Designing an Inspired Curated Learning Experience Using Immersive and Visual Open Access Resources

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Keywords: open access educational resources, immersive, constructivist, learnin objects metadata, studio thinking framework, content curation, pedagogy

Abstract

A curated learning experience is a method of organizing vast volumes of web and enterprise-based information and presenting it in a structured and significant layout. The study conducted allowed for an examination of how educators identify a diverse array of effective applications found in open-access educational resources using the Studio Thinking Framework (STF) and the Learning Objects Metadata (LOM) topology. The examination resulted in ascertaining ways to identify educational resources that provide student-centric knowledge construction and has the potential to inspire learning professionals to curate compelling learning experiences for their students.

Introduction

Differences exist between empowering learners to evolve and modernizing education (Hosseini, Kees, Manderscheid, Röglinger, & Rosemann, 2017). In the 21st century, the use of advanced technical solutions drives an increasingly visual culture in virtual applications, film, social media, and advertising (Brantley, 2015). Learners

could benefit from modern teaching practices if the educational community embraces the curation of authentic learning experiences. Some define a curated learning experience as the method of organizing large volumes of web and enterprise-based information and presenting it in a structured and significant layout (Luna-Nevarez & McGovern, 2018).

Inspired content curation has the potential to enhance the student's learning experience, the teacher's teaching strategy, and to maximize learning outcomes. What is inspired content curation? By inspired, the research team contends that educators are capable of locating and incorporating open access resources of extraordinary quality in their curricula. With the application of two models for classifying learning experiences and learning resources, inspired curation is possible.

To transition to the disruptive 21st-century environment extensive learning could require more than traditional knowledge and skills (Dede, 2010). Also, 21st-century learners will need cognitive skills, and intra- and interpersonal skills (Dede, Grotzer, Kamarainen, & Metcalf, 2017). Learners will need to engage, understand, persist, apply, and express a response to rapidly changing contexts. More than that, the successful learner will reflect and assess solutions (Hetland, Winner, Veenema, & Sheridan, 2013). Learning of this kind reflects constructivist pedagogies along with immersive and multi-media learning experiences, which allows personal learning and student-centered cognition to occur.

Research Questions

The questions posed in this study are:

1. How could educators use multi-media and immersive resources to curate effective learning experiences?
2. To what extent may students learn cognitive, interpersonal, and intrapersonal skills using open-access educational resources from the Internet?

Theoretical Framework

The frameworks chosen for the study are the Studio Thinking Framework (STF) (Hetland, et al., 2013) and Learning Objects Metadata Topology (Solomou, Pierrakeas, & Kameas, 2015). The foundation of the STF consisted of two years of naturalistic observation in studio classes for a goal to develop a work of art. Discovery of a second covert or hidden curriculum arose that allowed educators to teach critical cognitive and creative skills (Sheridan, 2011). The STF skills encompass Observe, Envision, Express, Engage/Persist, Stretch/Explore, and Reflect/Evaluate. Researchers have demonstrated the value of the STF model through its application to virtual environments (Steele, Johnston, Lawlor, Smith, & Lamppa, 2018) and over a lifetime of living and working (Johnston & Lane, in press).

This framework gives educators a way to assess open educational resources for 21st-century learning experiences that stemmed from naturalistic observations initially with the intent to create meaningful works of art. Additionally, the STF aligns to visual education by employing virtual applications and solutions to stimulate new educational experiences. Every classroom, home, or office connected to the Internet can obtain a rich assortment of educational experiences through available open access to educational resources. Their availability and accessibility should inspire learning professionals to select/curate the most effective learning experiences for their students.

In conjunction with the STF, the researchers chose the Institute of Electrical and Electronics Engineers (IEEE) Learning Objects Metadata (LOM) Topology as a basis to assess the selected resources. Secondary and post-secondary education learning environments utilize multi-media and immersive resources (Frantiska, 2018). As a result, educators can execute this combination through open educational resources. Students can attain competencies via several learning objects. Learning objects metadata are neither intangible nor abstract applications but the design aims to construct and enhance the learning environment that could have numerous forms and purposes (Frantiska, 2018). Hence, learning objects metadata can direct what intangible or abstract applications will be required and must be associated with a learner's applicable educational level (Girvan, 2018). Like many frameworks, learning professionals and students alike may characterize learning objects differently. The STF model and LOM topology displayed in Figure 1 includes the description for each.

Studio Thinking Framework (STF)	*Institute of Electrical and Electronics Engineers (IEEE) Learning Objects Metadata (LOM) Framework*
Visual-based framework Focus on visual education by using virtual applications **Habits/Tenants** Observe Envision Express Engage/Persist Stretch/Explore Reflect/Evaluate **Structural Elements** Demonstration (Lecture) Students-at-work (students to spend in-class time working on an assignment, while keeping the classroom focused on specific goals) Critique (allows students to make connections with habits different from those that may have been taught in other stages of the class) Exhibition (described as an "overarching" structure that encompasses the original three) Transitions (the time spent transitioning between all other structures) (Sheridan, 2011)	Educators can use any entity, digital or non-digital, for learning, education, or training **Educational Metadata Contains** Information regarding the resource's learning type Exercise Simulation Questionnaire Diagram Figure Graph Index Slide Table Case Study Narrative text Exam Experiment Problem statement Self-assessment Lecture Intended end users Teacher Student Learner Instructional context Implies the actual context where the learning process takes place, and can accept values like "distance education," "face to face learning" and "blended learning **Educational Metadata Categories/Tenants** General (groups the general information that describes the LO as a whole) Technical (provides the technical requirements of the LO) Educational (provides the educational requirements or pedagogic elements of the LO) Annotation (provides educational information about when an LO was and by whom) Classification (provides information about what classification system and LO resides) (Solomou, et al., 2015)

Figure 1. STF Model and LOM Topology

Population and Sample

The population for this study consists of educational resources considered open access and readily available for use by the public as found on the Internet. The researchers intended to locate a wide variety of open access resources based on the following criteria: subject matter, learning resource type, and technology type. The researchers chose purposive sampling for this study because this method allowed for an examination of the content

made available via online resources (Sheffer & Hunker, 2019). The samples selected for this study included examining a multitude of core subject-related content in the Language Arts, Social Sciences, Natural Sciences, Math, and Fine and Applied Arts. Additionally, the method allowed the research to appeal to a variety of demographic groups. The concept of prominence or recognition, such as nationally recognized TEDtalks, The New York Times feature, or validated by other expert testimonials, including most trusted, unique, innovative, or other recognition for quality, posited as a requirement for the population and the sample.

An online search aided in locating potential samples using a series of keywords developed in an earlier study (Johnston, Olivas, Steele, Smith, & Bailey, 2017) to locate websites that may feature an immersive and visual open access resource that includes a learning experience worthy of curation. The primary keywords used in the literature searches included video-based technology, applications, multimedia, and educational levels. Each contributor performed a close examination of the content and resources such as language arts, social sciences, natural sciences, and math.

Accessing webpages, such as Pinterest, YouTube, and PBS Learning helped during the search for the most technological materials instrumental in understanding the importance and usage of educational resources for curating a learning experience using immersive and visual open access resources, thereby allowing for triangulation. Accordingly, preferred applications involved those having visuals in the form of demonstrations, interactive videos, lectures, or narrative text. The research team did not purchase any examined technologies, because one of the criteria consisted of freely available curated resources. The analysis comprised solely of public information available online, and thus the team validated no claims in terms of any advertised distinction, subject matter, or age group appropriateness.

Methodology

Each member of the research team collaboratively documented specific details of at least five free open access educational technology applications in an Excel spreadsheet posted in Microsoft Teams resulting in the collection of 46 resources for examination, a summary of which is provided in Appendix A. The resulting cross-functional matrix displayed a header of columns consisting of:

- contributor's name
- title of the application
- retrieval date
- URL of the open access technology
- description of the technology
- academic subject(s)
- educational level(s)
- LOM technology type
- LOM technical data type
- LOM learning resource type
- presence of advertising
- distinction
- contributor's initial comments following the assessment of the resource
- six categories in the STF model
- rating value for the STF model
- additional comments after rater review

The cross-functional matrix also included dropdown menus allowing further categorization of the data in several columns. For example, the Subject column consisted of a dropdown menu to select the appropriate subjects impacted by a technology that included science, math, and the physical sciences. Each contributor completed the cross-functional matrix including the STF Habits of Mind (Winner, Goldstein, & Vincent-Lancrin, 2013). The contributors identified each Habit of Mind as either Student-Centric, Instructor-Centric, or Not Present in a specific application. Also, the contributing researchers included a justification of their decision to label them as such within the corresponding cell in the spreadsheet. The contributors added the Rating Value to the matrix later during the analysis phase.

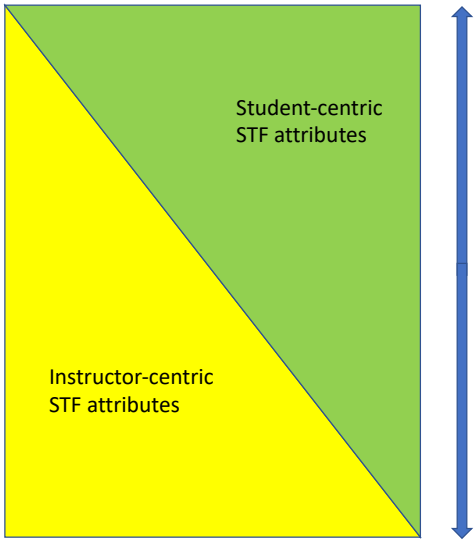
Data and Analysis

Using directed content analysis assisted with the interpretation of meaning from the content of textual data, hence, permitting adherence to the naturalistic paradigm. With a directed approach, data analysis begins with a theory or relevant research findings as guidance for initial codes (Hsieh & Shannon, 2005). Applying a directed content analysis on the sample of open educational resources allowed for a classification of the technology based on the Institute of Electrical and Electronics Engineers (IEEE) Learning Objects Metadata (LOM) Topology (Solomou, et al., 2015) and the Studio Thinking Framework (STF). The Excel document, as an efficient analysis tool, helped with tracking, organizing, and ranking resources based on various criteria established by the team aligning to attributes of the STF model, the IEEE's Learning Objects Metadata (LOM) topology, and descriptive information.

Macros within the Excel document enabled the team to use dropdown menus to categorize each resource rather than rely on free-form entry. With Microsoft Teams as the data hub, the team worked collaboratively on the Excel document by reviewing each contributed resource and coming to consensus on its fit for the curated collection as well as its STF and LOM categorization as a means for identifying emerging themes and trends. The research team developed a color legend for the STF model by assigning a specific color for each STF attribute. Student-centric attributes received green as the assigned color while teacher-centric attributes received an assigned color of yellow. For each open educational resource in the collection, those categories not present received red as the assigned color. After assigning a color to the STF attributes, the researchers applied a ranking on a scale between 0 and 2 based on the designated color. Red attributes received an assignment of zero, yellow received an assignment of one, and green received an assignment of two.

Totaling each resource's ranking provided a method to calculate an overall rating that represented the overall tendency for the technology to align to the STF model in terms of achievement of the attributes by students without guidance from the teacher, that is, distinguishing an inclination as a student-centric or an instructor-centric resource. Researchers found that 14 of the reviewed resources had a high STF rating (12, 11, or 10) that suggests a student-centric application, while seven had a medium STF rating, suggesting a mixture of student and instructor-centric STF attributes, while 26 of those had a low STF rating, suggesting a more instructor-centric attributed resource. Figure 2 includes information identifying the characteristics associated with the identified STF ratings and the compantion LOM attributes for the reviewed resources.

Representation of STF/LOM Reviewed Resources



Studio Arts Thinking Framework	Learning Objects Metadata Framework
Student-centric, student construction of knowledge occurs independently	Visual, interaction, application-oriented objects
Mixed, with some student-centric activity and some instructor-centric activity	Mixture of interactive objects and consumption-based objects
Instructor-centric, requires instructor intervention for student construction of knowledge	Mostly consumption-based objects such as presentation, text, streaming

Figure 2. Representation of Reviewed Resources based on STF and LOM Frameworks

Discussion and Results

Our first research question is, "How could educators use multi-media and immersive resources to curate effective learning experiences?" From our analysis and observations, we contend that by evaluating multimedia

and immersive resources using the STF and LOM frameworks, educators can identify and apply student-centered, constructivist-oriented learning experiences for their students thereby aiding in the learning process (Muir, Knezek, & Christensen, 2004). Students could gain the opportunity to collaborate with peers and engage with the software, thereby increasing intrinsic motivation while supporting the needs of the kinesthetic and visual learner (Basaran, 2016). A profound learning experience could occur because appropriately curated multimedia and immersive resources will consist of streaming media, images, text, interactive applications, or include a self-paced activity that relies on critical thinking skills (Hosseini et.al., 2017). Multi-media and immersive resources could allow educators to shift the learning paradigm and shift a student's mode of cognition through a more dynamic experience (Girvan, 2018).

Presenting knowledge and skills in new ways may challenge students and add value to the learning process, perhaps appealing to a diverse learner population. Exposing learners to interactive and vibrant sources of information could help learners feel more empowered and increase their level of engagement by exploring such curated learning experiences (Solomou et.al., 2015). Additionally, learners could view, summarize, and deduce information at their own pace. Conversely, educators could deliver a comprehensive curated experience for learners who have learning challenges. The multimedia and immersive resources posited as intuitive, thereby reducing the need for assistance when interacting with the programs (Sheffer & Hunker, 2019).

Our second research question posed is, "To what extent may cognitive, interpersonal, and intrapersonal skills be learned using open-access educational resources from the Internet? From our analysis and observations, we contend that educators should select multimedia and immersive resources supporting student-centered interaction. Through such activity, students have a higher propensity to develop into independent learners who use higher-order thinking skills to solve problems and navigate through knowledge sources (Kopzhassarova, Akbayeva, Eskazinova, Belgibayeva, & Tazhikeyeva, 2016). Using open-access educational resources from the Internet could allow a learner to attain several skills including, but not limited to, synthesizing information, increasing independent learning, applying critical thinking and problem-solving skills, and offering more options for a versatile classroom learning experience (Wang & Wang, 2011).

Multimedia and immersive resources may afford learners the opportunity to demonstrate levels of understanding through the reflective and evaluative process. Learners could create their own experience if developers designed the selected resource for exploration. Using multimedia immersive resources could allow learners to acquire cognitive, interpersonal, and intrapersonal skills by selecting resources designed for student exploration of an academic topic. According to Clark and Gibb (2006), with the teacher guiding the learning experience, learners could acquire such skills by encountering problem-solving scenarios that rely on small group interaction. All open access educational resources analyzed included some form of cognitive skill development, with cognition described as the totality of mental activities and processes involved in thinking, perceiving, understanding, and remembering (Ashcraft, 2005).

The results of the study support the contention that an identification of multi-media and immersive resources on the Internet is achievable and includes information about how educators can locate and deploy them. Furthermore, the learning experiences consisting of cognitive, interpersonal, or intrapersonal skills resulting from the curated educational applications are shared, as well as the techniques used to identify relevant resources.

Conclusion

According to the findings of this research study, many free resources exist on the Internet for educators to use to enhance learning. The research team analyzed 46 resources based upon specific criteria and their potential usefulness in an educational environment. The standards used to determine the value of these resources included educational level, subject, technology type, distinction, presence of marketing advertisement, technical data type, learning resource type, and alignment of the technology to the Studio Thinking Framework (STF). Because researchers apply their judgment about the efficacy and reusability of digital learning objects (DLOs), using a technique to evaluate technology via several measures aids in avoiding bias during the evaluation process of technology and could reduce the amount of time required to assess the technology (Basaran, 2016).

The researchers of this study suggest that open access Internet resources are available for the student to interact and experience many of the STF attributes directly, and only require teacher involvement for reflection and assessment. These student-centered resources included interactivity and often incorporated multiple paths to the learning objective for the student to follow. The Internet resources that did not incorporate means for student independent learning required teacher interaction with the program to meet curricular goals. Analysis of the data collected incorporated a ranking scale to enable the researchers to rate the extent of student-centrism in relation to knowledge construction. The learning resource type on the highest ranked open access online educational programs

were interactive. Technical data type paired with the STF framework could lead educators to believe that multi-media applications involving multiple forms of interaction receive high ratings for student-centeredness and could posit as a good choice for providing students with experiences leading to higher forms of critical thinking. Instructors who are inspired to select open educational resources which focus on independent learning and higher-ordering thinking provide students with outstanding opportunities to achieve learning objectives.

References

Ashcraft, M. H. (2005). *Cognition* (4th ed.). Saddle River, NJ: Pearson Prentice Hall.

Basaran, S. (2016). Multi-criteria decision analysis approaches for selecting and evaluating digital learning objects. *Procedia Computer Science, 102*, 251-258.

Brantley, P. (2015). The VR revolution. *Publishers Weekly, 47*(18), 262.

Clark, D. & Gibb, J. (2006). Virtual team learning: An introductory study team exercise. *Journal of Management Education, 30*(6), 765-787. doi:10.1177/1052562906287969

Dede, C. (2010). Comparing frameworks for 21st century skills. In *21st century skills: Rethinking how students learn* (pp. 51-76). Bloomington, IN: Solution Tree Press.

Dede, C., Grotzer, T. A., Kamarainen, A., & Metcalf, S. (2017). EcoXPT: Designing for deeper learning through experimentation in an immersive virtual ecosystem. *Journal of Educational Technology & Society, 20*(4), 166–178.

Frantiska, J., Jr. (2018). Learning objects. In *Visualization tools for learning environment development* (pp. 37-49). Cham, CH: Springer.

Girvan, C. (2018). What is a virtual world? Definition and classification. *Educational Technology Research and Development, 66*(5), 1087-1100.

Hetland, L., Winner, E., Veenema, S., & Sheridan, K. (2013). *Studio thinking 2: The real benefits of visual arts education.* New York, NY: Teachers College Press.

Hosseini, S., Kees, A., Manderscheid, J., Röglinger, M., & Rosemann, M. (2017). What does it take to implement open innovation? Towards an integrated capability framework. *Business Process Management Journal*, *23*(1), 87-107.

Hsieh, H. F. & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288.

Johnston, E. & Lane, J. (in press) Artist stories of studio art thinking over lifetimes of living and working. *International Journal of Education in the Arts*.

Johnston, E., Olivas, G., Steele, P., Smith, C., & Bailey, L. (2017). Exploring pedagogical foundations of existing virtual reality educational applications: A content analysis study. *Journal of Educational Technology Systems*, *46*(4), 414–439. doi:10.1177/0047239517745560

Kopzhassarova, U., Akbayeva, G., Eskazinova, Z., Belgibayeva, G., & Tazhikeyeva, A. (2016). Enhancement of students' independent learning through their critical thinking skills development. *International Journal of Environmental and Science Education*, *11*(18), 11585–11592.

Luna-Nevarez, C., & McGovern, E. (2018). On the Use of Mobile Apps in Education: The Impact of Digital Magazines on Student Learning. *Journal of Educational Technology Systems*, *47*(1), 17-31.

Muir, M., Knezek, G., & Christensen, R. (2004). The power of one to one: Early findings from the Maine learning technology initiative. *Learning and Leading with Technology*, *32*(3), 6-11.

Sheffer, J. A. & Hunker, S. D. (2019). Digital curation: Pedagogy in the archives. *Pedagogy: Critical Approaches to Teaching Literature, Language, Composition, and Culture*, *19*(1), 79-105.

Sheridan, K. M. (2011). Envision and observe: Using the studio thinking framework for learning and teaching in digital arts. *Mind, Brain, and Education, 5(*1), 19–26.

Solomou, G., Pierrakeas, C., & Kameas, A. (2015). Characterization of educational resources in e-learning systems using an educational metadata profile. *Educational Technology & Society, 18*(4), 246–260.

Steele, P., Johnston, E., Lawlor, A., Smith, C., & Lamppa, S. (2018). Arts-based instructional and curricular strategies for working with virtual educational applications. *Journal of Educational Technology Systems*, *47*(3), 411-432. doi:10.1177/0047239518803286

Wang, S., & Wang, H. (2011). Teaching higher order thinking in the introductory MIS course: A model-directed approach. *Journal of Education for Business*, *86*(4), 208. https://doi.org/10.1080/08832323.2010.505254

Winner, E., Goldstein, T. R., & Vincent-Lancrin, S. (2013). *Art for art's sake*? *The impact of arts education*. Paris, France: Organization for Economic Co-operation and Development.

Appendix A

Title	URL	Subject	Educational Level	Technology Type	Technical Data Type	Learning Resource Type	STF Rating
Answer Garden	https://answergarden.ch/	Fine & Applied Arts	Middle School, High School, Postsecondary	Application, Text, Image	Hypertext	Interactive	12
Echo360	https://echo360.com/higher-ed/	Math, Social Sciences, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School, Postsecondary	Text, Image, Streaming Media, Application	Photo, Document, Graph, Image, Presentation, Audio Recording, Video	Activity	12
Flash Card Machine	https://www.flashcardmachine.com/	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School, Postsecondary	Text, Image, Streaming Media, Application	Presentation, Hypermedia Application, Interactive Software	Interactive	12
Media Smarts	http://mediasmarts.ca/digital-media-literacy/educational-games	Language Arts	Elementary, Middle School	Text, Image, Streaming Media, Application	Hypertext, Presentation, Audio Recording, Interactive Software, Presentation	Activity	12
MIT Open Courseware	https://ocw.mit.edu	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Postsecondary	Application	Interactive Software	Interactive	12
Quizlet	https://quizlet.com/	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Math, Social Sciences, Elementary, Middle School, High School, Postsecondary	Text, Image, Streaming Media, Application	Presentation	Interactive	12
TutorPro	https://www.tutorpro.com/content- creation-tools/	Fine & Applied Arts, Math, Social Sciences, Biological & Physical Sciences, Language & Fine Arts	Middle School, High School, Postsecondary	Text, Streaming Media, Image, Application	Hypertext, Image, Audio Recording, Video	Interactive	12
Interactive Storytelling (Ex. Bublr)	https://elearningindustry.com/18- free-digital-storytelling-tools-for-teachers-and-students	Language Arts, Social Sciences	Elementary, Middle School, High School	Application	Hypermedia Application, Video, Animation, Presentation, Presentation, Interactive Software	Activity	11
Moodle	https://moodle.org/	Language Arts, Social Sciences, Math, Biological	Middle School, High School, Postsecondary	Application, Text	Interactive Software	Interactive	11

		& Physical Sciences, Fine & Applied Arts					
Padlet	https://padlet.com/	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School, Postsecondary	Text, Application	Presentation, Video	Demonstration	11
Prezi	https://prezi.com/	Fine & Applied Arts, Math, Social Sciences, Biological & Physical Sciences, Language Arts	Elementary, Middle School, High School, Postsecondary	Text, Image, Streaming Media, Application	Photo, Image, Presentation, Animation, Self-Running Presentation	Presentation	11
Scoop.it	https://www.scoop.it/	Fine & Applied Arts, Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	High School, Postsecondary, Middle School	Text, Image, Application	Document, Hypertext, Animation, Webcast, Video	Interactive	11
DOGO News	https://www.dogonews.com/	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School	Text, Streaming Media, Application		Case Study	10
History Animated	http://historyanimated.com/verynew historywaranimated/	Social Sciences	Elementary, Middle School, High School	Text, Image	Document	Simulation	9
Nova	https://www.pbs.org/wgbh/nova/	Math, Biological & Physical Sciences, Language Arts	Elementary, Middle School, High School, Postsecondary	Streaming Media	Video	Presentation	9
Reading Rockets	http://www.readingrockets.org/article/using-multimedia-support-reading-instruction	Language Arts	Elementary, Middle School, High School, Postsecondary	Text, Image, Application	Presentation, Document, Hypertext, Image, Hypermedia Application	Narrative Text	9
Wikis	http://www.clickonf5.org/internet/10- free-opensource-wiki-software-engine/7599	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School, Postsecondary	Application	Hypermedia Application	Interactive	9
Alison Courses	https://alison.com/	Math, Social Sciences, Biological & Physical Sciences, Language Arts,	Postsecondary	Application, Application, Application	Interactive Software	Presentation	8

		Fine& Applied Arts					
American Rhetoric	https://www.americanrhetoric.com/top100speechesall.html	Social Sciences, Language Arts	Elementary, Middle School, High School, Postsecondary	Streaming Media, Text	Video	Presentation	8
Audio Books, such as Lit2go	https://etc.usf.edu/lit2go/	Fine & Applied Arts, Language Arts	Elementary, Middle School, High School, Postsecondary	Application	Audio Recording	Narrative Text	8
David Bowie:Augmented Reality	https://www.nytimes.com/interactive/2018/03/20/arts/design/bowie-costumes-ar-3d-ul.html	Fine & Applied Arts	Middle School, High School, Postsecondary	Image, Streaming Media	Presentation	Presentation	7
Edgenuity	https://www.edgenuity.com/about- edgenuity/	Math, Math, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School	Text, Image, Streaming Media, Application	Photo, Presentation, Document	Guidelines	7
Khan Academy	https://www.khanacademy.org/	Math, Social Sciences	Elementary, Middle School, High School, Postsecondary	Streaming Media	Presentation	Demonstration	7
Listen to the world	https://www.nytimes.com/interactive/2018/09/21/magazine/voyages-travel-sounds-from-the-world.html	Biological & Physical Sciences	Middle School	Streaming Media	Self-Running Presentation	Presentation	7
Mars Landing	https://www.nytimes.com/2018/05/05/science/nasa-mars-insight-launch.html	Biological & Physical Sciences	Middle School, High School	Streaming Media	Presentation	Presentation	7
Pics 4 Learning	http://pics4learning.com/index.php	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School, Postsecondary	Text, Image	Image	Example	7
Pinterest recomended by Science &Nature	https://www.pinterest.com/search/pins/?q=slime%20mould&source_id=7iGbTDXw&rs=srs	Biological & Physical Sciences	High School	Image	Photo		7
Rescuing the boys in the Thai Cave	https://www.nytimes.com/interactive/2018/07/21/world/asia/thai-cave- rescue-ar-ul.html	Biological & Physical Sciences	High School	Application	Presentation	Presentation	7

Science and Nature recommended by Jeffrey Bloom	https://www.atlasobscura.com/articl es/see-dazzling-botanical-imagery-through-the-ages	Biological & Physical Sciences	High School	Image	Photo		7
Sports news from the New York times, text plus video, perfect example of mixed media	https://www.nytimes.com/2018/11/13/sports/basketball/allonzo-trier-knicks.html?action=click&module=Editors%20Picks&pgtype=Homepage	Language Arts	Middle School, High School	Streaming Media	Presentation	Presentation	7
Ted Talks: Art and Mathematics	https://www.youtube.com/watch?time_continue=269&v=PMerSm2ToFY	Fine & Applied Arts	Postsecondary	Streaming Media	Video		7
Ted Talks: The Art of the Metaphor	https://www.youtube.com/watch?v=A0edKgL9EgM	Language Arts	High School	Streaming Media	Video		7
The statue of Liberty	https://www.nytimes.com/interactive/2018/11/13/nyregion/statue-of- liberty-torch-ar-ul.html?smid=nytcore-ios-share	Social Sciences	Middle School, High School	Application	Presentation	Presentation	7
Trolling the Monster in the heart of the Milky Way-	https://www.nytimes.com/2018/10/30/science/black-hole-milky-way.html?action=click&module=MoreInSection&pgtype=Article&region=Footer&contentCollection=Science	Biological & Physical Sciences	Middle School, High School	Streaming Media	Presentation	Presentation	7
WatchKnowLearn	http://www.watchknowlearn.org/defa ult.aspx	Language Arts, Math, Social Sciences, Biological & Physical Sciences	Elementary, Middle School, High School, Post secondary	Text, Image, Streaming Media, Application	Graph, Presentation, Image, Presentation, Audio Recording, Video, Interactive Software	Lecture	7
National Center for Case Study	http://sciencecases.lib.buffalo.edu/c	Biological & Physical Sciences	Middle School, High School, Postsecondary	Text, Image	Presentation	Case Study	6

Teaching in Science	s/about/awards .asp						
Digital Library for Earth System Education	http://www.dlese.org/lib/	Biological & Physical Sciences	Elementary, Middle School, High School, Postsecondary	Text, Image, Streaming Media, Application	Interactive Software	Problem Solving	6
Disney Youtube Education	https://www.youtube.com/user/DisneyEducation/videos	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School	Streaming Media	Video	Presentation	6
FutureLearn	https://www.futurelearn.com/course s	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	High School, Postsecondary	Streaming Media	Hypertext	Narrative Text	6
Open Stax	https://openstax.org/	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Postsecondary	Text	Document	Narrative Text	6
PBS Learning Media	https://www.pbslearningmedia.org/	Math, Biological & Physical Sciences, Social Sciences, Language Arts, Fine & Applied Arts	Middle School, Elementary, High School	Text, Image, Streaming Media, Application	Presentation, Audio Recording, Animation	Demonstration	6
Watch Know Learn	http://www.watchknowlearn.org/default.aspx	Math, Social Sciences, Biological & Physical Sciences, Language Arts, Fine & Applied Arts	Elementary, Middle School, High School, Postsecondary	Streaming Media	Video	Presentation	6
Western Reserve Public Media	https://westernreservepublicmedia.org/education/classpro.htm	Biological & Physical Sciences, Math	Middle School, High School, Postsecondary	Application, Streaming Media, Image, Text	Interactive Software	Simulation	6
Creative Commons Search	https://search.creativecommons.org/	Math, Social Sciences, Biological & Physcial Sciences, Language Arts, Fine & Applied Arts	Middle School, High School, Elementary, Postsecondary	Image	Image	Non Interactive	1