

# Determining the Accessibility of K–12 Digital Materials: Tools for Educators

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- **The rapid growth in K–12 online learning has resulted in the need for developing learning materials that are appropriate for—and accessible to—all learners, including students with disabilities. Because the development of online learning materials requires an investment of time and resources that are often outside the capabilities of school districts and individual teachers, materials used in the K–12 online classroom are typically developed by external, for-profit vendors.**
- **Federal regulations direct state and local educational agencies to follow Universal Design for Learning (UDL) guidelines at crucial levels of planning, implementation, and execution of educational practices. The inclusion of UDL principles in educational practice is intended to create effective, meaningful, and accessible technologies in K–12 education—including online education.**
- **The Voluntary Product Assessment Tool (VPAT) is used to determine if—and to what degree—various products, including educational products, meet Section 508 criteria for accessibility. Although widely used by designers and developers of digital products and online learning materials, the VPAT tests primarily for physical accessibility and adherence to accessibility requirements. But as online learning continues to grow and expand, reaching more and more students each day, are these testing measures enough to ensure accessibility for all learners?**
- **Using the UDL framework as a measure, learning materials can be evaluated (beyond VPAT capabilities) for appropriateness and accessibility for all learners. The creation of the UDL Scan Tool allows product developers, school administrators, teachers, and parents to evaluate online learning materials for alignment with the UDL guidelines, thus helping provide accessible materials for all K–12 digital learners, including those with disabilities.**

## The State of K–12 Online Learning and Digital Materials

Over a relatively short period of time, states and districts have adopted various forms of blended and fully online learning with some estimates suggesting that by 2019 half of all K–12 students will be taking online courses (Christensen, Horn, & Staker, 2013). Increases in K–12 online learning are taking place in all 50 states. Blended, supplemental, flipped, fully online learning, and the variations of what is increasingly being called “personalized learning” are changing at an exponential rate and affect all students,

including those with identified disabilities. Most school districts—small and large, urban and rural—have entered the online learning experience at different rates and levels of commitment (Evergreen Education Group, 2015).

Students’ motivation for taking online courses, especially at the high school level, appears to be related to availability (47% pursue online learning to access courses unavailable through their local school) and learning needs (43% select online courses in order to work at their own pace) (Powell, Patrick, & Roberts, 2015). Likewise, credit recovery—again, for the high school learner—is a primary reason for online

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enrollments. Although online coursework remains a high school option, charter schools, which represent a significant portion of the fully online K–12 learning experience, report that more than 60% of their full-time student enrollment is at the K–8 level with the remaining 40% in grades 9–12 (Center for Research on Educational Outcomes, 2015). Annually, statewide virtual school enrollments continue to grow—as reported in *Keeping Pace With K-12 Digital Learning* (2015), The Evergreen Education Group's most recent publication—with states, including North Carolina, Florida, and Michigan, offering a variety of online options, including online coursework that is tied to high school graduation requirements.

### Blended Learning 101

Online learning takes a variety of forms, such as blended or fully online learning. Blended learning is defined as a K–12 experience with which students learn in part through online content and they control portions of the pace, time, and path of the instruction; part is also supervised in a brick-and-mortar location away from home. Full-time online learning is virtual or online learning that takes place entirely online away from a brick-and-mortar school and typically within the home environment. Online learning may also be used as supplemental learning with which students are enrolled in an online class that is not offered as a face-to-face option in their local school (Horn, Staker, & Christensen, 2014). Online learning may also be referred to as digital learning or, increasingly, as personalized learning, which is an approach that seeks to customize content, activities, pace, tools, and supports for each learner's needs (Basham, Stahl, Ortiz, Rice, & Smith, 2015). Although the field of K–12 online learning is relatively new, its practices are in wide use, and the related vocabulary continues to increase to further clarify elements of the overall online learning experience.

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With the rapid growth in online learning at the K–12 level, districts and classroom teachers face a

dilemma in providing online learning experiences that are suitable for all students (Watson, Gemin, & Coffey, 2010). Identifying the digital materials to be used and designing them for an effective online learning experience requires extensive resources. For example, consider a classroom teacher interested in teaching a blended class for which a portion of the assignments is available online, including readings, interactive activities, and formative assessments. All of these materials take time and expertise to develop in a manner that is effective for good instruction and also considers the amount of information that a teacher would need to address in a traditional face-to-face experience. The limitations are in the time, expertise, knowledge of instructional design, basic capacity to create virtual materials that work within a content or learning management system, and a host of other variables that often prevent classroom educators (as well as school district leadership) from developing materials for effective online learning. Due to these constraints and the rapid growth in online learning, instead of the teacher or district personnel developing digital materials, publishers and outside vendors have stepped in to fill the void. Estimates are that 85–90% of all K–12 online learning content and related digital materials are developed by outside vendors (Powell, A., Patrick, S., & Roberts, V., 2015).

### Development of Digital Materials for the K–12 Classroom

Many of these vendors include traditional book publishers (e.g., Pearson Learning) that have historically provided districts with content and learning materials. In addition, a number of companies have been created to focus entirely on the development of the lessons, activities, assessments, and other learning resources to be used as part of a digital or online learning experience (Smith, 2016). For educators, these resources fill a void, allowing them to concentrate on their students and classroom instruction. The digital materials or the prepackaged online lessons that are created by these outside entities offer the foundation from which blended or fully online learning takes place for the student.

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Consider the experience of a sixth-grade English language arts classroom teacher attempting to incorporate blended learning into the face-to-face classroom. To develop this content on her own, she would need to consider the state standards and the focus of the content she traditionally teaches and identify digital materials that align with the instructional needs of her students and a host of other variables. Instead, her district identifies an English language arts digital learning package that provides lessons and accompanying activities for the sixth-grade classroom aligned with the required state standards. The teacher then assigns the online lesson. Here, each student works independently or in small groups with the assigned material, which has been sequentially organized into a series of required steps. Often the lessons will embed various resources and activities and end with some sort of assessment to ensure the student has gained knowledge as part of the activity. The role of the teacher is to facilitate the learning process and to engage the students at different levels while the student is focused on the digital materials contained in the prepackaged online lesson. The teacher (or district level curriculum specialist) selects the relevant digital material, but once assigned, the prepackaged online lesson provides and directs the primary structure for the learning experience.

The decision on the part of K–12 educators and district leaders to utilize prepackaged digital materials is often made out of necessity. Schools simply lack the resources to invest in creating learning experiences tailored to individual learners. Instead, schools purchase online learning materials that are developed by an external educational product vendor. Students interact with these prepackaged materials at every level of their blended or fully online experience, from content to instruction to assessment. Teachers work within the content management system (e.g., digital materials) assigning lessons and activities and reviewing completed assessments to determine the next lesson. *Figure 1* offers an overview of a sample of blended and fully online vendors.

At the district or the department level, the decision to engage with a specific online company or series of prepackaged digital material is critical, particularly for students with disabilities (Basham et al., 2015). Because of how digital materials are developed and then used by individual teachers—as well as across buildings—educational leaders making decisions about the digital material should be well informed

about the products they are selecting. An incorrect but widely held assumption is that online material aligned with state standards and content norms will be appropriate for *all* students at the specific grade level. Additional assumptions are that digital materials are more accessible and that the accommodations and modifications often required for struggling learners and those with disabilities are automatically embedded in online lessons. Research indicates that these assumptions are unfounded (Hashey & Stahl, 2014; Smith, 2016). For the educational leaders working to ensure appropriate access for all learners, including those struggling learners and particularly those with identified disabilities, it is critical to have access to tools to determine whether or not the prepackaged materials are appropriate for the needs of all learners.

This article explores the manner in which teachers and district leaders can further determine whether or not the digital materials they are considering are accessible for all learners—particularly those with disabilities—and appropriate to the accommodations and modifications provided in the brick-and-mortar school environment. The article introduces the issues of how to consider accessibility, discusses tools that have been created to assist in the evaluation of accessible digital materials, and reviews ways in which district leaders and individual classroom teachers can further determine whether digital materials used for blended and fully online learning experiences are appropriate for the learning demands of students, particularly those with disabilities.

## Reaching Students Is a Prerequisite to Teaching Students Federal Expectations

The recent Congressional authorization of the Every Student Succeeds Act (ESSA, 2015; PL 114-95) explicitly guides state and local education agencies to incorporate inclusive and accessible design principles into educational practices. ESSA directs these agencies to follow the Universal Design for Learning (UDL) principles in state plans when selecting and implementing assessments, accountability, literacy instruction, and state use of funds (ESSA Secs. 1005; 1204; 2221(b)(1); 4104). ESSA references the definition of UDL in the Higher Education Opportunity Act of 2008 (HEOA;

Figure 1. Sample of blended and fully online vendors.

Name of Content Provider	URL	Description
<b>Brain Pop</b>	<a href="http://www.brainpop.com/">http://www.brainpop.com/</a>	Brain Pop offers cartoon/video overviews. Each segment is aligned with a standard and content area and answers a specific question to help introduce students to a concept or idea.
<b>Khan Academy</b>	<a href="https://www.khanacademy.org/">https://www.khanacademy.org/</a>	Khan offers lessons across numerous content areas and all grade levels. Video overviews provide audio and a visual description of the content being displayed. Videos are also closed captioned.
<b>Study Island</b>	<a href="http://www.studyisland.com/">http://www.studyisland.com/</a>	Study Island is aligned to state standards and the Common Core, focusing on the four primary content areas. A strong focus is on practice and demonstration of critical concepts. Videos and interactive games help engage students.
<b>OER Commons</b>	<a href="http://www.oercommons.org/">http://www.oercommons.org/</a>	The Open Educational Resources Commons offers a numerous resources aligned with the Common Core standards. OER identifies itself as a resource for varied learning, although the formats and supports vary.
<b>Thinkfinity</b>	<a href="http://www.thinkfinity.org/">http://www.thinkfinity.org/</a>	Thinkfinity offers interactive games, student and teacher educational resource development tools, and other video and audio-based resources. Products are aligned to standards in science, math, and language arts.

PL 110-315): Universal Design for Learning (UDL) means a scientifically valid framework for guiding educational practice that

- provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged
- reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient

In a similar commitment, the National Education Technology Plan (NETP) emphasizes the importance of UDL as a means of personalizing learning and as a framework for designing and deploying educational technologies in effective, meaningful ways:

Education stakeholders should develop a born accessible standard of learning resource design to help educators select and evaluate learning resources for accessibility and equity of learning experience... Using the principles and research-base of UD and UDL, this standard would serve as a commonly accepted framework and language around design for accessibility and offer guidance to vendors and third-party technology developers in interactions

with states, districts, and institutions of higher education (U. S. Department of Education, Office of Educational Technology, 2016, NETP, p. 22).

NETP 2016 reemphasizes a commitment to ensuring the accessibility of instructional materials and practices that was previously articulated in NETP 2010:

... the Department is committed to taking a leadership role in ensuring that the benefits of educational technology are accessible to all learners “regardless of background, languages, or disabilities.” To meet that goal, the Department will not only exercise its authority under sections 508 and 504 of the Rehabilitation Act of 1973 as necessary to achieve compliance, but also will work with and encourage the broader educational community to ensure that individuals with disabilities are not denied the benefits of educational technology due to accessibility issues (ED: NETP 2010, p. 7).

## Accessibility Expectations in K–12 Education

In June 2010, the Office of Civil Rights (OCR) of the U.S. Department of Education and the Department of Justice published a joint “Dear Colleague” letter to college and university presidents, focusing on the use of electronic book readers and other emerging technologies that may be inaccessible to students who are blind or have low vision (U. S. Department of Education, Office of Civil Rights, 2010). This letter identified that instituting the use of a particular technology for instruction—if the technology is inaccessible to students with disabilities—constituted discrimination, which is prohibited by the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act. In May 2011, a letter was issued by the Office of Civil Rights, further noting that these civil rights requirements apply not just to postsecondary schools, but also to elementary and secondary schools (U.S. Department of Education OCR, 2011). The 2011 publication noted that the principles articulated in the 2010 letter related to all instructional technologies (not just eBook readers) and that the protected class of students was not limited to those who are blind or low vision, but also to students with other disabilities (e.g., dyslexia) that affect their ability to access materials in a traditional manner. These ADA and Section 504 requirements apply to all aspects of a school, and all faculty and staff must comply with them.

Although the legal mandates regarding accessible learning materials establish the foundation for what

needs to occur, implementation of these mandates requires guidelines that are appropriate for both curriculum developers and the state and local education agencies seeking to acquire accessible material and delivery systems. For digital materials and associated technologies, Section 508 of the Rehabilitation Act of 1973 was established.

## Identifying Accessible Products

Enacted in 1998 as an amendment to the Rehabilitation Act of 1973, Section 508 is a mandate for the federal government and its agencies to assure that information and computer technology is accessible (United States Access Board, 2000). It is also a series of functional specifications for meeting that mandate. In 2015, the United States Access Board began the process of finalizing an update to Section 508 (36 CFR Parts 1193 and 1194) to align its requirements with other related statutes and to the accessibility standards of the World Wide Web Consortium, an international body.

The Section 508 access standards cover software, operating systems, web and Internet, telecommunications, video and multimedia, self-contained products, and desktop and portable computers and have become a baseline for the nation’s de facto accessibility specifications.

Although Section 508 applies only to federal agencies as a procurement requirement, specifics of the law have been adopted by states, product developers, and educational entities because it represents a widely accepted set of accessibility standards. The Section 508 access standards cover software, operating systems, web and Internet, telecommunications, video and multimedia, self-contained products, and desktop and portable computers and have become a baseline for the nation’s de facto accessibility specifications:

- Their development was crafted by a broad group of stakeholders and overseen by the independent United States Access Board.
- The Section 508 standards were adopted by the United States Department of Justice for enforcement.

Figure 2. DigitalGov's Section 508 Checklist for Functional Performance Criteria. DigitalGov.gov: <http://www.digitalgov.gov/2015/06/05/using-section-508-guidance-to-improve-the-accessibility-of-government-services/#Criteria>

Product Name/Version #		Project Manager Name			Date
1194.31	Checkpoint	Yes	No	Not Present	Comments
(a)	<b>At least one mode of operation and information retrieval that does not require user vision shall be provided, or support for assistive technology used by people who are blind or visually impaired shall be provided.</b>				
a.1	For file types that support it (such as PDF or .doc) are tags used to structure documents, including for overall reading order, columns and form controls?	-	-	-	-
a.2	Are links and active elements worded in such a way that they can be used with screen reading technology?	-	-	-	-
a.2.a	For links and active elements, is different text used for different targets or functions?	-	-	-	-
a.2.b	Is text for links and active elements, meaningful both in and out of context?	-	-	-	-

- Vendors who sell to federal agencies also offer products to the nonfederal marketplace; meeting the Section 508 compliance standards supports both market sectors.

### Functional Performance Criteria

The Functional Performance Criteria definitions from Section 508 detail the intent of the technical specifications by including a set of functional criteria—how components should act for whom—designed to ensure that individuals with sensory, physical, and other disabilities are provided with appropriate, effective, and equitable product use (Section 508 §1194.31). Because this information is descriptive and unambiguous, it offers nontechnical explanations that can be helpful for defining the intent of the specifications:

- At least one mode of operation and information retrieval that does not require user vision shall be provided, or support for assistive technology used by people who are blind or visually impaired shall be provided.
- At least one mode of operation and information retrieval that does not require visual acuity greater than 20/70 shall be provided in audio and enlarged print output working together or independently, or support for assistive technology used by people who are visually impaired shall be provided.
- At least one mode of operation and information retrieval that does not require user hearing shall be provided, or support for assistive technology used by people who are deaf or hard of hearing shall be provided.

- Where audio information is important for the use of a product, at least one mode of operation and information retrieval shall be provided in an enhanced auditory fashion, or support for assistive hearing devices shall be provided.
- At least one mode of operation and information retrieval that does not require user speech shall be provided, or support for assistive technology used by people with disabilities shall be provided.
- At least one mode of operation and information retrieval that does not require fine motor control or simultaneous actions and that is operable with limited reach and strength shall be provided (United States Access Board, 2000).

The U.S. General Services Administration has created a DigitalGov website (<http://www.digitalgov.gov>) to provide federal government agencies with a detailed orientation to and instruction in identifying and procuring accessible digital products (<http://www.digitalgov.gov/2015/06/05/using-section-508-guidance-to-improve-the-accessibility-of-government-services/#Criteria>).

DigitalGov's Section 508 Checklist for Functional Performance Criteria (see Figure 2) provides some checkpoints for reviewing a product's accessibility detail.

### The Voluntary Product Accessibility Template (VPAT)

The Center on Online Learning and Students with Disabilities (Center) finds that the Section 508 functional accessibility standards provide an

Figure 3. VPAT template. <https://www.itic.org/policy/accessibility/> <https://www.itic.org/dotAsset/5644ecd2-5024-417f-bc23-a52650f47ef8.doc>

Section 1194.31 Functional Performance Criteria – Detail		
VPAT™		
Voluntary Product Accessibility Template®		
Criteria	Supporting Features	Remarks and explanations
(a) At least one mode of operation and information retrieval that does not require user vision shall be provided, or support for Assistive Technology used by people who are blind or visually impaired shall be provided.		
(b) At least one mode of operation and information retrieval that does not require visual acuity greater than 20/70 shall be provided in audio and enlarged print output working together or independently, or support for Assistive Technology used by people who are visually impaired shall be provided.		
(c) At least one mode of operation and information retrieval that does not require user hearing shall be provided, or support for Assistive Technology used by people who are deaf or hard of hearing shall be provided		

appropriate and widely adopted descriptive baseline for detailing the accessibility of digital media and delivery systems available for deployment in K–12 schools. In addition, given the publicly available detail associated with the performance criteria, product developers and consumers can use the Voluntary Product Accessibility Template (VPAT) mechanism for identifying the degree to which a product meets the Section 508 accessibility criteria. Although the creation of a VPAT by a product designer or developer is a voluntary procedure, every contributor to a VPAT’s development has a strong vested interest in its accuracy.

### Voluntary Product Accessibility Template (VPAT) Detail

The Information Technology Industry Council provides a VPAT template (Figure 3) that contains information about a product’s alignment with the Functional Performance Criteria as well as details about its interaction with or dependency on a particular operating system, the Internet, or specific device requirements.

An accurate VPAT provides a detailed description of product specifications, including the ways in which the Section 508 Functional Performance Criteria are addressed. Although VPAT detail—and, in some cases, accuracy—may vary from vendor to vendor, the fact that the VPAT is designed to reference a standardized set of functional specifications allows a purchaser to determine whether or not the product will meet the needs of students with disabilities. By providing a complete and accurate VPAT for instructional materials and delivery systems used in

digital learning, a product developer can significantly aid the informed decision making of their state or local education agency clients.

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Designers and developers seeking to document their product’s conformance want the information to be as accurate as possible, and because accessibility may be a contractual requirement, consumers (states and local education agencies, in particular) need the information to be sufficiently detailed to document due diligence in the procurement process. Students with disabilities (and their families) can use VPAT to identify the extent to which a product may (or may not) be appropriate for their use. These cross-stakeholder needs work as a series of checks and balances to ensure that VPAT documentation is as accurate as possible.

### A Representative Sampling of VPATs

Figure 4 represents a limited sampling of digital learning technologies presently marketed or available to elementary and secondary schools (the original table was created in 2012 and updated in 2015). The products listed are in widespread use in the nation’s schools. The intent of this listing is to identify which products offer readily discoverable and publicly available accessibility information, with an emphasis

Figure 4. VPAT example. <http://centerononlinelearning.org/resources/vpat/>

Product & Vendor	VPAT	Note	Category	Distribution	Updated	Responded
<a href="#">Adobe Acrobat XI Pro</a> Adobe Systems Incorporated	<a href="#">VPAT Info</a>		PDF Converter	Commercial	6/27/2013	Y
<a href="#">Adobe Digital Editions</a> Adobe Systems Incorporated	<a href="#">VPAT Info</a>		eBooks/eReader	Commercial	6/25/2013	Y
<a href="#">Adobe Reader XI</a> Adobe Systems Incorporated	<a href="#">VPAT Info</a>		PDF Viewer	Commercial	6/27/2013	Y
<a href="#">ATutor</a> ATutor	<a href="#">VPAT Info</a>		Content/Learning Management	Open Source	6/25/2013	Y
<a href="#">BlackBoard (Elluminate)</a> Blackboard, Inc.	<a href="#">VPAT Info</a>		Content/Learning Management	Commercial	6/25/2013	Y

on Section 508, and whether or not a public VPAT is made available for review.

The products are categorized as either A, B, or C according to the following rubric:

- A = VPAT available
- B = Accessibility/Section 508 referenced
- C = No accessibility information available

This information may be useful to both those producing and distributing digital learning products and materials and those purchasing or otherwise acquiring them. Every effort has been made to ensure that accuracy of the information presented, and the Center will update information regarding any of the listed products should inaccuracies be identified.

States and districts looking to acquire products or assess the accessibility of digital learning content or the systems that deliver them can use the VPAT table as a launch point for examining accessibility. Products that offer a detailed VPAT provide the most specific information, and those without a VPAT (but with publicly available accessibility information) tend to be more general. The table is sortable by product, VPAT, product category, and other indicators, and can provide information as a starting point for product consideration.

## Beyond Accessibility Requirements

Although accessibility is critical, the Section 508 guidelines and measures that are meant to determine the accessibility of digital materials can possibly be limiting due to what accessibility is meant to measure. That is, federal mandates and most international accessibility standards concentrate on physical and sensory disabilities in their efforts to determine whether or not a digital resource is accessible for

individuals with disabilities. As indicated, tools such as the VPAT are essential to ensure that additional materials will be able to reach students, particularly those with disabilities.

However, if the function of the accessibility standard is to provide an understanding of whether or not digital materials are accessible from both a physical and sensory perspective, the limitation in a VPAT review particularly affects the individuals with disabilities who do not have physical or sensory needs but instead are challenged due to learning and cognitive limitations. In these cases, tools such as the VPAT are of limited value in determining whether or not virtual materials and online lessons are appropriate to the instructional needs of individuals with these disabilities as well as their struggling peers. Although it is important to determine whether materials are physically accessible to students, it is equally important to clarify whether or not those same materials are appropriate for the learning needs of all students.

## Universal Design for Learning and Federal and State Legislation

Considering the limitations of the accessibility measures that focus on physical and sensory disabilities, the Center engaged in the development of additional measures to determine the appropriateness of digital materials and online resources used predominately in K–12 blended and fully online learning experiences. The Center, funded by the United States Department of Education, focuses on the appropriateness of K–12 blended and fully online learning for students with disabilities to better understand and identify strengths and potential challenges affiliated with the K–12 online learning enterprise. Looking to established frameworks as well

as guidance from federal standards and regulations, the Center determined that UDL and its accompanying principles would be an effective framework for evaluating digital learning materials for students with varied learning needs.

With the passage of ESSA, federal education law governing K–12 education includes a definition and endorsement of the UDL framework (ESSA utilizes the established definition of UDL found in the Higher Education Opportunity Act of 2008). ESSA expands on the essential requirements of the 2008 legislation by referencing state plans and requirements states need to follow when implementing “high-quality student academic assessments in mathematics, reading or language arts, and science.” These assessments shall “be developed, to the extent practicable, using the principles of universal design for learning.” In addition, “for students with the most significant cognitive disabilities,” states may provide for alternate assessments aligned to standards. They should describe in their plan “the steps the State has taken to incorporate universal design for learning, to the extent feasible, in alternate assessments...” (ESSA, 2015, p. 28).

ESSA further requires state education agencies to establish innovative assessment systems that demonstrate that they will “be accessible to all students, such as by incorporating the principles of universal design for learning ...” (ESSA, 2015, p. 28). States are also directed to utilize funds in support of local education agencies to provide programs that increase access to personalized learning experiences through the use of technology, consistent with the principles of UDL. Furthermore, ESSA states that the use of UDL is to further support the learning needs of all students, including those with disabilities and their English language learner peers. This last point is critical in that UDL is not stated as a framework for those with disabilities or those participating on the alternate assessment but, instead, all learners—including those with specific learning challenges.

As of 2016 Louisiana, Michigan, Kentucky, Maryland, and Maine had established statewide initiatives involving UDL and universal design activities. Maryland established a UDL task force that developed and supported the successful passage of a UDL bill and the State Board of Education adopted the task force’s primer on UDL for all learners. Michigan established a statewide project focused on sharing

resources and expanding professional learning on UDL and its impact on student outcomes.

## Universal Design for Learning as a Measurement Framework

The UDL framework provides a structure for teaching and learning that includes proactive planning of instructional goals, assessments, materials, and methods to enhance the potential success for all learners. UDL assumes that one size does not fit all and, instead, emphasizes proactive planning that takes into consideration the variability of all learners. The goal then of UDL is to build purposeful and motivated, resourceful and knowledgeable, and strategic and goal-directed learners (Center for Applied Special Technology [CAST], 2015). To this end, the UDL framework realizes that there is no single pathway for effective learning that works for each and every child and, instead, works to help educators and students make choices about *what* is to be learned and how the individual can make decisions about their own learning. Central to UDL implementation is the design of flexible curriculum and learning experiences that are consistent across conditions and yet varied to allow for the individual needs of the learner.

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The components of UDL curriculum that comprise goals, methods, materials, and assessments are the cornerstone of UDL. UDL curricula is not limited to students mastering a specific body of knowledge but, instead, designed to assist the learner in mastering learning itself or becoming what is commonly referred to as an expert learner (Gronneberg & Johnston, 2015). Thus, if we look to use the framework and the essential UDL curricula as a way to measure learning, understanding the four essential elements is necessary:

- *Goals* focus on the learning expectations. They include the curriculum standards that often drive grade- and content-level instruction but are predicated on the fact that learners learn differently, and due to this variability, goals should be differentiated. This then allows the teacher to offer

more options and alternatives utilizing varied pathways, tools, strategies, and scaffolds to reach the expected outcomes.

- *Methods* are the instructional decisions, approaches, procedures, or routines teachers utilize to facilitate instruction and enhance learner outcomes. Increasingly, evidence-based interventions are at the forefront of the methods teachers are asked to utilize, and UDL curricula seek to extend these applications, allowing for flexibility to address learner variability and what the task requires. Simply put, UDL methods adjust instruction based on continual monitoring of learner progress.
- *Materials* are often seen as the “what” of instruction. For the UDL framework, materials consider conceptual knowledge by offering multiple and embedded media to provide background knowledge and just-in-time supports. For strategic learning and expressions of knowledge, UDL materials offer tools and supports needed to access, analyze, organize, synthesize, and demonstrate understanding. For student engagement, multiple pathways are offered to provide choices and vary the level of supports offered to sustain interest and further engage the learner.
- *Assessment* seeks to determine the student’s performance. Within the UDL framework, the goal is to ensure that what is being measured actually provides an accurate measurement of the student’s knowledge, skills, and level of engagement. This is achieved through designed-for-learner variability, providing scaffolds and embedding supports to remove irrelevant items and maximize the assessments that truly determine a learner’s ability.

CAST (<http://www.cast.org/>) and the UDL Center (<http://www.udlcenter.org/>) have developed an extensive set of resources to inform educators (and the broader community) about what UDL is (<http://www.udlcenter.org/aboutudl/whatisudl>), the essentials and purpose of UDL curriculum (<http://www.udlcenter.org/aboutudl/udlcurriculum>), and ways to further develop expert learners through the UDL framework (<http://www.udlcenter.org/aboutudl/expertlearners>). These materials are available free of charge.

## The UDL Scan Tool

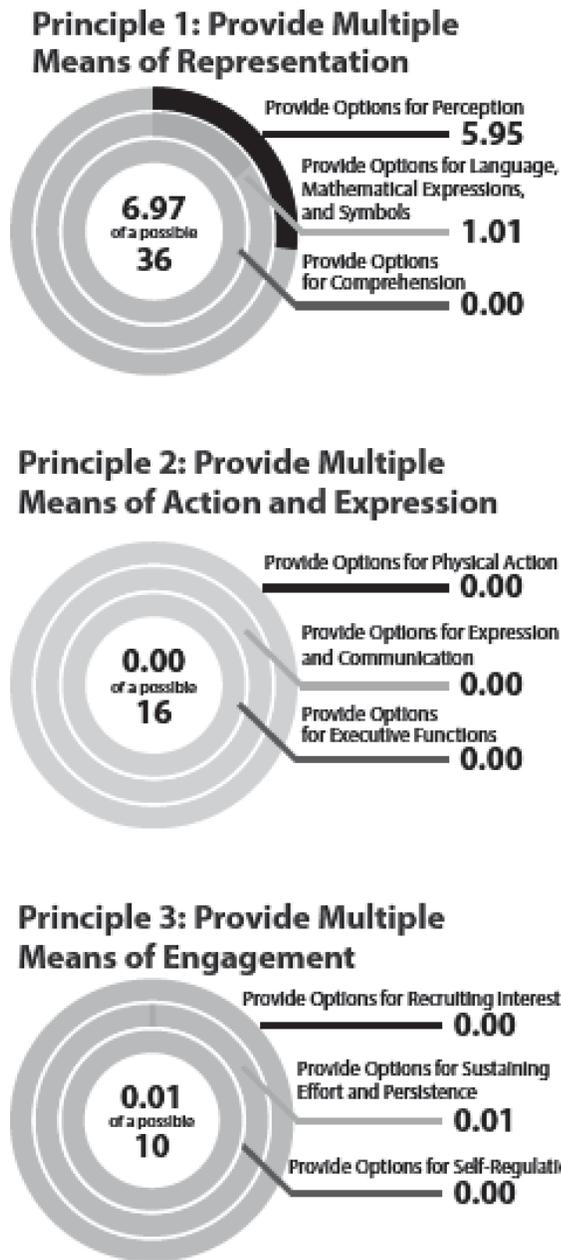
Employing the UDL framework, the Center (see [scan-tool/\) developed an instrument that sought to measure digital materials, including online lessons and related resources. Seeking to extend measures of accessibility, the UDL Scan Tool uses the essential UDL framework as a way to measure the availability and the appropriateness of digital materials for online learning. The tool includes a series of items that align with one of UDL’s three principles, nine guidelines, and at least one checkpoint. When used, the tool provides a detailed description of how the digital lessons/activities/materials are aligned to UDL.](http://centeronlinelearning.org/resources/udl-</a></p></div><div data-bbox=)

The tool contains 37 initial questions that are answered by a response of “Yes,” “No,” “Don’t Know,” and “Not Applicable.” Beyond the 37 items, the tool employs skip logic whereby if the information being sought in the particular question is not found within the online product, the reviewer selects the appropriate response (e.g., no), and then the tool skips to the next series of questions. If, however, the digital material *offers an embedded scaffold*, then another set of questions, meant to go deeper into the guidelines and checkpoints of a particular principle, appears to be scored. The flexibility of the tool requires a minimum of 37 initial questions to be completed with as many as 146 questions possible based on how questions are answered.

As the UDL Scan Tool was constructed, Center staff engaged experts in the field to determine the validity of the instrument. Reliability was determined through an extensive review of lessons across six primary developers of online materials in the K–12 market. To assess, three researchers evaluated six blended and online K–12 content management systems. After identifying a series of lessons for each of the six online products, a total of 1,000 different learning objects (e.g., activities, assessments, materials) across 90 lessons were reviewed.

To extend the utility of the UDL Scan Tool, the Center conducted a series of studies across an additional six vendors of blended and online learning materials. For each online developer, digital lessons were randomly selected to include a representative sample of all content areas and grade levels. Researchers then examined each lesson using the UDL Scan Tool. *Figure 5* offers an illustration of the data collected on one of the vendors, specific to the principle multiple means of representation. The findings indicated a significant difference between

Figure 5. Online learning content alignment to multiple means of representation.



what was possible (in regard to UDL alignment) and what was actually occurring in digital learning materials.

Findings are categorized across the three primary principles, but, as Figure 5 illustrates, data also drills down to the three accompanying guidelines (nine across the three principles). For the classroom teacher, building instructional leader, and district curriculum decision maker, this information may be useful in determining the accessibility of the

district’s digital materials for all learners.

Developers and educators looking for measures to inform future development and thus designing for learning variability can use the UDL Scan Tool as part of their iterative design process. For additional information about the UDL Scan Tool, including the tool, instructional videos, and data templates for analysis, or the Invited In report, which includes an analysis of six popular online learning vendors, see the Center’s website at <http://centerononlinelearning.org/>.

## The Importance of Due Diligence

The identification and selection of accessible learning materials, especially digital materials, presents an ongoing challenge. Despite the presence of clear expectations and guidance in the form of federal mandates, national and international accessibility standards, and multiple civil rights investigations, accessibility awareness is not widespread at the point of product review and procurement. Systematic approaches—even voluntary ones such as the VPAT evaluation process—can help inform digital curriculum developers and the state and local education agencies that are their customers. Furthermore, measurements such as the UDL Scan Tool can improve user awareness of what critical elements need to be in place during the initial design process, thereby further facilitating the development of digital materials for the online learning experience. Awareness builds understanding, and understanding builds expertise. Unless students with disabilities are able to access and interact with curriculum materials, it makes little difference whether or not the materials have been proven to be academically effective. Without reaching the students, there is no way to teach them. District and building leaders and accompanying educators need to examine blended and fully online digital materials determining their appropriateness for *all* learners and make these decisions beyond what is provided by the vendor who developed and is seeking to sell the prepackaged digital materials to the district/school, and thus, to the student and their specific learning needs. Fortunately, tools such as the VPAT and the UDL Scan Tool offer educational leaders options when increasingly faced with decisions on blended and fully online learning considerations.

## References

- Basham, J.D., Stahl, S., Ortiz, K., Rice, M.F., & Smith, S. (2015). *Equity matters: Digital & online learning for students with disabilities*. Lawrence, KS: Center on Online Learning and Students with Disabilities. Retrieved from <http://centeronlinelearning.org/equity-matters-digital-and-online-learning-for-students-with-disabilities/>
- CAST. (2015). *About Universal Design for Learning*. Retrieved from <http://www.cast.org/our-work/about-udl.html#.Vx4jh6MrLUI>
- Center for Research on Education Outcomes. (2015). *Online charter school study*. Retrieved from <https://credo.stanford.edu/pdfs/OnlineCharterStudyFinal2015.pdf>
- Christensen, C., Horn, M., & Staker, H. (2013). *Is K–12 blended learning disruptive? An introduction to the theory of hybrids*. Retrieved from <http://www.christenseninstitute.org/publications/hybrids/#sthash.xYVR5TH4>
- Evergreen Education Group. (2015). *Keeping pace with K-12 digital learning: An annual review of policy and practice*. Retrieved from [www.kpk12.com](http://www.kpk12.com)
- Every Student Succeeds Act of 2015, Pub. L. No. 114-95, § 4104 (2015). Retrieved from <https://www.gpo.gov/fdsys/pkg/BILLS-114s1177enr/pdf/BILLS-114s1177enr.pdf>
- Gronneberg, J., & Johnston, S. (2015). 7 things you should know about universal design for learning. *Educause Learning Initiative*. Retrieved from <http://www.educause.edu/library/resources/7-things-you-should-know-about-universal-design-learning>
- Hashey, A., & Stahl, S. (2014). Making online learning accessible for students with disabilities. *Teaching Exceptional Children*, 46(5), 70–78. doi:10.1177/0040059914528329
- Higher Education Opportunity Act of 2008. Pub. L. No. 110-315. (2008). Retrieved from <http://www2.ed.gov/policy/highered/leg/hea08/index.html>
- Horn, M., Staker, H., & Christensen, C. (2014). *Blended: Using disruptive innovation to improve schools*. San Francisco, CA: Jossey-Bass.
- Powell, A., Patrick, S., & Roberts, V. (2015). *Using online learning for credit recovery: Getting back on track to graduation*. Retrieved from <http://www.inacol.org/resource/using-online-learning-for-credit-recovery-getting-back-on-track-to-graduation/>
- Powell, A., Watson, J., Ogsby, J., Hibbard, L., Fetzer, L., Horn, M., ... Patrick, S. (2015). *Blending learning: The evolution of online and face-to-face education from 2008–2015*. Retrieved from [www.inacol.org/resource/blending-learning-the-evolution-of-online-and-face-to-face-education-from-2008-2015/](http://www.inacol.org/resource/blending-learning-the-evolution-of-online-and-face-to-face-education-from-2008-2015/)
- Smith, S. (2016). *Invited in: Measuring UDL in online learning*. Lawrence, KS: Center on Online Learning and Students with Disabilities. Retrieved from <http://centeronlinelearning.org/invited-in-measuring-udl-in-online-learning/>
- United States Access Board. (2000). *Section 508 Standards for Electronic and Information Technology*. Retrieved from <https://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-section-508-standards/section-508-standards?highlight=WyIxMTk0LjMxIl0=>
- U.S. Department of Education, Office for Civil Rights. (2010). *Dear colleague letter*. Retrieved from <http://www2.ed.gov/about/offices/list/ocr/letters/colleague-201010.html>
- U.S. Department of Education, Office of Educational Technology. (2015). *Future ready learning: Reimagining the role of technology in education*. Retrieved from <http://tech.ed.gov/netp>
- U.S. Department of Education, Office of Educational Technology. (2016). *National Education Technology Plan*. Retrieved from <http://tech.ed.gov/netp>
- Watson, J., Gemin, B., & Coffey, M. (2010). *Promising practices in online learning: A parent's guide to choosing the right online program*. Retrieved from [https://gosa.georgia.gov/sites/gosa.georgia.gov/files/A\\_Parents\\_Guide\\_to\\_Choosing\\_Online\\_Program.pdf](https://gosa.georgia.gov/sites/gosa.georgia.gov/files/A_Parents_Guide_to_Choosing_Online_Program.pdf)

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