

Invited In

Measuring UDL in Online Learning

Sean J. Smith, Ph.D.



The Center on Online Learning and Students with Disabilities

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Center researchers and staff have made every effort to provide clear and accurate information. We recognize however, that despite our careful efforts some errors in accuracy and omission are unfortunately unavoidable.

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Section I

**Measuring UDL
in Online Learning**



Online learning is growing at a rapid rate, reaching millions of K-12 learners. This growth is creating dramatic changes in the K-12 educational landscape. For students, K-12 online learning offers additional options and potential digital supports that are not always available in the traditional brick-and-mortar classroom.

For educators and administrators, this tremendous—often overwhelming—growth presents opportunities, and also creates the demand for identifying appropriate online content and instructional resources. School districts are continually seeking products that serve students across all content areas and grades (K-12) to meet the growing demands for online learning and to offer a variety of online learning options.

The Center on Online Learning for Students with Disabilities (the Center) was funded by the Office of Special Education Programs to research the changes taking place in K-12 online education for students with disabilities. This report focuses on the digital materials and

delivery systems used nationwide by online students enrolled in blended and fully online K-12 learning. The focus is on better understanding the online products used by K-12 students, how these materials serve the unique needs of students with disabilities, and to determine how additional research may be conducted to assist developers of online content and school districts providing online options in their ongoing efforts to meet all students' learning needs.

Online Learning

According to the Keeping Pace with K-12 Digital Learning 2015 report, there are 50.1 million students enrolled in public schools in the U.S.,

2.9 million in charter schools, 4.9 million in private schools, and 1.8 million homeschooled students. Online enrollments by these millions of students continue to grow: Correlating with the onset of extensive usage of the World Wide Web, the oldest K-12 online programs are now between 10-15 years old. Using information from vendor surveys and the data from published reports and state databases (where available), Keeping Pace places supplemental online course enrollments at 4.5 million. A number of these students are enrolled in online courses that are offered as supplemental courses through a state virtual school.

Online Learning and the Potential for Personalization

The growth in K-12 online learning stems from many factors. For struggling learners and those with disabilities, the potential for online learning to offer a personalized learning experience is of particular importance. Educators and developers of K-12 learning content contend that the digital features and embedded interactive online supports offered by online learning products can address the specific needs of each individual student. Personalized learning promises a flexible instructional experience to support individual students in their unique approaches to learning. Theoretically, in combination with teacher support, technological innovation expands on the traditional brick-and-mortar classroom experience to offer an interactive and responsive digital learning environment.

A prominent feature of blended and fully online environments is the ability to present content and instruction in multiple ways, thus personalizing instruction for each student's unique learning needs. Additionally, in real-time, synchronous learning, teachers can continually monitor student progress with immediate access to performance data.

Online education products are often considered especially valuable in improving access to effective materials. Central to these products are the easy-to-administer formative and benchmark assessments that offer instructors and administrators timely data on student performance. Data-driven decision making is of particular importance, often highlighted as the vital tool in determining what each student needs. This data permits individualization of instruction for each student.

Personalized learning is sometimes referred to as a "choice-based model" where learning environments are flexible, allowing students to set their own pace and determine in what format they wish to learn. It is also viewed as competency-based, where a student's prior experience is factored into his or her learning plan, and instruction is based on concepts and educational outcomes relevant to the learner's needs.

For the struggling learner and those with disabilities, the personalized nature of K-12 online learning appears particularly attractive. If the nature of online learning truly offers flexibility and just-in-time learning, its benefits should extend to all students, especially those with disabilities. One purpose of this study is to better understand the personalized nature of K-12 online learning. To this end, Center researchers sought to examine the foundation of K-12 online learning, including the digital lessons and supplementary materials that form the heart of the K-12 online learning experience.

How is Online Instruction Developed and Delivered?

In both blended and fully online models, the online learning experience is predicated on the online lessons, digital materials, and other online resources with which students engage as the majority of their learning experience. To better understand K-12 online learning, one would want to further understand the nature of the online materials that are developed for K-12 students and their teachers. But what is known about the nature of these online lessons and materials, and how they are developed?

Nearly 90% of the K-12 blended and virtual experience is provided through vendor-based content and curriculum (Patrick, Kennedy, & Powell, 2013). The materials that students are provided, learn from, and in which they complete assessments are most likely developed by an outside vendor. These lessons serve as the cornerstone of online learning—teachers use them in directing the day-to-day online instruction. These materials are often developed by and purchased from external vendors because the development of on-line lessons, materials, and overall discipline-specific content takes time, expertise, and critical resources. Thus, the investment required on the part of the school district and the individual classroom teacher to create these online lessons is tremendous and often too expensive.

Districts that decide to develop their own materials must invest in a learning management system (LMS) (e.g., Blackboard) and work to ensure that the curriculum aligns with state and Common Core standards. Districts are then responsible for the adoption of and technical support for an assessment tool or tools used to collect data on informal and formal assessments specific to a grade, course, or across courses. Beyond collecting the data, administrators and classroom teachers need to consider how to manage the data, align the data to the next content lesson, and maximize the utilization of the data for both individual and large class decision making. This (significant) investment of time and resources is often out of reach for districts.

Other challenges that often prevent districts from developing their own online lessons (and entire courses) include navigating copyright issues, ensuring grouping across course sections (e.g., different teachers developing materials for multiple sections of one course), and time as well as budgetary limitations. Additionally, teachers may not only lack the necessary time, but also have limited resources and/or training to develop content on their own. With these demands in mind, a viable option for most K-12 districts is to purchase course content, structured digital lessons, and the overall LMS from an outside vendor(s).

Districts and schools use K-12 vendor online products much in the way that they have historically used textbook content, investing in pre-packaged materials that align with the grade level and content discipline requirements. Some vendors, in fact, are major suppliers of textbooks and other materials (e.g., Pearson) to brick-and-mortar schools, allowing them to design online content in tandem with printed textbooks. The next page offers a sampling of K-12 blended and fully online lesson and content developers.

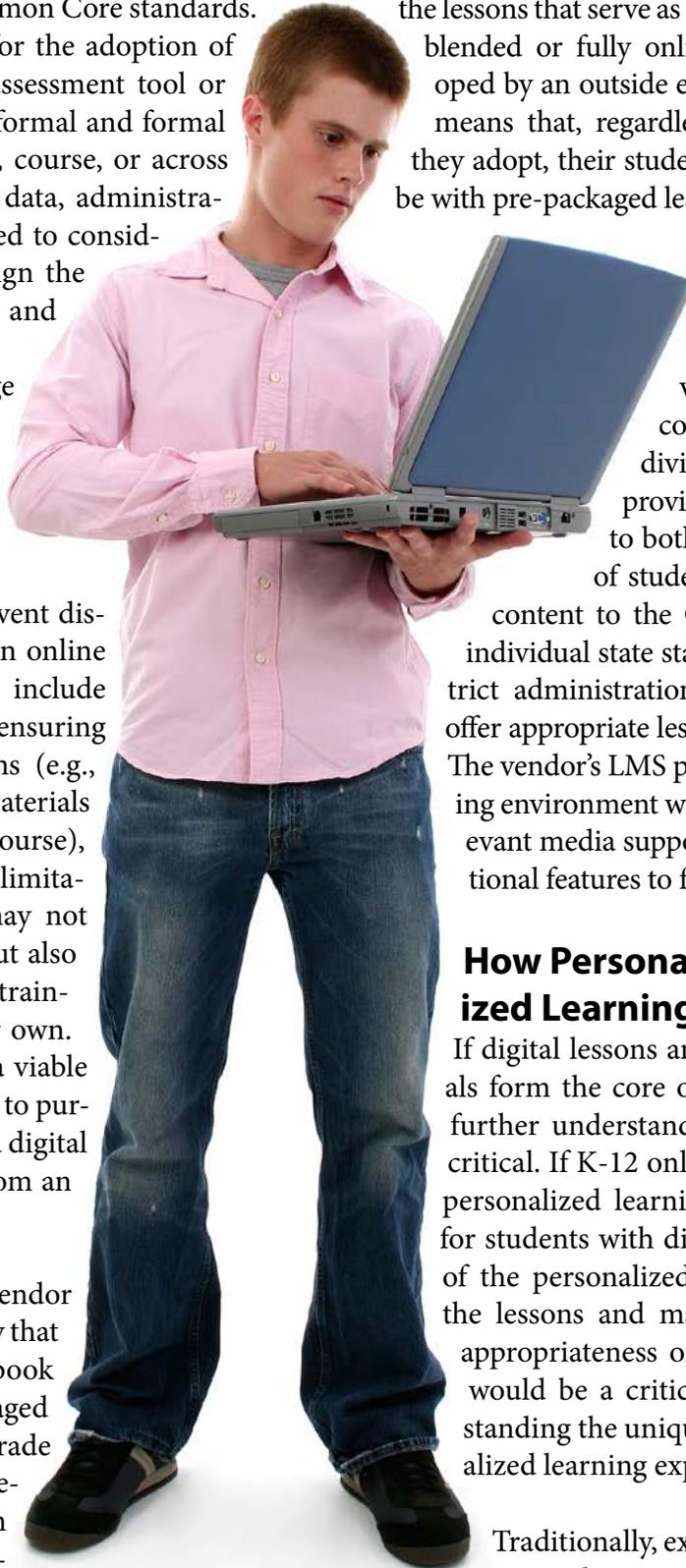
Some online learning products are available for free, however, most are for-purchase products developed for sale to school districts. For the student, this means that the lessons that serve as the primary mode for their blended or fully online instruction are developed by an outside entity. For the teacher, this means that, regardless of the blended model they adopt, their students' digital experience will be with pre-packaged lessons and materials.

The ability of vendors to develop online K-12 content at a significant volume and reasonable cost allows districts and individual school buildings to provide online learning options to both small and large numbers of students. Vendors align course content to the Common Core as well as individual state standards, ensuring that district administration and classroom teachers offer appropriate lessons and learning content. The vendor's LMS provides a structured learning environment with the flexibility to use relevant media supports and to embed instructional features to foster student engagement.

How Personalized Is Personalized Learning?

If digital lessons and supplementary materials form the core of K-12 online learning, a further understanding of these resources is critical. If K-12 online learning offers a more personalized learning experience (especially for students with disabilities), the foundation of the personalized experience would be in the lessons and materials. Determining the appropriateness of the online content then would be a critical step in further understanding the unique elements of the personalized learning experience.

Traditionally, examining whether content, curriculum, or the instructional experience is appropriate for struggling learners, as well as those with disabilities, would typically include accessibility considerations. For example, in traditional brick-and-mortar classrooms, inquiries may



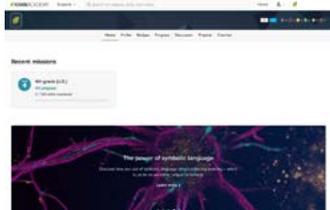
Examples of Online Content Providers



Brain Pop

www.brainpop.com

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. There is potential for UDL alignment in the way the videos, illustrations, audio, and scaffolded materials are presented.



Khan Academy

www.khanacademy.org

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 closed captioned. The video and audio features align with the basic principles of UDL.



Study Island

www.studyisland.com

Study Island is aligned to state standards and Common Core, and focuses on the four primary content areas. A strong focus is on practice and demonstration of critical concepts. Videos and interactive games help engage students. The visual and interactive capabilities provided appear to align well to the principles of UDL.



Gizmos

www.explorelearning.com

Gizmos is a highly interactive online resource offering labs, games, and interactive video simulations with content across grades K-12. Gizmos appears to be well aligned to the UDL.



OER Commons

www.oercommons.org

The Open Educational Resources Commons offers numerous resources aligned with the Common Core standards. OER identifies itself as a resource for varied learning, although the formats and supports vary. It is potentially aligned to UDL.



Thinkfinity

www.thinkfinity.org

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. Principles of UDL alignment are noted through the resources, implying that the products are aligned.

be made about the accessibility of a building, a learning environment, or the instructional materials used. If something is deemed “accessible,” it is often assumed that it will be appropriate for the educational needs of students with disabilities. Likewise, for the blended and fully online classroom, accessibility is currently at the forefront of the conversation on whether the materials and delivery methods are appropriate for struggling learners and those with identified disabilities.

Yesilada, Brajnik, Vigo, & Harper (2012) have determined that two primary definitions have emerged in defining Web or digital accessibility:

1. Web accessibility means that people with disabilities can use the Web. More specifically, Web accessibility means that people with disabilities can perceive, understand, navigate and interact with the Web, and that they can contribute to the Web.
2. Technology is accessible if it can be used as effectively by people with disabilities as by those without.

From these definitions, various entities and government agencies have worked to develop standards and basic requirements regarding accessibility for individuals with disabilities. The Web Accessibility Initiative (W3C) created the Web Content Accessibility Guidelines (WCAG) 2.0. In 1998, the United States Congress revised the Rehabilitation Act of 1973, strengthening Section 508, which requires providing access to electronic and information technology. The International Digital Publishing Forum (IDPF) developed the EPUB content publication standards which offer accessibility

parameters on e-books and other digital publications. For the blended and fully online K-12 classroom, these initiatives are often used in determining accessibility for students with an identified disability.

The table on this page offers a general overview of the three standards, illustrating similarities across the accessibility initiatives. The intent of these standards is to offer guidelines to assist developers, federal agencies, publishers, and similar entities in creating accessible digital materials. For school districts, these standards help determine what is accessible in digital information and content for students with disabilities. Districts looking to identify blended and fully online K-12 content appropriate for struggling learners and those with identified disabilities should be able to look to these standards as a guide.

To apply these standards, especially the Section 508 guidelines, a tool called the Volunteer Product Accessibility Template (VPAT) was developed. The VPAT helps determine how accessible a particular product is in accordance to the Section 508 standards, focusing on text, color, mark-up language, and other Web features to determine accessibility compliance. The VPAT examines if the user has access to the information, focusing on sensory and mobility features, but not necessarily cognitive and learning features and access. In an effort to better understand sensory and mobility access to common K-12 instructional materials, the Center employed the VPAT to review a variety of digital products (<http://centeronlinelearning.org/resources/vpat/>).

WCAG 2.0	Section 508 of the Rehabilitation Act	EPUB3
<p>The WCAG 2.0 standards were developed by the World Wide Web Consortium (W3C), an international group that creates Web accessibility standards based on four principles of accessibility. WCAG standards state that all content must be made to be perceivable, operable, understandable, and robust for all students. The standards include guidance on how to ensure these principles are met. http://www.w3.org/TR/WCAG/</p>	<p>Section 508 of the Rehabilitation Act, enacted in 1998, requires that all technology used, developed, and purchased by federal agencies be accessible to people with disabilities. This includes all websites and other forms of technology. http://www.section508.gov/</p>	<p>The International Digital Publishing Forum (IDPF) released the EPUB 3.0.1 standard in 2014. EPUB 2 was initially standardized in 2007. EPUB provides guidelines for developers, including ways of simplifying the mapping of WCAG and WAI-ARIA (Accessible Rich Internet Applications) to EPUB production to ensure access for users with disabilities. http://www.idpf.org/accessibility/guidelines/</p>

Section II
Determining
Content Accessibility



The VPAT helps determine if learners have access to information rather than if they can understand and can apply information. The VPAT seeks to determine, as the standards require, that all digital content be designed to be available for those with sight and hearing restrictions, and physical challenges.

While these are critical needs, what the current accessibility standards often fail to include are the learning or cognitive demands of the digital or information resource. When fully implemented, the websites designed to current accessibility specifications will not necessarily be accessible to all learners.

If the WCAG, Section 508, and EPUB accessibility guidelines limit accessibility determination, the proper tool must be used to evaluate materials for accessibility to all learners. While the VPAT can help successfully measure accessibility to the materials, its inherent design does not address issues with curriculum accessibility. Curriculum accessibility targets the learning of

the blended and fully online instructional experience. Accessible text will have a text-to-speech option but will continue to require a level of understanding and the ability, on the part of the reader, to determine what is important and what aligns with the instructional objective, as well the ability to organize this knowledge in preparation to demonstrate an understanding and application of the content. Additionally, students with learning challenges often struggle to convey what they know. These students may require additional options to help express what they have learned.

Determining the learning accessibility of content includes examining cognitive accessibility. To evaluate

UDL Guidelines and Principles

Principle 1: Provide Multiple Means of Representation

Guideline 1: Provide options for perception

Guideline 2: Provide options for language, mathematical expressions, and symbols

Guideline 3: Provide options for comprehension

Principle 2: Provide Multiple Means of Means of Action and Expression

Guideline 4: Provide options for physical action

Guideline 5: Provide options for expression and communication

Guideline 6: Provide options for executive functions

Principle 3: Provide Multiple Means of Engagement

Guideline 7: Provide options for recruiting interest

Guideline 8: Provide options for sustaining effort and persistence

Guideline 9: Provide options for self-regulation

cognitive Web accessibility, tools such as WAVE (<http://wave.webaim.org/cognitive>) can be used to generate a technical report. Employing a checklist, the WAVE Web accessibility tool examines the consistency of a given site, the ability to change an image to text as well as alter text font size, how a site enhances focus and structure, and the readability of a site based on the language used. While the WAVE and similar cognitive accessibility elements offer an alternative to the VPAT, the focus remains on access to the content through the various senses as well as modification to alter how one perceives the information.

The learning demands of Web-based lessons require a framework or series of recommendations that address the essential barriers to learning. The Universal Design for Learning (UDL) framework is such a system; its primary principles and guidelines seek to assist instructional designers and content developers with building curricula that is accessible to all learners. UDL serves as a general blueprint for assessing how instructional goals, methods, materials (including technology), and assessments provide—within the learning environment—learning options for all students.

From an instructional perspective, UDL is focused on supporting learner needs through a 5-step instructional planning and design process. UDL also provides a basic framework for assessing curriculum and products such as online tools or content.

UDL helps to expand educational accessibility for all learners by using flexible curricular, instructional, and evaluative means. Originated by the Center for Applied Special Technology (CAST) in the early 1990s, UDL is included in the Higher Education Opportunities Act (Public Law 110-315) and in the National Educational Technology Plan (Duncan, 2010). While accessibility is an essential prerequisite of UDL-oriented curriculum materials, it is important to distinguish between access to information and access to learning. Online learning resources must facilitate access to information, and UDL ensures that these resources will also facilitate access to learning. Together, online learning resources and UDL provide accessibility and options while maintaining high standards for all students by allowing educators to address both disability and learner variability.

The UDL framework is based on three principles, nine guidelines, and a variety of checkpoints. The four essential components of UDL comprise a curriculum: goals, methods, materials, and assessments. For example, in the UDL framework the goals themselves recognize learner variability and thus allow the teacher to offer a variety of options and alternatives in reaching mastery. Methods are adjusted based on continually monitoring a student's progress, and embedding materials that offer tools and supports to sustain interest and reach the desired outcomes. The UDL framework looks to improve the accuracy and timeliness of the assessments while reducing or removing any barriers to ensure what is measured is

accurate and representative of student's knowledge and their ability to attain the specific instructional goal.

Because the UDL focuses on learning as well as the limitations inherent in VPAT analysis, Center researchers determined that an accessibility analysis of K-12 blended and fully online learning experiences must be based on the UDL framework and that such an examination would then extend beyond the sensory and physical confines of the VPAT and the traditional accessibility of cognitive measures. To measure based on the UDL framework, Center researchers developed a UDL measurement tool (the UDL Scan Tool) that measured the principles, guidelines, and checkpoints.

UDL Scan Tool

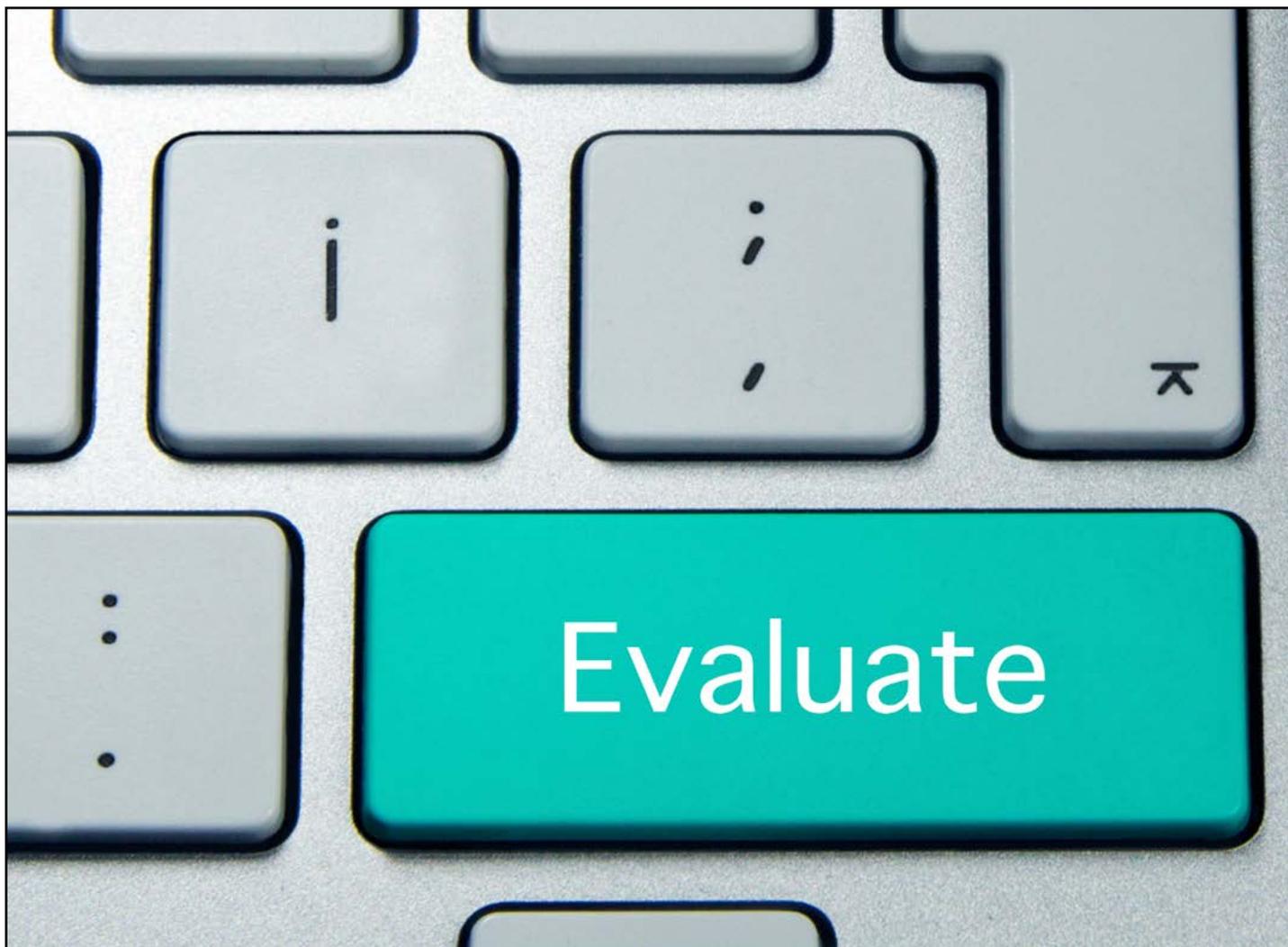
The UDL Scan Tool was designed to provide researchers and educators with a means to critically review online content systems for their potential to support learner accessibility and variability. Each of the UDL guidelines and checkpoints (<http://www.udlcenter.org/aboutudl/>

udlguidelines/) was mapped to specific and observable features within a content system.

The Scan Tool contains 37 initial questions with a total of 46 unique response items, including a general tool for measuring the usability of a product. The tool intuitively branches users to the specific questions they need for a complete understanding of what they are evaluating. The tool has been validated and widely tested on more than 1,000 individual pieces of product content.

Each item on the UDL Scan Tool aligns with one of UDL's three principles, one of the nine guidelines, and at least one checkpoint. The thoroughness of the tool ensures that each of the principles, guidelines, and checkpoints are measured for each lesson evaluated. Using the UDL Scan Tool, Center researchers sought to determine the content alignment of selected, widely used, blended and fully online lessons to the UDL framework. The study sought to better understand whether pre-packaged, vendor-created K-12 online lessons were appropriate to the learning needs of all students, especially those with disabilities.

Section III
The Study



Selection criteria sought to include free and for-profit providers that represented a large segment of the online lesson market, all grade levels, and all content areas. The online vendors each provide educational content in one of four primary areas (English language arts, science, mathematics, social studies).

Some online vendors develop and deliver the entire curriculum while others provide supplemental lessons, materials, and tools. While all K-12 grades were represented, not all online vendors developed products across the K-12 environment. Some, instead, specialize in particular grade level areas.

Researchers conducted a sampling process to identify a representative sample of a lesson that was specific to the vendor's unique content, and also grade-level specific. This ensured an appropriate sample for representative purposes.

The difference in data sample numbers is attributable to variances in the online vendor's purpose and product

offerings (e.g., full curriculum vs. supplemental products, grade content areas, variety of products, overall number of products offered). Once the primary content areas offered by each vendor were identified, researchers further divided these areas into sub-content areas. In order to randomly select lessons for evaluation, researchers created a content map and determined the number of lessons offered across the major content areas, then determined an appropriate sample size across the major and sub-content areas. After an appropriate sample size was determined, lessons from each category were randomly selected for evaluation. The vendor overview table offers a breakdown of the number of lessons sampled as well as the primary grade and content area that the online vendor serves.

Vendor Overview

The following number of lessons was sampled for each Vendor.

Vendor 1—478 lessons sampled

Vendor 1 offers numerous free, fully online, primarily video-based products for learners of any age. The most extensive content is in mathematics and related topics. Other topics include science, economics and finance, arts and humanities, computing, and test preparation. Grades K-8 are the primary audience.

Vendor 2—108 lessons sampled

Vendor 2's products are designed for small groups or entire schools, with a strong focus on grades 3-8. Content focuses on reading and math with additional middle and high school components including writing, social studies, and science.

Vendor 3—91 lessons sampled

Vendor 3 provides blended and fully online products for grades K-12. Curriculum includes math, science, English, social studies, world languages, and electives.

Vendor 4—87 lessons sampled

Vendor 4 focuses on math and science products for grades 3-12.

Vendor 5—182 lessons sampled

Vendor 5 offers a suite of products for K-8 students and multiple courses for 9-12 students. K-8 products include English language arts, history, math, science, music, art, and world languages. High school products include courses in English, mathematics, science, history and social sciences, and world languages.

Vendor 6—169 lessons sampled

Vendor 6 provides a comprehensive K-12 curriculum in blended and fully online formats. Subject areas include mathematics, literacy, health and science, social studies and history, arts and music, technology, and English.

For each vendor, researchers identified primary content areas from which to sample. Once the primary content areas were identified, researchers further divided these areas into sub-content areas (if science was chosen as a primary content area, sub-content areas could include

topics such as biology, chemistry, and physics). In order to randomly select lessons for evaluation, researchers created a content map and determined the number of lessons offered across the major content areas, then determined an appropriate sample size across the major and sub-content areas. After an appropriate sample size was determined, lessons from each category were randomly selected for evaluation.

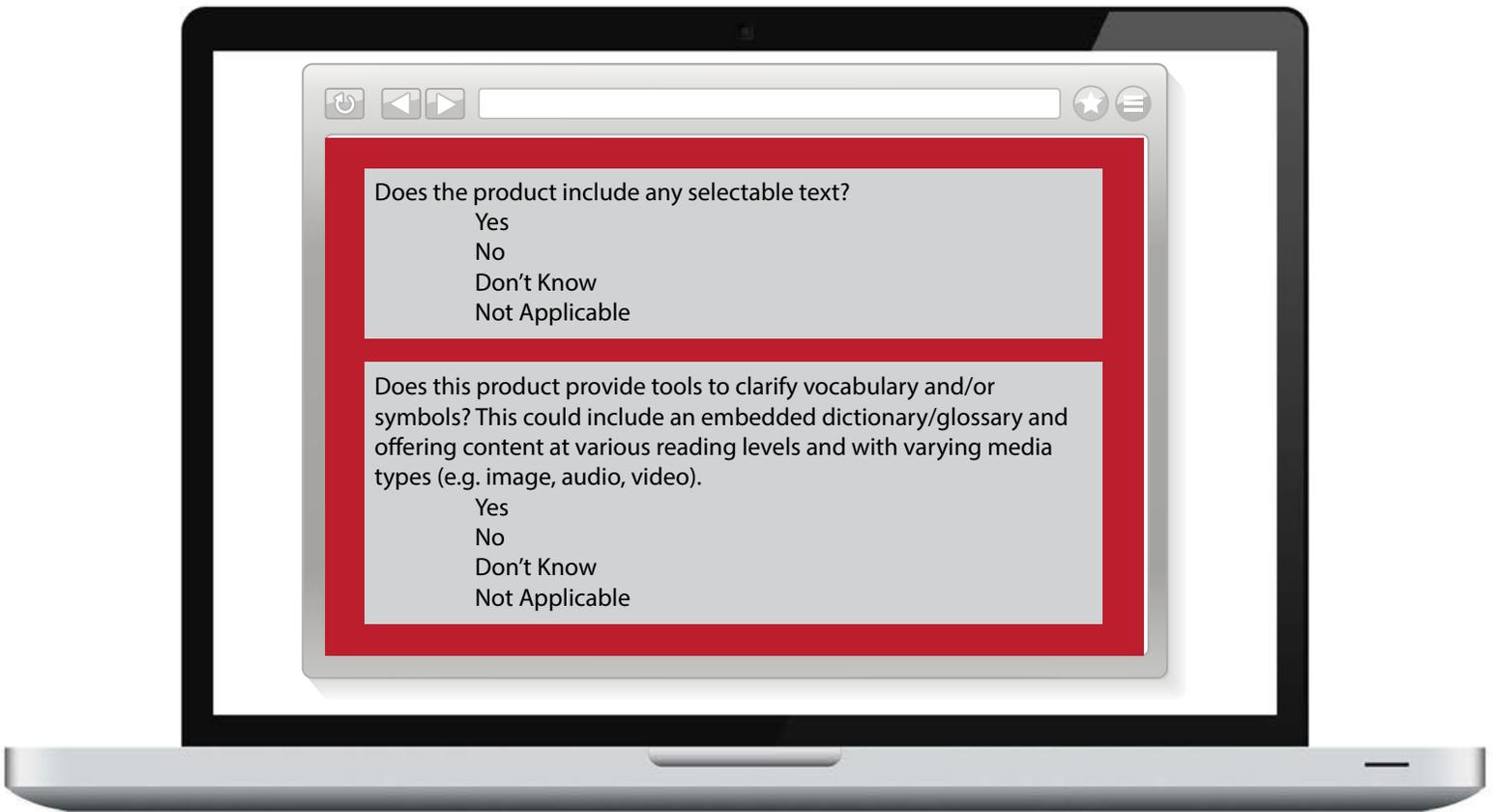
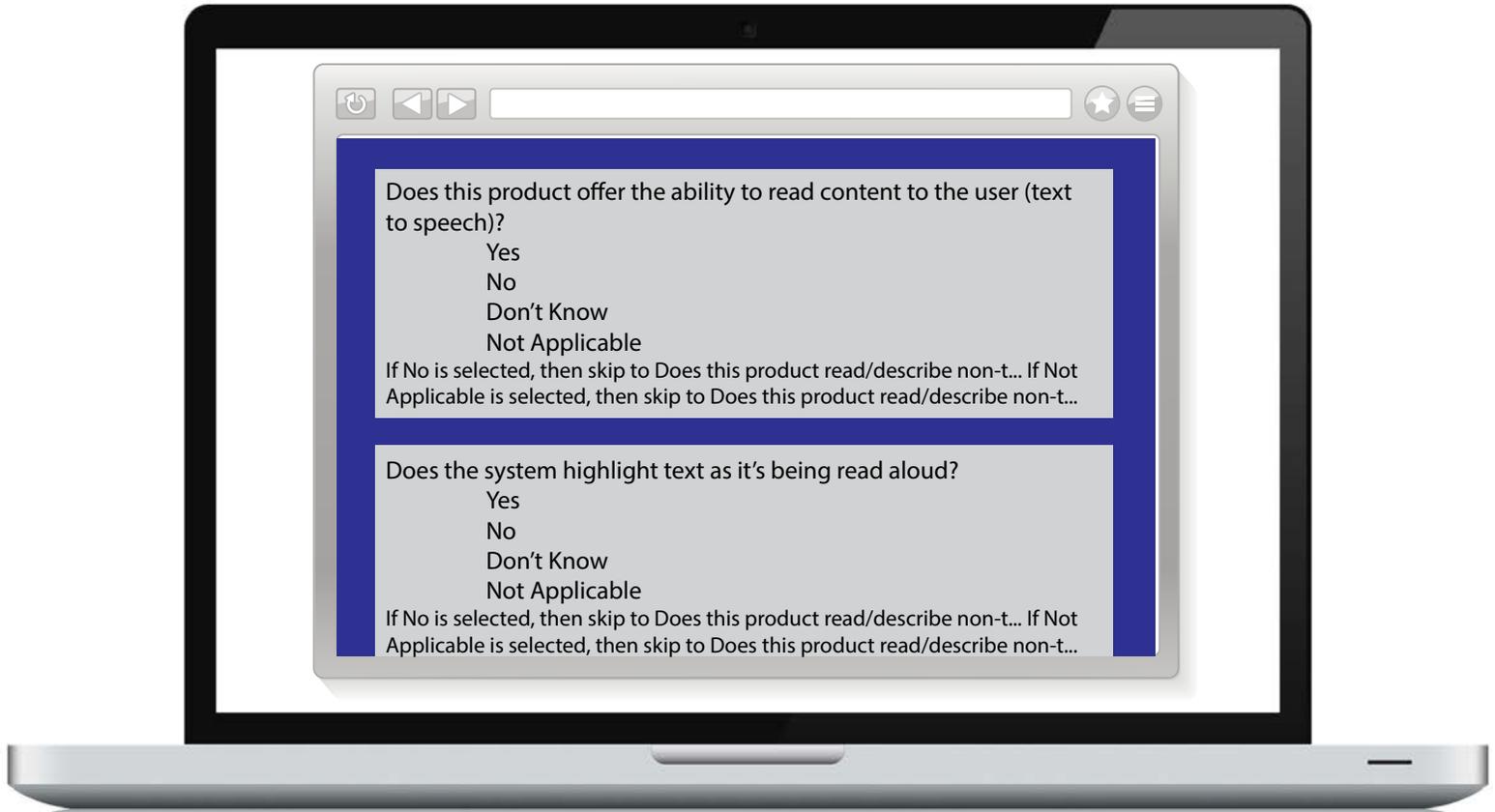
Procedure—Scoring

The randomly selected lessons were reviewed and evaluated by a single trained researcher. The researcher accessed a specific lesson, reviewed the entire lesson (noting specific features), and then completed the UDL Scan Tool. The UDL Scan Tool was housed in a Qualtrics file (<http://qualtrics.com/>) to easily provide the researcher with access to the data. Because the Qualtrics file required a response for each question or item, the file configuration ensured that the researcher scored each lesson completely and consistently.

The researcher was required to answer the 37 initial questions for each of the selected lessons. Each of these 37 questions are answered by an initial response of 'Yes,' 'No,' 'Don't Know,' and 'Not Applicable.' Each item was tied to a number, with 'Yes' indicating UDL alignment (score of 1), 'No' indicating no UDL alignment, (score of 0), and the remaining two responses indicating no score or requiring more information as the review continues. This latter element is critical in that the reviewer may initially score a 'Don't Know,' but a subsequent item might allow for clarity and a positive score specific to a checkpoint. Thus, while an item seeking information on one of the broad principles may score a 0, subsequent items that lead to a specific checkpoint might allow for a positive score for the checkpoint and related principle.

To allow for a nimble but accurate score, the UDL Scan Tool uses skip logic: 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 appropriate question. If the online product activates background knowledge, another series of questions with respective items appear to be scored. With this in mind, the initial 37 questions could expand to a total of 146 questions. Although the tool operates on a significant continuum, it can quickly and thoroughly determine whether an online product is aligned to UDL principles, guidelines, and checkpoints.

UDL Scan Tool Sample Questions



For each lesson, the UDL Scan Tool requires the completion of at least 37 items each with the scoring of a 'Yes,' 'No,' 'Don't Know,' or 'Not Applicable.' The researcher was instructed to answer 'Yes' if the feature was available (even minimally), 'No' if not available at all, and 'Don't Know' when in doubt. The 'Yes' would trigger the skip logic, which would provide another set of questions specific to that principle and guideline, often drilling down to the checkpoint. For example, if the researcher selected 'Yes' to indicate that the feature was included in the lesson, the researcher was directed to answer additional, follow-up items regarding the details of that feature. However, if the researcher selected 'No' to indicate that the feature was not included in the lesson, the researcher then skipped the follow-up items accompanying that specific feature and was directed to a separate item.

If the researcher selected 'Yes' and received follow-up questions, the researcher was instructed to choose 'Never' if the feature was never available to the user in the product, 'Sometimes' if the feature was available to the user across the product at least 50% of the time, and 'Always' if the feature was available to the user across the product all the time. The Tool also allows for the option to write in 'other' responses for elaboration.

Following the evaluation of all identified lessons, the data was accessed from the online survey platform, converted to an Excel spreadsheet, and downloaded into

SPSS predictive analytics software for analysis.

Conclusion

The purpose of the online lesson review described in this report was to provide objective information on the appropriateness of current K-12 online content used in today's blended and fully online learning K-12 class-room. Extending the examination beyond physical and sensory accessibility considerations, researchers employed the UDL framework to gain a further understanding of how lessons align with the cognitive and learning demands often facing struggling learners as well as those with disabilities. Taking into consideration respective grade and content areas, researchers found that, across six widely used vendors and the hundreds of lessons sampled, that current online lessons are poorly aligned to the principles, guidelines, and checkpoints that make up the UDL framework. These findings indicate that the essential foundations of K-12 blended and fully online learning may not be as individualized to the specific learning needs of students with disabilities. While data suggest limited alignment to the UDL framework, it is difficult to determine the added supports offered to students by their teachers, parents, or other support personnel.

The next section of this report summarizes key findings across six K-12 vendors of online content, using the UDL principles and primary guidelines as the structure for the summary of the findings.

Section IV
UDL Scan Tool
Vendor Results

Vendor 1

Vendor 1 is an online, non-profit educational organization that provides free, online education resources. Vendor 1 is primarily video-based, offering an extensive media library with a wide variety of content. Sign up is optional, but registered users (registration is also free) gain access to additional tracking and data tools.

Content and Grade-Level

Most content is in mathematics and related topics and includes: math, science, economics and finance, arts and humanities, computing, and test preparation. The math and science components contain standards-based topics such as algebra, geometry, calculus, biology, physics, and chemistry, and additional related subjects. The arts and humanities and economics and finance sections are smaller—but steadily expanding—content areas.

Content area is the primary means of division and organization on the site. Vendor 1 diverges from this model within Mathematics where grade-level alignment is available for different topics for the K-8 grade levels. Users may select content aligned with the familiar American model of teaching early math and arithmetic at the K-1 level before proceeding through algebra by the eighth-grade level. Beyond K-8 math, users will need to determine the specific, more advanced topic area that they are interested in pursuing.

Learning Model

Vendor 1's products are offered fully online. The information supplements traditional coursework, but does not replace an existing curriculum. Vendor 1 is most typically used by teachers applying the blended classroom approach, focusing on mathematics or other supported content areas.

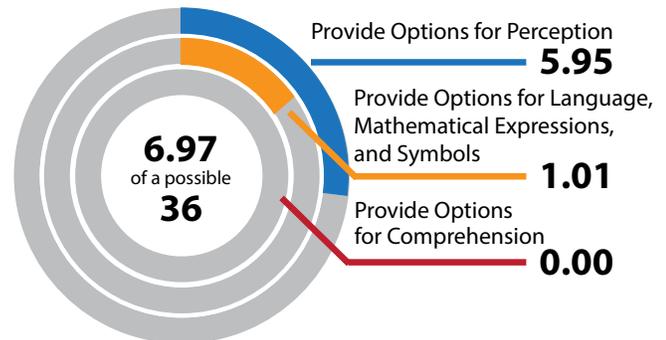
Vendor 1 contains features that allow parents, teachers, and coaches to monitor student progress during this additional, online practice time. Students are provided with an "online learning dashboard" that allows them to study at their own pace. The site also provides extensive support resources for teachers, coaches, and parents.

Standards Alignment

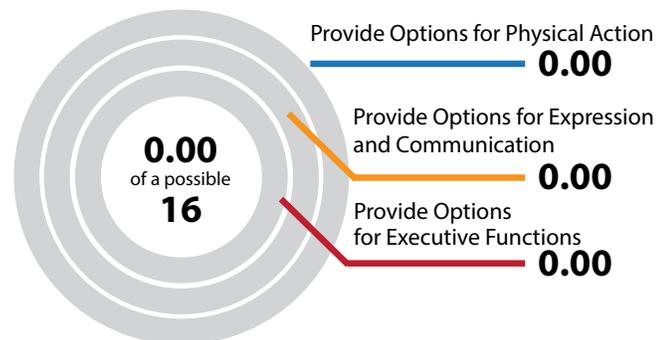
Vendor 1's products include an extensive section of exercises specifically aligned to the Common Core State Standards (CCSS) in math for grades K-12. At this time, Mathematics is the only subject aligned with the CCSS.

Within the vendor's CCSS section, users may select a grade level and the corresponding standard to be connected to an interactive skill exercise. This differs from selecting the content area, watching video tutorials, then working with skill exercises. Vendor 1's CCSS exercises are used to provide refresher information and additional skill practice around a specific standard, not to learn a standard from the beginning.

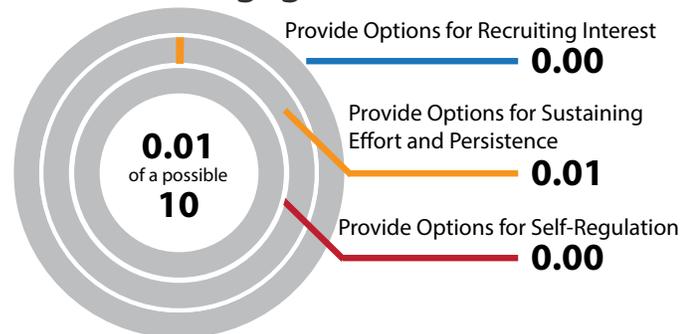
Principle 1: Provide Multiple Means of Representation



Principle 2: Provide Multiple Means of Action and Expression

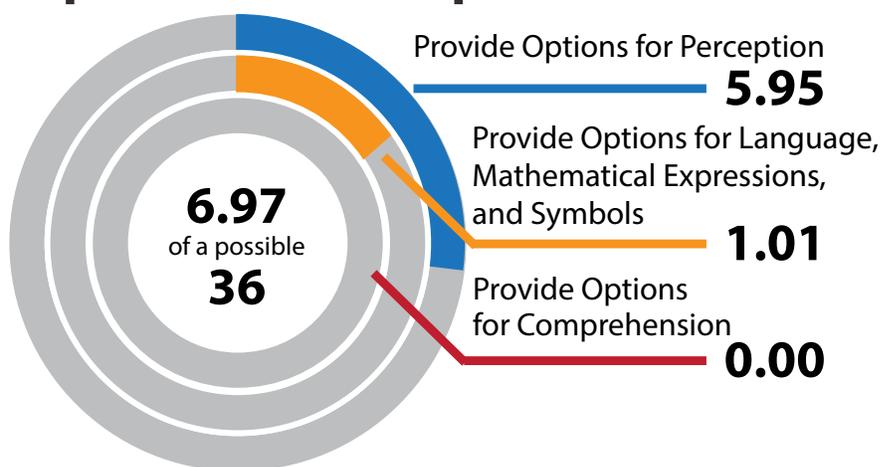


Principle 3: Provide Multiple Means of Engagement

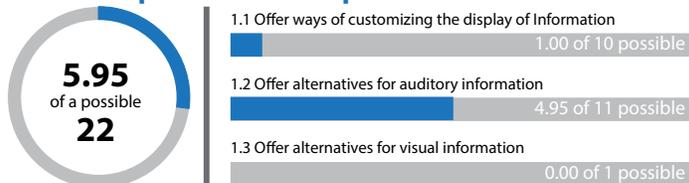


Principle 1: Provide Multiple Means of Representation

Vendor 1 features an extensive catalog of videos and accompanying interactive exercises. But to what extent can students customize the ways in which they receive information from these video tutorials? Vendor 1's sampled lessons (N=478, the largest sample taken during this evaluation) show some alignment between its library of video tutorials and the first UDL guideline. Aggregate reviewer scores indicate that out of a possible 36 items regarding Vendor 1's features that provide multiple means of representation, an average of 6.97 items were satisfied. This aggregate score indicates that Vendor 1's sample contained some features that would allow students to customize the way the video content was represented, but not in enough ways to be considered a UDL-aligned environment.

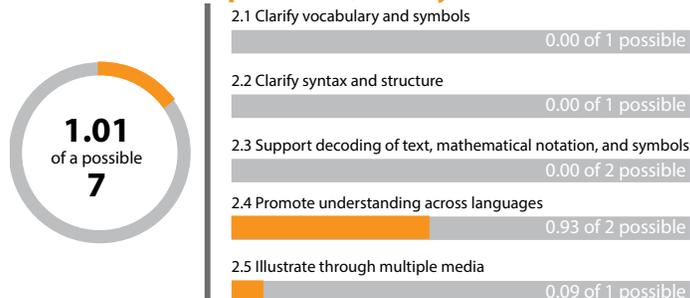


Provide Options for Perception



Reviewers determined that 27% of items were satisfied when evaluating Vendor 1's sample for alignment with the first UDL guideline. Two notable features include offering videos as alternatives to audio and using sub-captioned videos to provide accessibility for students with hearing or audio processing impairments. While videos and audio can be ideal ways to present information, each format can lose effectiveness if not accompanied by features that help students overcome media-specific barriers. Vendor 1 provides users with a transcript that textually represents what takes place in the lesson and also allows users to click on parts of the transcript to move to that specific point in the video. Subtitles can be toggled with a single switch and the video speed can be controlled. In many instances, videos depict a written mathematical notation in color, on a black background.

Provide Options for Language, Mathematical Expressions, and Symbols

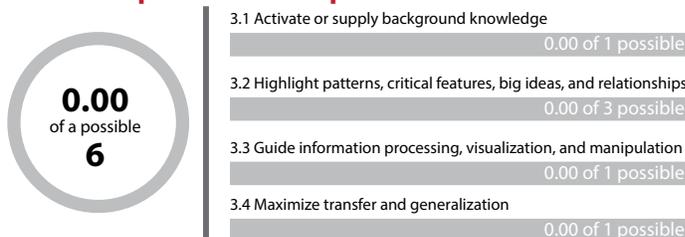


Vendor 1's sample lessons satisfied 14% of items concerning guideline 2 on the UDL Scan Tool. One aspect of guideline 2 that Vendor 1 specifically satisfied was the use of multiple languages across its video content. English, French, Spanish, and Portuguese are all supported and students can toggle

between languages on the dashboard. Obviously, these four languages do not fully encompass the diverse tongues spoken in classrooms across the United States (or in other countries); however, these language options do provide accessibility to educational videos for the large French, Spanish, and Portuguese-speaking populations.

While the language options were strong (if not comprehensive), elements of mathematical and symbolic expression were still lacking. Being able to toggle between languages on the screen provides support for multi-lingual students and helps learners understand a language in which they are not fluent. However, adding options for mathematical and symbolic representations would further increase accessibility for students who struggle with written communication or language comprehension.

Provide Options for Comprehension



Because Vendor 1 focuses on math content, it is critical that alternate mathematic and symbolic expressions be provided. Graphs, charts, or interactive content could be added to aid in accessibility for students who struggle with non-language-based representations of information.

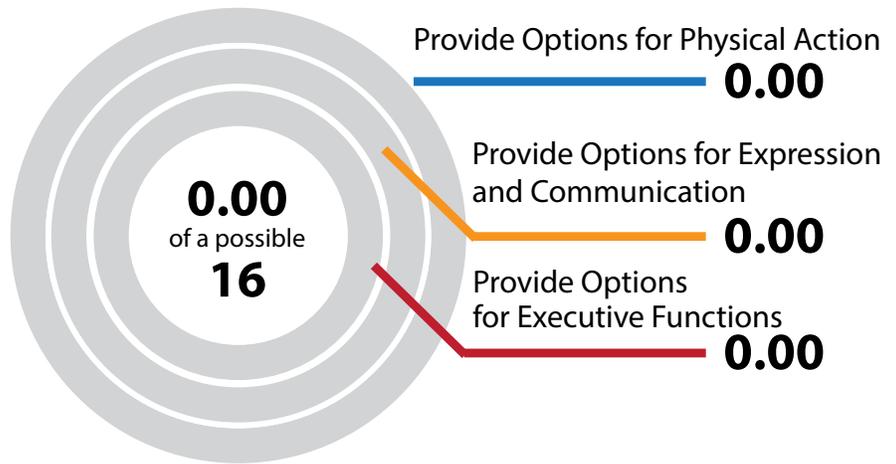
The UDL Scan Tool showed no alignment between Vendor 1's sample and the third UDL guideline, therefore reviewers assigned it a score of 0. Reviewers found no ways in which Vendor 1 provided students with options for comprehending what they were learning. A score of 0 indicates students were not asked or cued to review background knowledge and Vendor 1 did not highlight patterns that emerged between lessons (a type of scaffolding to show relationship). Vendor 1 offered no features that are aligned with the underlying research-based curriculum practices behind guideline 3.

Principle 2: Provide Multiple Means of Action and Expression

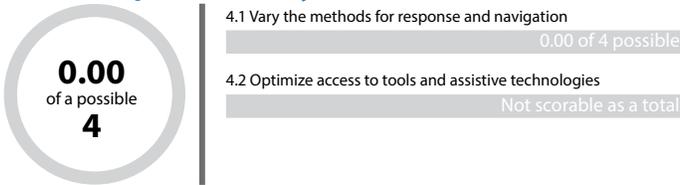
The use of video media in educational settings might suggest that there would be little physical interaction between the student and the video. However, with the advent of more sophisticated video games, simulations, and computer technology, virtual environments can be highly interactive.

Virtual environments may require students to use different tools to input commands. Mainstream video game technology (e.g., Xbox, PlayStation, Wii, etc.) incorporates motion controls and motion commands into activities. However, Vendor 1's sampled lessons show no alignment between its video-based lessons and the second UDL guideline. To be fair, Vendor 1's product is free and lacks the development power behind popular video game development.

Aggregate reviewer scores indicate that out of a possible 16 items that asked about Vendor 1's features that provide multiple means of action and expression, an average of 0 items were satisfied. This aggregate score indicates that Vendor 1's sample lessons provide no options for action and expression.

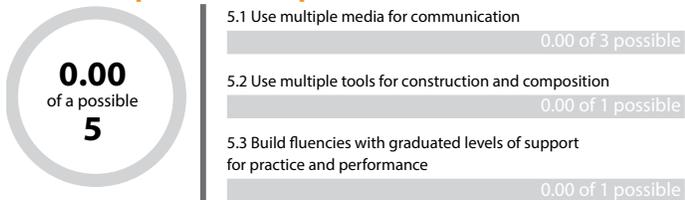


Provide Options for Physical Action



Vendor 1's sampled lessons lacked alignment with UDL's fourth guideline. Reviewers noted no existing features that provide options for physical interaction with the product. Students should have alternatives when they are required to physically respond to the curriculum. The repetition of physically clicking on a single answer option throughout the entirety of the lesson minimizes students' ability to express what they have learned.

Provide Options for Expression and Communication



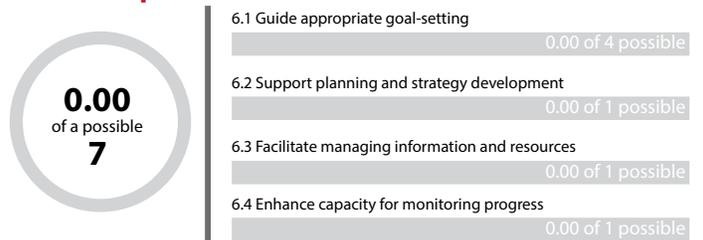
Reviewers found no alignment between Vendor 1's sampled standards mastery program and the fourth UDL guideline. As a result, a score of 0 was assigned.

The addition of an onscreen calculator and a Web commenting system would enhance Vendor 1's ability to provide options for expression and communication, particularly with the web commenting system. Having the ability to review other users' questions, ask questions of their own, and answer questions posted by other learners creates opportunities for expression of thoughts and ideas, and

interaction with fellow students. This type of communication system helps students both learn from and assist one another as they progress through various lessons.

Since the reviewers' initial analysis of Vendor 1's sample, new features have been implemented, including an onscreen calculator and a Web 2.0 comments system to aid students in asking questions about specific topics. Students can easily access the onscreen calculator to help them solve problems. Additionally, a web commenting system at the conclusion of every problem provides students with an outlet for asking questions, reviewing what others have asked, or answering questions.

Provide Options for Executive Functions

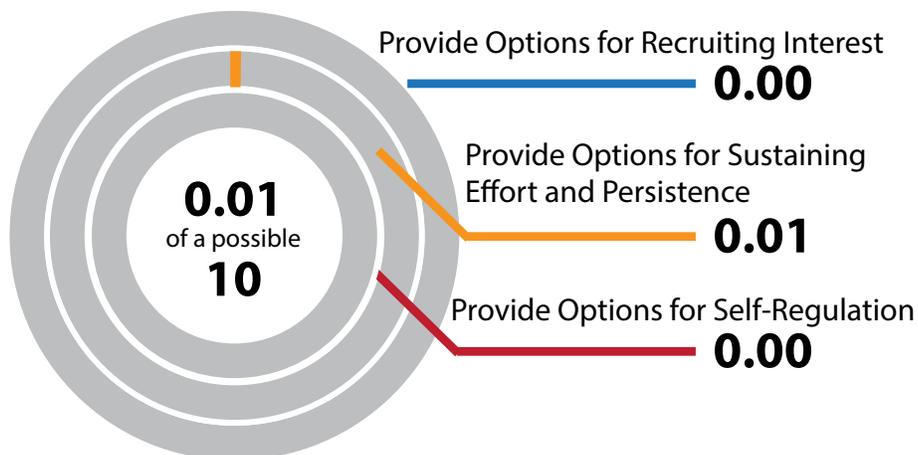


The score of 0 indicates Vendor 1's product lacks features that allow students to maximize their executive functioning skills. As such, students are solely responsible for managing skills associated with executive functioning, including goal setting and task management. UDL-aligned curriculum needs to explicitly state the goals for the lesson and make them easily accessible to students. Goals should be clarified with learning objectives and a schedule for attaining both the objectives and goals. This allows students to focus on the lesson and not require effort spent on cognitive processing to create a schedule and set of objectives.

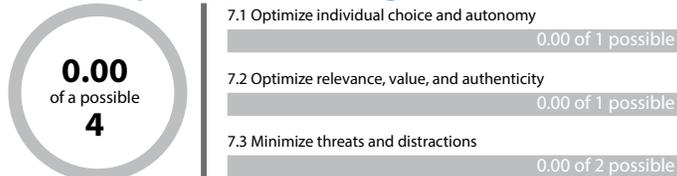
Principle 3: Provide Multiple Means of Engagement

Vendor 1 divides math disciplines into a smaller, more manageable series of video tutorials and problems. These series align with the classes that millions of K-12 students take during their primary and secondary educations.

Vendor 1's sampled lessons (N=108) show minimal alignment between its standards mastery program and the third UDL guideline. Aggregate reviewer scores indicate that out of a possible 36 items that asked about Vendor 1's features that provide multiple means of representation, an average of 5.18 items were satisfied. This aggregate score indicates that Vendor 1's sample standards mastery lessons tended more towards static presentation than customizable learning experiences.

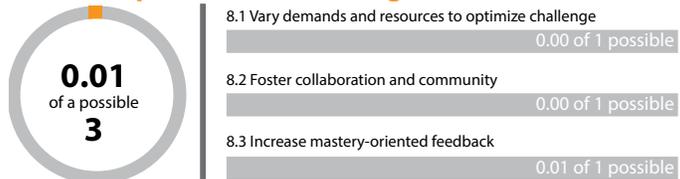


Provide Options for Recruiting Interest



Reviewers found no alignment (0%) between Vendor 1's sampled standards mastery program and the fourth UDL guideline. Learner interest is captivated not only based on the subject matter being studied, but also by the amount of autonomy granted by the teacher in studying the lesson. Curriculum designers should strive to allow students choices in how they learn (while teachers and schools preserve control over learning content).

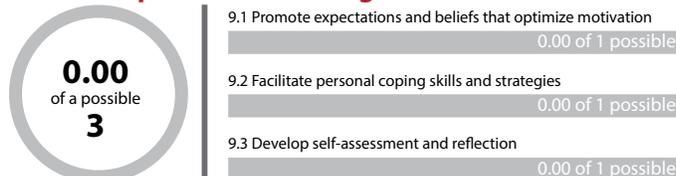
Provide Options for Sustaining Effort and Persistence



An insignificant number of items (less than 1%) were satisfied when comparing UDL guideline 8 and Vendor 1's sampled lessons, indicating negligible options were found for sustaining effort and persistence. Perhaps the only feature noted that aligns with guideline 8 is that Vendor 1 encourages taking one long-term goal and breaking it into smaller pieces. Vendor 1 features an array of badges—a form of tangible reward—that represent these smaller goals, goals that are more manageable for students to meet than one large goal. Some are easily achieved while others require several hundreds of hours of work. Users can preview the objectives before working toward them.

No alignment was found between Vendor 1's features that

Provide Options for Self-Regulation



assist students with options for self-regulation. A score of 0 was assigned to the sample by reviewers. The importance of adding these features cannot be overstated. Some students have significant difficulties in developing these skills. Students differ in self-regulation skills as much as they differ in the abilities, knowledge, and talents they bring to the classroom. Vendor 1 could implement visual displays of data that show the skills students have mastered, or need to master. This would not only reinforce that students are succeeding, but could also track other self-regulation-based data such as time on task, length of logins, and progress towards badges.

Some learners require explicit instruction and modeling to learn to self-regulate. Recognizing they are making progress can be very motivational, thus it is critical that self-regulation steps and goals be built into the learning product so that students recognize and appreciate their own progress. Vendor 1 should offer multiple models and scaffolds from which to choose so students can identify and select the best option for themselves.

Vendor 2

Vendor 2's products are available to and appropriate for small groups of students, or for an entire school. Products are also available for purchase by parents.

Content and Grade-Level

Content packages are available for pre-K, elementary, middle, and high school students, as well as college and post-secondary prep users. The majority of the online lessons, activities, and related supports are targeted for learners in grades 3-12, with a strong focus on grades 3-8. The K-12 products are aligned with individual state and Common Core standards. Every lesson plan, activity, and online supplement is aligned to either a state standard or an element of the CCSS, with most being aligned to both. All grade 3-12 products are directly aligned to reading and math, with middle and high school components that include social studies, writing, and science alignments. The grade level and content alignment varies per state, however, regardless of this variability, all product aligns to Core reading and math.

Users may also access supplemental programs (not aligned with standards or the CCSS) in areas such as graphic novels, fine arts, health, technology, and test prep for Advanced Placement (AP), college entrance, and General Educational Development (GED) testing. Access to these supplements varies by grade level but is consistent in format to the content-based lessons, activities, and related online resources. Many products are available translated into Spanish.

Learning Model

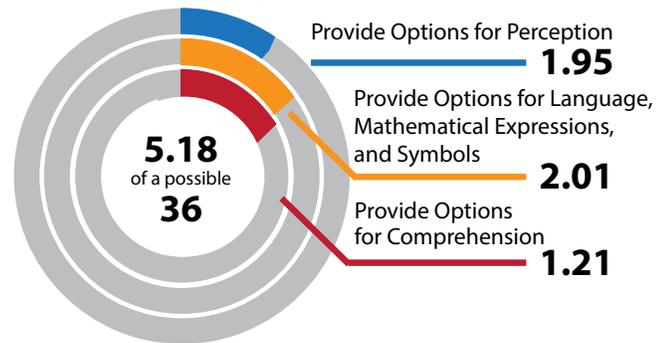
Vendor 2's materials are completely online. Focused on support, review, and targeted practice, the majority of this vendor's product is not suitable to address all the content, lessons, and activities required for a typical course. Instead, teachers and schools using this product will most likely integrate it within a blended environment supporting fully online and/or brick-and-mortar coursework.

Standards Alignment

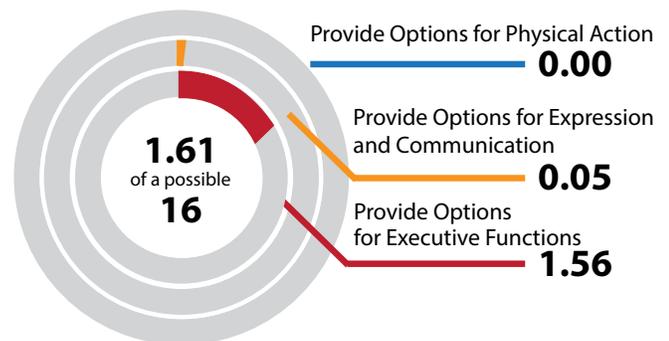
"Built from" CCSS material, Vendor 2 offers thorough coverage of both math and reading. Depending on the grade level, mathematics content is further subdivided into sections including algebra, mathematical functions, geometry, number and quality, and statistics and probability. English language arts provides a package designed around the CCSS or state standards, and also offers several supplemental reading programs featuring reading strategies and interventions for grades 2-12, along with reading-specific activities for English language learners.

Vendor 2 markets itself as offering preparatory material for students to use to master state and CCSS standards. For example, to assist teachers, related educational professionals, and even parents with identifying specific state or Common Core standard alignment, an interactive map of the United States is available on their website. Individuals can locate their state and then the appropriate grade level to determine the state standard and CCSS alignment and the related lessons, online activities, and related resources developed and available to support the state standard and Common Core understanding.

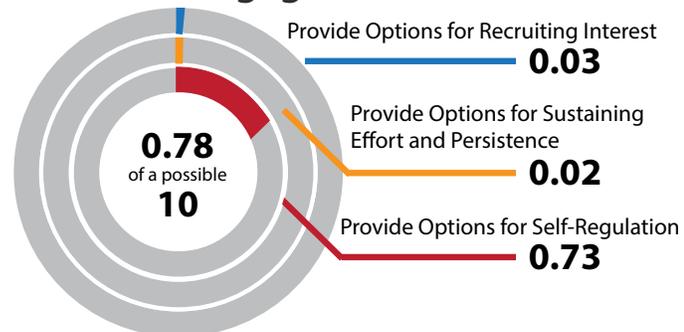
Principle 1: Provide Multiple Means of Representation



Principle 2: Provide Multiple Means of Action and Expression



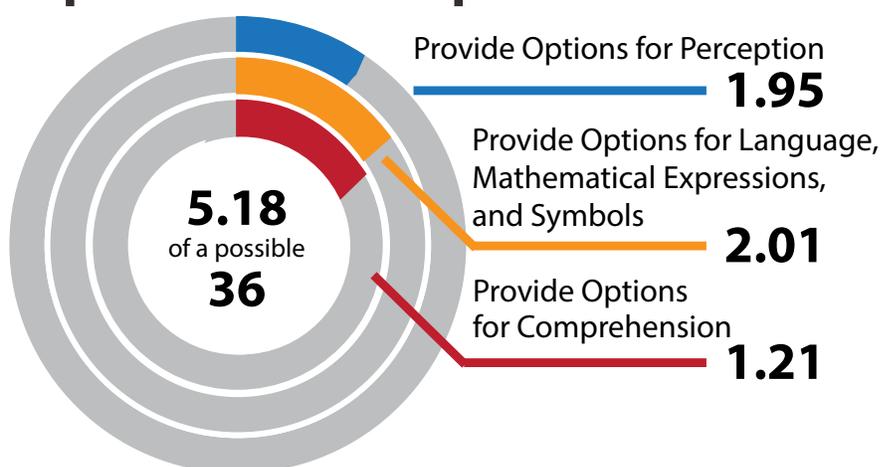
Principle 3: Provide Multiple Means of Engagement



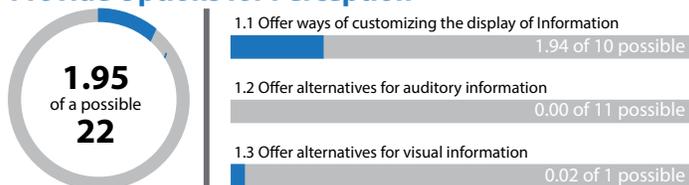
Principle 1: Provide Multiple Means of Representation

Educators help their students prepare for state and Common Core State Standards (CCSS) so that they can perform well on accompanying assessments. A critical component to any standards mastery program is to what extent the program is accessible to students. It is important to understand how the standards mastery product allows students to customize the representation of information when working practice problems, reading remediation, and when using other elements of the system.

Vendor 2's sampled lessons (N=108) show minimal alignment between its standards mastery program and the first UDL guideline. Aggregate reviewer scores indicate that out of a possible 36 items that asked about Vendor 2's features that provide multiple means of representation, an average of 5.18 items were satisfied. This aggregate score indicates that Vendor 2's sample standards mastery lessons provide more static presentations than customizable learning experiences.



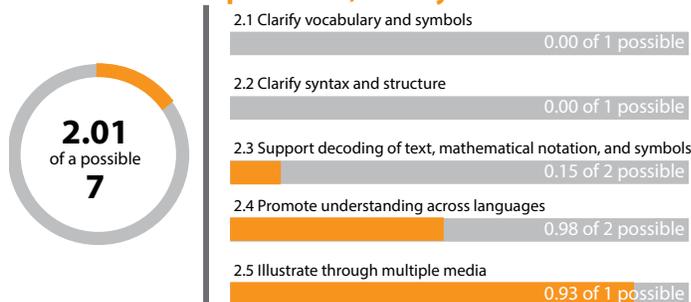
Provide Options for Perception



Only 9% of items were satisfied when looking for ways in which Vendor 2's sample aligned with the first UDL guideline. Vendor 2's sample provided few, if any, options for changing the way students could manipulate representations of the standards mastery lessons. Reviewers' scores indicate that Vendor 2's sample did contain some options for changing how information is displayed on the computer screen. On average, reviewers found no options for alternative forms of presentation when the information was provided in an audio or video format. When Vendor 2 used video, video was the only option. When Vendor 2 used text, text was the only choice. Alternatives to video and text are crucial because, without them, learners who have hearing, visual, or reading difficulties, or those who need more time to process verbal or video presentations of information, are at a significant disadvantage.

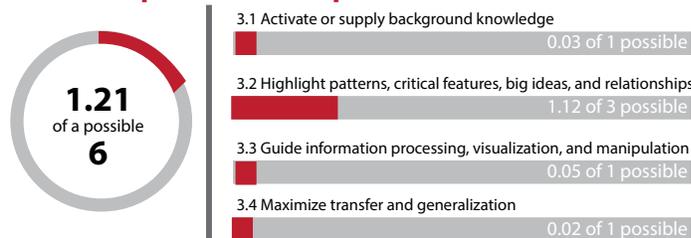
Providing graphic (e.g., video, interactive, print) or verbal representation of text-based materials would benefit learners who struggle with reading and/or reading comprehension. For a learner who has visual or hearing impairments, video presentation presents specific difficulties. Text-based and verbal alternatives to or supplements for video-based instruction would better serve students with visual or hearing disabilities. Adding these alternative methods of delivery would improve student access to Vendor 2's materials.

Provide Options for Language, Mathematical Expressions, and Symbols



The UDL Scan Tool revealed marginal alignment between Vendor 2's curriculum and the second UDL guideline. Reviewers' scores indicated that only 28% of items were satisfied in terms of providing multiple means of expression. Reviewers noted that there were video and audio options available, yet, within these options, few supports existed. Additional supports could be embedded via hyperlinked text within captions or hyperlinked points within a graphic so that students do not have to leave the text to navigate to a glossary or illustration for supporting information. There were no options for providing alternate mathematical or symbolic expression.

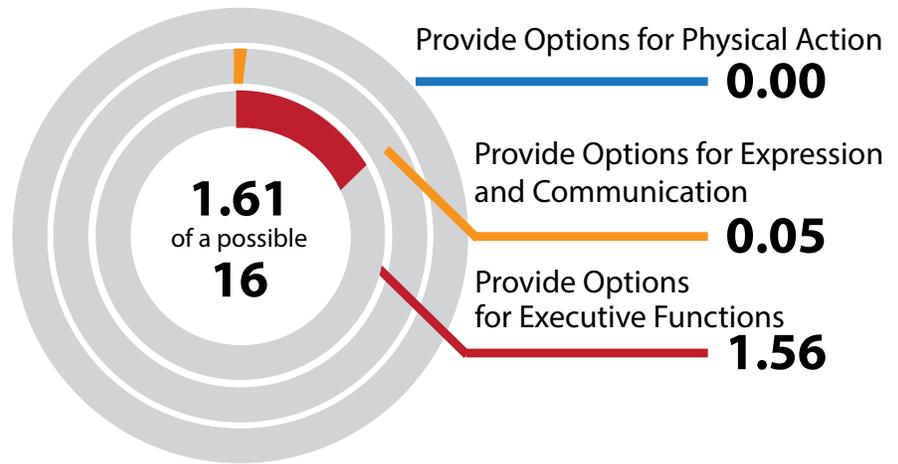
Provide Options for Comprehension



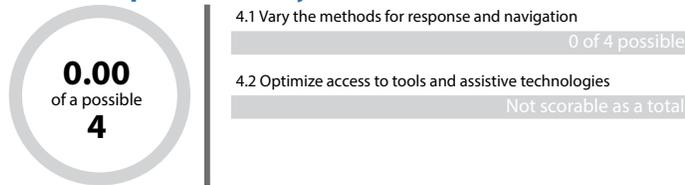
Vendor 2's sample lessons satisfied 21% of items concerning guideline 3 on the UDL Scan Tool. Reviewers noted that Vendor 2's product provided features that allowed students to understand the most important aspects of what they were learning, including offering immediate instructor feedback. Part of constructing usable knowledge is being able to distinguish the difference between critical and supporting information.

Principle 2: Provide Multiple Means of Action and Expression

Vendor 2's sampled lessons show minimal alignment between its standards mastery program and the second UDL guideline. Aggregate reviewer scores indicated that out of a possible 16 items that asked about Vendor 2's features that provide multiple means of action and expression, an average of 1.61 items were satisfied. This aggregate score indicates that Vendor 2's sample standards mastery practice lessons contained virtually no options for action and expression.

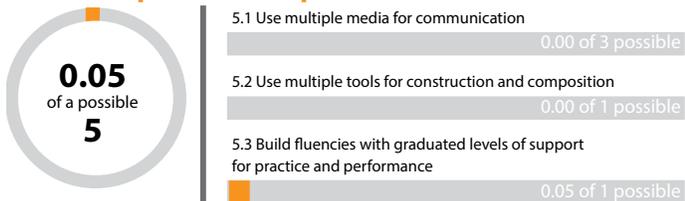


Provide Options for Physical Action



Reviewers found no alignment (0%) between Vendor 2's sampled standards mastery program and the fourth UDL guideline. Students can benefit by having access to multiple technology tools for use in interacting with their environment. In addition to a keyboard and mouse, students should have options like voice commands, a gaming controller, a joystick, or a touch screen. These interactive technologies help students physically select, manipulate, and navigate in different ways from the use of only mice or keyboards. The addition of these technologies would broaden the usability of Vendor 2's products to students.

Provide Options for Expression and Communication



Less than 1% of items were satisfied when comparing UDL guideline 5 and Vendor 2's sampled standards mastery program, indicating that there were no substantial options for student expression and communication. Using multiple media formats when teaching a concept helps learners who have difficulty absorbing information in one format. Unless the lesson demands using one medium (e.g., perhaps a practice on a state standard specifically geared toward writing a short paragraph), curriculum developers should always consider offering multiple ways of communicating the lessons' intent, including using film, music, speech, drawing, or illustration, depending on the student's preference and capability. Because Vendor 2's focus is on practice, assessment, and perfor-

mance results, it is crucial that students have tools and venues that allow for expression and communication. When the experience remains one-dimensional from the learner perspective, the opportunity to build graduated levels of practice and performance is lacking. By providing increased options for students to communicate what they have learned, it is easier and more useful to determine what students have gained from the materials they have studied and to assess whether they require additional support, or are ready to advance.

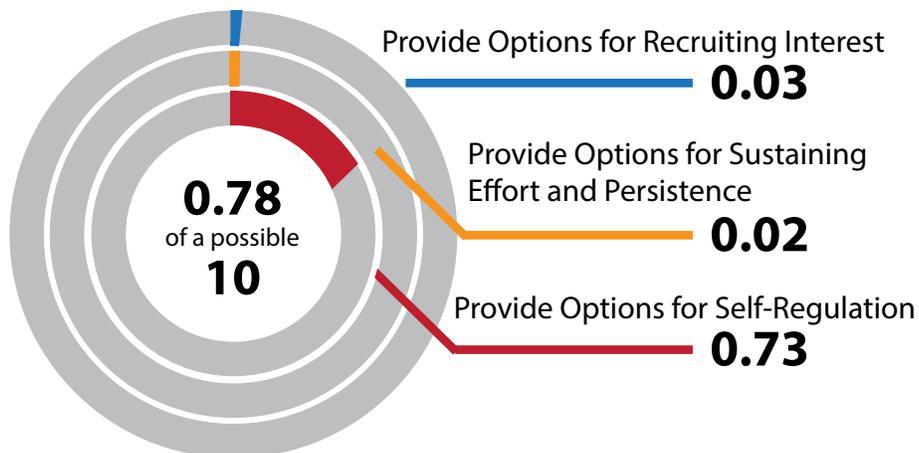
Provide Options for Executive Functions



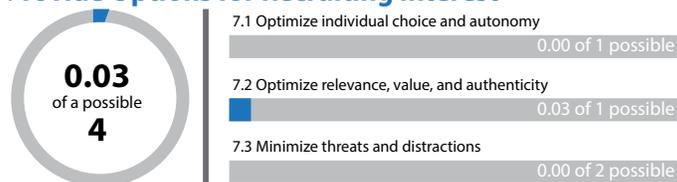
In Vendor 2's sample standards mastery program, reviewers' scores indicated that 22% of sampled lessons satisfied items related to guideline 6 on the UDL Scan Tool. Vendor 2 provides options for executive function in a detailed report system that can be viewed by students and teachers. Users can view performance breakdowns according to a particular skill, how many ribbons users have earned, and how many are still available for the student to achieve. Part of the reporting system determines where students should focus to achieve total mastery of the standard. A comparison tool is available for students to measure themselves against a statewide norm (exactly how the norm is calculated or how many users are included in the norm is unknown). These tools follow several recommendations made by the Center for Applied Special Technology (CAST), including recommendations to "show representations of progress (e.g., before and after photos, graphs and charts showing progress over time, process portfolios)" and "prompt learners to identify the type of feedback or advice that they are seeking."

Principle 3: Provide Multiple Means of Engagement

Student engagement is crucial and must be provided through a variety of means. Considering the importance of assessments and standards, all beneficial practices require student engagement to ensure success. Vendor 2's sampled lessons show minimal alignment between its standards mastery program and the third UDL guideline. Aggregate reviewer scores indicate that out of a possible 10 items that asked about Vendor 2's features that provide multiple means of engagement, only .78 (less than one item on average) was satisfied. This aggregate score indicates that Vendor 2's sample lessons offered few, if any, options for engagement.



Provide Options for Recruiting Interest



Only 4% of Vendor 2's sampled standards mastery program satisfied items related to guideline 7 on the UDL Scan Tool. While 4% represents minimal alignment with UDL guideline 7, the product did offer a ribbon system to captivate student interest. As discussed in guideline 6, Vendor 2's ribbon system shows students what they have mastered and, in this case, can enhance student interest by encouraging them to continue to collect and achieve ribbons. This is effectively a form of gameification—an instructional practice that has some merit in the research base.

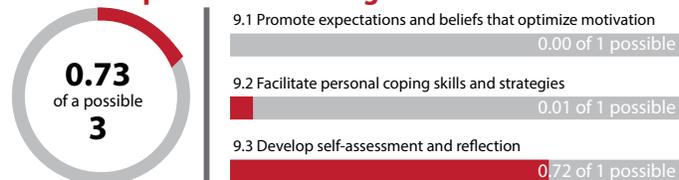
Provide Options for Sustaining Effort and Persistence



Fewer than 1% of items were satisfied when comparing UDL guideline 8 and Vendor 2's sampled standards mastery lessons, indicating there were essentially no options for sustaining student effort and persistence. Because Vendor 2 is primarily a review and preparation product, providing different ways of supporting and sustaining student persistence should be a focus. Online learning environments should provide a supportive structure for students lacking these skills, including offering a variety of demands and resources instead of a few. If the learning product does not promote and encourage persistence, students may disengage from the material.

One UDL-aligned way to accomplish this goal is to use “substantive and informative” feedback to complement the competitive and comparative nature of the ribbon system. Perhaps ongoing feedback from a teacher when a student works for a certain number of hours or days in a row (substantive) with a chart to note that continued and sustained practice (informative) would go as far as comparing the student to a statewide norm via the ribbon system. Because collaboration and community are important to sustaining student effort, Vendor 2 could consider ways in which to engage students with other online learners to create a community of support. The inclusion of additional mastery-oriented feedback would provide students support and encouragement in this area.

Provide Options for Self-Regulation



Principle 3 addresses how environments can extrinsically provide supports to students to help them engage with their learning. However, developing intrinsic motivation is important to the developing learner and is the aim of guideline 9. Reviewers indicated that 22% of items were satisfied when evaluating ways in which Vendor 2's sample aligned with this guideline. Supporting student motivation is a powerful component in their potential success. The same system used with the ribbon system can also be useful in teaching students how to look back at assessment data to narrow down what they need to work on to succeed. This emphasis on achievement and mastery can provide motivation to struggling students.

Vendor 3

Vendor 3 provides content for grades K-12 and operates a fully virtual high school. The vendor advertises its two major offerings as comprehensive courses and tutorials. Vendor 3's products are used for original credit, credit recovery, remediation, intervention, acceleration, and exam preparation. Advanced placement (AP) courses are offered for upper levels. Content is focused on state-specific standards and there is an emphasis on the multimedia components of the coursework.

Content and Grade-Level

Vendor 3 offers blended and fully virtual products for grades K-12. The standards-based digital curriculum includes math, science, English, social studies, world languages, and electives. A group of Career and Technical Education courses are also offered.

Content is divided into blended learning and virtual learning (fully online) and allows for schools to offer individual courses, supplement an existing curriculum, or create an entire virtual school.

Vendor 3 provides materials aligned to specific states assessments and reflects the standard state test in terminology, format, item types, etc. Test preparation products are also available.

Learning Model

Blended learning offerings include both digital courses and tutorials for use in enhancing brick-and-mortar classrooms. Vendor 3 offers fully virtual options, or specific courses can be used to fill gaps in the curriculum provided through other online schools. Full programs and specific courses can be used to help overcome teacher shortages, and provide alternatives to the traditional classroom experience.

Each product provides a personalized learning experience to support the individual learner. Students are encouraged to practice, apply, and confirm the materials they cover. The digital curriculum offers opt-in supports where students request feedback and benefit from ongoing support and guidance. Diagnostic assessments are built in to each course.

Vendor 3's virtual high school provides fully online content for high school students. Students have the option to enroll and begin courses at any time, offering additional flexibility. Full-time students can earn a high school diploma from Vendor 3.

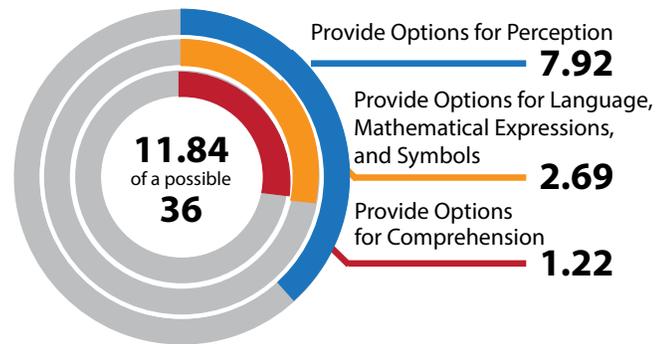
Standards Alignment

Vendor 3's products were developed for the Common Core State Standards (CCSS). Tutorials provide targeted support for meeting standards. Comprehensive digital courses designed for the CCSS are offered for high school students.

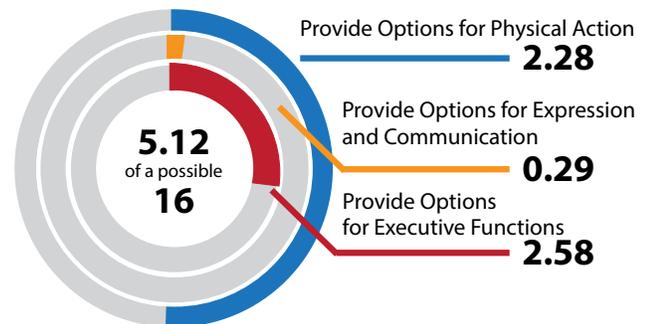
Professional development products provide schools with assistance in implementing the CCSS in both blended learning and virtual programs. Vendor 3 offers support for staff, teachers, and administrators to help address standards.

State-specific tutorials are offered in English and math. A Texas-specific digital curriculum is also available.

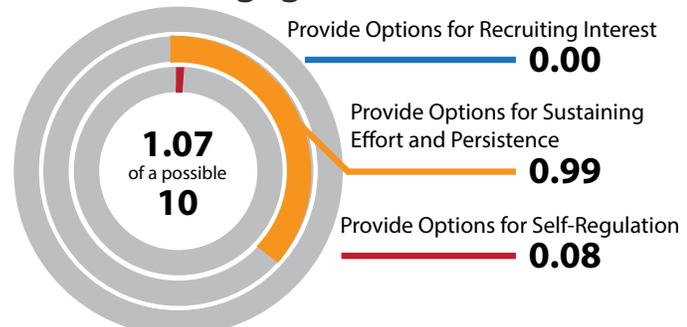
Principle 1: Provide Multiple Means of Representation



Principle 2: Provide Multiple Means of Action and Expression

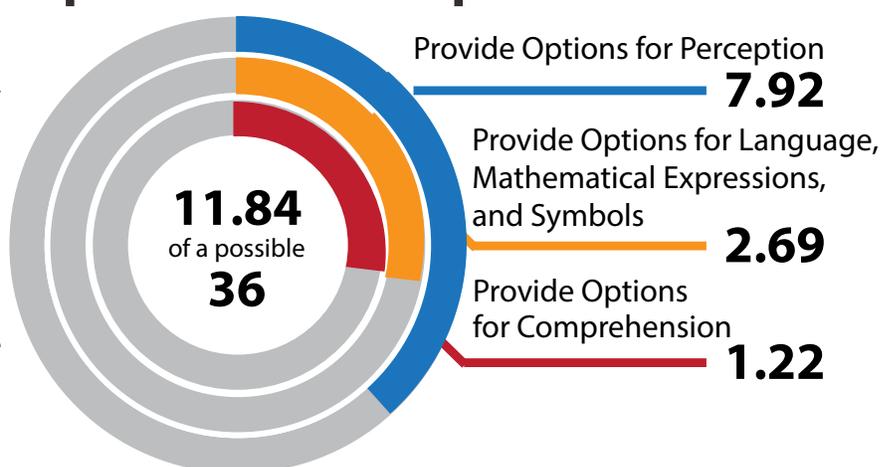


Principle 3: Provide Multiple Means of Engagement

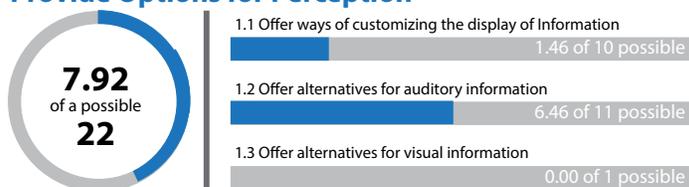


Principle 1: Provide Multiple Means of Representation

Districts and schools can choose from hundreds of products offered by Vendor 3 and purchase either a fully virtual school package or select individual courses and tutorials to create a blended learning program. If a district purchases the full course catalogue, students could be engaged in Vendor 3's program every day of the school year. As such, it would be important for Vendor 3 to offer easily accessible lessons. Vendor 3's sampled lessons (N=91) show more alignment with UDL guideline 1 than any other product sampled. Aggregate reviewer scores indicate that out of a possible 36 items that asked about Vendor 3's features that provide multiple means of representation, an average of 11.84 items were satisfied. This aggregate score indicates that about a third of Vendor 3's sample tended to contain features that would allow students to customize the way the content was represented.

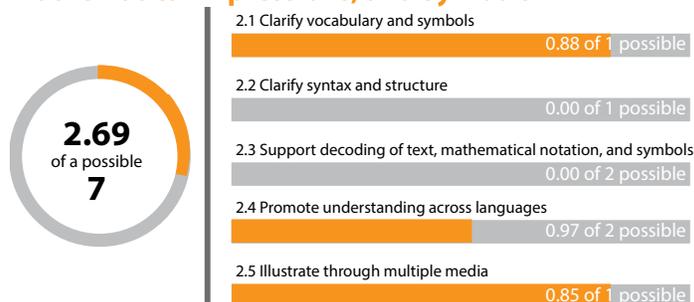


Provide Options for Perception



Reviewers discovered that 36% of items were satisfied when looking for ways in which Vendor 3's sample aligned with the first UDL guideline—giving students options for how they process the visual information in the lessons. One facet of visually displayed information is that it often represents complex relationships. Students lacking familiarity with how a relationship is represented graphically will not benefit from the display. In addition to providing a textual description of any given visual, content creators might provide audio cues to a student when a graphic is presented. For visually impaired students, it is critical that visual representations be accompanied by options for textual and auditory representations. Different choices in perception options will help the student understand that they can take what they have read, listened to, or watched, and see it represented another way (such as a diagram, graph, or animations). Cuing students' previous learning will help them see what they are learning currently represented in different forms.

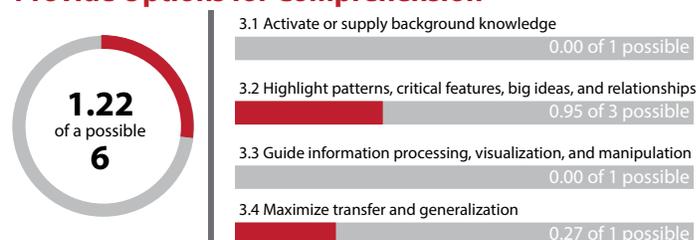
Provide Options for Language, Mathematical Expressions, and Symbols



Vendor 3's sample lessons satisfied 38% of items concerning guideline 2 on the UDL Scan Tool. One way Vendor 3 provides

students with options for language, mathematical expressions, and symbols (the main components of guideline 2) is through the use of diagrams. Curriculum aligned with the second guideline needs to clarify the structure of diagrams. As diagrams become more sophisticated and present more complex information, the curriculum needs to help students understand the structure of how the information is being presented. This will not only help students read the diagrams, but also help them construct their own diagrams in the future.

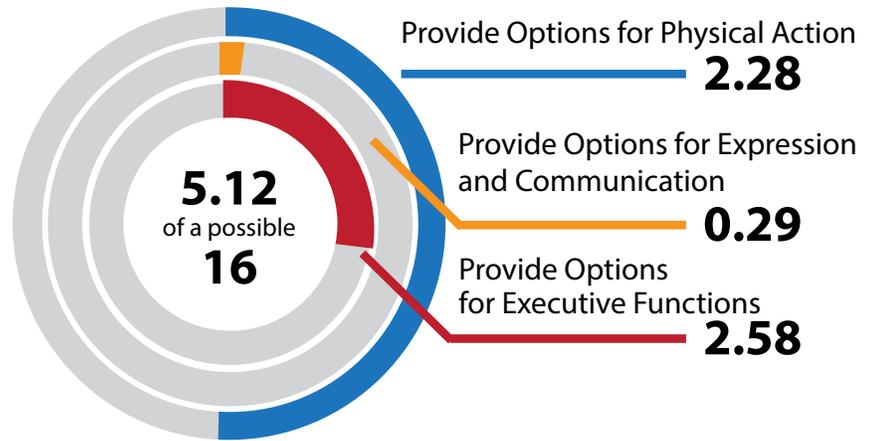
Provide Options for Comprehension



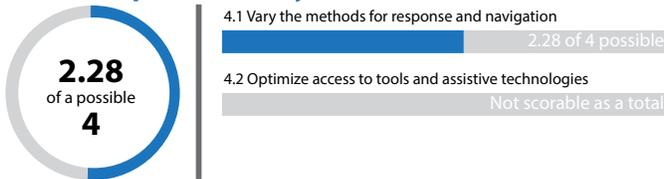
Within Vendor 3's sample lesson, reviewers' scores indicated that 20% of the sampled lessons satisfied items related to guideline 3 on the UDL Scan Tool. Reviewer scores indicated that Vendor 3's samples contained features that, to some extent, explicitly informed students when they were working with content that is key to understanding the core of the lesson. These options are far from comprehensive, however.

Principle 2: Provide Multiple Means of Action and Expression

Whether schools or districts choose to use Vendor 3 as a full-time, online program, or pick and choose from the hundreds of courses Vendor 3 offers, the degree to which options for action and expression are present should be taken into consideration. Vendor 3's sampled lessons show some alignment to the second UDL guideline. Aggregate reviewer scores indicate that out of a possible 16 items that asked about Vendor 3's features that provide multiple means of action and expression, an average of 5.12 items were satisfied. This aggregate score indicates that about a third of Vendor 3's sampled lessons contained the critical features that provided students with ways to act on and express the information they are learning through Vendor 3's products.

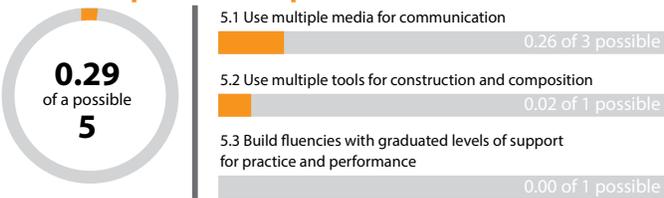


Provide Options for Physical Action



Vendor 3's sample lessons satisfied 57% of items concerning guideline 4 on the UDL Scan Tool. This score suggests Vendor 3's sampled lesson allows students to navigate the environment in multiple ways and provides students with options on how they respond physically to the curriculum. The learning environment is not limited to only mouse clicks or other repetitive motions but instead incorporates a number of other opportunities for physical interaction with the lessons.

Provide Options for Expression and Communication



Reviewers noted that a negligible number of items (less than 1%) were satisfied when comparing UDL guideline 5 and Vendor 3's sampled lessons, indicating they found essentially no options for student expression and communication. Teachers who are able to mold their curriculum to include social media platforms are creating an avenue for students to express themselves via technology that is specifically relevant to them and today's technological capabilities.

Discussion boards, online question and answer sessions, and increased support for interactive activities expand students' abilities to communicate and express themselves in an academic environment. Increased online access to instructors and support staff also increases students' opportunities for communication. These student-centric additions to the cur-

riculum would provide current, relevant, and familiar avenues for students to use for a variety of communications.

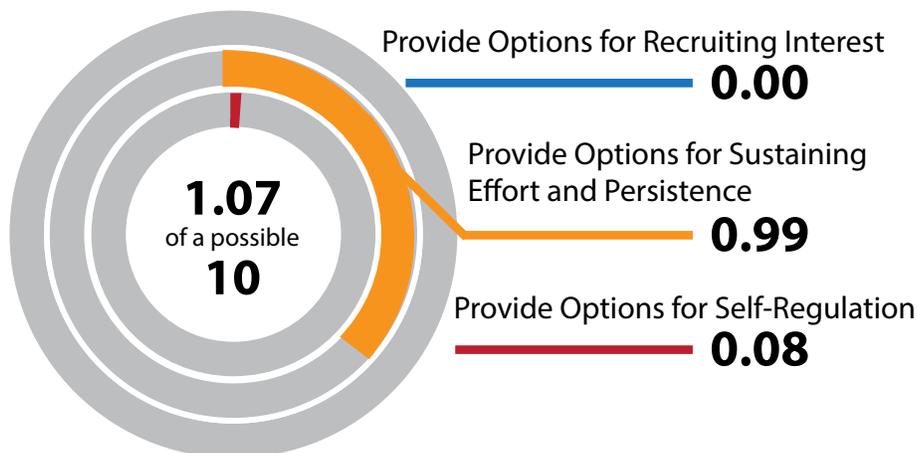
Provide Options for Executive Functions



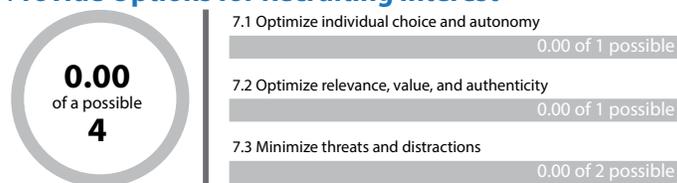
Concerning options for executive function, Vendor 3's sampled lessons satisfied 37% of items on the UDL Scan Tool relating to guideline 6. While Vendor 3 satisfied about a third of the items on the UDL Scan Tool that aligned with guideline 6, there are several implements that could improve its score. For example, providing checklists for project planning is a good strategy to implement UDL-aligned features. Project planning encourages goal-setting, strategy development, information management, and progress monitoring. These activities not only benefit students in the classroom, they also provide real world applications for students.

Principle 3: Provide Multiple Means of Engagement

Vendor 3's sampled lessons show minimal alignment with the third UDL guideline. Aggregate reviewer scores indicate that out of a possible 10 items that asked about Vendor 3's features that provide multiple means of engagement, only 11% were satisfied. This aggregate score indicates that Vendor 3's sample lessons offered few, if any, options for engagement.



Provide Options for Recruiting Interest



Reviewers found no alignment (0%) between Vendor 3's sampled lessons and the seventh UDL guideline. No alignment indicates that students have no choices or autonomy in selecting what they learn. Individual student differences, interests, strengths, weaknesses, and preferences must be considered. Because Vendor 3 is delivered online, students could greatly benefit from being allowed (and encouraged) to use the Internet more broadly to incorporate their own interests.

There is not one best way to engage and motivate all of the students in an individual class. Because of the variety of Internet-based options available to students, it is possible to offer students options to explore their own interests. Offering different options for individualized exploration can be an excellent way to engage students, and can be more effective than relying on a packaged, inflexible curriculum.

Students should be allowed to help design some of their own learning activities. These activities can range from assessments for which the students create rubrics to activities for which students may choose the medium they prefer to use to express themselves.

Provide Options for Sustaining Effort and Persistence

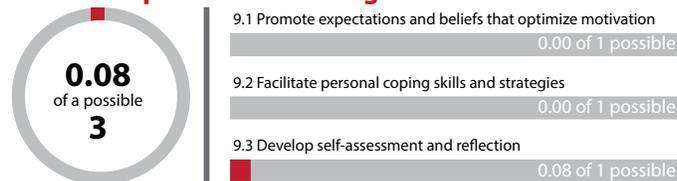


Vendor 3's sample lessons satisfied 33% of items concerning guideline 8 on the UDL Scan Tool. These guidelines address highlighting the value of goals and objectives, varying

demands and resources to maintain a challenging learning environment, increasing mastery-oriented feedback, and encouraging collaboration and community in the learning environment.

Part of satisfying the need for fostering collaboration could include the creation of a community to help students engage continually with their coursework. This community could offer assistance to students in the form of feedback or collaboration during the course of the schoolwork. With social media, online document collaboration, message boards, comment threads, etc., most online products employ communication tools with which students are already familiar.

Provide Options for Self-Regulation



Reviewers noted an insignificant number of items (less than 1%) were satisfied when evaluating Vendor 3 for features that aligned with UDL guideline 9. According to the creators of UDL, Principle 3 is about creating "purposeful, motivated learners."

To address weak scores in guidelines 7 and 9, Vendor 3 could implement additional features to foster and encourage motivated, self-regulating learners.

Vendor 4

Vendor 4 offers math and science online manipulatives designed to help users visually perceive scientific and mathematical concepts. The interactive digital experience, while similar to a traditional science lab experience, allows students and their teachers to run the same activity repeatedly to alter or change variables that affect the overall experience.

Content and Grade-Level

Vendor 4 focuses on mathematics and science. Within math and science, hundreds of items cover topics designed for grade levels 3-12. Grade levels are grouped in grades 3-5, 6-8, and 9-12, which translates to elementary, middle, and high school, depending on the user's district.

When selecting content by grade level, users first choose math or science and the appropriate grade-level group. In math, users can select from numbers and operations, algebra, geometry, measurement, and data analysis and probability. Each of these topics appears in every grade level group. In science, within the same grade level groups, students may choose from life, physical, and earth and space science in the early grades, then from the more advanced disciplines of biology, physics, and chemistry in the 9-12 grade group.

Vendor 4 offers a number of manipulatives that are correlated to commonly used textbooks. Users select specific math or science textbooks and the manipulative that aligns with the textbook content. Users may search by publisher, grade level, and the textbook title. The Vendor reports alignment with more than 300 textbooks produced by major academic publishers.

Learning Model

Vendor 4's products are supplementary and typically used in a blended learning experience where the main concepts of the math and science lessons are taught in class before students use the supplementary products to help them further explore the scientific or mathematical concepts they are studying.

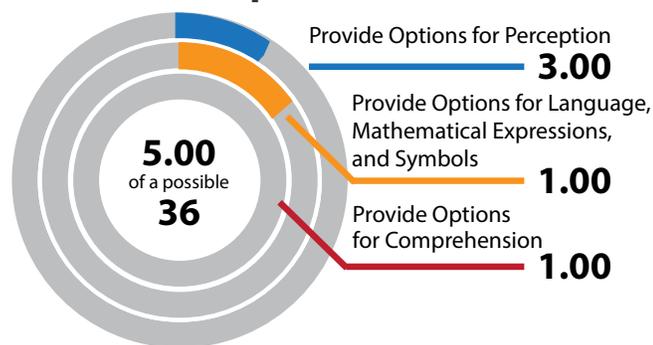
Vendor 4 is solely online-based, and provides an accompanying printout for teachers and students (e.g., lesson plan, vocabulary, worksheet).

Standards Alignment

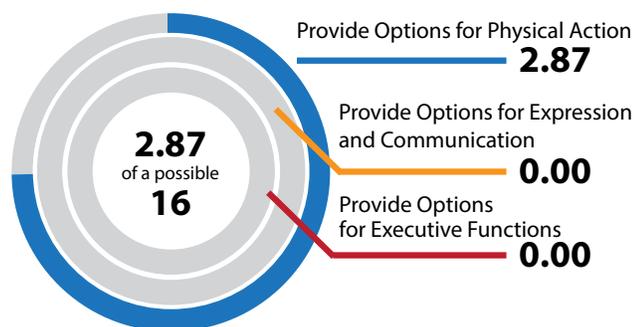
Vendor 4 is aligned to the Common Core State Standards (CCSS), state standards, and the Next Generation Science Standards (NGSS). For non-American users, the products also align with curricula from Australia, the United Kingdom, and Canada.

NGSS are aligned with material in grades 3-5, and middle and high school. Curriculum standards by state standards are organized similarly to the CCSS standards and the NGSS. Vendor 4 offers a series of professional learning opportunities for teachers to learn to use the products in association with CCSS or NGSS.

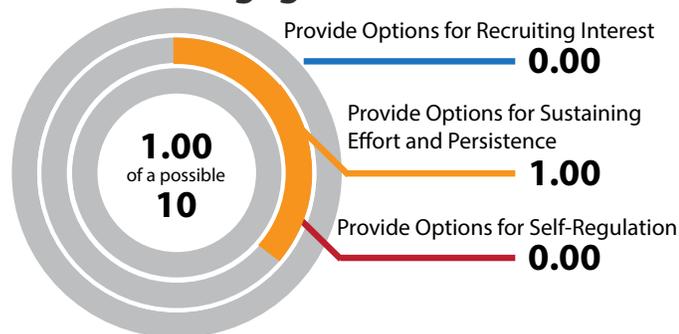
Principle 1: Provide Multiple Means of Representation



Principle 2: Provide Multiple Means of Action and Expression

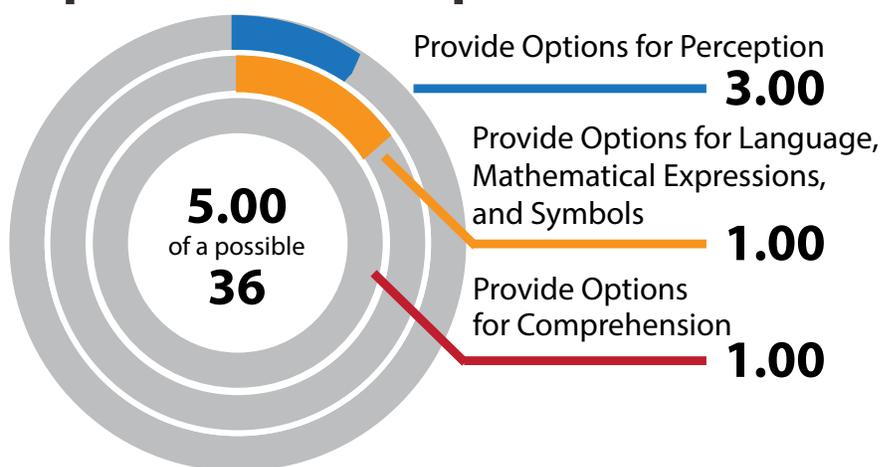


Principle 3: Provide Multiple Means of Engagement

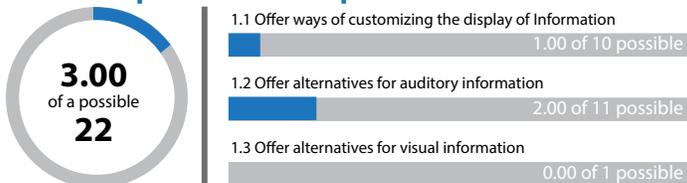


Principle 1: Provide Multiple Means of Representation

Targeting math and science content, Vendor 4 serves as a supplemental product for the blended classroom. While available to the fully online student, Vendor 4's primary audience are brick-and-mortar classroom students who are in need of supports, further practice, and enrichment in math and science. While the vendor claims an interactive learning experience rich with manipulatives, the analysis of 87 lessons shows a limited alignment to the essential elements of UDL principle 1. Scoring 5 out of a possible 36 indicates a very limited approach in offering varied ways to approach the learning content, suggesting an over-reliance on printed text instead of the video and audio supports often necessary for the struggling learner. This aggregate score of 5 indicates that Vendor 4's sample did not contain features that would allow students to customize the way the content was represented.

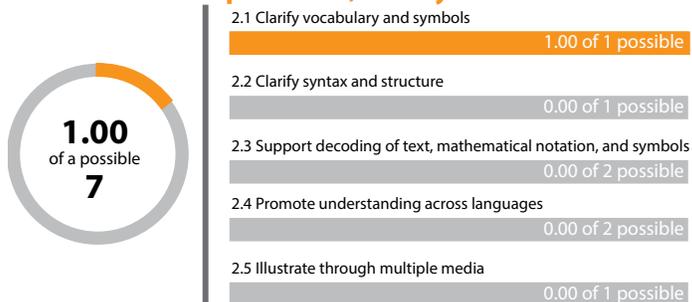


Provide Options for Perception



Reviewers found that only 13% of items were satisfied when looking for ways in which Vendor 4's sample aligned with the first UDL guideline. This guideline promotes enhancing the perception of information and reducing barriers to the information. Findings suggest that few opportunities are present for the user to customize how information is provided, thus limiting how the student can interact with the manipulative or similar content element. The score is of particular concern in the area of symbols, numbers, and the overall visual representation of materials. It may be difficult for students to understand the relationship between the content and subsequent application.

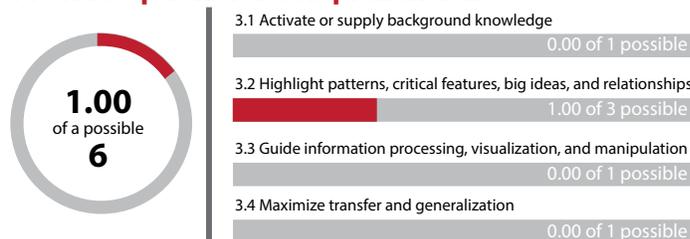
Provide Options for Language, Mathematical Expressions, and Symbols



A score of 1 out of 7 possible points (14%) suggests very limited alignment in an area where one might expect a strong connection. Given Vendor 4's emphasis on math and the complexity that numbers and mathematical symbols present, the Vendor should provide multiple ways to clarify mathematical notations or the relationship between text/symbols and meaning. Struggling learners often find the rules and structure of combined elements (e.g., symbols and text) complex. The change in meaning may be lost—the language of the

mathematical process confuses the learner, limiting their ability to move forward with the equation or problem. Clarifying these relationships by using a combination of symbols with text and further visuals or breaking the problem down into segments are effective ways to apply the multiple means for representation sought in guideline 2.

Provide Options for Comprehension

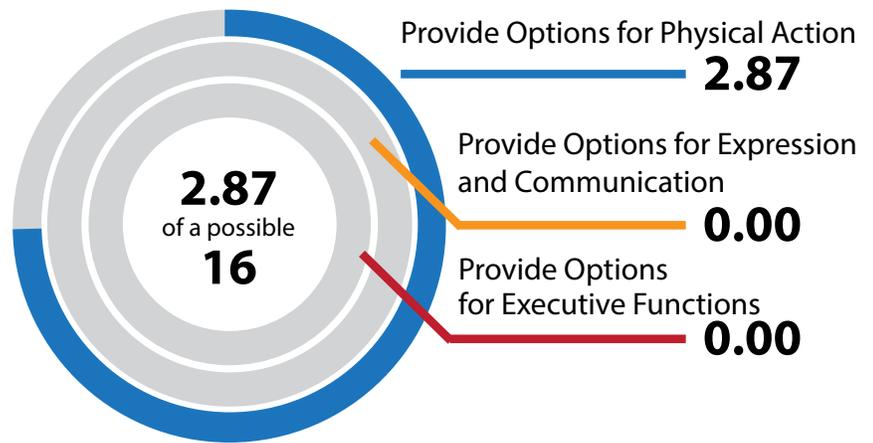


Students with disabilities struggle to distinguish between what is critical and what is unimportant. This challenge requires highlights or supports that emphasize key elements in a word problem, a science lab exercise, a diagram, a theorem, or a formula. Vendor 4's score of over 30% for the lessons reviewed indicates a degree of alignment with this guideline. Yet, there are indications that there are insufficient meta-cognitive strategies embedded to allow struggling students the ability to better summarize, categorize, or prioritize relevant information. Findings suggest a lack of explicit prompts or options to further organize and guide new information for subsequent understanding.

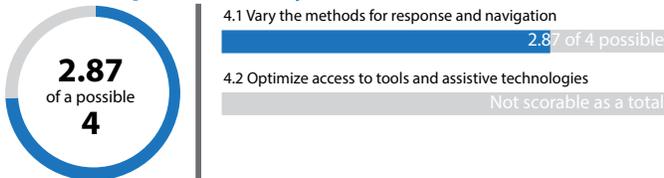
Principle 2: Provide Multiple Means of Action and Expression

Simulations can help demonstrate a complex concept during a single classroom session. This is a useful tool for students with reading difficulties as these simulations replace a textbook chapter or chapters, or other reading materials.

Vendor 4 gives its users limited options in terms of interacting with and navigating these manipulatives. Reviewers considered the lesson sample from Vendor 4 (n=87) as it aligned with the second principle of UDL. The reviewers concluded that only 17.9% of items were applicable to this sample. Reviewers concluded that Vendor 4 lessons from this sample did not align to the second UDL guideline.

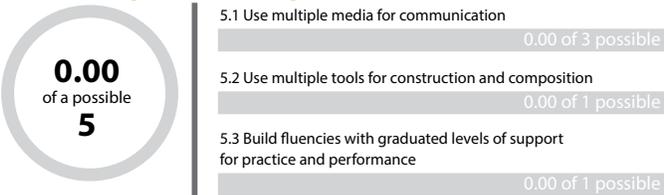


Provide Options for Physical Action



Reviewers found that 71.7% of items on the UDL Scan Tool were satisfied when comparing Vendor 4’s sample simulations to the fourth guideline of UDL. Product 4’s simulations have users extend angles and change rates of rotation and revolution by sliding digital levers to the left and right; users can “drop” marbles of different colors into a bag to learn about how probability changes. While a 71.7% alignment score indicates some accessibility, all of these motor actions—dragging, sliding, clicking, and dropping—revolve around a mouse click. Additional options for interaction would improve the score.

Provide Options for Expression and Communication

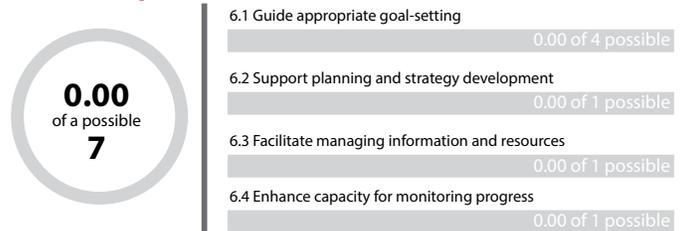


Students should be encouraged to use alternatives to overcome any media-specific barriers they might have. However, reviewers found no alignment between Vendor 4’s sample and the fifth guideline of UDL, assigning it a score of 0 out of a possible 5. The developers of Vendor 4’s product could improve its alignment with the fifth UDL guideline by providing users with tools such as dictation software, unique sentence patterns or prompts, and graphic organizational tools which would allow users to approach expression according to their preferences. Currently, the product requires learners to use a standard keyboard.

The inclusion of standard communication options, such as a discussion board or forum, would improve options for expres-

sion and communication. In addition, incorporating technology including voice commands, gaming controls, touchscreens, etc., would offer a variety of opportunities for expression and communication far beyond the current, limiting use of a computer keyboard.

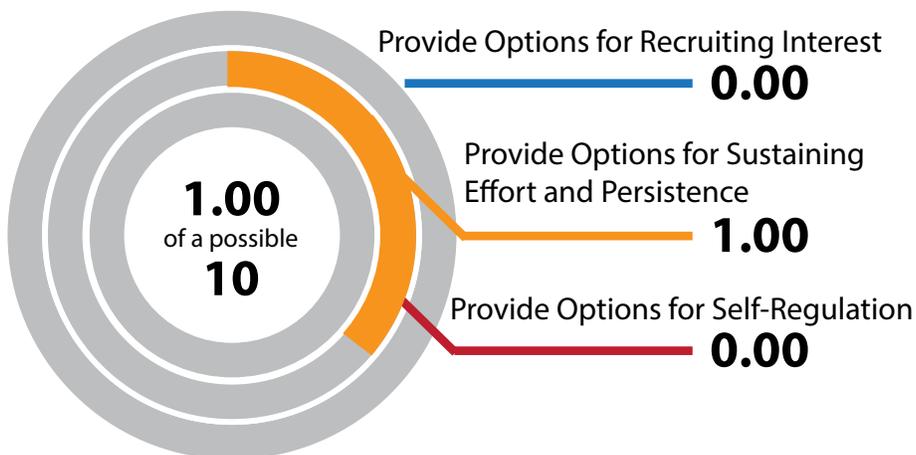
Provide Options for Executive Functions



No alignment was found with Vendor 4’s features that assist students with executive functioning. A score of 0 was assigned by reviewers to the sample, indicating they found no tools that would supplement student goal setting and task management, common skills that fall under the umbrella of executive functioning. Having skills associated with executive functioning constantly reinforced throughout lessons or curricula can help students strengthen long-term goal setting. This is especially important in online learning where learners are often working independently and/or remotely. Vendor 4’s simulations could use built-in breaks from learning—a time where the computer pauses the lesson and asks the student to stop and think about what he or she has learned. This is a UDL-aligned way of promoting executive functioning supports.

Principle 3: Provide Multiple Means of Engagement

Engagement and student motivation represents an essential part of learning—student engagement may be one of the primary factors in improving student outcomes across grade and content area. Digital learning has increasingly been touted as a way to successfully engage students. Vendor 4's sampled lessons indicate very limited alignment with the third UDL principle, scoring a 1 out of possible 10 points. Considering the supplemental nature of the math and science product and how the vendor claims to extend learning through an interactive learning environment, this low score would suggest that there are limited options for engaging students.

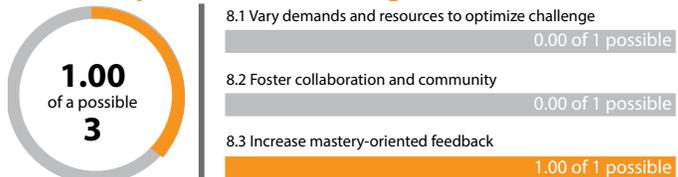


Provide Options for Recruiting Interest



Review of Vendor 4's sampled lessons found no alignment (0%) for guideline 7. Providing learners with a choice in the type of rewards or recognition they could receive upon completion of a task, or a choice in the sequence or timing of completion of a set of tasks can heighten learner interest. Similarly, personalizing an experience where activities are designed to be authentic to the learner and where the participant is active in their exploration can further engage student interest. A 0 out of 4 score implies a structured experience where activities have limited value to learner interest, with nominal self-reflection. Activities and tasks might also be limited in offering opportunities for exploration and experimentation, decreasing the relevance and value to the learner. Variance in the activity, sensory stimuli, pace of work, and length of the assigned task are key factors in optimizing student interest.

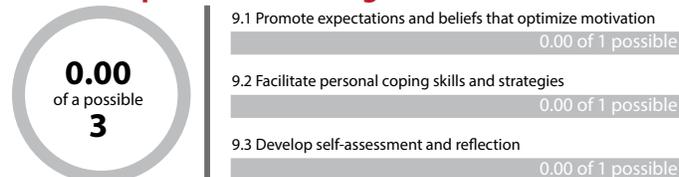
Provide Options for Sustaining Effort and Persistence



Relevant feedback can be productive in sustaining interest in an assigned task. Vendor 4 scored well in offering supports that encourage perseverance. In the math and science supplemental resources, the vendor embedded feedback elements that appear to be frequent, timely, and specific to the task at hand. This feedback was extended through guiding supports that modeled patterns of success, reinforcing pathways and

behaviors that lead to correct answers and successful completion of the content. There were also indications that some of the strategies introduced might be transferable to promote further persistence on the part of the student.

Provide Options for Self-Regulation



Vendor 4's score of 0 for UDL guideline 9 indicates poor alignment to self-regulation development. For struggling learners and those with disabilities, the ability to develop self-regulatory skills— independent of external supports—is challenging. Vendor 4's ability to promote expectation and foster motivation and persistence was not evident to reviewers. For blended and fully online work, individuals are expected to work (to a degree) independently with the digital lesson and related materials. Students would be expected to manage any of their own frustration or inattention as they proceed through the lesson. Controlling for external distractions or reducing anxiety that might be caused from the lesson expectation is also critical to students' success.

Vendor 5

Vendor 5 is a provider of both (fully online) school and individual courses. Vendor 5 is accredited by AdvancED, the Northwest Accreditation Commission, and several other accrediting institutions. The products may be used with teacher support or for independent study. Vendor 5's products are intended for fully online use, independent, or face-to-face learning.

Content and Grade-Level

Vendor 5 serves grades K-8 and high school students. K-8 course offerings include English language arts, history, math, science, music, art, and world languages. The high school products include more than 150 courses in English, mathematics, science, history and social sciences, and world languages. Additional courses are offered under career technical education and technology and computer science. Summer school courses and a wide variety of electives are also available. The vendor also offers their own series of textbooks and a reading kit.

Vendor 5 uses a traditional hierarchy beginning with subject, course, and unit, and concludes with lessons. The number of lessons varies by the unit selected.

Learning Model

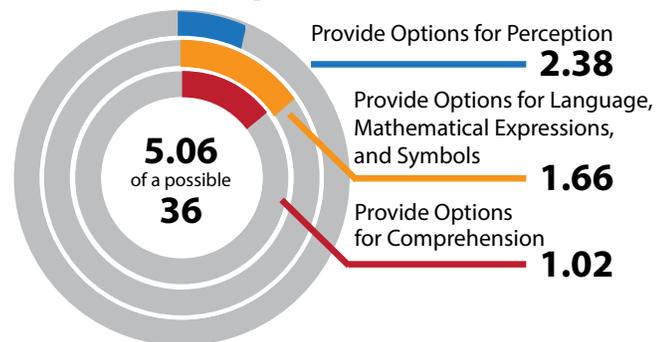
The content allows both public and private institutions to create fully online virtual schools. Under this model, students take all classes online from their home, library, or any other facility with an Internet connection. Online coursework is enhanced with specialized textbooks, CDs, videos, and materials to support hands-on experiments.

The vendor has one of the largest numbers of courses offered by the vendors surveyed for this report, stating they offer more than 450 "highly interactive online simulations" for grades 3-12. In addition to their high school and K-8 programs, Vendor 5 offers AP and honors courses, and technology-focused courses in specific programming languages, website design, and digital art. The summer program may be taken as a standard course or for credit recovery.

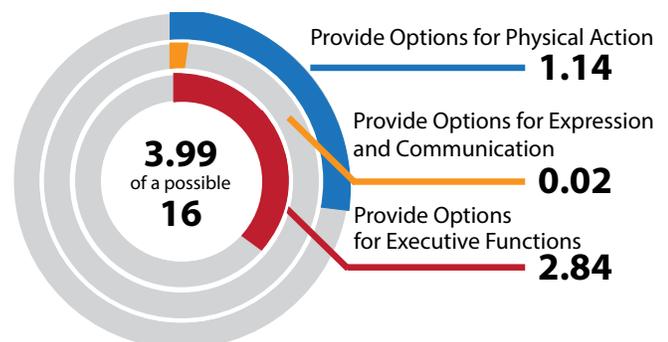
Standards Alignment

Vendor 5's products are aligned with the Common Core State Standards (CCSS) in grades K-12, across the four primary content areas. The vendor's website notes, "State standards are adhered to, with required attendance, standardized testing, and rigorous assessments." Vendor 5 also employs a tablet-friendly collection of education models aligned with state and Common Core standards in math, reading, social studies, and science for grades 1-12.

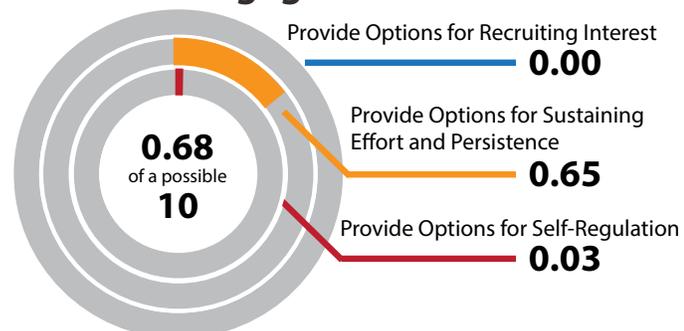
Principle 1: Provide Multiple Means of Representation



Principle 2: Provide Multiple Means of Action and Expression

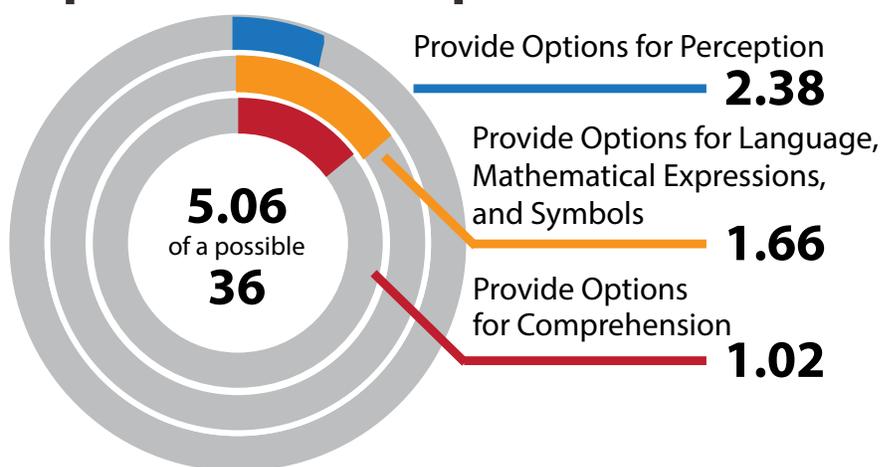


Principle 3: Provide Multiple Means of Engagement

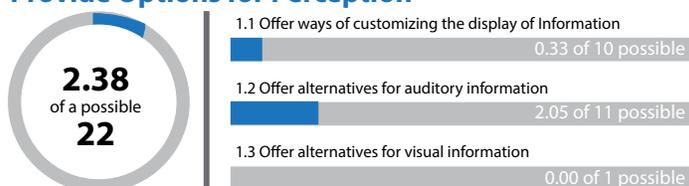


Principle 1: Provide Multiple Means of Representation

Vendor 5's sampled lessons (N=182) show meager alignment with the first UDL guideline. Aggregate reviewer scores indicate that out of a possible 36 items that asked about Vendor 5's features that provide multiple means of representation, an average of 5.06 items were satisfied. This aggregate score indicates that Vendor 5's sampled lessons had few options for providing students with ways to represent the curriculum they are learning.

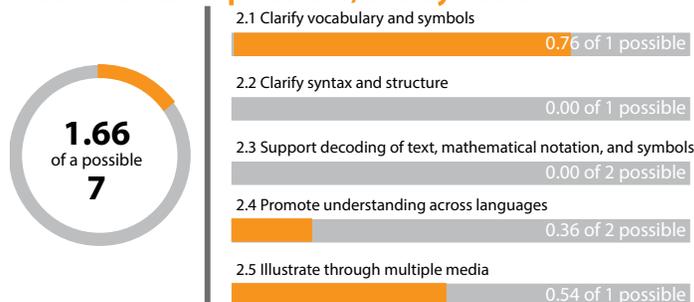


Provide Options for Perception



Reviewers discovered that only 11% of items were satisfied when looking for ways in which Vendor 5's sample aligned with the first UDL guideline. Having few means to customize the display of information was a factor in the vendor's low score. Curriculum developers should address that, just as students are able to organize their desks and binders appropriately for their needs, they should also have some control over the customization of the tools they use to learn. Having customizable information involves being able to customize more than just text. True customization may mean that students are able to control the speed of animations used in learning, the volume of audio information and the rate at which it is narrated, and control over the visual layout (including size, color, fonts, etc.) of all of the elements they are using to learn. Including alternate visual and audio choices would also improve the scope of perception options.

Provide Options for Language, Mathematical Expressions, and Symbols

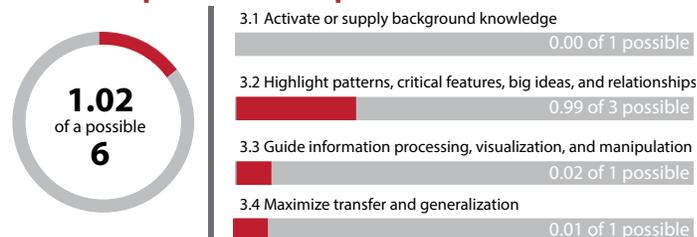


The UDL Scan Tool revealed little alignment between Vendor 5's curriculum and the second UDL guideline. Reviewers' scores indicated that only 28% of items were satisfied. Reviewers noted the sampled lessons contain some hyper-

linked words that allow students to define the words within the context of the lesson without navigating away from the lesson. Not all words can be defined by following the link, but those that are connected to the lesson's theme can be found either as a hyperlink or by accessing a glossary and browsing through all the entries found there.

Expressions for mathematical and symbolic expressions could also be improved by offering more choices for students to access and create not only language, but math and symbol options as well.

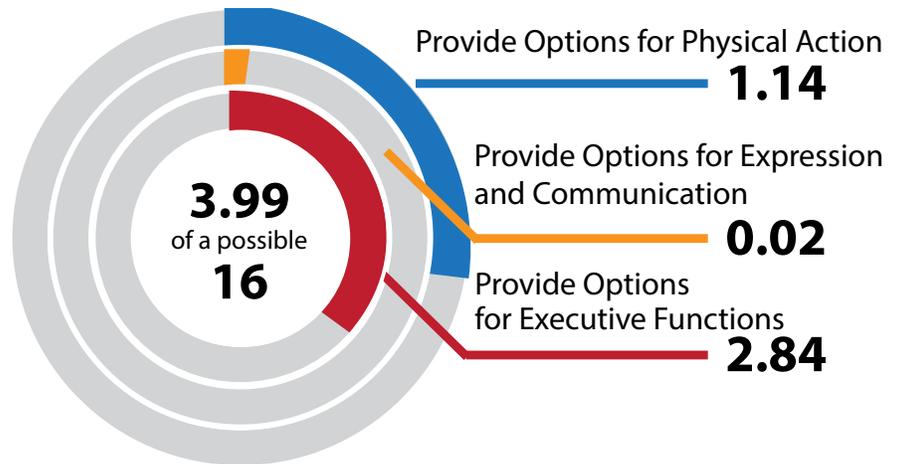
Provide Options for Comprehension



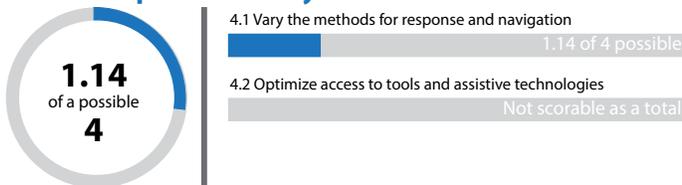
Vendor 5's sample lessons satisfied 17% of items concerning guideline 3 on the UDL Scan Tool. Part of assisting students with comprehension is supplying examples and non-examples related to a concept, which would have increased Vendor 5's score. Explicitly directing students to examples of new content can help them comprehend the information from secondary or supporting information, which becomes more relevant once comprehension of the basic idea is achieved.

Principle 2: Provide Multiple Means of Action and Expression

Vendor 5's sampled lessons show an insubstantial alignment with the second UDL guideline. Aggregate reviewer scores indicate that out of a possible 16 items that asked about Vendor 5's features that provide multiple means of action or expression, an average of 3.99 items were satisfied. This aggregate score indicates that Vendor 5's sampled lessons offered limited means of action and expression.



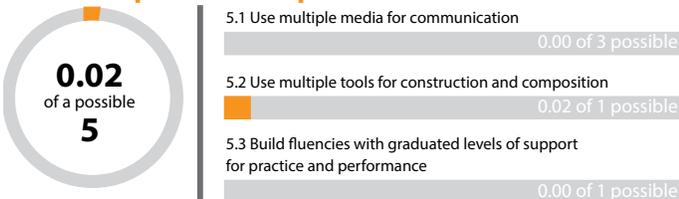
Provide Options for Physical Action



Reviewers discovered that 29% of items were satisfied when looking for ways in which Vendor 5's sample aligned with the fourth UDL guideline. When an environment primarily makes use of keyboard and mouse commands, the student should have the option of using keyboard shortcuts instead of using the mouse. Reviewers did not find any of these customization options within Vendor 5's sampled lessons. Students with motor difficulties might have a disadvantage in an environment where a mouse is used extensively. Keyboard shortcuts (with a supplementary tutorial and help system) should be included to remind students that these options exist and that they are customizable.

Other technologies could be employed to provide additional physical action options. Such technology could include the use of joysticks and other gaming-style hardware, touch screens (including the use of a writing stylus), and voice commands. These options would enhance the physical action choices for students with differing levels of physical abilities.

Provide Options for Expression and Communication



Reviewers noted that less than 1% of items were satisfied when comparing UDL guideline 5 and Vendor 5's sampled lessons, indicating they found practically no options for student expression and communication. This low score is concerning because students often differ in how they best express and communicate their ideas, questions, and difficulties. Online

environments, as they become increasingly sophisticated, should incorporate differentiation. Teachers can provide the use of different learning strategies by using dictation software, graphic organizers, and sentence prompts and starters when beginning a composition. Students should have the opportunities to express themselves verbally, in writing, and through graphic or video channels.

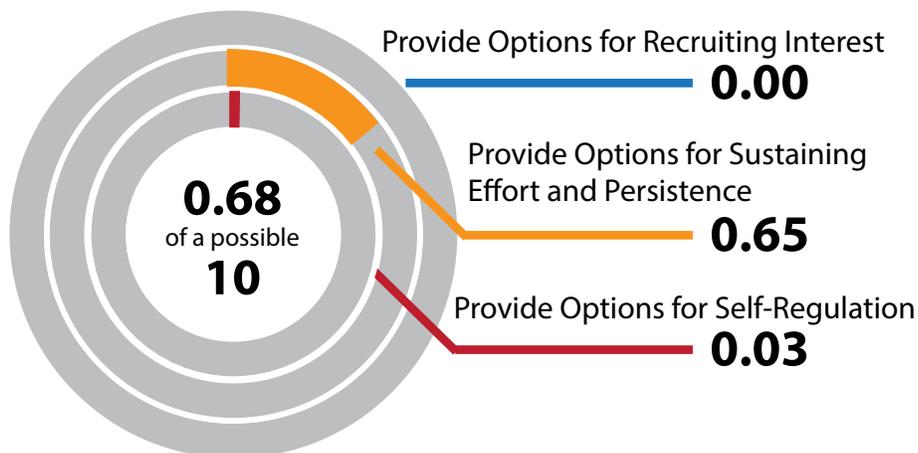
Provide Options for Executive Functions



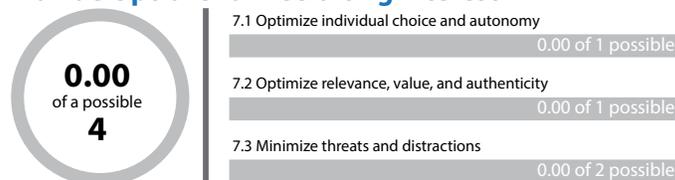
Within Vendor 5's sample lessons, reviewers' scores indicated that 41% of sampled lessons satisfied items related to guideline 6 on the UDL Scan Tool. This score satisfied more items because it had two key features: lesson objectives were provided at the beginning of each lesson, and a unit outline was present throughout the sampled lessons. As students begin each lesson, they can see which skills they need to develop. The unit outline is also provided at the beginning of each lesson and can be accessed at any time during the lesson, giving students a sense of where they are in regard to the larger picture of a particular unit.

Principle 3: Provide Multiple Means of Engagement

Vendor 5's sampled lessons show a tenuous alignment with the third UDL guideline. Aggregate reviewer scores indicate that out of a possible 10 items that asked about Vendor 5's product features that provide multiple means of engagement, an average of .68 items were satisfied. This aggregate score indicates that Vendor 5's sample lessons do not provide adequate options for students to engage with the materials.

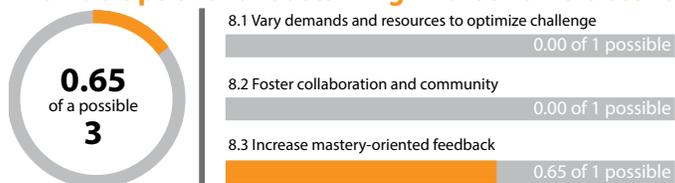


Provide Options for Recruiting Interest



Reviewers found no alignment (0%) between Vendor 5's sampled lessons and the seventh UDL guideline. No alignment indicates that students have no choices or autonomy in selecting what they learn. This score is unsurprising, as Vendor 5 provides entirely prepackaged courses. While this is convenient from a purchasing and organization standpoint, its packaged nature means that students must work with only what they are provided instead of being able to explore outside options.

Provide Options for Sustaining Effort and Persistence

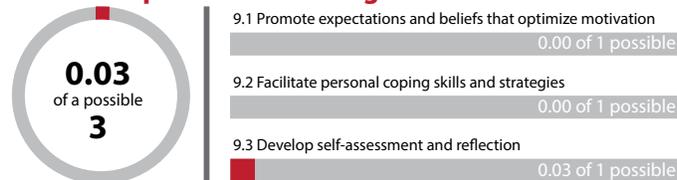


The UDL Scan Tool revealed marginal alignment between Vendor 5's curriculum and UDL guideline 8. Reviewers' scores indicated that only 22% of items were satisfied. This score indicates that Vendor 5's products lacked important goals and meaningful objectives, items which help inspire students to make progress and move forward. Also lacking are varying demands and resources to challenge users continually, opportunities for collaboration and community building, and mastery-oriented feedback. The product is largely "hands off" in terms of fostering student engagement. This may be problematic as many students require direct support to remain interested in and progress through a course or program.

Addressing the above issues would require deviation from the one-size-fits-all nature of prepackaged programs. Adding goals and objectives to lessons and creating unique levels of

demands could engage learners more actively. Providing options for dialogue between students and teachers—as well as with other students—creates meaningful engagements that help keep students motivated and on track.

Provide Options for Self-Regulation



Reviewers noted that less than 1% of items were satisfied when comparing UDL guideline 9 and Vendor 5's sampled standards mastery program, indicating they found practically no options for self-regulation. When students are presented with a subject, they often bring pre-existing anxiety to the lesson. A student who struggles in math might bring anxiety to the beginning of a new math unit. To lessen this effect, online learning systems need to reinforce personal coping skills. Personal coping skills are tied to self-regulatory skills, which are improved through the use of modeling strategies for coping with anxiety and emotional responses to school. Online environments could provide a checklist of these strategies and encourage students to reference them when they score poorly on a quiz or log back into the program after an extended absence.

Vendor 6

Vendor 6 serves as an online Learning Management System (LMS) that is compatible with many learning products commonly used in K-12 classes. Vendor 6 acts as both the classroom itself and the records management system used to assign material and track, grade, and analyze student performance. A major focus of Vendor 6's products is on improving student performance on assessments. A significant feature of this product is that the LMS may be accessed by students, parents, teachers, and administrators.

Content and Grade-Level

Vendor 6 offers K-12 content and has the potential to be used both as a fully online or blended learning resource.

Subject areas include mathematics, literacy, health and science, social studies and history, arts and music, technology, and English, with additional curriculum areas available, though with fewer options than the core subjects. Honors and higher education materials are offered in limited categories. Vendor 6 focuses on materials meeting the standards for individual states.

Learning Model

For use as a fully online resource, educators must also purchase Vendor 6's materials offering a full course load of subjects, divided by grade level. The vendor's own textbooks are commonly used in classrooms as the main educational resource and assessment provider. These products—text, assessment materials, teacher text, and activities—are all digitized and available online.

In addition to K-12 content, Vendor 6 offers products for pre-K students, ELL (English learners) from grade school through high school, career and technical education products, and a group of College and Career Readiness programs.

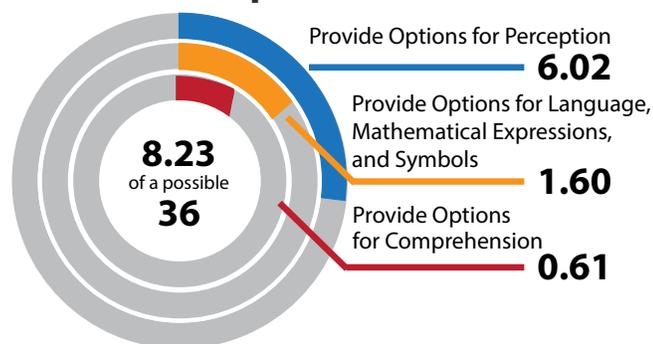
Standards Alignment

Vendor 6 provides K-12 math and English language arts materials that are aligned to the Common Core State Standards (CCSS). A specific math curriculum, built around CCSS, is available for grades K-6.

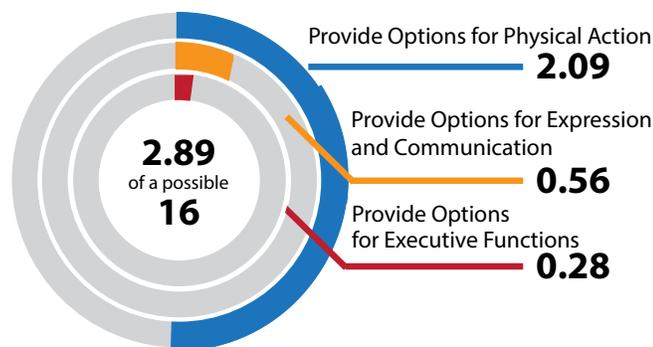
Vendor 6 offers support for preparing teachers to understand and address Common Core and Next Generation Science Standards in their educational materials and instruction methods.

The vendor offers some state-specific programs for which they create texts and materials, although it is unclear whether these are available specifically through this product.

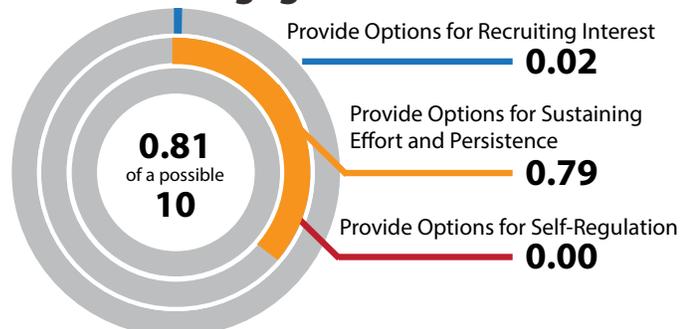
Principle 1: Provide Multiple Means of Representation



Principle 2: Provide Multiple Means of Action and Expression

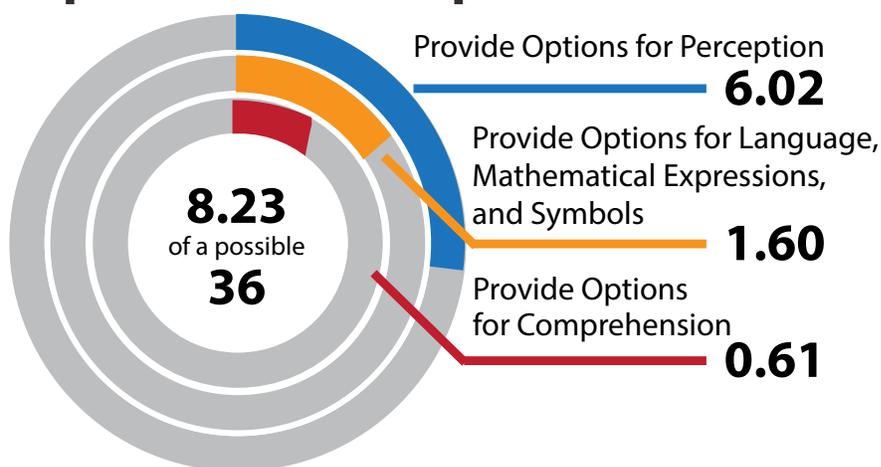


Principle 3: Provide Multiple Means of Engagement

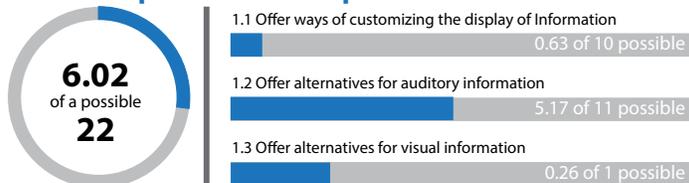


Principle 1: Provide Multiple Means of Representation

Vendor 6 offers a complete digital curriculum for grades K-12. The product also serves as a learning management system (LMS), providing not only curriculum, but also assessment, planning, and tracking features. The instruction is marketed as personalized and customizable. Vendor 6's sampled lessons (N=169), however, reflect a lack of opportunities for multiple means of representations and was scored by reviewers at 8.23. This score is of particular concern because Vendor 6 offers a complete, fully online package. Students work independently with limited teacher-directed instruction. The low score for UDL guideline 1 indicates very limited options for language or cultural differences and most likely that a singular approach is offered to the content and lesson completion.



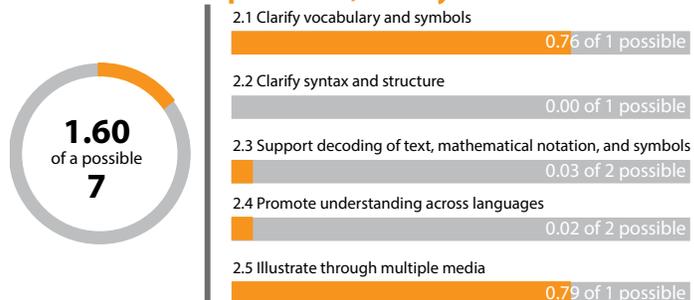
Provide Options for Perception



Guideline 1 represented the majority of points (6.02 out of a possible 22) awarded under principle 1. As with other vendors, it is highly likely that the score is indicative of accessibility alignment, attesting to adherence to accessibility standards and federal requirements rather than the vendor's efforts to align to the learning needs outlined in the UDL. Review of subsequent guidelines (where limited scores indicate extremely limited connection between the product and UDL) support this determination.

Reviewers found that Vendor 6 relies heavily on video and e-texts, formats that can limit perception options for students who struggle with video and/or audio representations of information. Because the curriculum and lessons are pre-packaged, students are provided with few options in terms of overcoming medium-specific barriers or for customizing the materials for their own needs. Expanding support materials to include alternatives such as charts, graphs, and audio translations of visual materials would benefit students who have difficulty obtaining information from certain specific mediums.

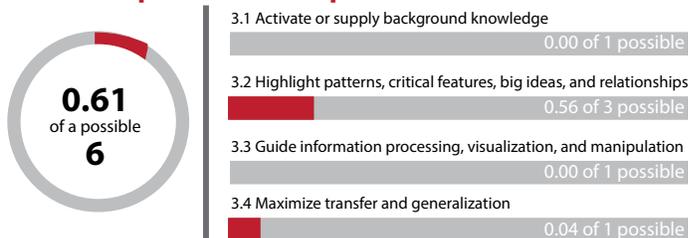
Provide Options for Language, Mathematical Expressions, and Symbols



Vendor 6 earned a score of 1.60 for guideline 2. While instructors and administrators have some options in terms of select-

ing content, grade level, and specific courses from this vendor, options for students are limited when it comes to choosing different forms of receiving and expressing information learned. The score indicates that only very limited alternatives for language, mathematical expression, or symbols existed in the lessons reviewed. Vendor 6 presents key concepts across grade and content areas in a number of forms, allowing for multiple representation options and alternative forms of access and understanding. However, the review indicates very limited support in promoting understanding across the demands of language and in the decoding of text and symbols.

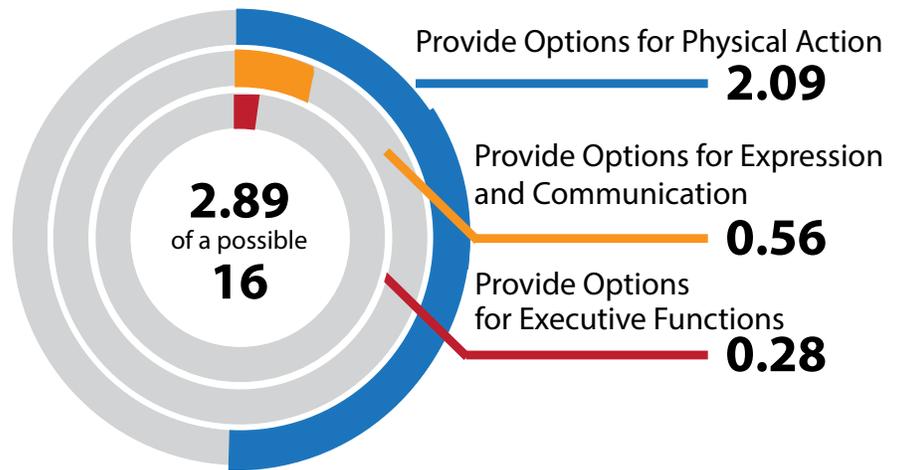
Provide Options for Comprehension



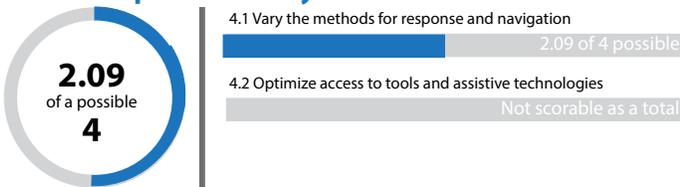
The UDL Scan Tool showed almost no (.61) alignment between Vendor 6's product and the third UDL guideline. Students were not prompted to observe ways in which the information related to other information or options related to better comprehension of the materials. Students were not asked to employ background knowledge or highlight patterns or relationships between information. The product did not guide students through processing, visualizing, or manipulating information. Interactive functions could be built in to the product to allow students to exercise and express their comprehension of the materials, for example.

Principle 2: Provide Multiple Means of Action and Expression

When examined across grade and content lessons for evidence that illustrates multiple and alternative ways to express knowledge, Vendor 6's score for principle 2 was 2.89. For a fully online K-12 product promising a personalized learning experience, this low score is troubling. The review suggests that there are limited options for practice and, most likely, a very limited number of options for the learner to convey competency and express understanding. Reviewers found traditional, text-based, multiple choice assessments offered as the closure assessment/activity for activities or lesson sequences.

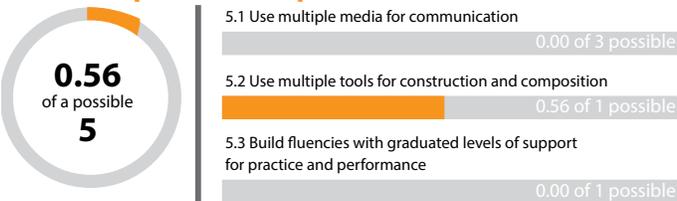


Provide Options for Physical Action



Vendor 6 markets their digital lessons as “dynamic” and “interactive.” However, reviewers found that few choices existed beyond standard desktop manipulations such as mouse and keyboard interactions. Lessons were structured in a sequential manner where users click through content as if working through the pages of a digital book. The LMS restricted any movement on the part of the user beyond the dictated sequence of material. While there were supports to enhance the learning experience, they were limited and formatted to prescribe to a pre-packaged and pre-directed navigation. The pre-packaged management system also restricted the use of external assistive technology features or devices embedded in a computer or tablet's operating system, or an external application learners might use.

Provide Options for Expression and Communication



Alignment between Vendor 6's sampled lessons and guideline 5 received a reviewer score of .56, reflecting very limited choices for expression and communication. Because students vary widely in how they express themselves regarding the material and concepts they have learned, allowing multiple methods of expression and communication are crucial to student success. Students should have access to the appropriate tools to help them better communicate using the method(s) they select as the best fit for their individual expression needs.

An advantage of the online learning environment is that it lends itself to effective use of technology, technology that can

be used and adapted to create new opportunities for students. The pre-packaged nature of Vendor 6's product offered few options for teachers and students to customize their courses to integrate alternative features to create these sorts of engagements. Options for unique lessons, teacher-student interaction, and student-student communications channels could benefit learners.

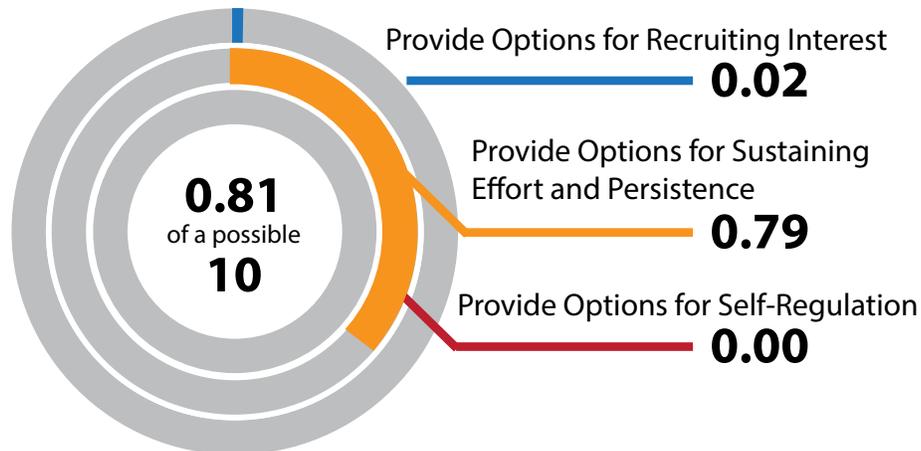
Provide Options for Executive Functions



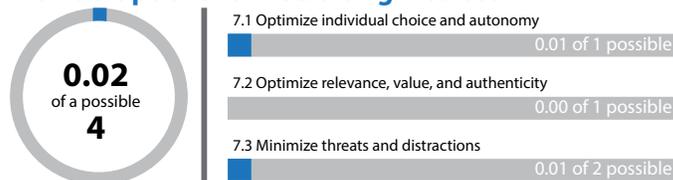
The reviewers' aggregate score of .28 demonstrates that Vendor 6's products offers very few options that allow students to maximize their executive functioning skills. For the fully online learning experience, having limited options to control for inattention, short-term focus, and impulsive actions can heighten challenges in lesson completion for struggling students and those with disabilities. Reviewers examined whether there were scaffolds in place to help students build on both lower and higher level executive functioning skills. The respective scores indicate that Vendor 6 is deficient in these areas.

Principle 3: Provide Multiple Means of Engagement

Vendor 6 scored .81 on principle 3. As previously emphasized, Vendor 6 markets itself as a personalized learning experience—across grades and content—for the independent, fully online student. Fully online learning is largely lesson-dependent, with access to the virtual teacher being periodic, not continual on a day-to-day basis. Center research indicates that the parent, adult in the home, or student will be the primary person to facilitate the learning experience, supporting the hour-by-hour lesson interaction. Engagements represents a crucial element in the learning experience—in an independent experience, engaging and motivating the student is critical. The scores for this principle suggest that the Vendor offers one—or a very limited number of—means to engage the learner. The onus is then placed on the student or the adult supporter to recruit student interest and to encourage sustained persistence.



Provide Options for Recruiting Interest



Vendor 6's alignment to guideline 1 suggests that lessons were developed factoring in accessibility compliance. Access to text and the basic information is important, but the limited score (.02) associated with guideline 7 suggests that the learning experience maybe inaccessible in that the information is not accessible at the level of interest required for students to successfully learn and then apply it. The low score indicates an online product that is not relevant to the learner, does not plan for expected distractions (especially for students for whom this is a particular struggle) and limits choice-making opportunities. Rather, the Vendor relies on a controlled and pre-packaged pathway, thus further reducing student attentiveness.

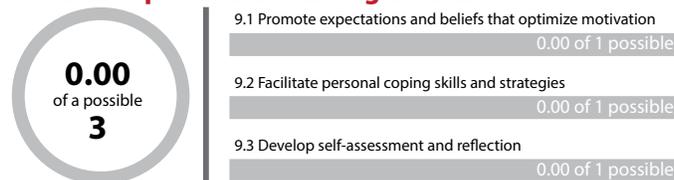
Provide Options for Sustaining Effort and Persistence



For any fully online product, periodic, independent, formative assessment is critical element. Vendor 6, like many fully online developers, offers regular assessment opportunities which provide feedback on where the student is in their progress, their next tasks, ways to increase productivity, and further reminders as students progress on their effort and succeed in their work. While Vendor 6 scored .79 on this guideline, an area of particular strength centered on ways to increase mastery-oriented feedback. While findings suggest limited oppor-

tunities to identify targeted goals, monitor goal achievement, and further encourage reaching short and long term objectives, research did indicate some alignment with developing persistence and determination in learning experiences for online students.

Provide Options for Self-Regulation



No alignment was found between Vendor 6 and options for students to self-regulate. A score of 0 was assigned by reviewers. This score is concerning for multiple reasons. Many students have difficulty developing self-regulation skills on their own, without support from the learning product and/or teacher. Built in options for self-regulation—including displays of data to help students see what they have mastered and where they need to concentrate on improvement—helps reinforce students' self-regulation skills.

Many students require an external prompt or series of prompts to successfully develop their own self-regulation skills. They need tangible proof that they are being successful and support in areas where they are struggling. Options within selecting support mechanisms help students develop the self-regulation abilities that are critical to their academic and personal success.

Section V
Conclusion



This report provides objective research on the appropriateness of K-12 online content used in blended and fully online K-12 classrooms. Looking beyond physical and sensory accessibility considerations, the Center employed the UDL framework to

assess how lessons align with the cognitive and learning demands of struggling learners and those with disabilities. After reviewing hundreds of lessons findings conclude that the lessons sampled align poorly to the principles, guidelines, and checkpoints of the UDL framework. Findings indicate that the foundations of these online learning products may be only marginally individualized to the specific learning needs of students with disabilities. While the data suggest limited alignment to the UDL framework, it is difficult to determine the added supports provided to students by teachers, parents, and other personnel as part of their overall experience.

Key findings across the vendors are summarized, using the three UDL principles and nine guidelines as the structure for the summary. For each vendor, an overview (including supported grade and content areas) and a review of UDL framework alignment is provided.

Vendor Overview

Each vendor develops online lessons and related digital content for the K-12 classroom. The overview provides an introduction to the primary focus (grade level and content area) of each vendor. Defining the vendor's primary purpose allows for better appreciation of and guidance for understanding the findings and their

interpretation in light of UDL alignment. Vendors were selected to be representative across all grade and content areas and include a mixture of supplemental and fully online K-12 products.

Principle One: Provide Multiple Means of Representation

The highest level of (reviewed) lesson alignment was to UDL principle 1. It is not surprising that digital materials that could be customizable—offering alternative video and audio options for the learner—showed greater alignment to Principle 1. The majority of the vendors scored some points under guideline 1, which provides options for perception. UDL guideline 1 and the corresponding checkpoint (customizing the display of information) align with accessibility standards, so this finding may not actually be as oriented to UDL principles as it is to meeting accessibility requirements. While this requires further investigation, concerns remain regarding the limited vendor scores for lessons providing multiple options for comprehension. Student access to materials through alternative formats is important, but learning from the materials based on existing knowledge, making connections, and the ability to generalize and transfer information to other lessons is vital.

Principle Two: Provide Multiple Means of Action and Expression

Analysis of principle 2 and guidelines 4, 5, and 6 found that students have limited options to navigate lessons and express what they know. The primary means for navigation were sequential throughout a structured lesson, requiring the student to click from page to page—similar to traditional work with texts. For majority of lessons reviewed, traditional assessments were typical, with multiple choice and brief essay responses serving as the primary option for expression. There was no readily available evidence of features or supports that offered options for executive functions. Of specific concern was the lack of prompts and embedded scaffolds that could reduce difficulty and effort on the part of the struggling learner. The nature of the digital lessons and features that exist in other web-based platforms (e.g., Chrome extension that offer embedded supports) were often absent. Across vendors, however, were available features permitting users to self-monitor illustrations for student progress.

Principle Three: Provide Multiple Means of Engagement

K-12 online learning offers the promise of personalized experiences that engage learners through interactive digital experience. Information available on each reviewed vendor website reinforces this, suggesting experiences meant to motivate and engage the student to enhance persistence and course completion.

Findings indicate, however, limited options to heighten attention and engagement through the digital online lessons. Instead, lessons reviewed appeared to offer static demand in lesson difficulty while limiting the degree of freedom that would indicate an acceptable performance on the part of the student. The significant majority of lessons reviewed did not offer embedded coaches or digital agents that could model the instructional process or further support the learning experience. The feedback feature in many lessons did not differentiate to manage student frustration or offer scaffolds or similar supports, but offered the same feedback to all learners.

Next Steps

The review of more than 1,000 online K-12 lessons suggest that progress is needed in creating learning experiences applicable to the learning needs of struggling learners and those with disabilities. This initial research helps determine the current state of online learning in respect to its alignment to the principles of UDL and its appropriateness to meeting the learning needs of those with disabilities. This report also serves to illustrate how the UDL Scan Tool can be used by educators and parents to better understand the nature and appropriateness of available online lessons and related digital materials.

The Center makes the UDL Scan Tool available (at no cost) for use by developers, educators, and others via the Center's website (see <http://centerononlinelearning.org/>).

While this review of online K-12 lessons identifies existing strengths and challenges related to UDL alignment, the Scan Tool, when used in combination with other accessibility tools, should help determine how online learning can be developed in order to ensure the needs of all learners are being addressed.

Section VI
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Additional Reading

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