Chapter 18

The Characteristics of Digital Curriculum

When something is defined, you can get multiple people agreeing and building a conversation around it. Since I had spent the years of 2007-2013 visiting many schools and getting on innumerable "demo calls" where publishers would demo their software to me, at one point it became obvious that I knew more about what was going on inside software than most folks. In 2014, I started to keep a list of what I thought of as "the things going on inside curriculum software," and then discussed this growing list over the next year with numerous educators and publishers. In conversations with my staff programmers, I had been making more and more sense of the details of digital curriculum.

While it is true that there are tens of thousands of options right now with the types of digital objects – apps, websites, courseware, eBooks, eTextbooks, assessments, loose content pieces in PDFs or word documents, games, and more arriving in schools – there is hope that it can be mastered from the inside out. More simply put, understanding the inside helps as a first step. I had already looked across the industry to see how the market was fracturing into various publishing types, the view of the *outside* of the transition, so to speak, and had been planning out how to bring some order and understanding to all the commotion with Knowstory.com.

Now with a new "Characteristics List" of digital curriculum evolving from looking at the *inside*,

Key Points

- Low-value versus high-value digitally sophisticated objects make a difference in how much teacher planning versus automated learning goes on.
- How much teachers focus on the learners versus the business of selecting and curating is a balancing act that should be weighted towards quality time spent with learners. Few teachers build highly engaging objects that can compete with ones that are professionally animated and intelligently designed from a software development perspective, but you only really know that when you really know the software capabilities today.

there was another aspect of developing to share with educators. I expect that this list will develop arguments from some, some exclamations of delight from others, a few confusions, and some comments that I have probably missed some important items.

I got to thinking about what's inside curriculum software during my travels across the U.S. with our Digital Curriculum Discussions tour, when I noticed that the national school market typically lands in one of two major camps:

"Organic" schools, where the digital things can run wild at the teaching and learning level.

"Repository" schools and even states, where a central office builds a master repository, usually with a Learning Management System to hold all the "things" or to be a switchboard mechanism into the username/password access of publisher websites.

Both camps have been eager to know more about the developments within digital content and curriculum. Why? Because some of the things are flat and fairly uninteresting digitizations of what was once in the analog-paper world of educational resources. Others are very deep into a foreign world of instructional design crossed with code development, user interface/user experience (UI/UX) high design, and the automation of functions like assessments.

Throughout 2014 and much of 2015, I was looking at what was going on *inside* software, turning digital content *into* courseware. This was what a lot of companies were then starting to get really good at. A lot of discussions with developers, a lot of research and asking what the software mechanisms were trying to do, brought about an ever-expanding confusion of terms. The terms list was attempting to describe what the various digital curriculum was trying to do, and a lot of work went into making sense of it. The Characteristics List became a set of six categories and 71 "characteristics" of what learning software is doing descriptively.

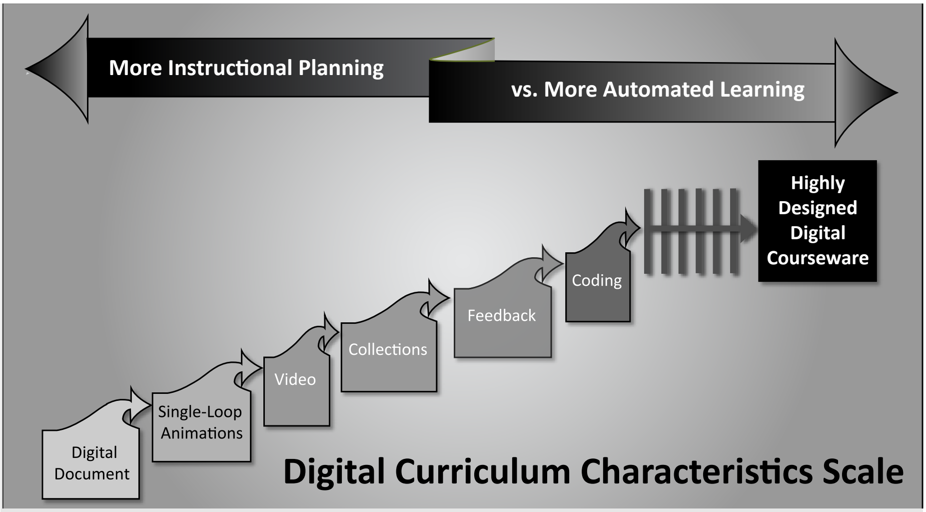
This list of characteristics became the "71 Characteristics of Digital Curriculum Special Report" published in 2015, and then republished because of high demand several other times. The report was not a comment on the rigor of the digital things, but it sparked a new conversation as to how digital curriculum could be changing teaching. It explored the creative ways learning was being evoked through *software* and not just the typical hardware conversation that had priorly dominated.

The reason for this was that printed content is printed content. It is static. It changes only when reprinted. Even in a digitized format, it is still "flat." It cannot talk, convert to a different language on the fly, become interactive, be searched internally on keywords or phrases across multiple of a document species in some instances, assess the ability of the user, or remember where you were when you quit interacting with the content, like the age-old bookmark. Yet when it comes to digital content, this list is only the beginning of the capabilities that can go on and on depending on the digital content, where it resides, how you access it, if it is a singular piece of content or part of a bigger collection, if interaction with the system causes an intelligent learning engine to adapt the digital environment to deliver a more personal experience, or if you can know how your skills rank alongside others interacting with the same content. Digital is "unflat" and that makes all the difference in a changed paradigm to teaching and learning.

Is it important to understand what is happening with the change in content? Resoundingly, yes. Not only is the form of the "content" changing, but the delivery, presentation, interaction, scope, sequence, and adaptability, too. The results of use can also be significantly different. The new capabilities do make the days of textbooks look obsolete. Both traditional and innovative new publishers are racing to put digital curriculum and content in the hands of students. All students can be accommodated through various mechanisms.

There is a real challenge in investigating and implementing digital content. This challenge is partly due to an incomplete understanding of the capabilities and characteristics of digital curriculum. A deeper challenge is the fact that merely digitized or "low technical value documents and videos" *seem* like a transition to digital but are an augmentation to existing pedagogy. They don't bring the promise of going digital, and worse, they add to the overall amount of work teachers have to do. As noted in the original Digital Curriculum Characteristics Scale, at the low end of "going digital" is just documents and single-loop animations. These are things anyone can do if they have a word processing program or can use the embedded animations inside Microsoft PowerPoint to do "single-loop" animations. These take a lot more work by the individual teacher to create than the use of textbooks.

This scale starts with things that could be considered low-technical value with way more work of instructional planning and rises to highly sophisticated software that has more automated learning. Envisioning where virtual reality and "touch screen floors and walls," as well as holograms, will go, it is conjectured that at the very



This above scale shows a progression of low-value technical objects up to the more sophisticated objects in terms of the complexity of their programming. At the height of the scale is software that is known as "courseware" and requires very little in the way of instructional planning, because it is the learning plan within a gaming type environment of scope and sequenced learning. A "single-loop animation" is a function like those in PowerPoint or Prezi where any user can do a single-loop action layered on any object to allow it to "swoop in" or "appear" in a timed interval after the slide is already up. A "collection" is often multiple eBooks or videos or objects with a website or App that serves them all to learners by assignment or by user choice. Feedback is something software does to give users the ability to input answers or receive answers on text, pictures, or video. Coding is something done to use a multiplicity of computer code mechanisms to craft a whole learning environment or a simple app to do a function – but by a coder. The range of characteristics in between this and the highest-level of digital object, designed digital courseware, is a wide arena of coding characteristics defined in our "71 Characteristics" Special Report.

highest levels of sophistication, there will be immersive virtual "worlds" that a student enters, which have been called serious gaming spaces. Think of the famed Star Trek "Holodeck," where an entire 3-D world exists holographically, or the "Room of Requirement" of the also-famous Harry Potter books, a magical space that gives you what you need.

The now ever-growing list of "Digital Curriculum Characteristics" describes the capabilities and options. After the 2015 release of the first list, education executives from major school districts began work in 2016 to edit, expand, and find more examples of what is going on inside commercial software to share it with peers nationally.

It's important to understand that "low-value" and "high-value" digital curriculum is a valuation of its *technical rendering,* on a continuum scale based on engagement capability and other user-interface/user-experience considerations. The subject of user interface and user experience is typically considered to be only the domain of programmers, but understanding how humans engage with machines is quickly becoming of high factual importance to teachers and administrators everywhere. A good learning experience from screen learning can only be wrought when the curriculum planner understands, selects, and implements a mix that, by its internal workings, will necessarily achieve the ends.

At the top of the scale is what is considered the "fully-adaptive-immersive-virtual-environment-curriculum-courseware" or shortened to courseware. This is not the same as adaptive curriculum or learning, which may or may not be a full course with scope and sequence along subject or topic lines, but for sure uses intelligent learning engines to "adapt" using pattern recognition and logic to give the right questions to guide the student into paths of learning appropriate to their level and style of learning automatically. The fully adaptive, immersive courseware will be even beyond that, creating a "world" for achievement across a multiplicity of subjects and, of course, including machine learning to adapt to the individual. This is no different than major gaming platforms and products like Siri or Cortana on smartphones or Echo from Amazon, all of which use machine learning to deliver greater and greater value to the individual as they "learn" your preferences.

Many of the new commercially available paid professional resources (PPR) and some free open education resources (OER) offer these leaps ahead with automation.

These characteristics do not address *rigor,* only the character of the digital learning object's development or programming within six categories. By the time this book is finished, there will be seven or more categories to include security and student data privacy and more characteristics, such as creative inception mind-mapping, back-up for self-review, timers, and more. The list in this chapter is the original and updates will be available at LearningCounsel.com.

Understanding this list is important in that how much teachers focus on the learners versus the business of selecting and curating is a balancing act that should be weighted towards quality time spent with learners. Few teachers build highly engaging objects that can compete with ones that are professionally animated and intelligently designed from a software development perspective, but you only really know that when you really know the software capabilities.

The 71 Characteristics are just that – how the software itself manifests utility. These are *not types of software*, but what is going on inside much of the software available. Of course, all digital curriculum and content is assumed to also have actual instructional value, something to learn, a lesson, a bit, chunk, or wide amount of knowledge. That's the "given" in the entire list.

The six major categories for better understanding and differentiation:

Actions:
Functions of the code that do things, generally, singularly, and discretely, without involvement with other processes.

Aesthetics:
Design or dressing or engagement-oriented elements.

Controls:
Administrative capabilities or reporting.

Individualizations:
Means of making unique, keeping in mind that "individualization" is something you do for someone else and "personalization" is when it is something one does for oneself.

Instructs:
Lesson-giving qualities.

Mechanisms:
Processes or techniques, generally longer

71 Digital Curriculum Characteristics by Category

Category:

Actions – Functions of the code that do things, generally, singularly, and discretely, without involvement with other processes.

1. **Audio Enhancement**
   Interaction with the content or even the delivery system includes sounds to provide audio cueing to help direct the student to respond. Buttons, clicks, appropriate and inappropriate responses, and music are just a few examples. Specifically, downbeats might signify an incorrect attempt or trial, while upbeats signify a win, and music tracks provide drama and more.

2. **Live Chat/Instant Messaging**
   Live chat or instant messaging is the ability to synchronously chat with another person via a text-based communication tool(s). This type of tool can be a stand-alone app or a built-in ability of a larger platform. This tool can allow two or more persons to communicate at one time and teachers to guide learning from a distance or even in class during individual study.

3. **Live Video**
   Live video is the ability to synchronously communicate with another via video with audio. This type of tool can be a stand-alone app or a built-in ability of a larger platform. This tool can allow two or more persons to communicate at one time via video with audio.

4. **Annotating**
   With a cursor, mouse, or digital stylus, students can place notations, highlights, comments, etc., into the body of the content presented. These annotations can be stored, and even possibly organized and manipulated, for later use by the student.

5. **Accessibility**
   On or offline access to strong digital content is a must. For example, the requirement for constant internet access to read and work on assignments, as well as in-school internet bandwidth pressure, is still a struggle in many places. Apps like HMH Player™ allow students to upload and download materials, including interactive features such as videos, when online, enabling off-line access to digital content.

Disabilities Access – In 1996, the U.S. Department of Justice clarified that the Americans with Disabilities Act (ADA) requirements apply to all programs offered on the Internet, which include all educational digital materials for students, as well as all digital professional conference materials. This means that web page materials and formalized online courses and programs must be made available to qualified individuals with disabilities and apply the Universal Design for Learning (UDL) framework to the degree possible. Understanding this in its entirety is starting to be addressed nationally for all areas of disabilities.[1]

6. **Social Gaming**
   Social gaming includes online games that may or may not be educational. These games can be for students of any age. These games can be played individually or with others in groups ranging from small to large. Results of

the individual player can possibly be posted and viewed in comparison to others playing the game.

7. **Spell Checkers**
   The ability to check the spelling of words, definitions, derivations, live-pronunciations, and parts of speech.

8. **Spatial Temporal-Reasoning**
   Intentional non-use of language or lecture-based instruction in favor of interactive, symbol-manipulation animations that visually represent mathematical concepts to improve conceptual understanding and problem-solving skills.

9. **Dynamic Definitions**
   The ability to access the definition of a word or phrase instantly from the immediate screen. This allows the student to go back to an earlier chunk of content to better understand that foundational definition. Definitions can be open for modification by students or curriculum leaders wanting to change them because of some new development. For example, if the content is about a science concept, and if there is a new discovery made commercially, the definition can be shifted. Additionally, if there is a reason for the leadership to shift a definition because of beliefs, advanced digital curriculum allows for an administrator-level user to do so.

10. **Probeware Viewing**
   Probeware hardware viewing is an action of software (i.e., microscopes displaying their

magnification right onto laptop screens). The software interfaces with and graphs incoming activity from scientific probeware instruments, such as digital microscopes, sound sensors, motion encoders, spectrometers, and more. This is not the same as device input which includes the incoming data within a lesson plan or project.

11. **Social Interaction**
    The embedded capability for students to synchronously communicate while learning but beyond one-to-one within a social environment. For example, students might share what they are getting out of materials with others in their classes. This makes use of the texting and social media that is already so familiar to students.

12. **Sketching**
    The ability to write, draw, or illustrate within an application as part of the practice or response process.

13. **Gambling**
    Gambling is something that can be done inside many commercially available games and on many sites, and it is banned in some areas of the U.S. There are some groups who would contend that the use of "coins" is representative of "gambling" within learning tools where the student is "spending" to purchase some device in the hopes of winning some at the end. Even if the learning tool is not using actual money but merely showing something symbolic of money, like gold coins, such a device could be construed to be teaching the

student to gamble and should be avoided based on potential conflicts with religious preferences or legal constraints.

14. Touch Enabled

The experience of interacting with a digital device through touch. The interaction modality has become second nature to most students. Their interactive preference for mobile phones and tablets is definitely touch enablement. The expectation is that the software experience takes advantage of touch regardless of form.

Category:

Aesthetics – Design or dressing or engagement -oriented elements.

15. Character(s)

The use of animated or actor characters within the content. The character could be someone of significance to the topic covered in the lesson or unit – for example, Abraham Lincoln – and dressed up in period costume or rendered in period outfits. Period costume or authentic dress would be utilized to make the character appropriate for the information being conveyed.

16. Voice

The use of recorded reading of text for playback on-demand. For example, an audio book.

17. Virtual Reality

An artificial 3D environment, such as a maker lab or "world" that consists of images and sounds created by a computer and is affected by the actions of a person who is experiencing it, including editing it or using manipulative interactive gloves, a stylus, glasses, an extra monitor, or other specialized holographic image creators.

18. Animations

From single-looped (like those anyone can do in a simple presentation) to full-motion cartoon animation, the use of animation today is unlimited. Higher value digital content and curriculum necessarily will have high-value animation embedded. The value of animation is that it can be played and replayed as needed for mastery learning.

19. Visual Advantages

The use of non-animated infographics, such as a backdrop photo of a landscape being discussed in the unit, or an image that shows a concept or person being discussed in a lesson, is similar to books and may be interactively linked.

20. Video Embedding

The inclusion of video as part of the content. An example of this is HMH's HISTORY®. HMH's core social studies curriculum infuses HISTORY® assets, bringing history to life with anytime, anywhere mobile access to videos and biographies that can be used to enhance classroom instruction and add a visual element to the teaching and learning of history and politics.

21. Avatars

In computing and digital learning, an avatar is the embodiment of a person or idea. In the computer world, an avatar specifically refers to a character that represents a user online. Avatars are commonly used in multiplayer gaming and online communities. When combined with intelligent learning engines, the avatar could take on a greater level of importance to the student in their learning.

Category:

Controls – Administrative capabilities or reporting.

22. Dynamic Curation

Dynamic curation is the ability to take individual "pieces" or chunks of content and place them into a repository for use. The closest thing to this vision is a Learning Management System, which is more of a repository for building out an inventory. That inventory may be full digital curriculum courses or it may be a lot of content pieces and lesson plans. We see the future as adaptability for dynamic curation by administrative users for subscription systems much like current customer relationship management systems do, such as Salesforce.com. Industry standard-setting organizations, such as IMS Global, are aiding in making digital curriculum and content "curate-able" by promoting interoperability standards for content. Dynamic curation may also apply to individual digital courseware wherein a function allows students to drag and drop in elements or chunks to their own collections to create portfolios or reports.

23. Plagiarism Checking

The ability to check the originality and authenticity of a student's work is the purpose of advanced plagiarism-checking sites and services.

24. Interoperable

The capability of a product or system to interact and function with others. Open and interoperable learning management systems, longitudinal data solutions, and digital content are becoming increasingly important in the education sector. Common cartridge compliant solutions and programs that align with IMS Global Standards can be used in open environments and provide educators with greater choice and flexibility.

25. Project-Based

Digital curriculum is built or can be linked in a manner to allow for projects to be assigned and tracked by teachers as they are being done by individual students or groups of students.

26. Gating

Gating is the ability of a teacher or adaptive learning engines incorporated into the curriculum platform to determine the progress of a student through learning. The gating controls would allow a student to move ahead or be redirected into remedial material based on their performance. Gating makes digital curriculum much easier to individualize for each student.

27. Analytics

Analytics based on student achievement for lessons takes old-style grading to a whole new level. With embedded analytics capabilities and screen learning, teachers can see exactly how students are doing with each lesson. Multiple data points, such as time spent, accuracy of response, or number of solutions can be collected, measured, and reported without paper. The efficiencies of digital analytics are great, and the enablement of individualization and personalization even better. Feedback can be as timely as needed to inform instruction.

28. Self-Contained Learning System

Digital curriculum and content, and all its associated tools for access, management, and reporting, contained within one learning system.

29. Metrics

Metrics are calculations performed on data from the data collection infrastructure to describe what is occurring (depending on what data you are collecting). These can be rendered with or without analysis, allowing the end user the ability to choose when making judgments about what the data mean.

30. Grouping

Grouping students per levels or by interests helps students grow in ways that maintain their enthusiasm for what they are learning. This may occur at the direction of the teacher or through the recommendation of intelligent or adaptive learning engines based on the analysis of student data.

31. Data Collection Infrastructure

A system for warehousing data generated by interaction with a delivery system of the curriculum and content. Digital curriculum publishers and learning management system providers are collecting information to make inferences, provide suggestions, or draw inferences. With the application of learning from statistics, intelligence learning engines, machine learning, and neuroscience, publishers are working to mine the databases and infrastructure to provide useful feedback for teachers and students that was never available with textbooks.

32. **Enveloping/Pull Mechanisms**

Enveloping and pull technologies address the need to protect intellectual property rights of specific content. To maintain control of the content, mechanisms for delivering a "protected" version to users are being developed that let the administrator of that system control how that content is then consumed. The end-user device can use the content only as prescribed, and the system administrator can remove, or pull, the content from end-user devices on demand.

33. **Favoriting**

The concept of "favoriting" something has become commonplace in online commerce sites and social media thanks to feedback mechanisms designed into these platforms. "Favoriting" serves as the method for promoting items or topics that are useful or of interest. This ability within dynamic curation repositories, discussion boards, etc., provides a way to crowd-source what is potentially better or most useful in the teaching and learning process.

34. **Administrative Personalization**

Teacher ability to manage student access to and progress through the curriculum to maintain motivation and attention and ensure mastery learning. For example, student progress through learning activities can be manipulated by the teacher in the best interest of the students' demonstrated learning or need for extra support.

35. Second Screen

Second screen learning refers to the "syncing" of the content to be viewed. Rather than students independently viewing material, second screen refers to content that is asynchronously viewed from teacher to student. The teacher controls the pace of the material viewed by all students on their individual screens or one shared by a small group.

36. Projection

The ability to share content on one or more screens. This can be asynchronous or synchronous projection, depending on the need. New device management also allows teachers to control all screens in their class at once, a form of projection that keeps everyone on the same task. In addition, the "projection" within the software has options to show part but perhaps not all of what is on the teacher or student's screen at that moment within that app, system, or site.

37. Portability

The ability to access and interact with content across multiple hardware devices of different screen size, input method, and operating system platform. Standards institutions, such as IMS Global, work to ensure that digital curriculum meets standards and can be delivered over any device.

Category:

Individualization – Means of making unique, keeping in mind that individualization is something you do for someone else and personalization is when it is something one does for oneself.

38. Feedback

Feedback opportunities allow the end user, in this case educators and/or students, the ability to provide written comments to the publisher or creator. Feedback may also include a rating scale that the end user may complete to share their level of satisfaction, from which an average rating for display can be calculated.

39. Student Personalization

The personalization of student learning allows the student to adapt the software to their preference of topics, outcomes, and pace. Digital curriculum by many publishers is built in this adaptive way. Students can be unleashed and gated forward to complete more than one grade-level equivalent of material in a single year. Others can choose more remediation that bolsters their mastery of the material before going ahead. Preference can be determined in consultation with a teacher, who in turn makes the necessary settings within the learning system (i.e., teacher individualization).

40. Multiple Languages

The capability of digital content to be quickly converted from one language to another, with both print and audio.

41. Collections

Software "libraries" of multiple assets, like books, videos, and other learning objects, usually wrapped with gradations such that a student is placed at his or her "level" by pre-assessment and continues from there.

42. Work Product Curation

The ability to store student work product for retrieval and review over a period of time within a digital learning system.

Category:

Instructs – Lesson-giving qualities.

43. Chunking

The process of presenting the curriculum and content that, 1) takes smaller pieces of information/benchmarks and combines them to make a unit of material for learning unified by a common theme or big idea, and 2) then presents the "chunk" to fit the screen size of the device of choice. Paper textbooks have always "chunked" material into chapters, but new digital materials are doing this in a different way – chunking even smaller and then using other new characteristics like clip or video embedding to demonstrate a concept. Students can follow directional arrows and pictures to interesting tidbits and quizzes. The benefits of providing less, as in curated-down minimalist text and more digital characteristics, give audio learners, text learners, visual learners, and explorers-of-tangents a different experience.

44. Intervention

Intervention programs are built to meet the needs of students performing below grade level. Tools that utilize adaptive technology can support teachers working with struggling students by providing tailored assistance that helps raise their achievement and abilities.

45. Training

Embedded "How-To" or professional learning in order to maximize teacher productivity and student achievement using the device, system, or content. This can be embedded training modules that help teachers be able to incorporate and deliver content effectively or that train students on how the system will work for them.

46. Project Mastery

Through a project as an individual or as a small group, the student has a computer-based project that culminates with the demonstration of mastery of one or more skills or knowledge sets. For example, a complex coding problem, illustrative challenge, writing exam project, or a combination of skill elements that are selected and then demonstrably mastered.

47. Distance Live-Lab

When physical distance or geography prevents the use of laboratory settings in order to perform exercises required for a class, a "virtual" lab can be used to facilitate the learning. In this scenario, the environment used by the student mimics as closely as possible all steps and manipulations that need to occur in order to perform a lab exercise. Recent advances in holographic and virtual reality computing will greatly enhance this type of environment simulation soon.

48. Content or Course Authoring
The software provides a framework for building an eBook or lesson or lesson plan.

49. Terminology
The better digital curriculum and content keeps a terminology reference list as part of the program that is reachable as a tab or link, and all newly introduced words in the material are linked with either a pop-up or drop-down definition.

50. Interactive Queries
Student or admin originated multi-layered queries are embedded or enabled through the system. Unlike flat texts or jaunts to the library, students can reach resources instantly and also do interactive queries of major data repositories to know the state of things in real-time.

51. Programming Practice
The ability for students to practice programming for things like manipulating robots. Through their own programming input, they are achieving the objectives of specific digital curriculum targeted at teaching math or scientific concepts.

52. Inference
Guided by the data collection performed as students interact with the digital curriculum system, inference can be made about the progress of the student. It is the job of the inference

engine to apply knowledge based on the knowledge base of the current situation. These inferences can be based on unbiased analysis of the data to help the teacher better understand the needs of a student. These inferences generated by pattern recognition could possibly be a superior method to evaluate students. Common biases, such as race, sex, socio-economic status, personality, and ambition (attributes that might consciously or subconsciously bias analysis) can be left out of the interpretation of student performance.

53. Clip Embedding

A clip is a short animation of a single, simple concept. Clip embedding is a multi-media addition to the material of a very short duration. It may be an animated cycle or graph. It could also be an excerpt from a historical address with a picture of the speaker. A clip is not full-motion video.

54. Standards Alignment/Attainment

With the advent of the Common Core State Standards, many schools have scrambled to try to find and organize appropriate content and adapt their pedagogy to fit the demands of mastery. New digital curriculum has been built specifically to address standards and remove a lot of the work of hunting through older materials. In addition, as mentioned prior with mastery, new digital curriculum provides practice for students with embedded capabilities.

Category:

Mechanisms – Processes or techniques, generally longer than actions.

55. Machine Learning

The following definition of machine learning comes from Wikipedia: "Machine learning is a subfield of computer science that evolved from the study of pattern recognition and computational learning theory in artificial intelligence. Machine learning explores the construction and study of algorithms that can learn from and make predictions on data. Such algorithms operate by building a model from example inputs to make data-driven predictions or decisions, rather than following strictly static program instructions." What does this mean for education? Think of learning platforms for knowledge learning that require scaffolded skill sets to keep advancing in knowledge attainment and understanding. The application platform could continuously monitor and adjust to the needs of the student, accelerating them, refreshing them, or remediating them as necessary based on the performance of the student. The key differentiator here is that this level of software builds its own adaptations.

56. Practice Microgames

Short, single skill, or object learning games of short duration. For example, a link to a puzzle to show some concept rather than merely adding a note or source, allowing kids to play to learn.

57. **Social Experimentation**
Safety alert! These are games that can be found online that are really collecting data in a social experiment as to how humans react to things and could be tracking computer IDs of students, which isn't disclosed to them. Even if the site or game is not asking for identity, it could possibly obtain the identity of the individual whose machine is being used through a triangulation of other available commercial data.

58. **Formative Assessment**
Assessment conducted during the instructional process designed to monitor learning as it occurs. Conducted in a variety of ways depending on the type of learning, formative assessment provides just-in-time feedback to adjust the pace of learning via either teacher monitoring or adaptive learning engines.

59. **Pre-Assessment**
The evaluation of what a student knows or can do prior to learning occurring.

60. **Coding**
Computer language code or an order of logical operations created as part of the learning.

61. **Game-Based Learning**
The practice of and demonstration of learning using a game or game-like environment. The elements of a full game (one with purpose(s), freedoms, and barriers) can culminate in real challenges and recognition of accomplishment for students who can play simulations utilizing learning related to one or more areas of study.

Performing well by demonstration of mastery of abilities within the game can be rewarded with systematic recognition (for example, leader boards or rankings) as well as social recognition.

62. Gaming Rewards

Games are often engaged in because of the competition or rivalry between one or more persons. This competition is the motivation to play well in order to achieve a positive outcome. Rewards for successful game play do not need to be an outright "win," but can also be performance at various levels. The ability to replay and receive higher value rewards is the motivation of students to continue in the game play until a more satisfactory outcome is achieved. In digital curriculum, the concept of gaming rewards can be applied in many different ways in order to maintain student motivation to complete the desired course of learning over time.

63. Real-Time Attention Data/Neuro-determinism

Uses keyboard or eye tracking to adjust lesson developments or evaluate comprehension. By monitoring combinations of various physical response and/or brainwave data, digital curriculum software can monitor for such variables as time to answer and more. This input is analyzed in real time to make the curriculum adapt in even more precise ways to that student, depending on the need for such adaptation.

64. Device Input

Probes, sensors, or other single-purpose devices can enhance learning by collecting data being used within experimentation or a project. Sensors that can measure acceleration, three-dimensional movement, and temperature are plugged into computing devices to interface with software for data capture during student assignments, can provide an element to an overall lesson or project. For example, advanced calculators can provide added value alongside math software. Video capture allows for teachers to see students demonstrate understanding of an idea or concept or curate the completion or outcome of a task.

65. Intelligent Learning Engines (Pattern Recognition & Adaptation)

This is a capability in what is known as the "adaptive" sorts of curriculum software in that, in a certain lesson with a certain objective, if the student keeps getting something "wrong" in a certain pattern, the learning engine adapts with a new track of questions or alerts the teacher to intervene.

66. Gesture Controlled Data

The detection of physical movement and gestures by devices created to sense these activities has become highly reliable. The gaming industry is already commercializing this industry as part of the game playing experience. But when gesture control is combined with information systems that allow the manipulation and display of data in original ways, the ability to explore the relationship of the information takes on new capabilities.

67. Collaboration-Ware

Those software tools and platforms that enable multi-student authoring of content (documents, spreadsheets, presentations, etc.). Communication between individuals or groups may also be an integral part of the tool or platform. Versioning, reviewing tools, and change-management can also be functionality included to further enhance the ability to collaborate.

68. Assembly

Think puzzles, pictures, diagrams, or operations that when assembled would show a sequence, visual elements that are required to be assembled in a specific manner. The components of each could be manipulated with a cursor, pointer, finger, or stylus by the student in order to complete the proper order of the assembly.

69. Manipulative-Object Interplay

The use of a separate physical object in conjunction with a digital device that causes interaction between the physical object and the application on the digital device.

70. Summative Assessment

An assessment given after a period of learning to determine the mastery of knowledge and/or skill by a student.

71. Artificial Intelligence

Per Wikipedia, artificial intelligence is: "The intelligence exhibited by machines or software. It is also the name of the academic field of study, which studies how to create computers

> and computer software that are capable of intelligent behavior. Major A.I. researchers and textbooks define this field as 'the study and design of intelligent agents', [1] in which an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success, and [2] real A.I. is above machine-based learning by definition in its perceptivity. Machine-based learning is greater than Intelligent Learning Engines, which are pre-determined pattern recognition, which then shunts the learner down a pre-built additional path or alert loop."
>
> It is important to know and understand this definition to know what are and are not accurate claims by digital education content providers as to the true capabilities of their learning delivery systems. Artificial intelligence, as it has been defined by preeminent mathematicians, is not something the Learning Counsel has yet been able to find in learning software – yet.

So, there you have it.

71 Digital Curriculum Characteristics for digital curriculum and content – so far. In coordination with leading educators, we are currently working on an update due to be published soon.

When looking to introduce new curriculum and content into the teaching and learning process, especially if it is the first-time digital curriculum and content will be implemented, a holistic inventory and audit is not only advisable, but imperative. Look at what is available commercially or even free and look at your pedagogy – ask "Why?" The new software available may change the dynamics at the classroom level, and consideration must be given to the teacher's time – time to plan, time to teach, and time to take care of the logistics of both.

Digital curriculum and content that would be the core curriculum should be inspected closely against your class or school goals. Why? Because if there is a goal to individualize student learning, it will require that the teacher plans out a multitude of digital learning objects for each student, not just a single plan for the whole class or small group – unless a full curriculum software is chosen to do much of the individualization itself. Planning for each student in the digital realm will typically take more time than writing the "whole-class" lesson plans of old. Even supplemental curriculum will require a greater level of attending-to from the teacher to be meaningful. It is not fully adaptive, immersive-environment-type software with tons of the above characteristics embedded in it, but bits of video, apps and pieces.

The road to building your digital curriculum and content story as a school, a district, or a teacher is a wide open one – but becoming knowledgeable about what is going on in it may save many schools from becoming irrelevant while they pick things that only digitize the old ways and are not truly "digital."

[1] National Instructional Materials Accessibility Standard (NIMAS), *National Center on Accessible Education Materials*, http://aem.cast.org/creating/national-instructional-materials-accessibility-standard-nimas.html#.VhcqhWvVuql http://www.setda.org/wp-content/uploads/2014/03/SETDA_PolicyBrief_Accessibility_FNL.5.29.pdfhttp://teachinghistory.org/issues-and-research/roundtable-response/25092