Teaching With Rich Media
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The structure of this document coincides with the NERCOMP Workshop “Teaching with Rich Media” held September 27, 2017, College of the Holy Cross – Hogan Campus Center, Worcester, MA, authored and facilitated by Steve Covello.

Citation (APA):

This book was created as a response to emerging discussions with online faculty and program directors about what is possible in teaching and learning online beyond using just text-based instructional media.

The context of these discussions has been within my collaborative work as the Rich Media Specialist and an Instructional Designer at Granite State College since 2011. I have worked in the design, development, and formative revision of fully online courses in undergraduate and graduate degree programs and in facilitating faculty professional
development programs. I have also taught fully online courses for General Education, Program level, and Capstone undergraduate courses since 2012.

I recognized in my own teaching and in my instructional design discussions with faculty that there was an opportunity to promote a vision of what we do as online educators that separates us from the conventions of face-to-face (F2F) education. We teach differently than F2F instructors, encounter different challenges, and draw upon different skills to achieve our educational goals. Teaching online isn’t an offshoot of F2F teaching – it is an entirely different species of teaching.

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Much has been written about what is possible in teaching in traditional F2F education. In contrast, the answers to the question of *What is possible in teaching online* has only just begun to proliferate. In order to inspire more thinking about what is possible in teaching online, however, two significant challenges have to be overcome: one is a cultural barrier, the
other is a relatively large gap in evidence-based practice for teaching online as a profession due to its newness.

Culturally, online education was (and to some degree, still is) perceived as a second-class outgrowth of the F2F education model – something not quite as legitimate; not quite as rigorous. F2F learning is still regarded by traditionalists as “real learning”. While I agree that online teaching is not for every instructor nor is online learning for every student, none of those factors negates the reality that learning can occur in fully online instruction with no significant difference in outcomes compared to F2F. Unfortunately, for my faculty clients, there had not been enough high profile examples of well-designed and sustainable online education to convince skeptics that an entire degree program could be fully online and convey the same confidence in the graduate’s credential.
Perceptions have changed, however, partly out of necessity, partly out of discovery (as indicated below in the excerpt from Dr. Piña’s seminar), and partly because of the creative vision of new education leadership. (It is also worth mentioning that my two teenage children have learned many new complex skills on their own through YouTube videos with no assistance from me! Models for self-directed learning are evolving as we speak.)

At Granite State College, a cultural change began to occur around 2013. Up to that point leadership had sanctified the culture of academic freedom where online faculty were given total discretion to teach subject matter any way they wanted with no standards for the structural design of their online course, assignment development, and assessment strategies. The implication in this approach was that subject matter expertise was the only condition that mattered in order for learning to occur – the educational experience of being connected to a subject matter expert was, in itself, a form of learning.

However, the results were chaotic. Some courses were well designed while others were difficult to comprehend. Each instructor had their own (often improvised) concept of course layout, labeling, formatting, engagement logic, and instructional communication. From the student’s perspective, no two courses were alike making the experience of progressing from course to course similar to recalibrating one’s orientation, navigation, and movement strategies in a different airport every time one flew.
The shift away from absolute academic freedom meant embracing a new understanding that teaching and learning online required a more systematic approach to course design, development, implementation, and teaching that reflected the fundamental communication differences between traditional F2F and online learning. It also required recognizing and validating the experiential, emotional, and motivational differences online students bring to academic commitments.

And this is where we bring to light the newness of teaching online as a profession informed by instructional design models as a science.

For example, in a seminar offered by Educause in August, 2017, one educator recounted how the process of converting a F2F course to an online course through a systematic instructional design model improved the course so well that it completely changed how all new courses were created.

Here is an excerpt from Dr. Anthony Piña’s Educause presentation titled, “Changing Institutional Culture Using Instructional Design”.

My institution, when I arrived a little over eight years ago, was definitely stuck in an old paradigm and had a very strong established culture among the faculty. And that culture was, “I am going to put my face-to-face course online”. And so the idea is that “face-to-face drives the bus” here. It [ was ] very personalized to individual faculty members, and so it’s possible that different sections of the same course could be wildly different from each other.

The courses were often built in a vacuum, and the
A faculty member decided what was to be put in the particular online course. The faculty member said, “This is what I think should be taught in the course so I’m going to develop it this way,” without really consulting other faculty or even the division or program level outcomes, which were a little fuzzy at the time.

...We are now doing a new paradigm within our institution... Rather than having face-to-face development “drive the bus,” online is now driving the bus. One of the reasons for this is that academic leadership has realized that the online courses are built upon principles of instructional design. Bringing instructional designers in there, using ID models, using standards and rubrics, etc., resulted in online courses that were better developed than the face-to-face courses.

And so what’s happening now is that new course development, rather than developing the face-to-face course and then developing the online as an adjunct to the face-to-face, we are now developing all new courses online first and hybrid courses, and face-to-face courses are being developed from the online course.

So face-to-face is now adapted from online, whereas our previous culture was exactly the opposite.

**Key Theoretical Underpinnings**

The following understandings drive the principles presented in this book:

- Teaching and learning in a fully asynchronous online
delivery mode is fundamentally a communications challenge caused by transactional distance (Moore, M., 1993). What is gained in distance education in terms of reach is hampered by a loss of semantic richness in asynchronous communication compared to the semantic richness of face-to-face communication (Daft, R. L., R. H. Lengel, 1986).

• Each form of communication, e.g. text, image, video, audio, interactive multimedia, has inherent strengths and weaknesses to convey information compared to other forms of communication (Kozma, 1991), though these differences are not deterministic. Context, purpose, audience, rhetorical impact, professional competency, and feasibility are considerable factors in the decision to select a certain form of communication for instructional media instead of another.

• The design of information itself is both analog (analogous to that which it represents) and digital (symbolic) (Wilden, A., 1972) which requires cognitive effort to decode and interpret. Information, as a design, is engaged with by humans experientially (Dervin, B., 2003). This suggests that the character of information and the sensory experience of it should be a consideration in how it is conveyed as instructional media.

• Information, conveyed through communication, is an ingredient in human sensemaking amidst continual cognitive movement towards overcoming a gap, solving a
problem, or improving one’s condition (Case, 2007, Dervin, 2003). The human brain – a pattern recognition machine – processes sensory information with an urgency to make sense of it according to existing patterns of information in longterm memory and the immediate situation in which the learner encounters new information (Foreman-Wernet, 2003).

- Rich media alone does not cause learning to occur. No body of information by itself in any form constitutes “instruction”. Optimally, information should be situated within a pedagogically sound context, purpose, and structure.

There are references to many familiar areas of research throughout this book that align with broader principles of instructional design and learning theory. The following areas, however, are brought to the forefront because of their relevance to the unique experience of teaching and learning online.

**Dr. Brenda Dervin's Sensemaking Methodology**

Dervin’s decades of research into sensemaking centers around the description of human agency, emotion, communication, and behavior in situations that involve seeking information to close gaps that impede their cognitive movement towards
solving a problem. Dervin’s model of humans as information seekers, sensemakers, and sensegivers, aligns well with the proposition that teaching and learning online is fundamentally a communications challenge.

Readers are directed to review the most digestible summary of the history of sensemaking in Naresh Kumar Agarwal’s “Making sense of sense-making: tracing the history and development of Dervin’s Sense-Making Methodology” (2012). Dervin’s collected works in “Sense-Making Methodology reader: Selected writings of Brenda Dervin” (2003) describes the foundation narrative of sensemaking as a metatheory and methodology.

Below are key takeaways adapted from Dervin’s work that are valuable in understanding the perspective of learners involved in fully online asynchronous learning:

1. Humans are both orderly and chaotic; they enter into situations (such as online learning) with infinitely diverse historical, social, cultural, and cognitive understandings of the context of their needs and the means by which to fulfill them.

2. Humans improve their condition by seeking information and overcoming gaps through communication. Dervin organizes these “verbings” into various “helps” (see figure 1 below) that describe how a particular form of help enabled them to move forward.

3. The patterns of when users seek information/help and
how they overcome stopping points is more predictive of users’ needs than what is considered important or useful according to an individual subject matter expert or instructional systems designer.

4. The only way to know how learners encounter, operate, fail, seek help, and succeed in the challenges of learning online is to ask them. Dervin provides a methodology to discover patterns in these efforts called the Micro-Moment Timeline.

Fig. 1 – Dervin’s collection of “helps” that describe how individuals overcome stopping points in their cognitive movement.
From these and other observations proposed in Dervin’s work, I present the following propositions about online learners that drive instructional design practice:

Degree-based online education is still so new that students come into our programs with only fragments of understanding about what online learning is, what they are supposed to do to meet expectations, how/when to get help, and what kind of help they actually need.

In situations where online students are unsure what to do or how to do it, they may improvise a solution because they have no other people to confer with in the immediate moment when their sense runs out.

We design, develop, and teach our courses under a set of assumptions about our students that may turn out to be wrong – it is impossible to know and account for all of the realities students bring to our courses. However, it is possible to rethink what we do according to the patterns that emerge when online students seek information and help. We must therefore ask how students overcome stopping points, what forms of help enabled them to do so, and then use formative instructional design to improve instruction.

Dervin’s work calls for us think from a user-based perspective similar to the way Temple Grandin describes her ability to visualize how animals experience their environment in the livestock trade. To move to a user-based approach requires
relinquishing the belief that students *owe us the effort to figure out on their own* how we have conceptualized learning according to *our* philosophies, assumptions, rules, and expectations. For students, this experience can be, at best, disorienting; at worst, cruel and indifferent to their needs.

**Robert Kozma’s analysis of media**

Kozma is perhaps known for his battles with Richard Clark over whether the use of any given medium in delivering information has any effect on learning.

Kozma’s position states that there is a relationship between the affordances of a given medium and its ability to convey information analogously to human sensory perception. Certain media, under certain conditions, are optimized for the formation of cognitive models of knowledge according to the character of the information itself. In a way, Kozma portrays media as a *cognitive extension* as described in Andy Clark and David Chalmers’ theory of “*The Extended Mind*“.

Neither Richard Clark nor Robert Kozma argue that media cause learning. Rather, Kozma changes the focus of interest in the argument to something more metaphysical about how the human brain processes information in the formation of knowledge. Media, as symbolic, metaphoric, or isomorphic representations of real phenomena, are useful as *cognitive guides*. 
WHAT IS RICH MEDIA?

What is rich media and why does it matter?

If you do a Google search on “What is rich media?” you will be presented with results focusing almost exclusively on multimedia used in some form of advertising.

Rich media has not been identified as a conventional term used in education or instructional design research like, say, assessment, so it is not possible to present a summary of studies specifically related to the definition or use of rich media in online instruction. In fact, it is a bit of a curiosity that there is no specific body of research on the use of rich media in instruction, though a cursory search in employment listings for higher education will find positions for the purpose of developing rich media or “media rich content” for instructional purposes.

There is also a legitimate argument to suggest that perhaps the colloquial use of the term rich media in the educational context isn’t meant as a formal call for something actually called rich media, unlike how one might state the need for actual learning analytics. To say, “Our online courses need rich
media” might only mean “something more than just text” or in a more patronizing sense, “pizzazz”.

Setting these informalities aside, there is a strong case to suggest that the maturity of online education requires new strategic thinking about the means by which information is communicated in a purposeful online instructional situation in our contemporary communication ecology. We – educators and students – live in a world of communication very different than a mere 20 years ago (ca. 2000) yet our starting point still tends to begin by asking “What textbook should be use? Where do I upload my PowerPoint slides?”.

There has never been more information about every subject in the world available in as many forms of communication as there are today. It has never been more easy to organize, compose, present, access, annotate, and interact online with information using open source systems and tools. It has never been more easy to create online knowledge communities, share information, make connections, and participate in the discourse of what is knowable about subject matter, praxis, or leadership through social networks.

The conversation about how we communicate in online education needs to change from asking what textbook we will use to “What form of communication is optimal for online learners to engage with information in order for them to make sense of it?” Connected to this question are more philosophical ones that challenge the notion of what knowledge really is (is it expert driven and “settled”, or socially
constructed and dynamic?), how knowledge is demonstrated as an artifact of summative learning (term papers, multimedia, or online content?), and whether the works created by students should be submitted, assessed, and then forgotten, or made open for the world to discover and build upon (throwaway assignments versus Open Pedagogy?). Rich media – as we refer to it in this book – is an ingredient in these conversations.

Thus, the rationale for a book about teaching with rich media stems from the need to organize all of this “digital stuff” into something coherent, to articulate the unique affordances of rich media in a practical sense, and to employ rich media with pedagogical integrity. The outcome of implementing the principles in this book is a mindset in the practitioner that is habituated to...

- examining the character of information itself,
- identifying the needs of an instructional situation in terms of the natural human reflex for sensemaking,
- selecting the form(s) of instructional media appropriate to those needs, and
- crafting instructional messages and assessment designs that align to learners’ engagement with instructional media.
Defining rich media

We begin by assembling a definition of rich media according to the context of instructional design. First, what makes rich media “rich”? What substance in media is richer in some media than in other media?

Daft, Lengel & Trevino (1986) developed Media Richness Theory for the purpose of optimizing business communication. The research addresses the question of which form of communication is appropriate for managers to use given each contextual need for clarity, equivocality, and feedback in a business communication situation.

Communication media are classified along a continuum between the terms “lean media” and “rich media” (see Fig. 1). The position of a given medium on the scale is predicated on its inherent capacity to convey both information and how the information is intended to be taken as, semantically. Media that are closer to the rich end of the spectrum embody a greater capacity to provide unambiguous meaning and certainty in the receiver through the conveyance of nonverbal cues, rapid feedback, personality traits, and natural language. Thus, a face-to-face interaction is semantically rich compared to a semantically lean plain email message.
Note, however, that “richness” does not necessarily connote “good”, and “leanness” with “bad” forms of communication. Instead, each medium is best suited for a purpose, with rich media employed in situations with complex subject matter or high potential for ambiguity or conflict (such as gathering a group of people together to agree upon the goals of a project), and lean media, like email, best suited for communicating operational activities (Heeren, E. and Lewis, R., 1997).

We take from the Media Richness model that there are differences in the capacity for a given medium to convey meaning, however it does not tell us why. Robert Kozma (1991) takes this argument into a more scientific realm. He argues that there is a cognitive connection between the representative characteristics of a given medium and how it is analogous to sensory and cognitive functions in the human
brain. For example, if the characteristics of subject matter has to do with visual representations of spatial relationships, the use of a visual medium to convey this information is advantageous to the learner in forming mental representations more so than a simple text description. In sum, Kozma proposes that each form of communication has inherent strengths and weaknesses to convey information based on how they are analogous to that which they represent. This theory will be elaborated upon in more detail later in the chapter.

From Daft, Lengel, Trevino, and Kozma, we state that the substance that is rich in rich media is the qualitative ability to convey information in ways that are optimal according to the natural phenomena of human sensory perception and cognition.

Let’s now turn from the meaning of “rich” to the meaning of “media”.

In the word “media” we find not one, but several interpretations. The word “medium” is sometimes used to identify a communication object – such as an image, video, audio, or interactive program – or to identify a mode of communication, such as face-to-face engagement, telephone, television, an Internet platform, Web tool, etc. Each medium has a natural utility for communication based on its affordances which, in turn, have an effect on the interpretation, context, or integrity of its message. For example, Twitter is very strong in reaching a wide audience with a short message, but it is not very good in conveying
how that message was intended to be received or interpreted compared to the same message presented face-to-face in realtime.

From an instructional perspective, we may refer to media as either the material or means by which instructional information or messages are displayed, organized, accessed, or transported. For our purposes, we take the broadest interpretation of media because each of these characteristics will be observed in different ways as the communication ecology evolves. It would otherwise be risky to promote an absolute identity to the expression of media since current constructions or brands of media may become obsolete or disappear.

“Rich media”, then, may be described not necessarily as a particular thing, such as a video in a course, but rather a broad set of communication resources to be used optimally under certain conditions.

A definition of rich media

**Definition:** Rich media is a set of systems and resources with unique capabilities to convey information beyond the affordances of text alone.
Rich media systems are organized into the following classifications:

- Multimedia
- Social networks
- Web-based tools

A practical approach for instruction

The case for using rich media in instruction is based upon how it can be advantageous to learners in achieving a set of instructional goals or in preparing learners to communicate according to standards of professional or scholarly practice.

- Each form of rich media is useful because of its inherent characteristics, as media, to convey information compared to text media alone.
- Each form of rich media varies in its strengths and weaknesses. Rich media are not better in all cases – they are simply different.
- Rich media, used appropriately, streamlines cognitive effort, reduces cognitive load, and supports sensemaking/sensegiving.
- Rich media, as forms of electronic communication,
provide opportunities to practice communicating with tools learners will encounter under authentic professional or scholarly conditions.

However, we should note that rich media alone does not cause learning. Using rich media effectively requires employing a holistic pedagogical approach to an instructional challenge which we refer to as “the pedagogical wrapper” around a rich media resource. This topic is covered more thoroughly in the that chapter “The Pedagogical Wrapper“.

Classifications of rich media

Multimedia: Perceptual Resolution

Multimedia has optimal characteristics to stimulate sensory experiences and cognitive activity analogous to real world experiences and phenomena which, when used in instruction, are optimal for constructing mental models.

**Definition:** “The term ‘multimedia’ is a catch-all phrase to describe ... the presence of text, picture, sound, animation and video; some or all of which are organized into some coherent program. The
Multimedia has been a popular focus of educational research (Mayer, 2005; Mayer, 2009). While the exact definition of multimedia varies, commonalities among diverse perspectives include the simultaneous presentation of multiple modes of information: text, audio, still images, animated images, and sometimes interactive programming comprised of each of these modes. A simple example would be an animated video with spoken narration that describes how lightning strikes.

Multimedia may be employed in instructional contexts for a variety of purposes. For example, Mayer & Moreno (2003, p.46) state that multimedia-based instruction is intended to foster “... meaningful learning [through] the construction of a mental model of how a causal system works.” The operative word in this statement is “construction”, as we believe that learning is characterized by a process of building knowledge through active sensemaking. Multimedia, therefore, is a cognitive guide (Mayer, 2005) in this process.

For the sake of comparison, both a video representation and a text representation of the same phenomenon are equally capable of communicating information. The difference, and therefore the advantages inherent in video, audio, or
interactive simulations, is in the high degree of perceptual resolution inherent to multimedia, which may be described as its presentation being most closely analogous to that which it represents (Kozma, 1991).

For example, if an instructional activity involves observation and analysis of a situation-based phenomenon with human interaction, a video representation would offer learners a more authentic basis for analysis than a text description alone. This is because video can reproduce visual information, non-verbal cues, audio synchronization, situational contexts, and time-based phenomena with a greater ability to control the focus of attention than text.

Similarly, a class in linguistics would benefit from audio representations of phonetics; a statistics assignment would benefit from an interactive simulation that processes input to test a predictive output model.

Examples

Below are some examples of multimedia. Note that some of these will require Flash to be active in your browser. If they do not work because Flash is being blocked, try a different browser or enable Flash:

Gendered Language in Teacher Reviews: This interactive chart enables the user to explore the words used by students to describe their male and female
teachers based upon data extracted from about 14 million reviews at RateMyProfessor.com.

**NOAA Interactive Global Data Exploration tool:** Select data sets to display interactive global environmental data over time. Example: *Ocean temperature animation*

**IBM Watson Personality Insights:** Artificial intelligence used to analyze text input and display personality characteristics through linguistic analysis.

Washington Post *“Coming Home a Different Person”: An interactive multimedia presentation on combat related traumatic brain injury (TBI).*

TED Talks: *“Why climate change is a threat to human rights”*. Like most TED Talks, there are more resources here than just a video recording.

**Chrome Music Lab:** Browser-based interactive demonstrations of sound and music.

Online speech synthesis application: *“Pink Trombone”* is an interactive graphical representation of human speech synthesis.

**Cleverbot:** An ongoing experiment in artificial intelligence where website visitors interact with “Cleverbot” – an AI system that is programmed to learn from its cumulative interactions with humans and carry on an “intelligent” conversation. Anyone can go on the website and type in a conversation. It was featured in an *NPR RadioLab* episode.
ClickClickClick.click: An interactive Web page designed to do nothing more than show the visitor what they are doing within the Web browser as they interact with it. Includes both a text and speech-generated interface. Its design is intended to demonstrate how much information can be extracted from a person’s typical online interaction.

Thing Translator: Test out this browser app that looks at an object that you hold up to your webcam, tries to identify it, and then translates it into one of eight languages. It’s not very good, but it’s very engaging for use in language learning.

The Path of Protest: An interactive timeline of events related to the Arab Spring.

Test My Brain: An ongoing research project involving an interactive program for recognizing emotions and other cognitive processes. Includes a survey and results analysis.

Social media: Cognitive Presence

For the sake of discussion, “social networks” will refer to the systems upon which online communities and communication takes place. “Social media” will refer to the content on those networks.
Definition: Social networks are communication systems designed around the purposeful interaction of people and entities through electronic means. Keitzmann (2011) organizes the components of social media into functional building blocks composed of:

- **Identity** – The extent to which users reveal themselves.
- **Conversations** – The extent of communication among users.
- **Sharing** – The extent to which users exchange, distribute, and receive content.
- **Presence** – The extent to which users know if others are available.
- **Relationships** – The extent to which users relate to each other.
- **Reputation** – The extent to which users know the social standing of others.
- **Groups** – The extent to which users are connected into communities.

A functional definition is offered here instead of naming specific social network systems because it insulates us from the turbulence of emerging and dying social media systems, all of which
conform to some aspect of Keitzmann’s functional building blocks.

Social networks like Twitter, LinkedIn, StackExchange, Quora, TED.com, or an industry related forum like CreativeCow.net, are powerful platforms for collecting, organizing, and displaying information. Social networks are constantly expanding with membership, topics, content, and organizational schemes (Weinberger, D., 2011).

There are several ways social networks are useful in instruction as a form of rich media.

Connectivist theory (Siemans, 2005; Downes, 2010) proposes, in short, that “knowledge is in the network” through the facility of connections on the Internet and network enabled applications. Weinberger (2012) predicates his thesis in *Too Big to Know* on the notion that, as individuals, we are limited in our capability to know all of what is knowable, therefore the smartest person in the room (meaning, the network) is not a person on the network, but the network itself.

Evidence of this theory is found in the argument that it isn’t necessary to memorize, say, the order of presidents of the United States of America because that information can be found in the network easily enough at Wikipedia. But
information networks themselves do not inherently contain “meaning”. As Nicholas Carr suggests in “Is Google Making Us Stupid?” (2008), networked information systems are strong in providing immediate access to information, but the convenience of obtaining instantaneous information comes at the expense of thinking deliberately.

This is where the principles of cognitive presence should be brought to the fore. Cognitive presence is a human perceptual experience that is felt by a person when they are a participating member of an online community (Garrison, Anderson, & Archer, 2003). It is characterized by social, psychological, and emotional interplay that fosters a sense of community with others, and serves as a means for participants to construct their identities.

Most of all, cognitive presence in an online environment serves as an incubator to construct meaning (Palloff & Pratt, 2007) with multiple perspectives providing participants with a variety of facets to subject matter. So, when we suggest that social networks are a form of as rich media, we are less concerned about what is on the network – we are concerned with the quality of participation on the network: diversity, sharing, trust, interaction, etc.

Collateral to participating in a social network community is the necessity to develop skills in information literacy which, in itself, may be a justification for its use in instruction. And in doing so, we are implicitly endorsing the legitimacy of
participating in online social communities as a normal part of one’s presence as a scholar or professional.

Examples

Twitter as a search engine: [https://twitter.com/search-home](https://twitter.com/search-home). Use Twitter like Google to find people, organizations, topics, events, and publications. No membership required.

A **mazon.com**: Type in a book of interest (YA/children’s literature, contemporary psychology, political analysis, etc.) Review a range of reviews, both positive and negative. Here is an example using a controversial book by Pat Buchanan – “The Death of the West: How Dying Populations and Immigrant Invasions Imperil Our Culture and Civilization”. Scroll down to the filtering tools to review 5- and 1-star ratings.

Wall Street Journal – **Blue Feed, Red Feed**: A running side-by-side comparison of Facebook accounts configured with one side to receive only “blue” political content, the other side receiving only “red” political content.

**Quora.com**: Quora is a Q & A social network where members can post a question about any topic. Other members answer the questions and “upvote” the ones they feel are relevant, useful, or informative. It can be
hit-or-miss, but some questions can be revealing. Examples:

- What does it feel like to be poor?
- What does it feel like to be racially profiled?
- Why didn’t homeless vets stay in the military?
- Follow Topic: Discrimination
- Follow Topic: Race and Ethnicity

**Instagram:** An image-based social sharing app designed primarily for mobile devices where tags and hashtags are used as search filtering mechanisms.

**Pinterest:** An image-based curating site based on any topic or theme.

- Biology
- Criminal Justice
- Nursing
- Psychology

**Scoop.it:** A topic-based curating site.

- Dennis O’Connor’s E-Learning and Ed Tech scoops
- Search results for “Instructional Design”
- Search results for “Geography Education”
**Flickr.com**: A photo repository where a substantial amount of content is available through [Creative Commons](https://creativecommons.org) license.

**Web-based tools: Agency**

**Definition**: Web-based tools is a catch-all statement describing cloud-based tools and utilities used to access information, organize it, collaborate with others, manage projects, share resources, create and publish media.

Web-based tools, or webtools for short, are commonly accessible cloud-based applications used to access information (Twitter, Google Alerts), communicate (Skype, Twitter, Zoom, Join.me), manage projects (Basecamp, Asana, Google Drive), share resources (wikis, Diigo), publish media (WordPress, YouTube, Creative Commons, Wikimedia), build bibliographies (Zotero, EndNote, Evernote), annotate (Hypothes.is) and create media (H5P, Screencastify).

The case for using webtools in instruction is different than the other two classes of rich media. Webtools have less to do with the character of information in an instructional context (such as with multimedia) or the means by which a person finds meaning among peers in a social network. Webtools are
valuable because of the way learners use them to operate as *agents of knowledge*, such as being producers and organizers of knowledge instead of simply consumers.

Secondarily, there may be collateral benefits to integrating, say, Zoom video conferencing into an instructional context simply because Zoom video conferencing is the *de facto* brand of utility used in an industry or profession in the student’s field of study.

Third, and more fundamentally, practice with webtools promotes refinement of sub-skills that are commonly found in many applications. When students learn how to use a tool like Skype, they practice the following discrete sub-skills:

- Locate, download, and install an application on their computer or tablet.
- Establish a secure account username and password.
- Develop a contact list of other users through a user search process.
- Configure a webcam, microphone, or headset.
- Send and receive text, video, audio, screensharing, and file streams.
- Communicate synchronously with single or multiple partners.
- Construct a sense of presence and identity with others in a particular mode.
- Troubleshoot functional problems for themselves and others.
These sub-skills can be transferred to both similar and dissimilar applications which is valuable when new platforms or tools emerge that call for similar proficiencies. Exposure to and practice with even a few webtools can build a substantial collection of sub-skill proficiencies.

For example, a traditional assignment may ask a student to read and evaluate content in a textbook and produce a term paper. An alternative to this assignment, utilizing a Web tool, could be for students to search for and participate in an online community of practice using Twitter to curate articles or information using a subject-specific hashtag or search term, and then evaluate findings against textbook-based principles or systems.

A Twitter based activity offers the following benefits:

- Immersion in a realtime information stream on relevant news.
- Exposure to industry or subject-related blogs or forums on contemporary issues.
- Access to prominent practitioners or scholars who curate and share important research or commentary.
- Alerts to industry events or conferences.
- Interaction and connectivity with others with the same areas of interest.

Search results can be used as a focal point for academic analysis and evaluation, except in this case “facing outward” into global
community resources rather than strictly “inward” within the boundaries and editorial choices of the textbook.

When learners report to their formal learning communities with content curated externally, it enriches the learning experiences of other students, and can inspire them to explore or experiment on their own.

There is a pragmatic value for using Web tools for its own sake. But the additional opportunities afforded in rich engagement cannot be undervalued.

**Trello**: A flexible card-based collaborative system for organizing information and resources for various academic and professional projects.

**Mural.co**: A realtime and asynchronous collaborative system for visually organizing information and resources based on industry standard and customized organizational templates.

Video-based interactive tools: **GoReact.com**, **YouSeeU.com**, **ArcMedia.com**, **FlipGrid.com**, **PlayPosit.com**. These are communication systems designed around using video as a central aspect of the interaction. Some are asynchronous; some are both synchronous and asynchronous; some have affordances for branching. Most have the ability to thread comments to a specific timestamp in the media so that inquiry can be proximal to its presentation.

**H5P.org**: An open source platform where various forms of interactive media can be created and then
posted in your course. There are also integrations for H5P on several platforms including Moodle.

**Google Drive**: A system containing a suite of Microsoft-like office tools with the ability to operate collaboratively and openly.

**WordPress.com**: A world-class blogging platform that is also capable of integrating other forms of social media communication. Also useful in designing Open Education projects.

**Evernote**: A system for curating and organizing a wide range of resources according to a given project design and sharing with others.

**WolframAlpha**: A computational knowledge engine designed to respond to queries about a range of subjects and disciplines.

**InfoGraphic makers**: A list of cloud-based infographics applications.

**Zotero**: A browser extension to curate and organize Web-based resources for research purposes.

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**Footnotes**

1 – The term “authentic” in this context is not meant to suggest that a video holds greater “truthfulness” than text, as it is evident that editorial choices are made in the development of all media. Authenticity, in this context, refers to the inherent
representational capabilities of the video medium versus a purely symbolic text medium.
Overview

In the following example, the instructional challenge centered around a situation where students were having difficulty grasping an abstract concept: How is data collected in the process of navigating on the Internet that results in the formation of a data profile of the user?

A rich media resource was employed in the course that converted the hidden navigation data into an accessible and interactive graphical representation of the user’s Internet behavior. From this, students could review a visualization of their own Internet navigation so that they could discover how many trackers had been attached from each point of their navigation. This engagement was then used as a basis for discussion.
An instructional challenge with an abstract concept

COMM601 Trends in Digital & Social Media is an online upper-level undergraduate course at Granite State College (USNH).

One of the topics in the course is about Online Behavioral Targeting (OBT) – an online marketing technique based on using Internet tracking data (third-party cookies) saved in the user’s Web browser to predict what kinds of ads or content the user might respond to.

The technical underpinnings of OBT are mostly invisible. Most people do not know how or where browser cookie data is stored, where it comes from, how it is used by trackers, and how it causes a person to have a “personalized Internet experience”. From an instructional standpoint, the concept of OBT feels like it operates entirely in the abstract.

To illustrate the concept of OBT more clearly, students are directed to install a Firefox browser plugin called Lightbeam. The plugin processes all of the browser’s saved tracking data and displays it in an interactive graphical format.

Figure 1, on the left, shows text-based cookies (tracking data) as it appears in the user’s browser while in Developer Mode. Figure 2, on the right, shows how the Lightbeam plugin presents the same data as an interactive graphical display.
Rich media within the pedagogical wrapper

From an instructional design perspective, the Lightbeam experiment was intended as an integrated activity. It was not just a link dumped in the Resources section of the module. It was placed within a larger pedagogical scheme – a so-called pedagogical wrapper. The wrapper is composed of three parts:
1. **Prior to the activity:** An introduction to the resource to show relevance and credibility: The following text is included with the link to the Lightbeam resource (excerpt): “Have you ever wondered what entities are tracking your moves on the Internet? The Lightbeam Firefox plugin will show you, in graphic detail.... The plugin is funded by the Ford Foundation: ‘The work at the Ford Foundation focuses on building outreach campaigns to help people understand online data tracking — both the benefits and the issues.’”

2. **During the activity:** Learners install the plugin around Week 2 of the course so that enough meaningful data can be gathered by Week 5. Learners are advised that the results of the plugin will be used in their participation in the Week 5 discussion forum and are encouraged to review and explore interim results.

3. **After the activity:** Interactive engagement and reflection is drawn upon based on their observations and experiences:
   1. In Week 5 Discussion Forum #1, learners are directed to review their Lightbeam plugin results and comment on their discoveries against their expectations. This establishes learners’ personal positions about their discoveries and their interpretation of the
results. (See selected student response posts below).

2. In Week 5 Discussion Forum #2, learners are placed in a hypothetical “what if” situation where they must decide whether to use a new, very powerful (and ethically questionable) OBT algorithm to gain a competitive advantage for their fictitious business. The discussion forum prompt includes a statement, “How have the readings, media, and the Lightbeam experiment influenced your position?”. 

In short, the pedagogical wrapper provides learners with a context for their engagement, guidance on what to be focused on while they are engaged with it in anticipation of using their experiences later, and a call to draw from those experiences in an instructional interaction. For more on how this technique operates in relation to Bloom’s Taxonomy, please review the chapter “The Pedagogical Wrapper” for more details.

Below is a selection of actual student responses posted in Discussion Forum #1 for this activity:

At first I was kind of lost with exactly what tracking was, but then I went back, reread some stuff, finally installed Lightbeam, and boom, tracking explained.

Obviously I realize that, via metadata, those sites
probably say a lot about me.... **It’s one thing to realize, and another to see it spelled out in such detail.**

I reviewed data for a period of [seven days] and **the results are astounding.** I have a total of 467 [tracking] sites listed, of this 467, I only visited 39 sites. 428 sites are third party sites.

As far as the websites I have visited... **I did learn a lot more than I thought I would from this study.** Mostly, I learned that Good Housekeeping is riddled with these third-party sites.

That being said, the Lightbeam plugin for Firefox is awesome. **The data it shows as far as what sites you went to and ones that are connected that you didn’t go to are is amazing.**

After reviewing the data on Lightbeam, **I was blown away.**

**Very surprised by this data.** Since [one week] I have visited only 25 sites, however I have connected with over 370 third party sites! I’m assuming this means all the third party sites now know I visited the site it is connected to..... **Honestly, I’m not sure how I feel about this.**

I visited a total of 4 sites with Lightbeam and was connected with 247 3rd party sites. **Even I’m a bit surprised to find out so many trackers are being used.**
What were some of the pedagogical effects of rich media in this activity?

1. **Streamlined cognitive effort or reduction of cognitive load:** Even though the rich media component was not the primary resource for this instructional situation nor the focal point of the main topic, it enabled learners to more easily penetrate the abstract complexity of OBT so that their interaction can be more substantive.

2. **Promotion of sensemaking:** When asked to reflect on the ethical ramifications of OBT tracking systems, learners are able to draw from a concrete hands-on perspective and from a personally emotional position since the data they interacted with was their own.

3. **Promotion of sensegiving****: The instructor was in a stronger position to challenge students’ positions on the “what if” discussion because of their responses to the Lightbeam experiment. For example, some students may express indifference to the tracking information seen in the Lightbeam experiment, but feel the “what if” situation crosses an ethical line. The contrast in these positions can be used as a basis for deeper discussion and elaboration.

**Sensegiving is defined as “...a narrative process that is
intended to persuade others towards certain understandings and actions.” (Dunford & Jones, 2000, p. 1209).

How was this form of rich media advantageous to learners?

Consider the following:

- The OBT activity could have been presented by the instructor *without a rich media component* and learners would still have been able to understand how OBT operates.
- Learners could still have responded to the primary “what if” discussion with authoritative resources to support their positions *without drawing from their experiences with the Lightbeam plugin experiment*.

However, *with* the Lightbeam experiment integrated into the instructional challenge, learners benefited from the following advantages:

- The concept of OBT was visualized in a graphical representation that was analogous to the actual connected relationships between the user, trackers, and individual website destinations.
- Learners were personally engaged with the factors that informed their position on the topic because of their
interactive engagement experiences using their own Web browser and their own Internet behavior.

- Instructors had the benefit of referring to learners’ concrete experiences as a basis for interrogating the topic.

The key phrase to remember in this case study is how rich media was advantageous to learners.
THE PEDAGOGICAL WRAPPER

Three basic elements of the pedagogical wrapper

Rich media alone does not cause learning.

In a self-directed learning environment, it is risky to assume that online students will, without guidance, accurately interpret the purpose, value, or meaning of the resources they are assigned to read or watch for an instructional purpose. Online learners need to know what they are engaged with, what to look for as they are engaged, and how a resource relates in some way to an instructional activity or assessment.

The triangular “pedagogical wrapper” concept was developed to meet online learners’ need for coherence, relevance, and certainty as they operate as self-directed students in asynchronous online instruction.

Before engagement: Provide background information that conveys relevance and credibility to the resource in terms of the instructional goal.

Ideally, the learner should be maximizing their attention on what matters about the resource – not on
trying to determine what the resource is, where it came from, what it is about, and why it is relevant. Learners also benefit from knowing that the resource comes from an authoritative publisher or author since they will be referring to it later as part of their writing, reflection, or discussion participation.

Second, by providing provenance to the resource, the learner is able to explore it further to discover a new organization, prominent author, media resource, or event that could be added to their personal learning network.

**During engagement:** Provide tasks for learners to do while focused on the activity or resource such as themes, trends, or events to look for.

Learners are constantly constructing meaning from the flow of information that they receive (as they receive it) based on their unique prior knowledge and backgrounds (Wittrock, 1974). The challenge for instructors is to guide the focus of learners’ attention to help facilitate their knowledge construction towards the desired instructional goal (Wittrock, 1992).

Without guidance about what to look for, learners may focus on an aspect of the resource or activity that is secondary or superfluous to its intended use. It is best to assume that the purpose for learners’ engagement will not be self-evident to them without instructor guidance.

While we do not wish to limit what learners should
be looking for at the expense of other details, offering thematic guidance will make the best use of the time learners commit to engagement.

**After engagement:** Provide an opportunity for interactive discussion or reflection that draws upon learners’ observations and experiences. The key component to building coherence in the activity as a whole is to ask a variant of the following statement as part of the discussion or assignment prompt: “How did the readings and media influence your position?”

The goal in this technique is to produce the conditions for learners that will capture their emergent experiences and draw from them in a situation where those experiences can produce evidence of learning.

**Example:** Below is a screen grab from John Medina’s Brain Rules website where he has published narrated interactive multimedia about features and functionalities of the human brain. This multimedia uses animated images, text labeling, and audio narration to illustrate how the brain functions as a survival organ.
There are plenty of videos on YouTube that could be used to illustrate how the brain works. However, this one happens to be one of the better examples because its content is designed to be visually analogous to the way the brain works in the real world.

**Before engagement:** Below is an example of a written introduction that would precede students being engaged with the Brain Rules multimedia object.

Below is the first installment in John Medina’s “Brain Rules” series called “Survival”.

Medina is a developmental molecular biologist and is the author of the New York Times bestseller “Brain Rules: 12 Principles for Surviving and Thriving at Work, Home, and
School”. The “Brain Rules” book series can be followed on Twitter @BrainRulesBook.

From the learner’s perspective, this preface suggests “This video came from John Medina who is an authoritative person on brain science. This is the ‘Survival’ episode of what is a larger program about the brain, and it appears to be a credible and reliable resource. I can follow this author on social media.”

**During engagement:** Next, we must find a way to reduce the possibility that learners will “lean back” passively while watching this presentation. We give them something to look for thematically by including the following instructions. The passage below is a continuation of the preface:

Medina claims that the human brain evolved as a way to improve our chances for survival. Note the various theories he uses to support this claim and how he explains why humans are capable of abstract thought. In this week’s discussion we will explore a case study that draws upon these theories.

In this example, learners are directed to focus upon a certain theme of the presentation (among several other possible themes or areas of interest). The theme is placed in the instructional context of how it will be relevant to the weekly discussion forum and directed to note their observations.

**After engagement:** In an online discussion forum
prompt, learners are directed to draw upon their engagement:

This week, you reviewed readings related to [subject matter] and Medina’s “Brain Rules” video pertaining to the evolution of the brain as a tool for survival.

As we review the first three years of a child’s growth, which factors in the brain’s growth contribute to language development? Discuss how the theories presented in Medina’s “Survival” episode could be used to explain the importance of these factors.

The outcome of the discussion should produce evidence of the subject matter applied towards a given context and assessed according to whether they have accurately applied certain theories to explain phenomena. The instructor may also wish to assess their ability to employ techniques related to reflective thinking as described below, in brief. Reflective Thinking is explained in depth in a later chapter.

**How does Bloom’s Taxonomy fit into this approach?**

In the Bloom’s Taxonomy illustration below, there are Action Verbs associated with each level of thinking skills. The verbiage used in a discussion or assignment prompt can be adapted
according to the level of thinking the assignment is intended to operate on, i.e. introductory, intermediate, advanced.

**Bloom’s Digital Taxonomy**

<table>
<thead>
<tr>
<th>Higher-order Thinking Skills</th>
<th>Lower-order Thinking Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating</td>
<td>Remembering</td>
</tr>
<tr>
<td>Designing, constructing, planning, producing, inventing, devising, making, programming, filming, animating, blogging, video blogging, mixing, re-mixing, wiki-ing, publishing, videocasting, podcasting, directing broadcasting.</td>
<td>Recognizing, listing, describing, identifying, retrieving, naming, bulletpointing, highlighting, bookmarking, social networking, social bookmarking, favoriting, searching.</td>
</tr>
<tr>
<td>Evaluating</td>
<td></td>
</tr>
<tr>
<td>Checking, hypothesizing, critiquing, experimenting, judging, testing, detecting monitoring, blog commenting, reviewing, posting, moderating, collaborating, networking, refactoring, testing.</td>
<td></td>
</tr>
<tr>
<td>Analyzing</td>
<td></td>
</tr>
<tr>
<td>Comparing, organizing, deconstructing, attributing, outlining, finding, structuring, integrating, mashing, linking, validating, reverse engineering, cracking, media clipping.</td>
<td></td>
</tr>
<tr>
<td>Applying</td>
<td></td>
</tr>
<tr>
<td>Implementing, carrying out, using, executing, running, loading, playing, operating, hacking, uploading, sharing, editing.</td>
<td></td>
</tr>
<tr>
<td>Understanding</td>
<td></td>
</tr>
<tr>
<td>Interpreting, summarizing, inferring, paraphrasing, classifying, comparing, explaining, exemplifying, advanced searches, Boolean searches, blog journaling, tweeting, categorizing, tagging, commenting, annotating, subscribing.</td>
<td></td>
</tr>
</tbody>
</table>

**Example:** Using the Brain Rules example above, the engagement with the multimedia resource could be leveraged in the following forms of prompt design, each operating on a different order of thinking.
Creating: “Produce a screencast that explains _____ based on ...”
Evaluating: “Evaluate this case study analysis based on the principles found in...”
Analyzing: “How do Medina’s “Brain Rules” theories compare to...”
Applying: “How would you use Medina’s “Brain Rules” theories to explain...”
Understanding: “What are some examples of the use of ______ theories used in Medina’s “Brain Rules” presentation...”
Remembering: “Which theories are used in Medina’s “Brain Rules” presentation ...”

How does reflective thinking fit into this approach?

Engagement with rich media can be designed to support a Reflective Thinking assessment strategy. Instructors can select which level of Reflective Thinking would be appropriate for the level of instruction designed in the course.

Levels of Reflection: Hatton and Smith (1995,
p.40) describe four levels of reflection, each increasing in the degree of self-interrogation and contextual analysis of a learning experience. Titles and descriptions below are adapted.

- **Level I – Descriptive Writing:** A description of events that occurred presented as a report but without evidence of a perspective. No attempt to provide reasons or justifications for events.

- **Level II – Descriptive Reflection:** A description of events that occurred presented as a report with some evidence of a perspective, but only at a surface level of inquiry to explain the reasons or justifications for events.

- **Level III – Dialogic Reflection:** A demonstration of “stepping back” from the events and actions in the learning process leading to an interrogative discourse with oneself. The author explores the experiences, events, and actions using qualitative judgement and possible alternatives for explaining outcomes;
identifies connections, cause/effect, and patterns in its rationales and critiques.

- **Level IV – Critical Reflection:** Includes all the elements of Dialogic Reflection but also takes into account the larger/global social, scholarly, and professional context in which events occur; considers perspectives other than one’s own.

**Example:** Let’s say a video is presented to learners at the beginning of a course where, as novices, they identify as many interpersonal communication factors as they can and then propose an alternative strategy for managing a given situation.
At the end of the course, learners can be directed to revisit the same rich media resource and respond to a prompt along the lines of:

“Now that you have completed the course, re-watch the video, look at your original comments and reflect on how you would approach this situation differently now.”

Students can then be assessed according to the degree of critical thinking that has been applied in their reflection, holistically.
COMPETENCIES FOR TEACHING WITH RICH MEDIA

Overview

The richness of realtime face-to-face communication enables participants to cue each other when there is a gap or an agreement in understanding, certainty, or coherence when a message is conveyed.

In contrast, asynchronous text-based or pre-recorded media is semantically poor because the points of engagement with the receiver are detached from the non-verbal cues of the sender. Mediated messages operate “cuelessly”.

While asynchronous online communication is strong in its ability to extend a message to reach more people, its advantages are offset by learners’ struggle to make sense of information in the absence of an in-person communicator.

Online instructors should be knowledgeable of the various ways information can be communicated and how it can be presented in an online course in a way that supports learners’ need for certainty, clarity, relevance, and meaning as learners form mental models.
And since online instructional material is, by nature, delivered electronically through the Internet, it is incumbent on online instructors to know how to use common Web tools and use the proper vernacular to describe online tasks and processes.

Why create a set of competencies for teaching with rich media?

We assume in this chapter that online instructors who participate in professional development for teaching with rich media are already initiated into teaching online in general. This is to say that there are critical skills and knowledge that are prerequisite to one’s readiness to teach online using rich media. These include:

- Acculturation to being present online as an asynchronous facilitator of learning rather than the live physical center of attention in a classroom.
- Acclimation to using a computing device and an LMS as the primary access points for course content, student communication, and content authoring.
- Reconciliation with the distinct differences, assumptions, and needs of students who choose to take online courses compared to those who take F2F courses.
We grant that it is reasonable that an instructor can complete training to teach an online course and then teach effectively \textit{without using rich media}.

However, given the unique affordances of rich media and the potential advantages they hold for learners, we make the case that proficiency in using rich media should be a required component of online instructor training at some point in an instructor’s longterm professional development plans.

The TPACK framework: A motive for designing a set of competencies

A discussion about teaching with rich media should include acknowledging the foundation principles of the Technological Pedagogical Content Knowledge Framework (TPACK) framework as a motive for constructing a set of competencies related specifically to teaching with rich media.

TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge.
to develop new epistemologies or strengthen old ones (Koehler, M. J., & Mishra, P., 2009, p. 66).

We take this as a call for online instructors, in the most general sense, to collaborate with instructional designers, learning designers, instructional technologists, media specialists, and librarians to conceptualize the use of rich media in ways that are appropriate to the unique needs of a given instructional challenge.

Therefore, a set of competencies ought to inform the structure of a systematic program of professional development to support this effort. The section below describes the skills, knowledge, and attitudes online instructors should demonstrate in a professional development setting.

**The IBSTPI Competency Model**

A model for the design and structure of competencies is found in the Competencies and Performance Statements produced by the International Board of Standards for Training, Performance, and Instruction (IBSTPI).

IBSTPI defines competency as:

A knowledge, skill, or attitude that enables one to effectively perform the activities of a given occupation or function to the standards expected in employment. (Richey, Rita & C. Fields, Dennis & Foxon, Marguerite, 2001, p. 31).
The Generic IBSTPI Competency Development Model describes Competencies as general statements which are then elaborated upon in a set of Performance Statements to indicate exact behaviors. Below is an excerpt from a set of IBSTPI Instructional Designer Competencies and Performance Statements (Richey et al, 2001):

**Competency:** Communicate effectively in visual, oral, and written form.

**Performance Statements** (partial list):

- Create messages that accommodate learner needs and characteristics, content, and objectives.
- Write and edit text to produce messages that are clear, concise, and grammatically correct.
- (etc...)

*Excerpt taken from “Instructional Designer Competencies” © IBSTPI – used with permission.*
Competency Sets for Teaching With Rich Media

Based upon the IBSTPI model, we present the following set of Competencies for Teaching with Rich Media. They are organized in the following hierarchy:

[ Category of Competency ]

▪ [ Individual Competency ]
  ▪ [ Performance Statements ]

Technical Competencies

Technical competencies refer to skills related to using a computing device to locate resources through network communication systems (Internet, social media, databases, etc.), using various methods to facilitate student access to resources, producing one’s own content, manipulating content produced by others, and employing the affordances of the Learning Management System (LMS) to post resources as needed.

1. **Competency**: Locate rich media resources relevant to subject matter.
   1. Use Internet search skills to locate resource repositories, Open Educational Resources (OER), social media based communities, and Web tools.
2. Use collaborative strategies, i.e. social media, internal institutional communication, professional organizations, etc., to locate and share resources within the community of practice.

2. **Competency:** Curate existing rich media resources appropriate to the modes of instructional communication.
   1. Identify appropriate file formats used in publishing instructional media.
   2. Employ methods for downloading, converting, importing, and optimizing resources.

3. **Competency:** Modify or create rich media resources that are compatible with the modes of instructional communication.
   1. Use computing and digital devices to edit or modify existing media.
   2. Write a narration script or outline to use as a basis of performing in an original media production related to instruction.
   3. Use computing and digital devices to record video and audio media.
   4. Use computing and digital devices to compose original image media.
   5. Use computing and digital devices to compose original interactive media.
   6. Create or modify an existing blog, social media account, Web tool, or widget.
7. Compose or organize content in a social network or Web tool to use as the focus of instructional activity.

4. **Competency**: Facilitate universal access to rich media.
   1. Generate embed codes and ADA compliant share links from resources and publish them according to the means of instructional communication.
   2. Use captioning utilities to support accessibility.
   3. Prepare multimedia with tab logic that supports accessibility.
   4. Compose technical instructions that explain how to access resources that are accessible only from the learners’ devices.

**Pedagogical Competencies**

Pedagogical competencies refer to the ability to identify, explain, and apply the theories that support the effective use of rich media in instructional contexts.

1. **Competency**: Demonstrate knowledge of applicable theories and research that describe the advantages of rich media in online learning.
   1. Recognize opportunities for using rich media in online course design which offer an advantage for learners in comparison to other communication methods.
2. Explain theories and research that connect the affordances of rich media to human sensory experience, cognitive processing, and social learning.

3. Identify the connections between learners’ needs and the affordances of rich media resources to meet those needs.

2. **Competency**: Select rich media resources with appropriate pedagogical value.
   1. Evaluate multimedia resources for their suitability to use in instruction.
   2. Evaluate the affordances of a social network for its suitability to connect learners to the knowledge or value in that network.
   3. Evaluate a Web-based tool for its suitability for use in instruction.

3. **Competency**: Write assignment briefs and prompts that present rich media with coherence, relevance, and meaning to learners within a given instructional context.
   1. Introduce rich media resources that describe provenance, authorship, and context of publication.
   2. Write a preface that explains the relevance of the rich media resource to the instructional context.
   3. Write instructions for engagement with rich media so that learners are actively and purposefully engaged.
4. Write assignment briefs or prompts that draw from learners’ rich media engagement experiences that are relevant to instructional objectives.

4. **Competency**: Evaluate the effectiveness of a rich media-based resource or activity.
   1. Determine how a rich media-based resource or activity has contributed to the learning experience based on a review of student work; propose steps for improvement if needed.

**Leadership Competencies**

Leadership competencies refer to one’s identity as a professional online instructor within a community of practice. Professional qualities in this category are embodied in exemplary social participation in the overall improvement or advancement of online teaching and learning practice.

1. **Competency**: Participate in the community of practice related to teaching with rich media in online instruction.
   1. Participate in periodic professional community-based gatherings for the purpose of professional growth.
   2. Offer presentations on the subject of using rich media in online instruction.
   3. Continually share information, experiences, and resources with colleagues through online
professional social communities.

2. **Competency**: Provide direct assistance to others in improving their skills in teaching with rich media.
   1. Participate in mentorship relationships with other instructors.
   2. Provide demonstrations to colleagues on using rich media in instruction.
   3. Serve as a peer reviewer for the work of others offering constructive feedback and support.

3. **Competency**: Comply with and maintain ethical and legal standards in the use of rich media.
   1. Use rich media in compliance with the laws and regulations of copyright and fair use.
   2. Use rich media in accordance to appropriate standards for cultural and historical sensitivity.
THE CURATE / MODIFY / CREATE MODEL FOR PROFESSIONAL DEVELOPMENT

A strategy for introducing instructors to teaching with rich media

This chapter is intended for use by training managers who are considering an enhancement to basic training for instructors preparing to teach online.

Some instructors may think that teaching with rich media requires knowing how to create rich media from scratch – an impression that implies undertaking an impossibly monolithic commitment to learn ICT skills that are exceptionally advanced for them. The following model describes how it is possible to use rich media in instruction at all levels of ICT skill.

The Curate, Modify, Create model shows that rich media can be used as effective instructional content even if the instructor is not able to create their own media from scratch.
The most important factor in learning to teach with rich media is to surround the rich media content with good pedagogical design. Each level of the model below builds upon the prior skill level, cumulatively. Below is an example referring to video resource:

**Curate:** Locate a high quality video resource, provide access to it for instruction, implement the principles of the pedagogical wrapper.

**Modify:** Locate a high quality video resource, modify it (edit, remix, annotate, integrate with other content, etc.), provide access to it for instruction, implement the principles of the pedagogical wrapper.

**Create:** Create an original video resource, provide access to it for instruction, implement the principles of the pedagogical wrapper.

Here is another example using Twitter:

**Curate:** Locate a useful Twitter hashtag or search term, provide access to it for instruction, implement the principles of the pedagogical wrapper. (No Twitter account is needed).

**Modify:** Locate several useful Twitter hashtags or search terms, use [TweetDeck](https://www.tweetdeck.com) to create a dashboard to view all of them, provide access to it for instruction, implement the principles of the pedagogical wrapper.

**Create:** Create a Twitter hashtag for your course or course topic, place a Twitter widget in your course based on the hashtag, provide instructions for students to
tweet to the designated hashtag, implement the principles of the pedagogical wrapper.

**Key takeaways**

In presenting the principles of teaching with rich media, it is vital for instructors-in-training to know that they can begin teaching with rich media *right now* while they are still learning about it.

Training managers may wish to offer incentives to instructors-in-training to climb the ladder of proficiency as their foundation skills mature.

Employing instructors to serve as peer mentors for new instructors-in-training can elevate the credibility of using these new instructional communication strategies.
How can instructor competence be assessed?

There is no singularly accurate method to assess instructor competence for teaching with rich media. A training manager may choose to assess competence using whichever educational philosophy or instructional theory desired.

We offer two approaches to assessment that reflect typical approaches to competency assessment in-practice: the **Key Phrase** method based on objective measures of proficiency, and the **Practitioner** method which is based on the candidate’s value to a community of practice.
The Key Phrase method of designing assessment criteria

In the Key Phrase method, each Performance Statement is deconstructed down to its key word or phrase and then surrounded by qualifiers that are observed in a candidate’s work. Variations in the qualifiers serve as the levels of differentiation across the assessment instrument. This method was developed by and is used as a foundation for developing assessment instruments in the CWPro eportfolio assessment system (Chalk and Wire Learning Assessment, Inc., 2013).

The basic principles of the Key Phrase assessment instrument framework are:

• “Proficient” is designated as the target level of performance. A level beyond Proficient, such as “Exemplary”, is not a relevant level of assessment in this context because we are only interested in whether the candidate has achieved proficiency. Anything beyond attaining proficiency is extraneous, from a performance assessment perspective.

• The key phrase is retained throughout all levels of assessment. Progressing levels of assessment are differentiated according to the observable presence or absence of a set of qualifiers or indicators.
Below is an example of the Key Phrase method for constructing a proficiency statement:

**Step 1:** Select a Performance Statement:

“Write assignment briefs or prompts that draw from rich media engagement experiences that are relevant to instructional objectives.”

**Step 2:** Identify the key phrase embedded within the Performance Statement:

Key phrase: “Write assignment briefs...”

**Step 3:** Surround the key phrase with qualifiers or indicators that can be observed as a basis of determining proficiency. In this case, we will use “consistent and independent performance” as the observable criteria. This statement will become the Proficient level of assessment.

**Proficient:** “Able to consistently and independently write assignment briefs or prompts that draw from learners’ rich media engagement experiences that are relevant to instructional objectives.”

**Step 4:** Generate the other levels of assessment using variations of consistency and independence that can be observed in the performance. Additional assessment levels are provided below to demonstrate the range of granularity to describe performance.

**Novice:** “Able to identify instances for the need to write assignment briefs or prompts that...”
draw from learners’ rich media engagement experiences that are relevant to instructional objectives.” (This statement presumes that the learner’s skill is limited only to being able to identify when the skill is needed but is unable to perform the process due to lack of skill or knowledge).

**Emerging:** “With significant support, able to write assignment briefs or prompts that draw from learners’ rich media engagement experiences that are relevant to instructional objectives.”

**Basic:** “With minimal support, able to write assignment briefs or prompts that draw from learners’ rich media engagement experiences that are relevant to instructional objectives.”

**Proficient:** “Able to consistently and independently write assignment briefs or prompts that draw from learners’ rich media engagement experiences that are relevant to instructional objectives.”

Several factors support this method for producing valid and reliable results (Chalk and Wire Learning Assessment, Inc., 2013):

- The key phrase in the assessed performance remains
consistent and transparent throughout each level of performance. There is no “moving the goalposts” across different assessment levels by using vague subjective terms such as “good”, “strong”, or “excellent”.

- Assessment across levels is keyed strictly to observable performance in terms of the pegged level of proficiency. This enables the candidate to gain a meaningful sense of their progress based solely on the words used in the rubric.

- Using this method system-wide supports inter-rater reliability by minimizing subjective or abstract interpretations of performance.

The example above uses four levels of assessment, but alternative labels can be used:

<table>
<thead>
<tr>
<th>Performance Statement</th>
<th>Benchmark</th>
<th>Milestone 1</th>
<th>Milestone 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Statement</td>
<td>Novice</td>
<td>Emerging</td>
<td>Proficient</td>
</tr>
<tr>
<td>Performance Statement</td>
<td>Unsatisfactory</td>
<td>Marginal</td>
<td>Proficient</td>
</tr>
</tbody>
</table>
What is (intentionally) missing from the Performance Statements?

The Performance Statements provided in the proposed set of Competencies are purposefully descriptive. They do not articulate all of the possible details related to a candidate’s expected performance. For example, the Performance Statements do not prescribe:

- Which devices, software, hardware, or methods of computing to use.
- Which forms of social communication to use in the community of practice.
- Which channels of internal communication to use.
- Which personnel or offices to collaborate with.
- Which specific standards of institutional ethical practice, UDL, or ADA compliance to adhere to.
- Which theoretical underpinnings for teaching, learning, or instruction to align with.
- Which modes of instructional program delivery to which performance must be applied, i.e. face-to-face, blended/hybrid, fully online, professional development training, etc.

This design leaves space for the Competencies and Performance Statements to be used as a general set of standards
upon which context-specific demonstrations of proficiency can be added by or removed by Training Managers as needed. The instructor-in-training would be advised in advance as to the specific outcomes of their training that are relevant to their institution’s system and practice.
Example Matrix of Competencies and Performance Statements for Teaching with Rich Media
<table>
<thead>
<tr>
<th>Technical Competency</th>
<th>Performance Statement</th>
<th>Emerging</th>
<th>Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locate online rich media resources relevant to subject matter.</td>
<td>Use Internet search skills to locate resource repositories, Open Educational Resources (OER), social media based communities, and Web tools.</td>
<td>With significant support, able to use Internet search skills to locate resource repositories, Open Educational Resources (OER), social media based communities, and Web tools.</td>
<td>With minimal support, able to use Internet search skills to locate resource repositories, Open Educational Resources (OER), social media based communities, and Web tools.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pedagogical Competency</th>
<th>Performance Statement</th>
<th>Emerging</th>
<th>Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate knowledge of applicable theories and research that describe the advantages of rich media in online learning.</td>
<td>Recognize opportunities for using rich media in online course design which offer an advantage for learners in comparison to other communication methods.</td>
<td>With significant support, able to recognize opportunities for using rich media in online course design that offer an advantage for learners in comparison to other communication methods.</td>
<td>With minimal support, able to recognize opportunities for using rich media in online course design that offer an advantage for learners in comparison to other communication methods.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leadership Competency</th>
<th>Performance Statement</th>
<th>Emerging</th>
<th>Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Participate in the community of practice related to teaching with rich media in online instruction.

Participate in periodic professional community-based gatherings for the purpose of professional growth.

Minimally able to participate in periodic professional community-based gatherings for the purpose of professional growth.

With some assistance, able to participate in periodic professional community-based gatherings for the purpose of professional growth.

Able to participate in periodic professional community-based gatherings for the purpose of professional growth.

The Practitioner method of designing assessment criteria

Wenger’s Community of Practice model (2011) describes the characteristics of a group of people who “... share a concern or a passion for something they do and learn how to do it better as they interact regularly (p. 1).” A community of online instructors would determine what is knowable, relevant, and observably present in the performance of teaching online with rich media from the perspective of an exemplary practitioner of the craft.

To apply structure to this approach, we adapt a framework used by Aric Mayer, Western Washington University, as the basis of their MBA graduate program (Mayer, 2014). This framework originates from and is endorsed by the Institute of Leadership & Management (UK).

Competencies are observable at three tiers of proficiency: Knowing, Doing, and Being.
Applied to teaching with rich media, three tiers of proficiency are set as follows:

**Knowing**: Candidate demonstrates theoretical comprehension of the body of knowledge and the ability to connect knowledge to situational needs within the online teaching and learning environment.

**Doing**: Candidate demonstrates the ability to apply skills and theories in praxis.

**Being**: Candidate demonstrates the character of professional participation in the community of practice to promote exemplary work and share knowledge.

As stated in Mayer’s program and adapted for our purposes, “Goals represent what we want our instructors to be. Objectives describe what we want our instructors to do.” Thus, the goal in the Practitioner approach is to nurture online instructors’ proficiencies so that they more than merely practitioners – they are change agents who are able to lead by example and influence their colleagues’ practice. Competencies, as an expression of a Community of Practice, represent what practitioners would do to embody this goal.

Our matrix for Knowing, Doing, and Being are projected across three sets of proficiency: Technical, Pedagogical, and Leadership (see table 1).
<table>
<thead>
<tr>
<th>BEING</th>
<th>TECHNICAL</th>
<th>PEDAGOGICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KNOWING</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Matrix of Rich Media Competencies across CoP Proficiencies

Here is an example of how a Performance Statement can be implemented in the CoP model:
<table>
<thead>
<tr>
<th>Proficiencies</th>
<th>TECHNICAL</th>
<th>PEDAGOGICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BEING</strong></td>
<td>Teach others how to use Internet search skills to locate resource repositories, Open Educational Resources (OER), social media based communities, and Web tools.</td>
<td>Teach others about the purpose of and how to evaluate multimedia resources for their suitability to use in instruction.</td>
</tr>
<tr>
<td><strong>DOING</strong></td>
<td>Use Internet search skills to locate resource repositories, Open Educational Resources (OER), social media based communities, and Web tools.</td>
<td>Evaluate multimedia resources for their suitability to use in instruction.</td>
</tr>
<tr>
<td><strong>KNOWING</strong></td>
<td>Describe how to use Internet search skills to locate resource repositories, Open Educational Resources (OER), social media based communities, and Web tools.</td>
<td>Explain the purpose of and multimedia resources for their suitability to use in instruction.</td>
</tr>
</tbody>
</table>

Table 1: Matrix of Rich Media Competencies across CoP Proficiencies

Some areas of the matrix can be assessed with one-time demonstrations or with examples of proficiency; others will require more longitudinal observation to assess, such as those associated with leadership.

Training program designers and their stakeholders must
consider these factors when planning how to certify instructors for specific qualifications.
BOURNER'S REFLECTIVE THINKING MODEL

This chapter is tangentially related to teaching with rich media because the Pedagogical Wrapper model calls for reference to engagement with instructional media as a basis for discussion or reflection. When reflective discussion or writing is called for, a model for assessing reflective thinking will be needed. Bourner’s model below outlines who this can be approached.

Overview of Reflective Thinking

Some instructional assignments are designed to be reflective learning experiences, but the problem persists on how to measure reflection in any given student narrative, e.g. written work, video, oral presentation, etc.

The following summary of Bourner’s (2003) Reflective Thinking method attempts to address this challenge using indicators of critical thinking within the context of a reflective learning experience. Hatton and Smith (1995) provide a qualitative basis of assessment across four levels.

**Origins:** Bourner proposes combining the technique of
reflective learning with principles of critical thinking to identify instances of *reflective thinking* in student communication, independent of content knowledge. The outcome of this approach, given proper feedback and scaffolding, is intended to help build the capacity for learners to capture the lessons of their learning experiences and articulate them on a high level of critical reflection.

**Definition:** Reflective thinking is the ability to apply the techniques of critical inquiry toward documenting experiences that describe how changes in knowledge, skills, or attitudes occurred over time.

**Levels of Reflection:** *Hatton and Smith* (1995, p.40) describe four progressive levels of reflection with each increased level indicating greater depth and/or breadth in the reflection process. Level titles and descriptions below are adapted.

- **Level I – Descriptive Writing:** A description of events that occurred presented as a report but without evidence of a perspective. No attempt to provide reasons or justifications for events.
- **Level II – Descriptive Reflection:** A description of
events that occurred presented as a report with some evidence of a perspective, but only at a surface level of inquiry to explain the reasons or justifications for events.

- **Level III – Dialogic Reflection:** A demonstration of “stepping back” from the events and actions in the learning process leading to an interrogative discourse with oneself. The author explores the experiences, events, and actions using qualitative judgement and possible alternatives for explaining outcomes; identifies connections, cause/effect, and patterns in its rationales and critiques.

- **Level IV – Critical Reflection:** Includes all the elements of Dialogic Reflection but also takes into account the larger/global social, scholarly, and professional context in which events occur; considers perspectives other than one’s own.

**Operational Definition:** Reflective thinking is measured across four progressive qualitative levels of reflection found in communication where there are indicators of interrogative inquiry in a reflective learning assignment.
Pedagogical basis

In summarizing Bourner, when asked to reflect on learning experiences, only the learner can determine whether the learning experience was significant to them. This subjective perspective challenges whether an objective assessment of reflective thinking can be made, and if so, upon which standards.

If the learning experience is emergent – meaning that the outcome of learning is unique to the experience of the learner – it is difficult to know in advance how to assess whether outcomes have been achieved.

Bourner tackles these obstacles by performing a “mash-up” of reflective learning and critical thinking into a model of reflective thinking.

The first principle of reflective thinking is to separate the content of reflection from the process by which it was produced:

[ The rationale for this ] is because (1) the core of the reflective learning process is interrogating experience with searching questions, and (2) we can identify searching questions independently of the content of the reflection.

Reflective learning is not what happens to a student, it is what the student does with what has happened. When we assess reflection it is important that we do not assess the content of an experience but rather that
we assess what the student has done with the content (Bourner, 2003, p. 3).

From an assessment perspective, this strategy enables the instructor to more easily assess student work on the basis of the capacity to think reflectively:

In fact, once the content/process distinction has been made, it does then become possible to specify ... a learning outcome at the level of the capacity for reflective thinking. The intended learning outcome could then be phrased in terms of ‘the capacity to think reflectively’ or, less abstractly, ‘the capacity to capture the lessons of experience’ (Bourner, 2003, p. 5).

Bourner provides a set of guiding questions from which this form of assessment can be made, stating, “When we assess student work and we spot evidence of the use of these sorts of questions we can reasonably conclude that the student has developed the capacity for reflective thinking. (p. 4).”

Questions as tools for reflective thinking (p. 4):

1. What happened that most surprised you?
2. What patterns can you recognize in your experience?
3. What was the most fulfilling part of it? And the least fulfilling part of it? What does the experience suggest to you about your values?
4. What happened that contradicted your prior beliefs? What happened that confirmed you prior beliefs?
5. How do you feel about that experience now compared
with how you felt about it at the time?

6. What does the experience suggest to you about your strengths?

7. What does the experience suggest to you about your weaknesses and opportunities for development?

8. How else could you view that experience?

9. What did you learn from that experience about how you react?

10. What other options did you have at the time?

11. Is there anything about the experience that was familiar to you?

12. What might you do differently as a result of that experience and your reflections on it? What actions do your reflections lead you to?

These questions can be consolidated into a set of heuristics that may be presented to learners prior to a reflective learning exercise, such as in a discussion forum or narrative writing assignment.

In actual assessment work, however, we should be mindful of whether the learner has actually responded to their internal inquiry in alignment with what the questions inquire about. In other words, we should look for the presence of self-questioning strategies in reflective thinking as well as the actual responses to those questions.

The following text can be integrated into a discussion forum prompt to foster reflective thinking.
Example:

Before you post your responses to this week’s discussion question, think about whether your post includes any of the following:

- Does your post show how your learning experience changed how you think about the topic compared to how you thought about it before?
- Does your post show how you could have approached the learning experience differently, other options you could have considered, or other opportunities that emerged?
- Does your post show anything about your strengths, weaknesses, development assumptions, values, or biases?
- Does your post identify any patterns that contradicted or confirmed your beliefs?

Effective Implementation

While the heuristics of reflective thinking may be easily understood as part of a discussion or assignment prompt, learners must know in advance of their engagement in instruction that they will be tasked with reflective deliberation about it (either along the way or at the end of instruction). Learners must be instilled with the presence of mind to capture “a-ha moments” as they occur as well as adequate time
to process their thoughts into a form that meets assignment expectations.

The following are recommended practice when designing a reflective learning assignment:

1. A set of reflective thinking heuristics should be provided to learners in advance of the reflective learning activity along with an opportunity to discuss what the questions mean, if needed.
2. An opportunity should be offered for learners to practice assessing samples of reflective thinking against the four levels of assessment prior to engaging in graded assignments.
3. Students should be given advance notification when reflective learning assignments will be due and which topics, subject matter, or experiences should be the focal point of their deliberation.
4. The levels of assessment and their respective descriptions should be available to learners as a point of reference while they are composing their work.
5. Instructors should provide feedback to learners on where their work needs improvement and how that improvement could be attained. Ideally, if feasible, a completed draft of the assignment should be reviewed for feedback prior to final submissions. This will ensure that if learners were unclear about what reflective thinking means or how it is to be interpreted, they can
benefit from an opportunity to discuss and clarify with the instructor

A Reflective Thinking rubric

The following rubric applies the levels of Reflective Thinking into a simple rubric along with typical writing criteria.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Level I - Descriptive Writing</th>
<th>Level II - Descriptive Reflection</th>
<th>Level III - Dialogic Reflection</th>
<th>Level IV - Critical Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrates reflective thinking</td>
<td>(40 points) A description of events that occurred presented as a report but without evidence of a perspective. No attempt to provide reasons or justifications for events.</td>
<td>(45 points) A description of events that occurred presented as a report with some evidence of a perspective, but only at a surface level of inquiry to explain the reasons or justifications for events.</td>
<td>(50 points) A demonstration of “stepping back” from the events and actions in the learning process leading to an interrogative discourse with oneself. The author explores the experiences, events, and actions using qualitative judgement and possible alternatives for explaining outcomes; identifies connections, cause/effect, and patterns in its rationales and critiques.</td>
<td>(60 points) Includes all the elements of Dialogic Reflection but also takes into account the larger/global social, scholarly, and professional context in which events occur; considers perspectives other than one’s own.</td>
</tr>
<tr>
<td>Criteria</td>
<td>Level I - Descriptive Writing</td>
<td>Level II - Descriptive Reflection</td>
<td>Level III - Dialogic Reflection</td>
<td>Level IV - Critical Reflection</td>
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<td>---------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
<td>(13 points) Organization</td>
<td>(15 points)</td>
<td>(18 points)</td>
<td>(20 points)</td>
</tr>
<tr>
<td>Organization</td>
<td>narrative is clear with some exceptions. Story follows a logical path with some exceptions.</td>
<td>Organization narrative is clear, with minor exceptions. Story follows a logical path, with minor exceptions.</td>
<td>Organization narrative is clear. Story follows a logical path.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lacks organizational narrative. Does not follow a clear sense of storyline or logic.</td>
<td>(15 points) Writing mechanics sometimes meet college standards.</td>
<td>Writing mechanics meet college standards, with minor exceptions.</td>
<td>Writing mechanics meet college standards.</td>
</tr>
<tr>
<td>College level writing</td>
<td>(13 points) Writing mechanics do not meet college writing standards.</td>
<td>(15 points) Writing mechanics sometimes meet college standards.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Heeren, E. and Lewis, R. (1997), Selecting communication media


practical guide for educational applications. Sterling, VA: Stylus Publishing.


Weinberger, D. (2011). Too big to know: Rethinking knowledge now that the facts aren’t the facts, experts are everywhere, and the smartest person in the room is the room. New York: Basic Books.


