessments whose teachers indicated they demonstrate each form of receptive communication more than 80% of the time. Nearly one-fourth of students can consistently follow two-step directions presented verbally or through sign language; 55% perform simple actions, movements, or activities when asked; and 60% of students point to, look at, or touch things in their immediate vicinity when asked.

Figure 1. Percentage of students who demonstrated receptive communication skill more than 80% of the time (N = 92,080).



Expressive Communication

Students with the most significant cognitive disabilities communicate in a variety of ways. Approximately 76% (n = 70,209) of students who take DLM assessments use speech to meet expressive communication needs. Of those, 60% combine three or more spoken words according to grammatical rules, 27% use two words spoken at a time, and 13% use only one spoken word at a time.

Students who do not use speech for expressive communication use sign language, augmentative or alternative communication (AAC) devices, and/or symbols. Approximately 5% (n = 4,912) of students use sign language in place of or in addition to speech to meet their expressive communication needs. Of these students, 61% use American Sign Language, with the remaining using a hybrid or personalized signing system (36%) or signed exact English (3%). Only 4% of students using sign language combine three or more signed words according to grammatical rules, 10% use two signed words at a time, and over 85% sign one word at a time. Twenty-three percent (n = 21,296) of students use an AAC device in place of or in addition to speech or sign language to meet their expressive communication needs. Of these, 8% combine three or more symbols at a time according to grammatical rules, while 26% use two symbols at a time, and the remaining 66% use one symbol at a time.

Forty-seven percent (n = 43,283) of students use some form of symbol to communicate, though for some students, this is in addition to speech or sign language. When using symbols to communicate, 24% of students choose from ten or more at a time, 14% choose

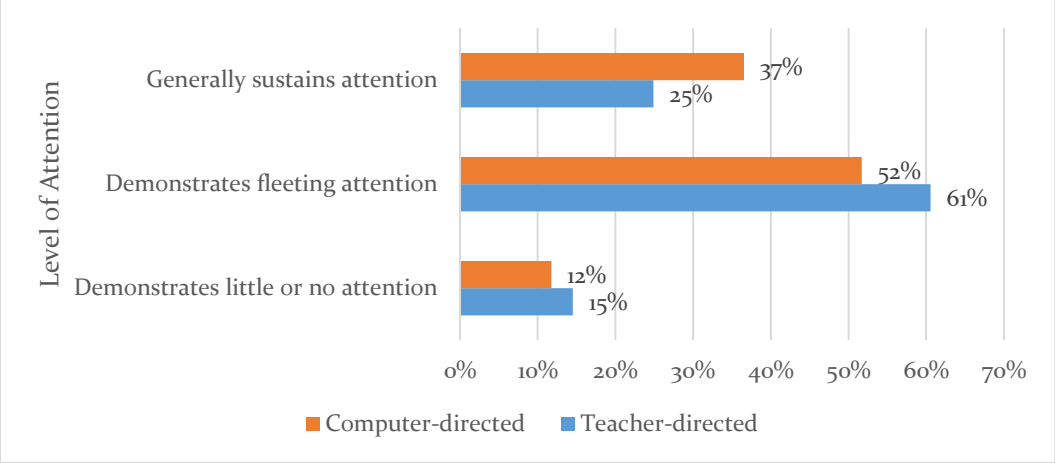
from five to nine, 27% choose from three or four, and 36% from one or two. Students respond to various types of symbols to facilitate their expressive communication, including photos (31%), real objects (26%), line drawing symbol sets (26%), text only (13%), and tactual symbols (12%), while 19% use a voice output technology device.

Of the remaining 7% (n = 6,896) of students who do not use speech, sign language, or AAC devices to communicate, 18% use only unconventional vocalization, unconventional gestures, and/or body movement to communicate intentionally; 34% use conventional gestures and vocalizations to communicate intentionally but do not yet use symbols or sign language; and 47% exhibit behaviors that may be reflexive and are not intentionally communicative but can be interpreted by others as communication.

Attention

Teachers were asked to indicate their students' attention to both teacher-directed and computer-directed instruction. Results are displayed in Figure 2. Over half of the students who take DLM assessments demonstrate fleeting attention to either teacher-directed (61%) or computer-directed (52%) instruction. A small percentage of students demonstrate little or no attention to teacher-directed (15%) or computer-directed (12%) instruction.

Figure 2. Percentage of students by level of attention and type of instruction (computer-directed instruction: N = 79,995; teacher-directed instruction: N = 86,340).



Sensory Characteristics and Access Needs

Students with the most significant cognitive disabilities often also have hearing, vision, and/or motor skill impairments that can impact their ability to access content across various settings.

Vision

Nearly 5% of students who take DLM assessments are blind or have low vision. Twenty-one percent of these students are legally blind, 33% have low vision, 33% have cortical vision impairment, and 8% are completely blind. Students who are blind or have low vision may access content via large print, tactile media, or through technology supports such as screen readers or closed circuit television magnifiers Table 5 presents the percentage of students who use vision aids. The highest percentage of students require enlarged print or tactile media.

Table 5. Use of Vision Aids by Students who are Blind or have Low Vision (*N*=4,320)

Vision Aid	*n*	%
Requires enlarged print	3,839	88.87
Requires tactile media	3,221	74.56
Uses screen reader and/or talking word processor	1,605	37.15
Uses screen magnifying device	1,568	36.30
Uses closed circuit television magnifier	205	4.75
Uses a braille writing device	162	3.75
Requires or uses braille	118	2.73
Uses a device with refreshable braille display	24	0.56

Hearing

Nearly 4% of students who take DLM assessments are deaf or hard of hearing; of these students, 23% have severe or profound hearing loss and 36% have moderate to moderately severe hearing loss. Students who are deaf or hard of hearing use various supplementary aids to access content, including hearing aids, amplification devices, and cochlear implants. Table 6 summarizes use of auditory aids for students who are deaf or hard of hearing. Forty-one percent of students who are deaf or hard of hearing use a bilateral hearing aid.

Table 6. Use of Auditory Aids by Students who are Deaf or Hard of Hearing (*N*=3,372)

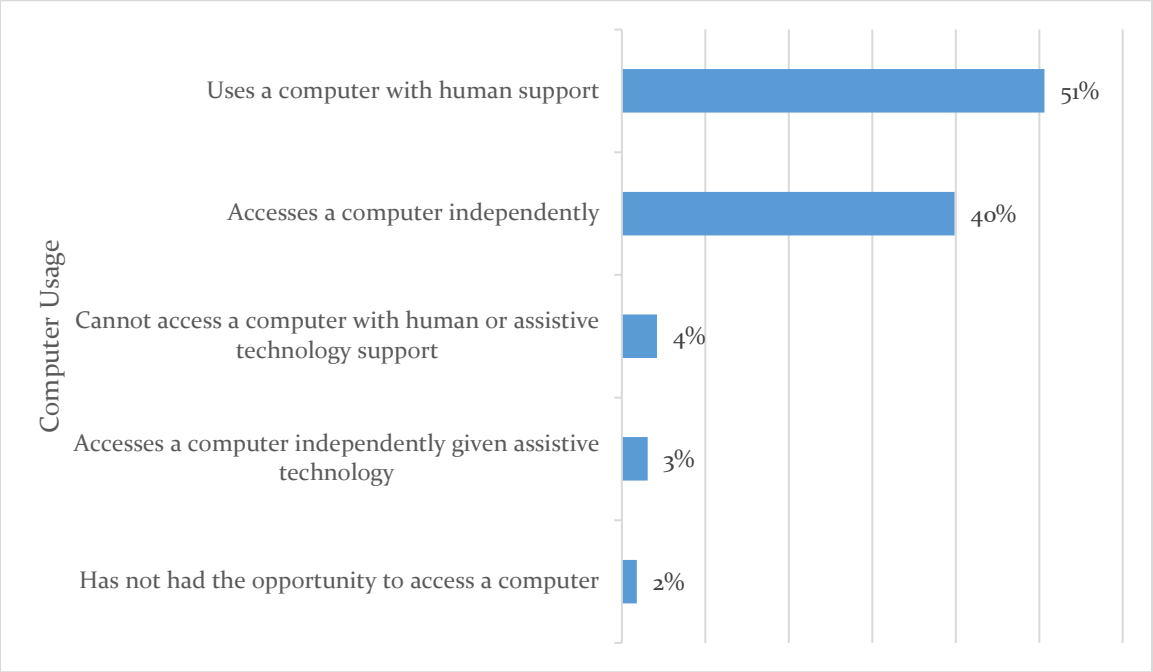
Auditory Aid	*n*	%
Bilateral hearing aid	1,405	41.67
Personal or classroom amplification	1,191	35.32
Unilateral hearing aid	503	14.92
Cochlear implant	362	10.74

Mobility

Approximately 17% (*n* = 15,966) of students use one hand to perform tasks. Another 15% (*n* = 14,172) of students require physical assistance to perform tasks with their hands, and just over 2% (*n* = 2,115) are not able to use their hands to complete tasks even with assistance.

Student mobility may impact how students indicate what they know and can do. Because the DLM Alternate Assessment System is a computer-based system, it is important to understand students' access to and use of computers. As shown in Figure 3, approximately 40% of students access a computer independently. However, 4% of students are not able to access a computer even with human or assistive support.

Figure 3. Percentage of students by primary use of a computer during instruction (*N* = 91,508).



Students utilize various technology and supports when using computers to access content. Sixty-seven percent (*n* = 61,975) of students who take DLM assessments access a computer with a standard keyboard, 42% use a standard mouse or a head mouse, 47% use a touch screen, 4% use an alternate keyboard, 2% use scanning with one- or two-switch scanning, and less than 1% use eye gaze technology.

For students who are unable to or have not had an opportunity to access a computer (*n* = 5,371), 64% are prevented from doing so because of their disability. Seventeen percent have not had the opportunity to learn how to use a computer and 14% refuse to use a computer. Five percent of students did not have access because there was no equipment available.

IV. Academics

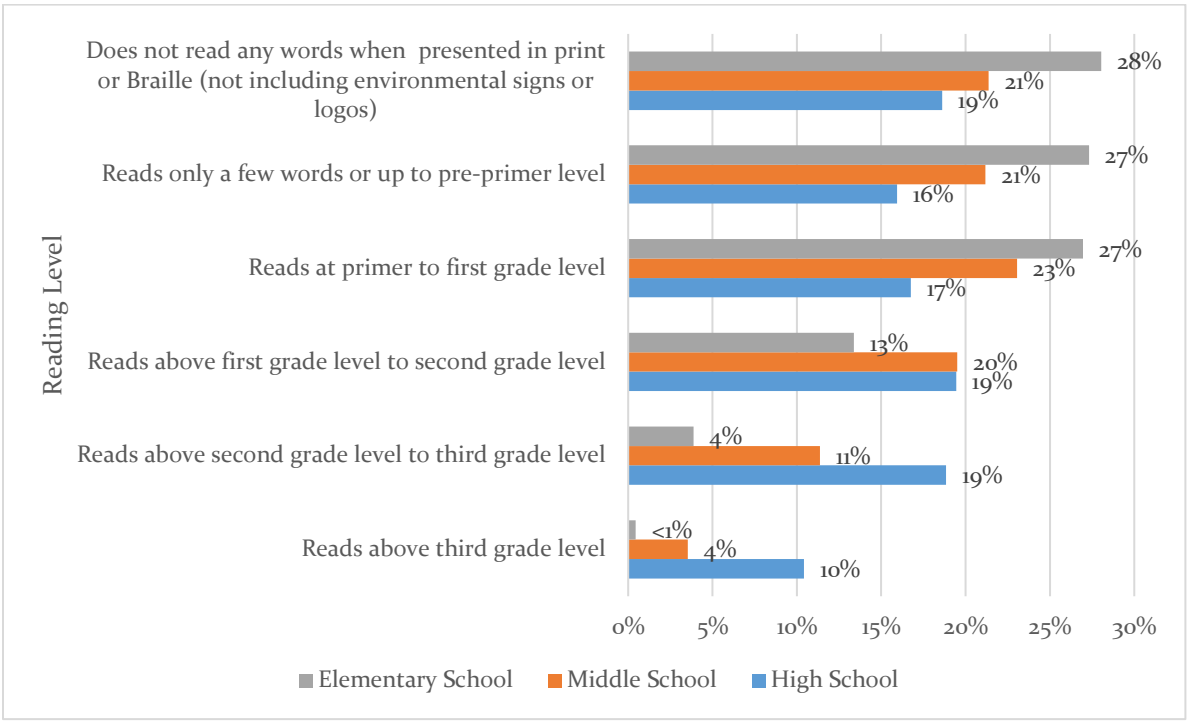
Information about students' academic skills in English language arts, mathematics, and science is used to inform student testlet assignment in each subject and ensures content is optimally matched to the students' knowledge, skills, and understandings.

English Language Arts

English language arts questions summarize teachers' ratings of students' reading and writing knowledge, skills, and understandings. Forty percent (*n* = 35,972) of students read at a primer to second grade level. Another 14% read above a second grade level, while 23% do not read any words when presented in print or braille.

Figure 4 presents reading level disaggregated by grade band. Twenty-eight percent of elementary school students, 21% of middle school students, and 19% of high school students do not read any words when presented in print or braille. Conversely, only 4% of elementary school students read above a second-grade level, compared to 15% of middle school students and 29% of high school students.

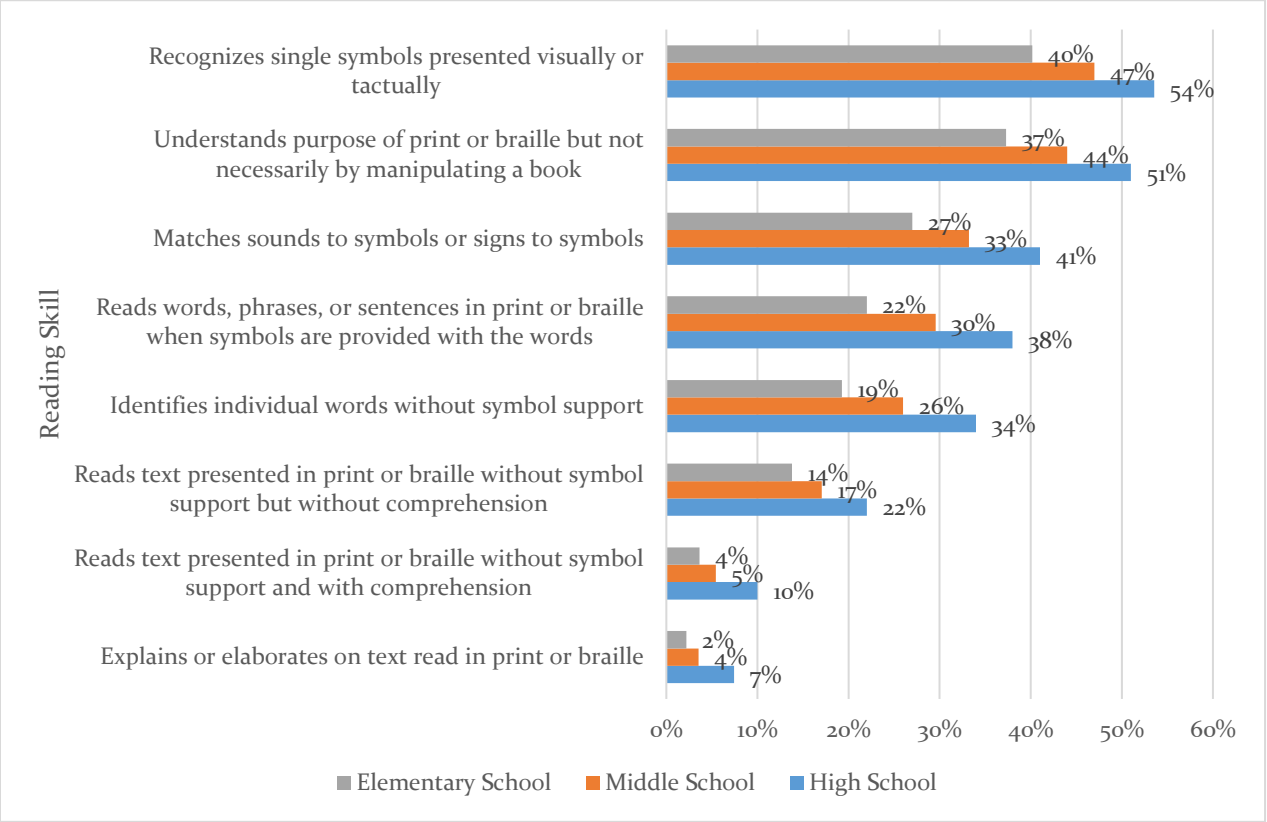
Figure 4. Percentage of students by grade band rated as performing at each reading level (*N* = 89,467).



Teachers also rate the percentage of time students demonstrate reading skills. Figure 5 displays the percentage of students by grade band who performed the specified reading

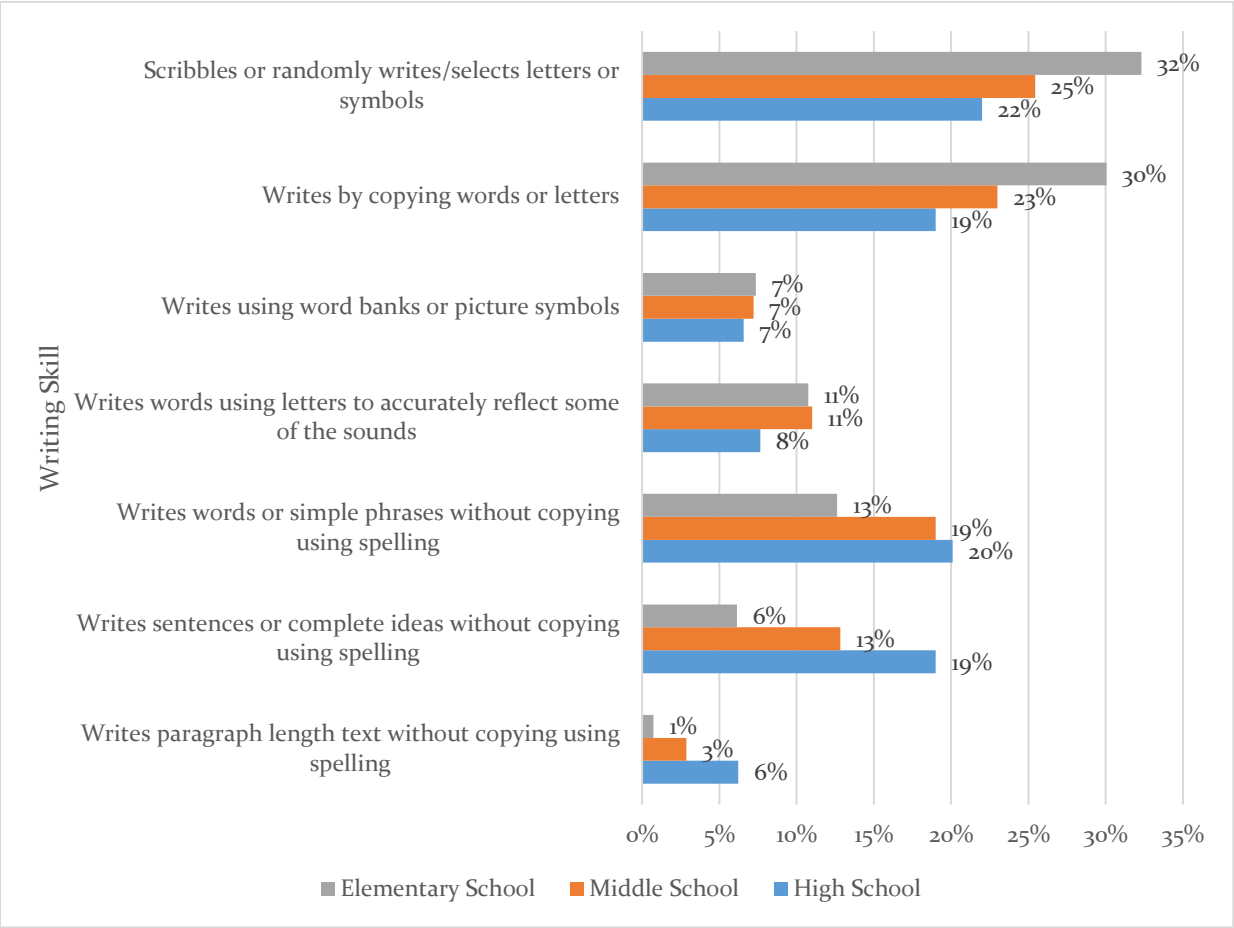
skill consistently (i.e., more than 80% of the time). Overall, students are more likely to consistently perform simpler skills, such as recognizing single symbols presented visually or tactually, than more difficult skills, such as reading text presented in print or braille without symbol support and with comprehension. For each skill, there was an increase in the percentage of students who consistently demonstrate the skill from elementary to high school.

Figure 5. Percentage of students by grade band who perform each reading skill more than 80% of the time (N = 89,467).



Teachers indicate the highest-level writing skill that the student has demonstrated at least once, even if the student does not consistently use this method. Writing includes any method the student uses to write using any writing tool that allows access to all letters of the alphabet. Beyond paper and pencil, this may include traditional keyboards, alternate keyboards, and eye gaze displays of letters. Writing levels vary for students taking DLM assessments. Across all grade bands, 27% (n = 24,086) of students scribble or randomly write or select letters or symbols while 17% (n = 14,955) write words or simple phrases without copying. Figure 6 depicts the highest writing level that describes students' writing skills, summarized by grade band. The highest percentages of students either randomly write letters or copy words.

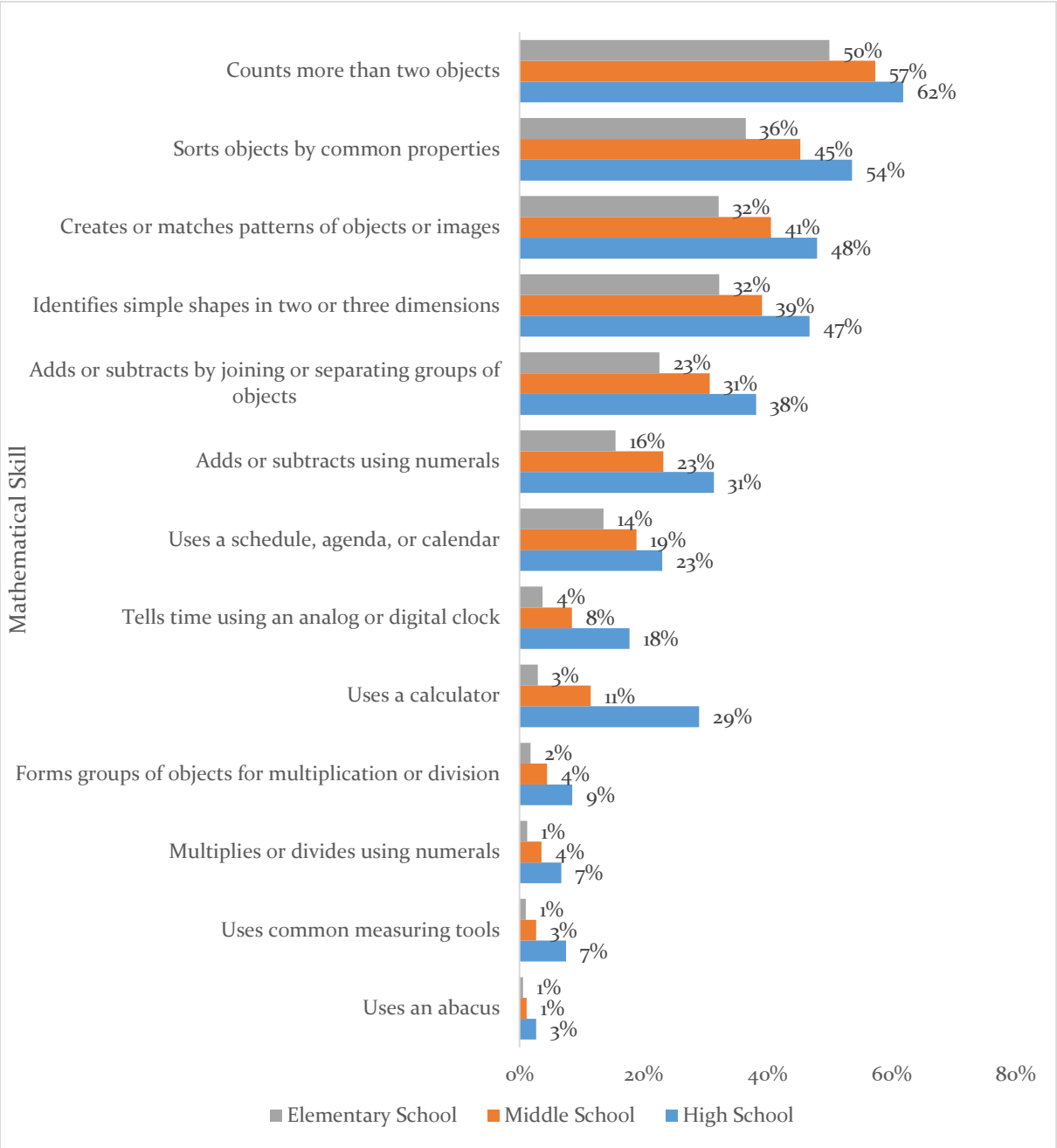
Figure 6. Highest writing level by grade band that students have demonstrated at least once during instruction (*N* = 89,467).



Mathematics

Mathematics questions summarize teachers' ratings of students' knowledge, skills, and understandings of mathematical concepts. Teachers rate the percentage of time students demonstrate specified mathematics skills. Across all grade bands, 56% (*n* = 49,782) of students consistently count more than two objects, and 22% (n = 19,874) consistently add or subtract using numerals. Figure 7 displays the percentage of students who performed mathematics skills consistently (i.e., more than 80% of the time), summarized by grade band. Across grade bands, students more frequently count multiple objects, sort objects by common properties, and create and match patterns of objects, while multiplication and division using numerals and using common measuring tools were less frequently reported.

Figure 7. Percentage of students by grade band who perform each mathematics skill more than 80% of the time (N = 89,467).

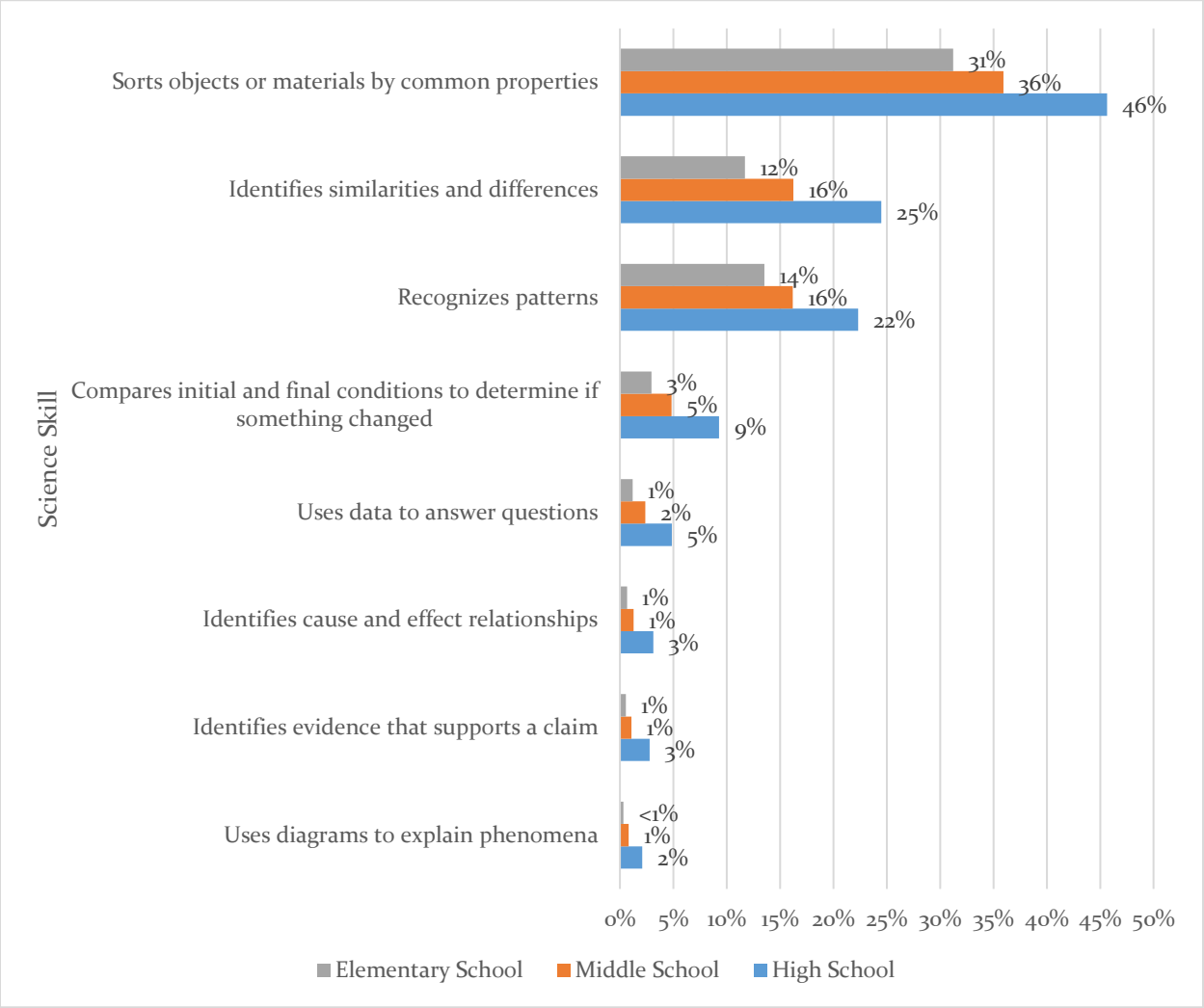


Science

Teachers answered questions about students' knowledge, skills, and understandings related to scientific concepts. Sixteen percent (n = 13,567) of students across all grade bands consistently identify similarities and differences, and 5% (n = 4,260) consistently compare initial and final conditions to determine if something changed. Figure 8

summarizes the percentage of students who performed the science skill consistently (i.e., greater than 80% of the time), by grade band. Higher percentages of students consistently demonstrated sorting objects or materials by common properties, identifying similarities and differences, and recognizing patterns. Smaller percentages of students consistently performed skills such as using data to answer questions, identifying evidence that supports a claim, or identifying cause and effect relationships.

Figure 8. Percentage of students by grade band who perform each science skill more than 80% of the time (*N* = 82,462).



V. Relationship of Expressive Communication with Other Variables

Previous research on students who participate in AA-AAS suggests student communication skills impact literacy and sensory skills (Erickson & Geist, 2016; Kearns et al., 2011). Furthermore, students who use or appear to require the use of AAC to effectively communicate have been found to have less teacher interaction and be more likely to engage in passive activities than other students with significant cognitive disabilities (Kurth et al., 2016). To determine if there are differences between students' mode of expressive communication and students' placement, receptive communication, attention to instruction, sensory characteristics, and academic skills, students were grouped based on teacher responses to questions about their mode of expressive communication. Seventy-six percent of students use speech with or without AAC to communicate, just over 16% of students use sign language or AAC in place of speech, and 7% of students do not use speech, sign language, or AAC to communicate. Mode of expressive communication is further analyzed in relation to student demographics, characteristics, and academic skills using chi-square tests of independence.

The chi-square test of independence examines the differences of frequencies obtained from a sample survey with the frequencies expected if there were no differences between the categories investigated. If the chi-square test is significant, the differences between the observed and expected frequencies are considered to be an actual difference between the categories of the variable (Rea & Parker, 2014). While a chi-square test of significance can determine whether a relationship exists, it does not give an indication to the strength of the relationship. Cramer's V, with values ranging from 0 to 1, provides an indication to the strength of the relationship between two or more variables. Cramer's V measures of association are interpreted as follows: .00 < .10 = negligible; .10 < .20 = weak; .20 < .40 = moderate; .40 < .60 = relatively strong; .60 < .80 = strong; and .8 <= 1.0 = very strong (Rea & Parker, 2014).

Educational Placement

The majority of students who took DLM assessments were served in non-inclusive settings. Kleinert et al. (2015) found that students with the least communication competence were more likely to be served in non-inclusive settings. To examine whether there are differences in students' mode of expressive communication and their educational placement, a chi-square test of independence was conducted. There is a significant relationship between educational placement and student's mode of expressive communication, X^2 (10, N = 91,380) = 5,265, p < 0.0001, Cramer's V = 0.17, with the effect size for this relationship demonstrating a weak association (Rea & Parker, 2014). Table 7 demonstrates that although all students were more likely to receive their instruction in a separate special education setting, students who use speech to communicate expressively were more likely to spend 40% or more of their day in a general education classroom than

students who primarily use sign or AAC or do not have a means of expressive communication.

Table 7. Mode of Expressive Communication by Educational Placement (N = 91,380)

Mode	≥80% of Day in Regular Class		40%-79% of Day in Regular Class		< 40% of Day in Regular Class		Separate School		Residential Facility		Homebound	
	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Speech	4.1	2,866	17.8	12,409	57.0	39,715	20.3	14,158	0.5	353	0.2	161
AAC/Sign	1.8	269	6.1	915	47.4	7,158	42.8	6,460	1.3	189	0.8	115
None	3.2	212	6.1	405	55.1	3,646	32.1	2,120	1.2	81	2.2	148
Total	3.7	3,347	15.0	13,729	55.3	50,519	24.9	22,738	0.7	623	0.5	424

Receptive Communication

Expressive and receptive communication skills are necessary for individuals to be effective communicators. Erickson and Geist (2016) found that students who used speech to communicate demonstrated more receptive language skills than students who used AAC and/or sign language instead of speech.

A chi-square test of independence revealed a significant relationship between a student pointing to, looking at, or touching things in the immediate vicinity when asked and mode of expressive communication, X^2 (2, N = 91,911) = 25,376, p < 0.0001, Cramer's V = 0.53. The effect size for this relationship demonstrated a relatively strong association (Rea & Parker, 2014). Table 8 demonstrates students who use speech to communicate were more likely to point to, look at, or touch things in their vicinity when asked than students who use AAC or sign or who do not have a means of expressive communication.

Table 8. Expressive Communication by Frequency Student Points to, Looks at, or Touches Things in Immediate Vicinity (N = 91,911)

Mode	> 50% of the Time		≤50% of the Time	
	%	*N*	%	*n*
Speech	92.0	64,483	8.0	5,595
AAC/Sign	47.5	7,199	52.5	7,968
None	34.7	2,314	65.3	4,352
Total	80.5	73,996	19.5	17,915

A chi-square test of independence revealed a significant relationship between students responding appropriately in any modality to phrases and sentences at least 50% of the time and mode of expressive communication, X^2 (2, N = 91,626) = 21,723, p < 0.0001, Cramer's V = 0.49. The effect size for this relationship demonstrated a relatively strong association (Rea & Parker, 2014). As demonstrated in Table 9, students who use speech

were more likely to respond appropriately greater than 50% of the time whereas students who use AAC, sign, or who do not communicate expressively were less likely to respond appropriately.

Table 9. Expressive Communication by Frequency Student Responds Appropriately to Phrases and Sentences (N = 91,626)

	> 50% of the Time		≤50% of the Time	
Mode	%	*n*	%	*n*
Speech	79.4	55,482	20.6	14,390
AAC/Sign	26.1	3,951	73.9	11,181
None	23.9	1,584	76.1	5,038
Total	66.6	61,017	33.4	30,609

Similarly, a chi-square test of independence revealed a significant relationship between following two-step directions presented verbally or through sign and mode of expressive communication, X^2 (2, N = 91,678) = 15,966, p < 0.0001, Cramer's V = 0.42. The effect size for this relationship demonstrated a relatively strong association (Rea & Parker, 2014). Table 10 demonstrates that students who use speech were more likely to follow two-step directions more than 50% of the time than students who use AAC, sign, or who do not communicate expressively.

Table 10. Expressive Communication by Frequency Student Follows Two-Step Directions (N = 91,678)

	> 50% of the Time		≤50% of the Time	
Mode	%	*n*	%	*n*
Speech	64.7	45,253	35.3	24,658
AAC/Sign	15.1	2,283	84.9	12,859
None	17.5	1,157	82.5	5,468
Total	53.1	48,693	46.9	42,985

Attention to Instruction

Students with the most significant cognitive disabilities display varying levels of attention to both teacher and computer-directed instruction. Chi-square tests of independence revealed significant relationships between method of expressive communication and (a) student level of attention to computer-direction instruction, X^2 (4, N = 79,995) = 10,305, p < 0.0001, Cramer's V = 0.25 and (b) student level of attention to teacher-directed instruction, X^2 (4, N = 86,340) = 13,009, p < 0.0001, Cramer's V = 0.27. Both of these relationships demonstrated a moderate association (Rea & Parker, 2014). Students who used speech were more likely to sustain attention to both computer- and teacher-directed instruction, as demonstrated in Table 11 and Table 12, respectively. Students who did not

communicate expressively were slightly more likely to sustain attention to computer-directed and teacher-directed instruction than students who used AAC or sign, which is an unexpected finding.

Table 11. Mode of Expressive Communication by Level of Attention to Computer-Directed Instruction (*N* = 79,995)

	Generally Sustains		Fleeting		Little or None	
Mode	%	*n*	%	*n*	%	*n*
Speech	42.4	26,891	51.1	32,375	6.5	4,150
AAC/Sign	12.8	1,583	58.0	7,142	29.2	3,602
None	18.0	766	43.5	1,849	38.5	1,637
Total	36.6	29,240	51.7	41,366	11.7	9,389

Table 12. Mode of Expressive Communication by Level of Attention to Teacher-Directed Instruction (*N* = 86,340)

	Generally Sustains		Fleeting		Little or None	
Mode	%	*n*	%	*n*	%	*n*
Speech	30.2	19,746	62.0	40,523	7.8	5,079
AAC/Sign	7.9	1,161	62.3	9,153	29.8	4,371
None	9.5	597	41.6	2,621	49.0	3,089
Total	24.9	21,504	60.6	52,297	14.5	12,539

Sensory Characteristics

Previous research has shown students with significant cognitive disabilities who use speech for communication are less likely to have vision or hearing loss (Erickson & Geist, 2016). Chi-square tests of independence revealed significant relationships between method of expressive communication and (a) students who are deaf or hard of hearing, X^2 (4, N = 91,393) = 1,004, $p < 0.0001$, Cramer's V = 0.07 and (b) students who are blind or have low vision, X^2 (6, N = 91,381) = 5,763, $p < 0.0001$, Cramer's V = 0.18. The effect size for the relationship between method of expressive communication and students who are deaf and hard of hearing was negligible, while the effect size for the relationship between method of expressive communication and students who are blind and have low vision demonstrated a weak association (Rea & Parker, 2014). In both cases, students who used speech for expressive communication were less likely to experience hearing or vision loss and students who are blind or experience low vision were more likely to not use speech or AAC or sign. These findings are summarized in Table 13 and Table 14, respectively.

Table 13. Mode of Expressive Communication by Students who are Deaf or Hard of Hearing (*N* = 91,393)

	No Hearing Loss		Deaf or Hard of Hearing		Inconclusive	
Mode	%	*n*	%	*n*	%	*n*
Speech	95.8	66,746	2.9	2,003	1.3	935
AAC/Sign	90.0	13,581	6.9	1,046	3.1	468
None	91.3	6,038	4.9	323	3.8	253
Total	94.5	86,365	3.7	3,372	1.8	1,656

Table 14. Mode of Expressive Communication by Students who are Blind or Have Low Vision (*N* = 91,381)

	No Vision Loss		Normal Vision		Blind or Low Vision		Inconclusive	
Mode	%	*n*	%	*n*	%	*n*	%	*n*
Speech	65.5	45,661	30.2	21,010	2.8	1,916	1.6	1,095
AAC/Sign	70.2	10,589	14.7	2,221	9.4	1,423	5.6	847
None	63.3	4,190	14.0	925	14.8	981	7.9	523
Total	66.1	60,440	26.4	24,156	4.7	4,320	2.7	2,465

Academics

Students with significant cognitive disabilities who use speech to communicate have demonstrated greater reading and writing skills than those who use AAC or sign to communicate (Erickson & Geist, 2016). Chi-square tests of independence revealed a significant relationship between method of expressive communication and (a) student's approximate instructional reading level with comprehension, X^2 (10, N = 89,467) = 31,130, $p < 0.0001$, Cramer's V = 0.42 and (b) student's highest level of writing skills demonstrated, X^2 (12, N = 89,467) = 31,044, $p < 0.0001$, Cramer's V = 0.42. Each of these relationships demonstrated a relatively strong association (Rea & Parker, 2014). Students whose mode of expressive communication is speech were more likely to read with comprehension above a 2nd grade level than students who use sign, AAC, or do not have a method of expressive communication, as demonstrated in Table 15. Conversely, students who use AAC or sign or do not use speech were more likely to not read any words in print or braille than students who use speech. An unexpected finding is students who do not have a method of expressive communication appear to read at a 1st grade level or higher at a greater rate than students who use AAC or sign. More research is necessary to determine why students who do not use speech are reported to read at a greater level than students who use AAC or sign.

Table 16 demonstrates that students who use speech to communicate are more likely to write words or simple phrases or sentences or complete ideas without copying than students who use AAC or sign or do not have a communication system. Students who use AAC or sign or do not have a communication system are more likely to scribble or randomly write or select letters or symbols.

Table 15. Mode of Expressive Communication by Instructional Reading Level (*N* = 89,467)

	Above 3rd Grade Level		Above 2nd Grade Level		Above 1st Grade Level		Primer to 1St Grade		Reads Only a Few Words or Up to Pre-primer		Does Not Read Words Presented in Print or Braille	
Mode	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Speech	5.0	3,413	13.0	8,860	21.3	14,531	27.5	18,804	23.4	16,009	9.8	6,689
AAC/Sign	0.3	45	1.0	144	3.1	459	9.1	1,340	21.9	3,219	64.6	9,490
None	1.8	119	3.3	214	5.8	375	7.2	463	10.6	686	71.3	4,607
Total	4.0	3,577	10.3	9,218	17.2	15,365	23.0	20,607	22.3	19,914	23.2	20,786

Table 16. Highest Level of Student's Writing Skills Demonstrated at Least Once (*N* = 89,467)

	Paragraph Length Without Copying		Sentences or Complete Ideas Without Copying		Words or Simple Phrases Without Copying		Words Using Letters to Accurately Reflect Some Sounds		Uses Word Banks or Picture Symbols		Copies Words or Letters		Scribbles or Randomly Writes/ Selects Letters or Symbols	
Mode	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Speech	3.6	2,473	15.0	10,210	20.8	14,193	12.4	8,450	7.9	5,414	27.7	18,937	12.6	8,629
AAC/Sign	0.1	9	0.7	95	3.0	434	1.8	270	5.2	760	16.1	2,372	73.2	10,757
None	1.0	62	2.8	178	5.1	328	2.9	184	3.1	199	12.6	813	72.7	4,700
Total	2.8	2,544	11.7	10,483	16.7	14,955	10.0	8,904	7.1	6,373	24.7	22,122	26.9	24,086

Chi-square tests of independence revealed significant relationships between mode of expressive communication and (a) students who identified individual words without symbol support more than 50% of the time, X^2 (2, N = 89,467) = 12,282, p < 0.0001, Cramer's V = 0.37, (b) students who read words, phrases, or sentences in print or Braille when symbols are provided with words more than 50% of the time, X^2 (2, N = 89,467) = 15,378, p < 0.0001, Cramer's V = 0.41, and (c) students who count more than two objects more than 50% of the time, X^2 (2, N = 89,467) = 27,846, p < 0.0001, Cramer's V = 0.56. The effect size for the relationship between mode of expressive communication and identifying individual words without symbol support was moderate, while the effect size for the other relationships demonstrated a relatively strong association (Rea & Parker, 2014).

Table 17 demonstrates students who use speech identify words without symbol support more often than students who use AAC or sign or do not use speech to communicate.

Table 17. Expressive Communication by Frequency Student Identifies Words without Symbol Support (N = 89,467)

	> 50% of the Time		≤ 50% of the Time	
Mode	%	*n*	%	*n*
Speech	56.2	38,382	43.8	29,924
AAC/Sign	12.0	1,767	88.0	12,930
None	14.4	933	85.6	5,531
Total	45.9	41,082	54.1	48,385

Table 18 shows that students who use speech reads words, phrases, or sentences in print or braille with symbol support more often than students who use AAC or sign or do not use speech to communicate.

Table 18. Expressive Communication by Frequency Student Reads with Symbol Support (N = 89,467)

	> 50% of the Time		≤ 50% of the Time	
Mode	%	*n*	%	*n*
Speech	61.7	42,119	38.3	26,187
AAC/Sign	12.3	1,805	87.7	12,892
None	14.3	923	85.7	5,541
Total	50.1	44,847	49.9	44,620

Table 19 demonstrates that students who use speech are more likely to count more than two objects than students who use AAC or sign or who do not communicate expressively.

Table 19. Expressive Communication by Frequency Student Counts More Than Two Objects (*N* = 89,467)

	> 50% of the Time		≤50% of the Time	
Mode	%	*n*	%	*n*
Speech	87.3	59,608	12.7	8,698
AAC/Sign	30.9	4,537	69.1	10,160
None	26.2	1,693	73.8	4,471
Total	73.6	65,838	26.4	23,629

VI. Discussion

Students with the most significant cognitive disabilities are a small and historically understudied group of students. They have only recently been included in state accountability requirements, and many state education agencies are still working toward meeting the 1% threshold on participation in AA-AAS, as mandated by ESSA. As state agencies continue to refine definitions and decision rules around participation, they must also provide local education agencies with guidance in determining who is eligible to take AA-AAS without interfering with IEP team decisions. For these reasons, it is important to better understand the characteristics of the students AA-AAS serve. Because the DLM project now serves students in 20 states, the consortium is uniquely positioned to contribute important descriptive information to this conversation.

The findings presented in this report reflect the shifting understanding of the characteristics of students with the most significant cognitive disabilities, given the contracting population eligible for AA-AAS. For instance, in 2011, Kearns et al. found that 37% to 56% of students across seven states could independently follow one-to-two-step directions, while the 2019 DLM assessment results show only 24% of students consistently follow two-step directions and only 37% respond appropriately to phrases and sentences (i.e., more than 80% of the time). There are similar differences regarding students' academic skills. Towles-Reeves et al. (2009) determined 59% of students in one state could do computational problems with or without a calculator. However, only 12% of students who take DLM assessments consistently (i.e., more than 80% of the time) use a calculator, and only 22% consistently (i.e., more than 80% of the time) add or subtract by using numerals. Kearns et al. (2011) found that from 14% to 18% of students were able to read fluently in print or braille from narrative or information texts with literal understanding. Comparatively, teacher ratings suggest that only 10% of students who take DLM assessments read texts without symbol support and with comprehension. Finally, Kearns et al. (2011) found that 13% to 20% of students had no awareness of print or braille, while the current study determined nearly 24% of students do not read any words in print or braille.

While some of these differences could be attributed to how questions are worded across studies, the findings also likely reflect changes in the population as states work toward lowering the percentage of students participating in AA-AAS. It is likely that students who perform more cognitively demanding tasks are less likely to be served by AA-AAS under the 1% threshold. Students demonstrating stronger communication or academic skills who previously may have been eligible may no longer qualify under updated eligibility criteria. The population is expected to continue to shift in coming years as more states reach the 1% threshold on AA-AAS participation.

This population shift has important implications for instruction and assessment. Students who use speech to communicate expressively perform academic skills and sustain attention to instruction at greater rates than their peers. As Erickson and Geist (2016) concluded, teachers should teach students who need intensive communication supports symbolic language representations for many words and purposes that can be used across the life span, while also focusing on language in ways that will facilitate academic success. Students who use speech have increased rates of attention to both computer- and teacher-directed instruction, thus increasing students' language skills may also increase their academic engagement. Additionally, students who have traditionally been taught alternate achievement standards measured by AA-AAS but no longer qualify may instead be taught to the general state academic achievement standards. Special educators should plan to address any learning gaps as students make this transition, as well as explore both classroom and assessment accommodations that will help students access academic content and general education assessments when working with general education teachers who may now be teaching students that were previously served in non-inclusive settings.

Future research should examine how special education teachers are meeting the instructional and assessment needs of their students as their instructional caseloads shift in response to the 1% threshold. Research should also address how teachers meet the unique support needs of the subset of AA-AAS students who do not use speech for expressive communication, as increasing these students' communication skills may lead to greater academic skill acquisition across domains. Furthermore, as students continue to be exposed to higher academic expectations through AA-AAS, longitudinal studies of students can inform if there are teacher perceived skill progressions in communication, English language arts, mathematics, and science, and any effect this may have on their teaching and instruction practices.

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