

EDUCATIONAL HYPERCOMICS: LEARNERS, INSTITUTIONS, AND COMICS IN
E-LEARNING INTERFACE DESIGN

BY

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DISSERTATION

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Abstract

Current literacy education research suggests that formal affordances of the comics medium lend themselves to critical pedagogies of new media literacy (see, e.g., Schwarz, 2006; Jacobs, 2007; Schwartz & Rubinstein-Ávila, 2006; Duffy, 2010). This research connects comics and new media because both are visually dominant, juxtapositional compositional forms that make meaning through multiple modes of communicative design. However, this research generally construes comics as a narrative form that bridges the traditions of print-based literacy with the wide array of multiliteracies required by new media. The evolution of comics as a form of digital communication within new media pedagogical texts has received far less attention. The present study addresses this lacuna in the literature through analysis of social semiotics of comics in the contexts of online learning.

This is a study of multimodal pedagogical discourse in online educational comics, specifically educational hypercomics. Hypercomics can be loosely defined as comics on the World Wide Web which incorporate semiotic affordances of digital delivery such as interactivity, multiplicity of reading paths, hypertextuality, audio, video, and animation. This study is a comparative social semiotic analysis of three educational hypercomics, focused on the ways in which the comics form interacts with digital affordances in educational institutional contexts in order to construe readers as learners. The goal of this research is to explicate ways in which digital comics' formal characteristics can function not only as a vehicle for narrative expression in pedagogy, but also as a strategy for e-learning information organization and interface design.

To Jen, Simon, and Gwen, as always

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CHAPTER 1: INTRODUCTION

Comics has long been implicated in education as variously deleterious and beneficial to learning. In contrast to the discourse surrounding comics and education at the middle of the twentieth century, best characterized as cautious approval (see, e.g. Lehman & Witty, 1927; Frank, 1943; Sones, 1944; Zorbaugh, 1949) drowned out by rabid condemnation (see, e.g. North, 1940; Mulberry, 1943; Legman, 1948; Wertham, 1954), recent studies of intersections between comics and education tend to extol the benefits of the use of comics in curricula throughout primary, secondary, and higher education (e.g. Versaci, 2001; Gorman, 2003; Bitz, 2004; Carter, 2008). A growing body of research is especially concerned with the affordances of comics for teaching and learning to be critically literate in multiple modes of meaning making, beyond traditional word-based literacy (e.g. Norton, 2003; Yannicopoulou, 2004; Schwarz, 2006; Schwartz & Rubinstein-Ávila, 2006; Jacobs, 2007; Chun, 2009). This research on the use of comics in multimodal literacy pedagogy places comics in conversation with the production and interpretation of new media, i.e. media making use of digital information communications technology (Moulthrop, 2009; Duffy, 2010; Gardner, 2012).

However, despite implicit connections between comics and new media, the majority of this literature focuses on comparing digital multimodality with the multimodal design of meaning in print comics formats like comic books, manga, and graphic novels. Far less attention has been paid to comics-related pedagogy on the World Wide Web. This is hardly surprising, given that study of emergent contemporary forms of comics on the World Wide Web is relatively sparse overall. The majority of webcomics scholarship employs a mix of economic and cultural historical analysis (see McCloud, 2000; Fenty, Houpp, & Taylor, 2004; Campbell, 2005; Allen, 2007; Salkowitz, 2012).

Scholarly literature specific to the use of ICTs and comics in education has also been mostly limited in its analytic methodology, focused primarily on case studies of student comics creation using software or online applications that provide simplified drag-and-drop interfaces and customizable predesigned templates for image, panel, and page compositions (e.g. Francis Pelton et al., 2007; Seyfried, 2008; Lawrence et al., 2009; Zimmerman, 2010). In contrast, comics created as online pedagogical texts have been largely overlooked. This inattention to educational online comics is problematic because comics that make meaning through modes of representation and interaction which print cannot easily reproduce represent a largely untapped area for innovation in online pedagogical design. This study addresses the current lack of research on the social semiotics of educational hypercomics through a comparative multimodal discourse analysis of digital-born texts¹ that combine the comics form with online interactivity in order to promote learning. The results of this analysis will contribute to the emerging body of research on the use of comics in critical multimodal literacy pedagogy, as well as the utility of comics as information organization and e-learning interface design.

Comics, literacy, and multiliteracies

Librarians and educators alike assert that comics help raise literacy rates by engaging reluctant readers (see, e.g., Gorman, 2003; Krashen, 2004; Goldsmith, 2005; Andera, 2007). This is a long running thread in comics research dating back to the first half of the 20th century, owing, in part, to the tendency of anti-comics critiques of the 1940s and 1950s to declare comics (especially comic books) as causing the degradation of both children's morals and their (verbal linguistic) reading ability, usually under the auspices of the pictures in the comics "ruining"

children's ability to pay attention to works that are exclusively prose, especially those prose works canonized as "good literature" (see, e.g. North, 1940; Mulberry, 1943; Legman, 1948; Wertham, 1954). In reaction to the popularity of comic books among young people and the attendant popularization of such anti-comics sentiments during this period, a primary focus of 1940s and 1950s comics research is "...the relations of comics to education and educational method" (Sones, 1944, p. 232). A number of early empirical comics studies investigate children's self-directed comics reading habits, and compare those habits to other forms of reading, as well as to measures of intelligence and academic achievement (e.g. Witty, 1941a, 1941b; Heisler, 1946; Blakely, 1958). In these studies, findings are generally inconclusive, in the sense that there are few findings to indicate that comics reading had any significant correlation to intelligence, academic achievement, or overall reading habits.

Beyond this research on the seemingly negligible effects of comics reading on children's academic performance, a small number of case studies from this early period actively investigate the inclusion of comics in classroom pedagogy, often finding that the form can be beneficial to both literacy education, and learning outcomes across disciplines. For example, Sones (1944) enumerates several uses of comics as instructional texts, ranging from the use of Superman themed workbooks, to comic book adaptations of classic literature and true stories, to the utility of comics in remedial reading instruction, to disseminating military and governmental information, ultimately recommending comics for the classroom because their popularity and easy comprehension fit well with a teaching philosophy "...that instruction must begin in the on-going activities and concerns of the learner and that its effectiveness depends on the efficiency of the form of communication that is employed" (p. 233). Hutchinson (1949) reports on an instructional program where, based on a pilot study in Philadelphia schools, a handbook on using

comic strips in the classroom was compiled and offered to teachers nationwide for a 13 week experiment in comics pedagogy. Of the 2,027 teachers who requested the material, 438 returned the questionnaire included with the material, reporting generally favorable responses to the instructional method across subject areas, noting especially the utility of comics' popularity in motivating children to work on language assignments, while the support of word comprehension by pictorial representations recommended comics for teaching remedial readers (Hutchinson, 1949, p. 239). From these mid-20th century beginnings, the usefulness of comics as a way to lure children into more sophisticated readings of the classics is a persistent theme in comics-related education and library science research (see, e.g., Schoof, 1978; Wright, 1979; Dorrell & Carroll, 1981; Brenner, 2006; McTaggart, 2008).

Despite the positive learning outcomes of increased literacy among reluctant readers, Hatfield (2005) critiques such educational research for construing comics reading as "easy" while neglecting "the *specificity* of the comics reading experience" characterized as "a complex means of communication" with "a plurality of messages... heterogeneous in form," and defined by interwoven "tensions" wrought in part by the co-presence of words, images, along with compositional and narrative meaning making (p. 36, emphasis original). Jacobs (2007) echoes Hatfield's critique, arguing that conceptions of comics as "debased or simplified word-based literacy" ignore the "complex multimodal literacy" required of and taught by reading the form (p. 21). Schwartz & Rubinstein-Ávila (2006) similarly align comics, and specifically *manga* (Japanese comics), as requiring a complex understanding of hybridized visual and verbal semiotics, which in turn complements a pedagogy that teaches students to be self-reflexive and self critical readers. According to Jacobs (2007), it is through the coexistence of these multiple modes of meaning on the page that comics engender an "active process" of reading and writing

which can “prepare students for better negotiating their worlds of meaning” (p. 25). Norton (2003) describes this active process of reading comics as developing a “sense of ownership” on the part of students, a connection to students’ worlds rarely found in traditional classroom curriculum.

In part, by explicating potentials for comics in critical pedagogy of multiple literacies, Jacobs (2007), Schwartz & Rubinstein-Ávila (2006), and Norton (2003) pinpoint overlapping and interrelated formal and sociocultural similarities between comics and new media (i.e. media created and distributed through information communication technologies). From a predominately sociocultural perspective, the unique sense of interaction and ownership comics can engender in its readers predicts and parallels similar online community-driven media production, what Jenkins, Clinton, Purushotma, Robinson, & Weigel (2006) term “participatory cultures.” Indeed, the participatory nature of fandom associated especially with serialized print comics formats like comic books and *manga*, as well as the various transmedia properties based on comic books and *manga* (through, e.g. film, live action television, animation, merchandising), are among the signal examples used by Henry Jenkins (2006) in explicating the similarly conceived "convergence culture" in which contemporary transmedia interrelations between corporate-controlled cultural production and popular participation blur boundaries between consumer and producer, professional and amateur. The convergence cultural connotations of comics are vital to literacy pedagogy, given "the powerful role popular culture plays in the online literacy practices that are central to media convergence... particularly when it comes to the performance and interpretation of identity" (Williams, 2011, p. 201-2). Of course, the conflation of comics with popular culture is not entirely accurate, since relatively few comics works have large audiences, and idiosyncratic stories for small niche audiences are as possible in comics as crowd-pleasing

genre fiction. However, in this instance, the limiting conception of comics as solely popular culture, and especially youth culture, is useful in that it serves to highlight the tendency in comics culture towards building the kinds of participatory communities that increasingly characterize online interaction, as well as the opportunities for online learning within those community contexts.

The idea of using popular culture materials generally, and comics specifically, to motivate learning and make education relevant to students' interests has a long history. For example, during the 1930s and 1940s National Comics solicited and published reviews and recommendations of prose books from educators and young readers, and in so doing "... leveraged the experimental and subversive nature of comics to help... create a different kind of community of readers, where comics and classics could co-exist" (Tilley, 2012, p. 12). Comics fans who regularly, critically wrote into the letters columns of 20th century comic books, published fanzines, engaged in community building with fellow collectors and aspiring creators, and made their own comics exemplify the notion that comics has always been "a form that openly inspired... collaboration, community, and communication" predicting ways "the Internet connects fans along infinite numbers of axes" in digital virtual communities (Gardner, 2012, p. 104).

From a formal standpoint, both comics (or, more specifically, those characteristics of sequential pictorial juxtaposition and the integrative use of words and pictures that generally evince a form of reading recognized as "comics") and new media (broadly understood as communicative works designed and distributed through contemporary and emergent digital technologies like computers and the Internet) simultaneously and overtly make meaning through multiple modes of design, often with a dominance of pictorial over verbal linguistic elements,

part of what Mitchell (1994) describes as the "pictorial turn" in contemporary cultural philosophy. Gunther Kress (2003) frames this overall cultural trend as "...the broad move from the now centuries-long dominance of writing to the new dominance of the image ...the move from the dominance of the medium of the book to the dominance of the medium of the screen" (p. 1). These technocultural trends necessitate pedagogy which values "...the wide array of literacies [students] will need in order to participate fully and productively in the technological dimensions of their professional and personal lives" (Selber, 2004, p. 234).

According to the New London Group (1996), teaching this formidable array of literacies requires a reconceptualization of literacy to recognize that "...language and other modes of meaning are dynamic representational resources, constantly being remade by their users as they work to achieve their various cultural purposes" (p. 64). The primary focus of multiliteracies theory is digital ICTs, but the tendency of comics towards overtly pictorial, generally narrative meaning making necessarily implicates the form in multiliteracies pedagogy. According to Jewitt (2004):

The move from page to screen realizes a changed compositional relationship between image and writing. Image dominates the space in the majority of the screens. The relationship between image and writing is newly configured and is itself a visual meaning-making resource. In the context of the screen the writing has become a visual element, a block of "space," which makes textual meaning beyond its written content (p. 185).

The "textual meaning" to which Jewitt refers, in which verbal linguistic written representation moves within a visual compositional space, is the kind of meaning making typically identified with comics. This change in the dominance of visual over verbal linguistic composition supports observations by educators that, "...the act of reading a comic cuts much more closely to how our students today receive information. ...the Internet, where the sites... are densely packed and ask

readers to move their eyes diagonally and up and down in addition to side to side--the same kind of movements that come with reading comic book panels and pages" (Versaci, 2008, p. 97).

Explication of the shared tendency between comics and new media towards juxtapositional and imagetextual multimodal designs of meaning is aided by the "metalanguage" of multiliteracies suggested by the New London Group (2000), a typology of modes of meaning making that can be combined through multimodal design: Visual, Gestural, Linguistic, Audio, and Spatial. As I have noted elsewhere (Duffy, 2010), the complex network of meanings found in comics can make use of all five of the New London Group's typology of modes of meaning making:

- Visual: As a form of visual communication, visual modes of meaning making are essential, and perhaps the most obvious shared feature of comics and new media.
- Gestural: Figure drawings function as abstracted visual symbols of real physical gestures, and the lines drawn in comics are records of the gestures of the artist's hand.
- Linguistic: The textual component of comics' hybridization of image and text.
- Audio: Devices such as word balloons and onomatopoeic sound effects function as simulated audio, making synaesthetic use of silent image and text to stand in for aural elements.
- Spatial: Aspects of page design, particularly those related to the sequential and architectonic placement of panels, are a key component to the unique ways in which comics communicate the passage of time, and thus narrative (see, e.g., McCloud, 1993; Groensteen, 1999/2006; Pratt, 2009).

For Gardner (2006), the century-old imagetextual characteristics associated with comics function as a sort of temporal reciprocal to the contemporary dominance of visual information organization occasioned by new media:

New media technologies (the database, internet, hypertext, etc.) are ideally suited for making sense of the present in relation to the future [...] But it is the comic form that might be best suited to articulating the complex demands of the present new media age in relation to the media of the past (p. 803).

Here the comics form is conceptualized as a through line between industrial and post-industrial media, evoking the notion of comics as a bridge between 20th and 21st century pedagogy. For Schwarz (2006), this connection between past and present means that "Both traditional, alphabetic literacy and literacies such as information, visual, and media literacy can be well served by classroom engagement..." with comics because the form "...combines the visual and verbal as do films, TV, and even popup ads," with the signal difference being that comics "...holds still and allows special attention to be given to its unique visual and word arrangement" (p. 59). However, in order for this idea to be pedagogically useful, it is necessary to understand with greater specificity how the formal properties of comics straddle this line between past and future information communication, and what forms of "special attention" the "unique visual and word arrangements" necessitate.

Multimodality, temporality, and interactivity

As explained above, the comics form can make use of the same modes of meaning making available for digital new media design as described by the New London Group (2000) typology, with the caveat that time based modes using sound and motion to design meaning are simulated through common visual symbolic strategies including speech balloons, motion lines,

onomatopoeic sound effects, and the widespread comics design practices of spatial composition of juxtaposition, a visual/verbal blend, and sequentiality. In these elements comics exemplifies what Kalantzis & Cope (2000) term synaesthetic design, wherein meaning is made through “processes of integration and moving backwards and forwards between the various modes” (p. 211). This integration of modes of meaning making is largely characteristic of online spaces, where image, text, audio, and video commonly come together creating a high level of what Norris (2004) terms modal density, the complexity and intensity of multiple modes of “embodied” and “disembodied” communication:

Any communicative event consists of the interplay among a multiplicity of communicative modes. Social actors draw on certain embodied modes... At the same time, the social actors may employ disembodied modes, such as... reading magazines. Disembodied modes always entail some frozen actions, where *frozen action* does not imply one static form but rather a higher level of permanency of a communicative mode (Norris, 2004, p. 103, emphasis original).

Norris (ibid.) discusses modal density in reference to video recorded multimodal discourses of interpersonal body language in face to face social interactions, but modal density is also relevant to the more literally static images of comics.

The comics form tends towards a high level of modal density generally characterized by its high degree of visual permanence, allowing readers to navigate the text at their own pace and through their own choices of reading path, a characteristic Yang (2003a) sees as pedagogically useful in that it “can be harnessed in practically any subject and at practically any grade level.” The frozen design actions of the comics creator in a sense embody disembodied communication, using visually permanent images to both represent and imply the more fleeting embodied communications of human interaction, cognition, and imagination. This complex of potential meanings made available through comics' interrelated imagetextual representational resources,

derived from the form's simultaneously high levels of modal density and visual permanence, "...responds to a model of organization that is not that of the strip nor that of the chain, but that of the *network*" (Groensteen, 1999/2006, p. 146, emphasis original).

In *The System of Comics*, Groensteen (ibid.) refers to the networked meanings of comics in his explication of the "hyperframe" and the "multiframe," terms he borrows from fellow Francophone comics scholars Benôit Peeters and Henri Van Lier respectively (p. 30). For Groensteen (ibid.), the hyperframe describes the framing of a comics page as a single unit of meaning, within which the potentials for meaning are enacted through page layout (*mise-en-page*), while the multiframe encompasses the totality of the comics work, from the three panels of a single daily newspaper comic strip to the entirety of a graphic novel (p. 31). Groensteen uses the term "arthrology" to describe his semiotic analytic framework for the systems of relations between various units of meaning in comics, specifically relationships between panels, both linear ("restrained arthrology") and nonlinear ("general arthrology"). Restrained arthrology is comprised of "sequential syntagms" that create linear progressions of meaning "suborned to narrative ends," as in, e.g., the basic communication of meaning along the reading path from left to right on the pages of English language comics, while general arthrology studies hyper- and multiframe for ways in which relationships between various design elements are repeated, reused, and recontextualized in spaces that are "translinear and distant," as when a certain image is repeated with slight changes or in juxtaposition with differing images on non-consecutive pages (ibid., p. 22). This general arthrological analysis in particular is what leads Groensteen to characterize the meanings in comics as networked. One example he offers of such meanings is "the proliferation of a motif," where a particular image or visual element is repeated throughout a comics work in differing contexts, imbuing that visual element with shifting or accruing amounts

of meaning, as in the famous repetition of the smiley face image spattered with blood repeated throughout Alan Moore and Dave Gibbons' influential Cold War-era superhero graphic novel *Watchmen* (ibid., p. 155).

In *Watchmen* the smiley face image appears in the first panel, a button worn by a particular character whose murder frames one of the main plot threads of the work. Versions of the same circle circumscribing two dots for eyes, a curved line for a mouth, with a drop-shaped spatter over one eye, repeats throughout the work, sometimes as the reappearance of the original button, but also in everything from a topographic view of Mars to a smiley face t-shirt spattered with ketchup. Each instance recalls the original image of the button, and the murder mystery it indexes, but beyond that the narrative and compositional contexts of the smiley face motif add to, alter, and call into question the symbolic meaning of the iconic image. In part this exemplifies the tendency in Moore's work towards performance of formal virtuosity which highlights the more unique potentials for meaning making in comics (see, e.g. Di Liddo, 2009). Moulthrop (2009) identifies such complex interwoven networks of meaning in *Watchmen* as paralleling the “many changes of mind” required by continual technological emergence and thus encouraging “...an ability to map across multiple coordinate systems, an awareness of contingent or emergent forms, and a keen appreciation of the limits to any neat, self-enclosing order” (p. 300). Moore describes these affordances for reflection in comics, focusing especially on the modal density and visual permanence of the form:

A picture can be set against text ironically, or it can be used to support the text, or it can be completely disjointed from the text - which forces the reader into looking at the scene in a new way...[and] you cannot do [this] anywhere near as precisely as you can in comics. Here the reader has the ability to stop and linger over one particular 'frame' and work out all of the meaning in that frame or panel, as opposed to having it

flash by you at twenty-four frames per second in a cinema (quoted in Wiater and Bissette 1993, p. 162-163).

Far from an idiosyncrasy of Moore's oeuvre, this tendency towards patterning through linear juxtaposition and sequence combined with nonlinear compositional repetition and recontextualization of visual images is essential to the potential density of modes of meaning making in comics.

Much like Moore, McCloud (1993) compares comics and film in order to posit the principal method of interacting with the comics text, what McCloud calls closure. In McCloud's conception of closure, the reader's imagination is engaged by the blank spaces between panels (called gutters) to mentally insert what the printed static images *excerpt* from the visual representation of the scene. McCloud asserts that narrative time in comics is propelled by this closure, a form of cognition that takes place as the eye moves from panel to panel. Thus, the reader is "a willing and conscious collaborator" with the artist, the two collaborating to create closure, which McCloud dubs, "the agent of change, time and motion" and thus narrative meaning in comics (p. 65). Lawrence Abbot (1986) places a greater emphasis than McCloud (1993) on text as such an agent, although McCloud does touch on the place of text in comics narrative time, quoting heavily from Will Eisner's writings on the subject. Abbot (1986) asserts that the time it takes to read a caption or word balloon is what gives the reader's mind a chance to perceive "the illusion of running time, the 'duration' of a scene" within a single panel (p. 165). In effect, Abbot is describing the same participatory reader cognition as McCloud's closure, but with the focus of that cognition occurring within panels, rather than between them. Eisner (1985) discusses the visual side of this in-panel cognitive creation of narrative time, asserting that the imposition of imagery within the panel acts as a "catalyst," transforming panels set in sequence

to “the criterion by which to judge the illusion of time” and “the device most fundamental to the transmission of timing”(p. 28).

In his critique of McCloud's articulation of closure as an essential difference between comics and film, Beaty (1999) argues that the process of closure is not so different from watching moving images, since effects created in film and video editing like montage and jump-cuts can provoke a similar leap of viewer cognition as the investment of meaning required of the comics reader when inferring change from one panel to the next. For Beaty (1999), the important idea is "the acknowledgement that the same type of transition [between panels or shot sequences] in the two media functions differently because of the way each processes time and space" as opposed to "a false claim that comics do something that film does not" (p. 71). Beaty is one of the scholars who translated Groensteen's *The System of Comics* into English, unsurprising since Groensteen is especially focused on the peculiarities of comics' use of space (see, e.g. the discussion of the hyper- and multiframe, above). In fact, Groensteen (1999/2006) describes a comics work as a "spatio-topical system" whose meaning is "...not just a matter of proportional and positional relationships between the panels, but also of the perceptive and pertinent degree of autonomy to the space of the strip and of the network composed by the [speech] balloons 'over' or 'within' the drawing of the frames [i.e., the borders surrounding the panels in which each depicted visual instance takes place]" (p. 91). Hence, in their introduction to *System of Comics*, translators Beaty and Nguyen (2006) assert that semiotic analyses of comics such as those put forth by Groensteen "offer a wide range of possible insights into the spatial and temporal operations of the image" (ibid., p. viii).

Despite his strict delineation of comics as an interaction completely apart from film, McCloud does not overlook the role of space in the temporality of comics. The popular theorist

of comics has referred to the form as based on the "simple idea" of "placing one picture after another to show the passage of time" (McCloud, 2000, p. 2). In *Understanding Comics*, McCloud's cartoon avatar literally gestures towards the temporal implications of comics' spatial designs of meaning (see Figure 1 in the Figures section below). Pulitzer Prize winning graphic novelist Art Spiegelman makes a similar assertion, that comics is "...made up of units of time placed next to each other so that one sees past and present simultaneously, before decoding the moments that are being depicted in any given box" (quoted in Cioffi, 2001, p. 19).

A number of scholars (e.g. Eisner, 1985; McCloud, 1993; 2000; Groensteen, 1999/2006; Bernard & Carter, 2004) observe what Moulthrop (1999) surmises: "...the time sense in comics is inherently complex because this form demands both sequence and simultaneity." Simultaneity refers to the idea that the real-life time events we experience in a linear fashion actually occur all at once, simultaneously, all fragments of a singular fourth dimension that we are incapable of perceiving as a whole. This concept is explained thematically in *Watchmen* through the character of Dr. Manhattan, a supernatural being capable of perceiving the fourth dimension all at once, making him "...a metaphor for the art of the graphic novel in and of itself as well as for the graphic novel experience. He is everywhere all the time as well as where he is presently" (Bernard & Carter, 2004). Thus comics is able to offer the linear conception of narrative time similar to that found in traditional prose texts, while at the same time able to show multiple narrative moments simultaneously, with all the panels visible on the page at once as a single unified design. The difference between real-life time and comics' narrative time is that, in comics, we are capable of perceiving the singular fourth dimension as well as its linear components, allowing for the coexistence of linear and nonlinear meaning making. The latter form of meaning making connects with contemporary sociotechnical reflexivity, which elides

any transcendent space for critical reflection from outside the increasingly ubiquitous digital new media:

Reflexivity in the technological culture is not a separate process of reflection. There is no time, no space for such reflection. There is fusion of words and things, of thought and practice. [...] In technological culture, reflexivity becomes practice; it becomes communication (Lash, 2002, p. 18).

Comics can reopen the space for reflection that Lash (2002) argues is erased by immediacy of technologically mediated information, because comics allows a space for the coexistence of linear narrative meaning and nonlinear, networked, informational meaning. In comics, if you do not understand the meaning of a panel, the form allows you to detach from the diegetic world, move your eye back to a previous point in the line of the narrative, and reflect on what has come before, in a way that is understood as closer to reading words than viewing moving images. At the same time, comics is able to access the tendency towards reflexivity in contemporary society, which "...presumes the existence of non-linear systems" (Lash, 2003, p. 50).

With the increasing ubiquity of computers and the internet, "...we pass from the linear time typical of the alphabet to a dimension of time and space connected to each other and capable of drawing a net of relations and 'places,'" by altering the perception of proximity so that, "What was once perceived as distant is now part of our space of experience, that is, of that place where everything appears to be simultaneous" (La Rocca, 2012, p. 2). Comics pauses this "passage" from linear to simultaneous notions of time and space precisely at the moment where the two perceptions overlap, where the linear and nonlinear coexist, creating what Kuhlman (2007) describes as a complex "network of visual and semantic correspondences" (p. 855). The interstitial juxtaposition of linear and nonlinear temporality in comics design creates a basis for the comparative analysis of linear with nonlinear, the sort of space for reflection that Lash (2002) argues is elided by the immediacy of digital networked information communication.

A number of educators identify the space for critical reflection in comics specifically in the form's marked "unfixability" (Hatfield, 2005, p. xiii); what Gardner (2012) alternately describes as "...the liminal space between past and present, text and image, creator and reader... the comic frame is necessarily a space where these binaries overlap, collaborate, and compete for attention and meaning" (p. 176). As Eisner (1985) states, comics "presents a montage of both word and image, and the reader is thus required to exercise both visual and verbal interpretive skills" (p. 8). The form's hybridity makes reading comics "...an unstable process as continual transitions... require readers to constantly shift perspective" (Bernstein, 2008, p. 86). Comics can thus "facilitate" critical analysis because, "By combining words and pictures, comic books force students, rather directly, to reconcile these two means of expression," an affordance teachers can make more explicit with open ended questions about the ways visuals and words work to create complex narrative meanings (Versaci, 2001, p. 64). Low (2012) advocates comics-related literacy pedagogy that focuses specifically on the functions of the gutter in making meaning (i.e. McCloud's notion of closure), because by attending to the gutter comics becomes "...an extremely suitable medium for readers in twenty-first century schools" since "...each gutter in a piece of narrative sequential art presents a distinctive challenge (large or small) to the reader, and cumulatively, the superset of all gutters in a work gives readers the task of coauthoring the entire narrative using their own inferences" (p. 376). Again, the prototypical use of gutters in the spatial composition of comics is approached as a salient point of reader interaction with the comics text, the liminal space of meaning making where reader inference meets creator's implication, an interaction that invites critically literate practices abetted by critical literacy pedagogy.

One preeminent pedagogical strategy for teaching comics as a unique form of reflective multimodal reading is making readers' "co-authorship" of comics texts literal. The role of comics

creator software and web-based applications in education is an area of inquiry that has garnered much of the research attention on education, comics, and technology, primarily in the form of case studies of programs integrated in or appended to classroom curriculum. However, there are myriad intersections of comics and education on the internet, including downloadable and/or viewable files of educational print comics;² the digital distribution of comics-related curriculum, lesson plans, and research guides;³ online communities for comics educators;⁴ and *educational hypercomics*, i.e. comics that make use of the forms of digital interactivity and the inclusion of multimedia characteristic of content on the Web. However, little critical attention has been directed towards the latter, especially in terms of specific pedagogical affordances for meaning making in the remediation of the temporality of print comics traditions within the continual immanence of new media.

Chapter 2 discusses the development and operationalization of the term "educational hypercomics" as a scoping mechanism during stages of data collection and analysis. This includes a survey of the contentious history of attempts to define "comics," and how the issue is further problematized by the indistinct boundaries of subcategories like "educational comics," "digital comics," "webcomics," and "hypercomics." Defining comics and their intersections with education and digital technology necessarily implicates the role of disciplinary approaches to comics studies. The chapter concludes by locating the place of the present study within those disciplinary definitional boundaries. The focus of this study on pedagogical issues, and the impact that cultures of education have on definitional meanings, relates, in turn, to the applicability of multimodality and social semiotics as a theoretical framework for comparative analysis.

Chapter 3 enumerates a list of 22 examples of educational hypercomics formed during initial data collection, as a means of establishing a bibliographic beginning and curatorial context to the broad study of comics in online learning. From this initial list, I identify three exemplar hypercomics that are the subject of comparative analysis, introducing their institutional origins and stated educational goals. The variety of formats and diversity of topics identified in research on educational hypercomics, and typified by the list of 22 examples, serve to contextualize the selection of these three sample educational hypercomics as subjects of close analysis.

Chapters 4 and 5 present comparative analyses of the ways in which these three works incorporate comics and digital methods of communicative design to create multimodal pedagogical discourses. The purpose of these analyses is to explicate how these works construe readers as learners in a digital environment. Chapter 4 focuses on the heterogeneous institutional contexts of the three exemplar educational hypercomics. This chapter analyzes how sociocultural contexts created by institutional stakeholders give shape to these multimodal designs of pedagogical discourse. Chapter 5 moves from institutional contexts to the specifics of interface design. Analysis in Chapter 5 compares and contrasts navigation and digital interactivity in the respective works to elucidate ways traditional notions of reader control of temporality in print comics are variously simulated and subverted towards pedagogical purposes in e-learning environments. A deeper understanding of ways these interfaces are designed for pedagogy, within the affordances and constraints established by institutional contexts, serves to further knowledge of how the comics form is employed as, variously, a visual aesthetic style, a means of narrative development, a cultural and/or generational signifier, and a model for information organization.

Taken together, comparative analyses of ways in which the sample educational hypercomics construe readers and reflect institutions offers insight into the evolving practices and processes of integrating comics—already identified as a potent tool in teaching critical multimodal literacy—into online learning design. Chapter 6 discusses ways in which the conclusions of this study indicate future potentials for the use of educational hypercomics in critical multimodal literacy pedagogy. In particular, this conclusion highlights the limitations imposed by describing comics in digital spaces solely in relation to storytelling, especially storytelling for younger audiences. Commonly understood as an inherently narrative form of communication, the study of educational hypercomics shows that comics can also be used to restrain or contravene narratological meaning in service of didactic educational goals. The study of educational hypercomics thus gestures towards the flexibility of comics as both a form of information design and as a cultural signifier; as a means of both combining multiple critically literate practices and accommodating the sometimes disparate expectations of teachers, students, and educational institutions involved in online learning.

Figures



Figure 1: McCloud (1993) literally illustrates the simultaneity of narrative time in comics composition (p. 104).

¹ i.e. authored digital pedagogical works, as opposed to Web 2.0 comic creator applications—interactive websites that allow users to compose their own comics works with premade templates for panels, characters, word balloons, etcetera.

² e.g., the University of Nebraska-Lincoln Government Comics collection, <http://contentdm.unl.edu/cdm/landingpage/collection/comics>; Ethan Piersoff's Comics with Problems, <http://www.ep.tc/problems/>; the Duke University Center for the Study of the Public Domain comic *Tales from the Public Domain: BOUND BY LAW?*, <http://web.law.duke.edu/cspd/comics/>

³ e.g., Reading with Pictures, <http://readingwithpictures.org>; ReadWriteThink, <http://www.readwritethink.org>; Comics in the Classroom, <http://comicsintheclassroom.net>

⁴ e.g. Making Curriculum POP, <http://mcpopmb.ning.com/>; Comix-Scholars Discussion List, <http://www.english.ufl.edu/comics/scholars/>; Graphic Novels in Libraries Listserv, <http://www.angelfire.com/comics/gnlib/>

CHAPTER 2: COMICS INDEFINITE, DISCIPLINARITY, AND MULTIMODALITY

Early in *Information Comics*, an exhaustive study of pedagogic print comic books, Heike Elisabeth Jüngst (2010) notes that, "Many people will find a definition of the term 'comics' simply superfluous" because "Everyone knows what a comic looks like" (p. 13). Jüngst is comfortable with "a restricted definition" composed of "prototypical" elements of comics composition (ibid., p. 13). These prototypical elements are commonly identified by a number of scholars to include 1) the sequential placement of multiple images (e.g., Kunzle, 1973; Eisner, 1985; McCloud, 1993); 2) the juxtaposition of images coincident with their sequential placement (e.g., McCloud, 1993; Hayman & Pratt, 2005); and, 3) the blend of pictures and words (e.g., Harvey, 1996; Carrier, 2000), but there is perpetual debate over which of these elements is most essential to defining comics. For Jüngst (2010), this debate is inconsequential since it is based on "...discussions of special cases [that] are important in the field of artistic comics" but are unimportant for her study since pedagogic comic books "often do not have a strong artistic design" and "never have a primarily artistic or expressive purpose" (p. 13).

Questions of aesthetic philosophy aside, whether or not the pedagogic online comics that are the focus of the present study might be labeled "artistic," they all represent "special cases." Because the works that comprise this study's corpus of data employ a variety of new media via digital delivery, these works inexorably raise questions as to what qualifies something as a comic as opposed to, for example, animation or illustrated prose. With their respective heterogeneous incorporations of digital interactivity and time based media (e.g. audio and video), the comics analyzed in this study compete with and problematize historically prototypical characteristics of their print predecessors, calling into question the extent to which comics theory is applicable in

contextualizing and analyzing such online texts. Defining essential characteristics such as the juxtaposition of images in sequence and the integration of pictures with words provide a useful heuristic for describing the form and function of comics in online spaces, but are inherently problematic insofar as they connote totalizing views whose generalities prove insufficient to describing the vast diversity of idiosyncratic expression that construes comics as a field of discourse.

Comics understood as "an artistic form that historically developed with technologies belonging to print culture" has that history "both reflected and challenged" in digital spaces (Priego, 2012). Positioning the present study within that contested historical space, establishing what makes the texts in this corpus of data all in some sense "comics," and then, more precisely, "educational comics," "hypercomics," and finally "educational hypercomics," requires a foray into an already highly contested theoretical space: the notion of defining comics. The purpose here is to articulate salient formal characteristics scholars and practitioners commonly identify with "comics," while simultaneously outlining the sociocultural contexts that rhetorically shape and reshape those definitions, working towards what futurist Bruce Sterling (2005) calls "a designed metahistory" (p. 42).

Sterling (*ibid.*) describes metahistory as a "cultural thesis" for understanding how information about people and objects transits time; a socially constructed set of underlying assumptions about what constitutes shared meanings of past, present, and future. For Sterling these metahistorical underpinnings govern views on the appropriateness of the incorporation or rejection of new objects and ideas into historical understandings of self and community. However, while these overarching cultural narratives are important determinants of how associations between objects and meanings are made, and how these associations evolve over

time, metahistorical constructions are inherently flawed when they do not account for their own provisional nature (ibid., p. 38). The notion of a designed metahistory, then, is meant to be multiple histories of the construction of history that account for the provisional nature of assumptions about what counts as historic. In this case, I seek to highlight the various and competing ways comics is clarified and operationalized as a term in scholarly literature, in order to locate my own self-reflexively provisional use of the term.

One provision that immediately necessitates reflection is that the notion of comics in this study is limited to English language comics. Of course, comics of all types, including comics made for the purposes of teaching and learning, exist throughout the world in myriad social, cultural, political, and economic contexts, the subject of a heterogeneous array of scholarly research (see, e.g., Lent, "The World's Potent"). The limitation of the present study to mostly English language comics history and texts is a scoping measure by the monolingual author, and should not be misinterpreted as support for the claim sometimes made that comics is an American invention, as opposed to a widespread communicative practice with formal and cultural contiguity with medias past, present, and future. The claims made for the role of comics in e-learning are necessarily contingent upon sociocultural context because "comics" is like "culture", as described by Jahoda (2012): "...not a thing, but a social construct vaguely referring to a vastly complex set of phenomena" (p. 300). Like Marianne Hirsch (1997) in her study of photo albums, I want my own critical analysis of imagetexts to be grounded in "...theory as a form of reflection and contemplation [that] emphasizes mutual implication over domination, affiliation over separation, interconnection over distance, tentativeness over certainty" (p. 15). In other words the term "comics," like terms such as "culture" or "discourse," is heuristic; an analytic abstraction not a finite exactitude.

Defining comics as interstitial form

Following the examples of McCloud (1993), and Witek (1992), I will use the term "comics" as a singular (i.e. "comics is...") to refer to the form of expression found in various formats, including comic strips, comic books, graphic novels, and webcomics. I understand the term to also inescapably connote both commonly identified formal characteristics (e.g., pictures juxtaposed with words and other pictures, pictures in sequence, word balloons) as well as various histories of sociocultural contexts (e.g. popular culture, newspaper and magazine publishing, superhero fandom, graphic novels). However, my terminology will depart from the common tendency of comics creators and scholars to classify comics as a medium (see, e.g. Witek, 1992; Wolk, 2007). Referring to comics as a medium serves the rhetorical function of separating comics form from content, a move that comes partially in opposition to the stereotype, particularly prevalent in America, that comics is solely a genre of youth literature, limited in content to humor or superhero stories (McCloud, 1993). Conversely, Jüngst (2010) makes the logical argument that "...comics are not a medium, as they can appear in a variety of media (print, Internet)" and "[comics] ...are also not a genre, as they can accommodate a variety of genres (cooking recipes, superhero stories)," so comics is best described by a term that mediates between medium and genre (p. 12).

Jüngst (2010) opts for the term "format," which fits with her "restricted definition" of comics, and its emphasis on communicative/normalized rather than artistic/experimental practice. However, "format" somewhat grounds comics in a materiality antithetical to the less restricted visual spatiality of digital comics, because "format" connotes, especially in a library

science context, types of physical library materials (e.g. comic books, graphic novels, manga, CD-Rom, etc.), as opposed to the means of communication that appears in all of these artifacts.

More appropriate to the variable digital formats of the comics in this study, I will describe comics as a *form* of expression, one that can contain various discursive genres and (re)produce those genres in multiple media, i.e. in the multiple material bases for composition (e.g. pencil, pen, marker, paint), which are generally reproduced through ink and/or pixel on paper and/or screen, through analog and/or digital information communication technologies. The singular, "comic," will function as a general term for particular instantiations of the comics form, e.g. a single item in a format like comic books, graphic novels, manga, etc.

Of course, none of these usages are standardized, which is the point. My use of "form" is especially inspired by Bourriaud's (1998/2002) notion of "relational aesthetics," found in "...art taking as its theoretical horizon the realm of human interactions and its social context, rather than the assertion of an independent and private symbolic space" (p. 14). In discussing relational art, Bourriaud (ibid.) insists on "the instability and diversity of the concept of 'form'" that arises from the increasingly complex "visual experience" occasioned by visual information communication technologies; a technocultural context that presents a space in which, "An artist's artwork... acquires the status of an ensemble of units to be re-activated by the beholder-manipulator" (p. 20). Bourriaud (ibid.) describes this as conceptualizing an artwork as a social interstice, "a space in human relations which fits more or less harmoniously and openly into the overall system, but suggests other trading possibilities than those in effect within this system" (p. 16). My particular use of "form" to describe comics connotes an understanding of comics as an interstice of pictures and words, genre and medium, sociocultural contexts and formal expressions. Comics' interstitial nature allows the form to "...represent the unmapped spaces between familiar forms" in the sense

that comics "...borrow something from prose fiction (comics as over-illustrated stories) and other elements from cinema (comics as runaway storyboards, or movies with exceedingly low frame counts) but really belong to neither of these major domains" (Moulthrop, 1999). In other words, I am choosing to call comics a "form" of expression precisely because the ambiguity of this categorization evokes potentials for critical (re)conceptualization.

One result of comics' interstitiality is the marked ambiguity that pervades scholarly work seeking to define the form, historicize its cultural production, and distinguish comics from other related forms of pictorial and literary expression (Heer & Worcester, 2009, p. xiii). This formal and cultural ambiguity is readily observable in the profusion of alternate names for the form, such as comic art, graphic narratives, trade paperbacks, the funnies, funny pages/papers/pictures, picture stories, picture magazines, picto-fiction, visual narrative, visual humor, imagetexts, image strips, sequential art, and narrative illustration/design (Yezbick, 2008, p. 112). In addition to connoting a multitude of narrative genres, intended audiences, and compositional techniques, the proliferation of naming conventions also grows out of a desire to "disassociate" the form from the "preconceived notion of a comic book as cheap (if not trashy) juvenile entertainment" (Duncan & Smith, 2009, p.18). These limiting cultural preconceptions of comics disproportionately grow out of "long-standing commercial considerations and the formal attributes of comics as physical and cultural artifacts" (Witek, 1992, p. 75). Because comics is "a tightly woven matrix of art and commerce," the understanding of comics as a culturally legitimate form of expression, appropriate for all types of stories told by all sorts of people, competes with the idea of comics as a narrative genre, "...where the distinctive graphic look and storytelling elements associated specifically with superhero comic books... have taken hold in other media like film, television, and video games" (Salkowitz, 2012, p. 16). Material, social,

economic, and cultural histories collude to give comics its characteristic “unfixability,” making it “an unresolved, unstable, and challenging form” (Hatfield, 2005, p. xiii). But despite this “unfixability,” or perhaps because of it, the definition of comics remains a predominant debate in the growing interdisciplinary field of comics studies, to the extent that articulating such a definition has become a typical opening rhetorical gambit for work in the field (Hatfield, 2010, ¶ 10).

Disciplinary limitations in formalist versus sociocultural definitions

The two definitions of comics to have gained the most widespread use in the last 30 years come from comics creators Will Eisner and Scott McCloud (Tilley, 2008). Eisner (1985) describes the form of comics as “Sequential Art... a means of creative expression, a distinct discipline, an art and literary form that deals with the arrangement of pictures or images and words to narrate a story or dramatize an idea” (p. 5). McCloud (1993) explicitly builds on Eisner's term with more precise language: “Juxtaposed pictorial and other images in deliberate sequence, intended to convey information and/or to produce an aesthetic response in the viewer” (p. 9). In addition to echoing Eisner, the emphases of McCloud's definition on the placement of images in sequence and the intentions of author towards audience draw on the “four conditions” art historian David Kunzle (1973) uses to define comic strips:

- 1). There must be a sequence of separate images; 2). There must be a preponderance of image over text; 3). The medium in which the strip appears and for which it is originally intended must be reproductive, that is, in printed form, a mass medium; 4). The sequence must tell a story which is both moral and topical (p. 3).

French semiotician Thierry Groensteen (1999/2006) critiques Kunzle's definition, among others, as “normative and self interested” and “made to measure in order to support an arbitrary

slice of history," due to such strict qualifications as original intent towards a mass medium and story content focused only on the moral and topical (p.13). Groensteen (ibid.) rejects definitions as impossible, opting instead to develop the critical vocabulary of arthrology, described in Chapter 1.

Meskin (2007) discounts the overall "definitional project" of comics studies as problematically ahistorical and ultimately unnecessary for analysis of comics texts, which also sums up various critiques aimed specifically at McCloud's definition and argumentation in his highly influential 1993 treatise on the comics form, composed in the comics form, *Understanding Comics*. For example, both Harvey (1996) and Horrocks (2001) critique McCloud's emphasis on juxtaposed sequential images as a defining characteristic of comics because this criterion includes works of pictorial narrative historically unconnected to comics, (e.g. cave paintings, the Bayeux tapestry), while excluding works that have historically been identified as comics, such as single image newspaper comic strips (e.g. editorial cartoons, daily features like *Family Circus* or *The Far Side*).

In contrast to McCloud's focus on sequential imagery, Harvey (1996) defines the "static blending of word and picture" as the essential characteristic of comics (p. 3). Carrier (2000) also focuses on "word/image unity" as necessarily characteristic of comics, but goes a step further by identifying the convention of the speech balloons as the "defining element" (p. 4). But just as McCloud's definition excludes single panel comic strips, Harvey and Carrier's definitions exclude wordless comics. A number of comics scholars label comics as an essentially narrative form (e.g. Blackbeard, 1974; Harvey, 1996; Hayman & Pratt, 2005), but even that basic characteristic is called into question by abstract comics: "...sequential art whose panels contain little to no representational imagery, or that tells no stories other than those resulting from the

transformation and interaction of shapes across a comic page" (Molotiu, 2009, p. 1). On the other hand, abstract comics' inability to completely escape narrative, to the extent that even non-representational imagery goes through processes of "transformation and interaction" that evoke narrative, may support the interpretation of comics as an inherently storytelling form.

Groensteen (1999/2006) argues that the profusion of attempts at defining "the essence of comics" is caused by the same state of affairs that makes such a definition ultimately impossible: any one comic "is necessarily (constitutionally) a sophisticated structure" and "only actualizes certain potentialities... [of the form] to the detriment of others that are reduced or excluded," (p. 12). The inherent complexity and incomplete actualization of the comics form in any particular instantiation ensures that any attempt to "draw a boundary that includes everything that counts as comics and excludes everything that doesn't" will produce examples of the form that traverse those boundaries while highlighting the implicit political ideologies of said boundaries' author (Wolk, 2007, p. 17). This is because attempting to define comics is inherently polemical, making arguments based on value judgments about what comics should and should not be (Horrocks, 2001, p. 29). While McCloud (1993) believes establishing a definition of comics is important to "give lie to the stereotypes" of comics as a limited genre of juvenile literature (p. 3), science fiction author Samuel R. Delany (1996) argues that the converse is true: such definitions actually capitulate to limiting stereotypes by implying that comics is a form of expression so simplistic and unchanging as to be easily categorized (p. 240).

Instead, Delany (1996) posits comics as an example of "social objects," a term inspired by the work of sociologist Lucien Goldmann. For Goldmann (1966/1969), sociological study is concerned with "collective consciousness," understood as "*...only the totality of states of individual consciousness and of their tendencies resulting from the mutual influence of men* [sic]

upon each other and their effects on nature" (p. 127, emphasis original). Thus, while an individual work may express the inner workings of an individual author's consciousness,

...these ways of thinking and feeling are not independent entities... They exist and may be understood only in terms of their inter-subjective relations... a text becomes an expression of collective consciousness only to the extent that the structure which it expresses is not peculiar to its author but is shared by the various members who form the social group... (ibid., p. 128-9, emphasis original).

Delany (1996) interprets this to mean that comics, like other forms of expression, cannot be defined by characteristics observed in "a relatively limited number of material objects," but instead can only be understood as "an unspecified number of recognition codes" shared by "an unlimited population," a group of codes that is "constantly developing and changing" (p. 239). The changing and dynamic social sharing of these "recognition codes," the "inter-subjective relations" between people engaged in the production, distribution, consumption, and critique of comics artifacts (re)form the meaning of comics in the collective consciousness. In this conceptualization comics is understood as "part of an organized social world," which requires "understanding the social contexts in which... [comics] are produced, circulated, consumed, and commented upon" through analyses of "a wide range of objects and practices that articulate with the space of comics" (Woo, 2011).

Cohn (2003) also identifies comics studies with the social contexts occupied by comics-as-cultural artifacts, but is more radical in his assertion that, "...categorically, comics can *only be understood* as a sociological, literary, and cultural artifact, independent from the internal structures comprising them" (p. 14, emphasis added). Cohn (2005) rejects the tendency of comics scholars to discuss comics as a medium or art, asserting instead that the formal attributes of comics should be understood as a type of language:

Bearing in mind McCloud's focus on sequence, sequential images can also be considered a language – a purely visual language (VL) – following the same structural properties and mental processes as verbalized symbolic language, though in a separate modality of thought: a visual modality. Indeed, any time someone draws a picture without viewing the referent, its origin must be conceptual. And, like verbal or signed languages, the unique property that separates visual language from other forms of visual communication lies in its deliberate and systematic sequence – its syntax (p. 2).

Cohn (2004) asserts that the notion of "comics" must be separated from this visual language commonly found within comics, because notions of comics-as-Art limit expectations for images to be rendered in either photorealistic or highly individualistic illustration styles, constructing comics creation as a specialized practice, thus preventing "the creation of a more systematic and shared use of a vocabulary." Cohn (2003) describes the relationship between comics and visual language as "symbiotic," but insists that viewing the two as separate entities would allow comics scholarship to "embrace its place within the interdisciplinary fields of literary, sociologic, and cultural investigation" while formal analysis of visual language "opens a new field of inquiry within linguistics, psychology, and the cognitive sciences" (p. 14). Cohn (2012) characterizes visual language as a "unifying theory" for the analysis of sequential pictorial narrative that resolves debates over formal definitions of comics by recognizing comics as just one of many sociocultural objects within which visual language and verbal linguistic writing co-occur.

Cohn's overall cognitive linguistic approach to the comics form presents a forceful disciplinary paradigm especially useful for cognitive scientific inquiry, just as Woo (2011) makes a strong disciplinary case for reader response and audience studies as the preeminent way in which to frame comics as an object of study within a social world. In both cases, comics is understood as a socially constructed field of discourse, its formal elements the site of social

(re)interpretations of the meaning of comics. Cohn's insistence on the separation of the formal structures of visual sequence from the sociocultural milieu associated with comics as an industry and art form can usefully generate theory within linguistic and cognitive scientific fields, but at the expense of integrated attention to the construction of meaning at the point of interaction between visual formal elements and sociocultural contexts. However, it is exactly within this intersection of social and formal meaning potentials that actual meaning is (re)created, and meaning-making is learned. To understand comics in a way that acknowledges the complex interactions of compositional form with sociocultural context, interactions which define the learning and practice of communication (i.e. literacy), "'comicsness' might be usefully reconceptualized[...] as a historically contingent and evolving set of reading protocols that are applied to texts" (Witek, 2009, p. 149).

Witek (ibid.) analyzes the use of arrows and numbered panels by early 20th century comics artists (as well as more contemporary appropriations of those forms to reference incipient comics texts), concluding that these indicators of reading order and direction "remain as traces of the process by which the Western comics reader has been constructed...trained to perceive the comics page as both a linked sequence of separate panels and a meaningful semiotic field in itself," an evolutionary process that continues "as reading conventions and textual practices continue to revise each other" (p. 149). Like Delany's (1986) notion of comics as social object, Witek (2009) frames comics as a dynamic process in which the formal elements and sociocultural contexts that Cohen seeks to separate are understood as co-constitutive of meaning. Witek's (ibid.) conception of "reading conventions and textual practices" describes the interaction of form and context as mutually (re)defining comics in those intersections of shared understanding among the varied perceptions of society, the "collective consciousness" described

by Lucien Goldmann. It is in this notion, where the sociocultural and formal elements of comics evince a mutable kind of imagetextual literacy, that the implication of comics in critical new media literacy pedagogy comes to the fore, largely because this is a conception of comics as a species of interactivity where creators imply and readers infer narrative through spatial expressions of temporality. The comics reader is "...given space within the comics page to make choices, to make connections, and to make her own comics... [inviting] the reader to project herself into the narrative and project the narrative beyond the page" (Gardner, 2012, p. 193). Again, from this perspective the similarities in the interactivity of both comics and new media engage "multiliteracies" that account for both "...the increasing multiplicity and integration of significant modes of meaning-making, where the textual is also related to the visual, the audio, the spatial, the behavioral, and so on ...particularly important in the mass media, multimedia, and in an electronic hypermedia" and "...the realities of increasing local diversity and global connectedness" (New London Group, 1996, p. 65).

Because this study is concerned with uses of comics as a form of interactivity in pedagogy, it requires attention to that space of meaning where the formal and sociocultural interact. As I will explain below, the term "educational hypercomics" is a rhetorical means of laying claim to the interstitial space required by the disciplinary paradigm of multiliteracies pedagogy —the fuzzy edges of definitional meaning whose very indistinctness provides space for teaching and learning.

Meanings of "educational comics"

In this section and the next, I will locate "educational comics" and "hypercomics" within the broader field of comics discourse, and then explain the need for understanding how the two can interact. In discussing "educational comics," Duncan and Smith (2009) use the simple descriptor, "comics with intentionally educational aims," including nonfictional works and comics adaptations of works from the traditional literary canon. Nonetheless "...to stipulate what an educational comic is 'about' proves to be highly problematic, contingent mainly on the use to which an observer means to put it... educational comics are didactic, not analytical, and to classify them accurately one needs to discover what sort of lesson they are each intended to convey" (Van Hook, 2008, ¶ 2). However, "Since the motives for creating and consuming comics are inescapably mixed and complicated," depending on "identifying these motives" to categorize educational comics means the categorization will "necessarily remain fuzzy" (Rifas, 2009, p. 161). In part, the "disparate provenance as to purpose and intended audience" of educational comics, often "produced in very small numbers to be marketed to specific groups," given "limited distribution," and representing "a low priority for preservation among their target audience..." have made such works "perhaps the most marginalized and culturally invisible comics category of all" (Witek, 2008, ¶ 2-3).

Pioneering educational comics creator, publisher, and scholar Leonard Rifas (1991) contextualizes this marginalization by describing educational comics as neither an industry, a subculture, nor a professional field, but rather "a flexible, popular art that is constantly being reinvented by diverse people working in isolation from each other" (p. 81). This lack of a well-defined community of practice for educational comics means that, despite a long history of

comics being used for "imparting information, shaping attitudes and teaching skills," educational comics are often viewed as "a perennial novelty item" (Rifas, 1988, p. 145). Tendencies towards the ahistorical conceptualization of educational comics belies their longstanding use in furthering a wide variety of socio-political perspectives "...by establishment institutions to propagandize for the status quo, and also by establishment critics of both Left and Right" (ibid., p. 145). Like comics overall, educational comics functions as a social object that resists distinct definition:

Rather than constituting a single genre, 'educational comics' encompasses a large constellation of related (and somewhat overlapping) categories. These include local and global history comics, 'true fact' comics, illustrated adaptations of novels and plays, instructional comics, propaganda and psychological warfare comics, religious education and proselytizing comics, advertising and industrial public relations comics, political campaign comics, health education comics, biography and autobiography comics, development education comics, educational fotonovelas, benefit/cause comics, comics-illustrated brochures, cartoon-illustrated nonfiction picture books, infotainment and classroom-based edutainment (Rifas, 2009, p. 160-161).

Davidson (2008) describes some of these forms of didactic comics as "special purpose" or "impact comics" which are "created by an individual or organization" with a particular goal in mind, seeking "...to promote an idea... a product... or a purpose" (p. 340). Thus, didactic comics are understood as especially "pragmatic" and attempting "to reach the most diverse audiences with the widest range of objectives," compared to other types of comics (ibid., p. 341).

The delineation between fiction and non-fiction comics is a common scoping technique, generally employed to differentiate adaptations of prose novels and plays seeking to broaden audiences for culturally canonized "classics" from educational comics intended to communicate strictly factual information (Davidson, 2008; Jüngst, 2010). As Rifas (2009) notes this distinction "only goes so far" since "comics have combined factual and fictional elements in many ways" (p.

161). Again the comics form evinces a tendency to break down binary notions: like socio-cultural divisions between word and picture and high and low art, the lines between fact and fiction, education and entertainment, are actively blurred: "Just as educational aspects are present in all comics, dramatization, embellishment and imagination are part of even the severest factual presentations" (Davidson, 2008, ¶ 4). Comics offers "a larger inventory [of stylistic devices] from which to choose, if only by virtue of the fact that comics are a *forme mixte*, a polysemiotic genre consisting of many codes (linguistic, cultural, graphic, color, pictorial, symbolic); in brief, their message is reinforced and made redundant at many levels" (Brown, 1977, p. 24-5). In essence, educational comics exploit various actualizations of the form's tendencies towards social, temporal, and technocultural interstitiality in order to facilitate pedagogical imagetextual expression.

Like comics generally, there are a variety of alternate names and approaches to defining and/or categorizing comics with pedagogical aims. McCloud (2000) uses the distinction between "narrative non-fiction," including historical retellings and comics journalism, and "pure nonfiction" that does not couch its informational content in a story, such as Larry Gonick's *Cartoon History of the Universe* and its multiple sequels, whose slightly humorous tone and abstracted "cartoony" illustration style inspired McCloud's own theorizing about comics through the form of comics (p. 41). Gonick is among the many authors inspired by the "...for Beginners" books of Mexican cartoonist Eduardo del R o, better known as Rius. In a discussion of "pedagogical comic books" that function as Leftist historical critique, Gene Bell-Villada characterizes the teaching and learning through comics as necessarily aesthetic, informal, and experiential:

Marx for Beginners and *Cuba for Beginners* grew out of Rius's day-to-day activities as a popular artist working for the press. His comics were conceived not for school or university use but for general non-

academic readers situated somewhere on the left, who might read the book in a cafe or on the bus and may not even purchase a great deal of "political" literature. A comic book by Rius or for that matter by anyone else (whatever its politics) bought and read as much for the achieved pleasures of its "art" as for the social values of its "content." I don't think it a risky value judgment to say that Rius's appeal as a left-wing "pedagogue" owes everything to the fact that he is a fine graphic stylist and a first-rate wit (quoted in Brown, 1984, p. 239-240).

Participating in the same symposium as Bell, Larry Gonick also describes pedagogy in comics as necessarily bound to the abilities of the cartoonist not only as an illustrator and writer, but also as a researcher:

The humor in a pedagogical comic book should be based primarily on the material and social contradictions of its subject matter ...it imposes on the cartoonist a heavy responsibility to understand history well enough to express those contradictions. The rewards are rich: the book will be funnier, as the humor springs from the very crux of the issue; the book will be more comprehensible, as humor and story line work together instead of at cross purposes; the characters will come more fully alive, as the reader sees people respond in a familiar way to situations which are often, after all, not so unfamiliar; and unfamiliar situations can also be more fully explained. In short, find humor there, and it will facilitate the goal of every historian to arouse empathy, to make history come alive (quoted in Brown, 1984, p. 235).

Eisner (1985) links this "familiarity" to the "experience sequential art is so good at providing," an experience described by salient characteristics of 1) visual permanence: "...there is no pressure of time as there would be in a live action motion picture or animated film... The amount of time allowed to the reader of a printed comic... is unlimited"; 2) modal density: "...the arrangement of panels, the position of the balloons and/or explanatory text carefully arranged on the page are all calculated to involve the reader [in performing the technical procedure]"; and 3) frozen design actions mitigating embodied and disembodied communication: "There is room for approximation and opportunity for specific performances which the reader can examine ...the broad generalization of artwork permits exaggeration which can more quickly make the point

and influence the reader" (ibid., p. 144). Again, in discussing comics as pedagogy, the socio-cultural (e.g. the familiarity of comics as popular culture), is intertwined with the formal (e.g. the use of sequence and static image in creating narrative temporality).

Eisner (1985) describes "the arena of instruction visuals--or the application of sequential art to teach something specific" as divided into two categories: technical instruction comics, "...in which the procedure to be learned is shown from the reader's point of view, gives instruction in procedures, process, and task performance..." and attitudinal instruction comics, whose function is "conditioning an attitude toward a task," accomplished through "the identification evoked by the acting out or dramatization in a sequence of pictures [which] is in itself instructional" (p. 143-4). Jüngst (2010) adopts Eisner's two categories and adds a third, "fact comics":

Fact comics do not give instructions and are also not meant to primarily change the reader's attitude or behaviour, apart from the fact that they are meant to create interest in a given topic[...] The three types of comics can mix in varying proportions. Fact comics can have an element of attitudinal instruction, particularly if they deal with subjects that consist of complex facts but at the same time have a connection to the readers' everyday world. This is true e.g. of comics about environmental protection. They list the facts behind the problem and sometimes give detailed explanations of chemical or physical processes, but often they also encourage the readers to tackle the problem locally wherever they can (p. 18).

Jüngst (2010) applies these categories to the analysis of "information comics," defined as a subset of educational comics that focus on the popularization of expert information in a prototypical comic book form. As mentioned previously, the emphasis on prototypical characteristics of comic books is problematic for the present study because my focus is as much on innovative uses of digital interactivity and compositional design as it is on the social, historical, and cultural meanings coproduced by creators and readers of comics artifacts, thus my description of the corpus of this study as educational, not informational, hypercomics. It is nonetheless important to note the *technical*, *attitudinal*, and *fact* categories, while sometimes

overlapping within a single work, present a useful organizational tool for analysis of any corpus of educational comics. The three categories simultaneously articulate both the *primary learning objective* and the ways in which reader subjectivities are construed by the text via "competencies shared by producers and consumers" that allow for the understanding of "visually encoded" representations of social interaction (Kress & van Leeuwen, 2006, p. 115). Technical instruction involves relating the steps of performing a task and generally involves the direct address of the reader. Attitudinal instruction, in contrast, necessitates comparatively more instances of indirect address of the reader (e.g. dramatization), since modeling social behaviors involves representing social interactions within the text. The fact category suggests a notion of objective truth that puts the reader in a less interactive position, in the sense that the reader is not engaged in a way that encourages action or behavioral change beyond general interest.

The use of comics texts as educational tools has a long history of dispersed, parallel practices, with as wide a variety of intended audiences, proposed learning outcomes, and institutional contexts. Educational comics can sometimes function as a form of public relations to counter accusations of the correlative influence of comics as popular culture (Perry & Aldridge, 1971, p. 245). Alternately, non-fiction comics meant to inform, instruct, and/or persuade readers can provide nuanced socio-historical observation and contextualization. The scattershot nature of educational comics as a field of social discourse means that "No survey of educational comics could possibly be complete" (Rifas, 1988, p. 204). If anything, the attempt to nail down a definition of educational comics (or non-fiction comics, instructional comics, pedagogical comics, information comics, etc.) presents an even greater challenge than defining comics in general. Works considered quintessential educational comics, like the works of Ruis and Larry Gonick, tend to incorporate images in panels alongside large blocks of text, which leads Jüngst

(2010) to classify such works as "picture books," sometimes nearing "the fuzzy edge between picture book and comic" occupied by hybrid works that incorporate "some comics-specific properties" (p. 23). In short, educational comics, as a field of discourse, is *hyperinterstitial*, by which I mean educational comics is an area of inquiry that intensifies the formally and socially interstitial tendencies scholars identify as characteristic of comics overall. This is just one of several characteristics educational comics share with comics on the Internet: both are characterized by an extreme mutability. Educational comics and comics on the Internet both move along the fuzzy edges of formal categories.

Comics on the Internet

Comics on the Internet exemplify hyperinterstitiality in that, like educational comics, the ambiguity and "in-betweenness" associated with comics generally is intensified by 1) the blurring of traditional boundaries between different forms of communication, and 2) the multiplicity of socio-cultural contexts in which comics works are created and read. To take the second issue first, the proliferation of socio-cultural contexts of digital comics proceeds from the "few barriers to entry" for online creators since "there are no editors to fire off rejection slips and no retailers who refuse to order your books" (Salkowitz, 2012, p. 204). The term commonly applied to comics on the Internet is webcomics, i.e. comics on the World Wide Web (see, e.g. McCloud, 2000; Campbell, 2005). Because of relative freedoms from editorial interference and preexisting market constraints, Fenty et al. (2004) equate webcomics with the underground comix movement of the 1960s and 1970s, due to the shared common characteristics of aesthetic experimentation, transgressive self-expression, and developing niche audiences within an

alternative distribution framework. These are, incidentally, some of the same contiguities that exist between underground and educational comics. And, as with educational comics, contiguities with the underground movement only go so far, pertaining only to certain webcomics works, in certain contexts.

Fenty et al. (2004) define webcomics as "comics that are made first for the web, made by an independent creator, who may be working with others, but who all have no originary print version and no corporate sponsorship" (¶ 6). In this conception, webcomics is construed as either akin to or an outgrowth of the "alternative press" (Lacy, 2007). However, attempting "to construct a webcomics subculture" using "ideologically loaded" constraints, and focusing on the particular cultural foci of a small sample of popular online comics, is highly problematic because there are actually "many webcomic subcultures, or rather, subcultures in which webcomics are made public (such as gaming or arts and craft)" (Kogel, 2013, p. 9). Like educational comics, webcomics are best understood as widespread, diverse, often more connected to various other subcultures than a comics-specific subculture akin to the fandom associated with print comic books. Garrity (2008) describes this as potential for webcomics to reach "the audience that abandoned comics in the real world—people who, to their surprise, really love comics after all," by appealing to diverse, niche interests with unconventional, experimental, and politically radical content (p. 28). Thus, Garrity conceives of webcomics as providing something akin to Bourriaud's notion of art as a social interstice, presenting alternative possibilities for relational transaction within a dominant discourse, in this case the stereotypical discourse of comic books as limited to superheroes, comic strips to humor.

Nonetheless, analyses of webcomics through the lens of print comics like Fenty et al. (2004) and Lacy (2007) help characterize a certain subset of the larger amorphous phenomenon

of comics on the Internet. The rise in popularity of webcomics in the late 1990s and early 2000s coincided with the dwindling number of small press comics during the same period and, while myriad factors lead to both trends, their shared time frames meant that monetizing comics on the Internet became technologically and financially viable at around the same time small press print comic books were largely priced out of the specialty comic shop market (Allen, 2007). "Many independent comics artists are choosing to lower printing costs and release their first efforts via the Web" (Jenkins, 2002).

Prior to 1993, "The few comics that made it online tended to be work by college students studying computer-tech stuff, since those were just about the only people with Internet access" (Garrity, 2011). These included humor strips published through CompuServe, FTP and Usenet (ibid.). The common interests of early Internet users in computer technology led to many early humor strips "written from a technically savvy position with primarily a geek audience in mind" (Blasingim, 2004, p. 5). However, by the early 2000s, as display technologies improved, bandwidth increased, and computers became increasingly ubiquitous, genres became more various, and making generalizations about webcomics increasingly difficult. The most popular and long running strips tended to reflect broader interests than just technology, but, "...the most popular webcomics tended to be gag strips about nerd interests. Strips about video games outstripped all else in popularity" (Garrity, 2011). Examples of web comics based on nerd interests include: "... gamers (*Penny Arcade*, *Ctrl-Alt-Del*, *PvP*), Dungeons & Dragons and World of Warcraft players (*The Order of the Stick*, *Looking for Group*), math and science geeks (*xkcd*), anime fans (*Megatokyo*)... science-fiction (*Girl Genius*, *Saturnalia*), and so on" (Lacy, 2007). "Webcomics cater to a large number of niche audiences by providing for interest groups who would otherwise never receive the attention of the mainstream media" (Hicks, 2009, 11.15).

Although some are extremely popular (*Penny Arcade* has, over the past 15 years, developed into a media empire with its own nonprofit charity and convention), more commonly, webcomics are similar to blogs: websites created and updated by independent, self-employed authors that survive by developing "a smaller group of dedicated readers" that provide financial support for creative work, "...either through donations or product purchases" with only a small percentage becoming a sustainable way for creators to earn a living (Liming, 2012, p. 20). Some common means of monetizing webcomics:

1. Traffic and advertising
2. Sponsored by larger sites
3. Springboard for other media deals (books, TV, movies)
4. Generating more freelance opportunities and higher rates
5. Sales of branded merchandise
6. Sales of print-on-demand or e-book collections
7. Sales of original art or commissions
8. Crowdsourced publication/subscriber-based model
9. Tips/donations
10. Leads to paid speaking/teaching/media opportunities (Salkowitz, 2012, p. 209).

Many of these paths to monetization, including the need for online content to be portable to print formats, as well as the more general requirements of developing a large or at least dedicated fanbase, have tended to curb experimentation with new formats that lack an analog analogue (i.e., a point of comparison drawn from print comics examples).

Returning to Hatfield's (2005) theory of comics as defined by multiple tensions, we might describe online comics as (re)defined by tensions between print and digital forms of composition, interaction, and monetization. At first glance, it seems like comics and digital interfaces should be fairly interoperable. Even beyond their shared tendency towards visually

dominant multimodal meaning making, discussed in an earlier section, new media has also adopted specific information design strategies commonly associated with comics. For example, both comics and computers require the navigation and ordering of multiple frames or windows, and graphical user interfaces remediate comics tropes like word balloons and cartooning (e.g. the Microsoft Office Assistant Clippy the Paperclip, desktop icons) (Saraceni, 2003). In fact, the cartooning conventions found in comic strips and books have been viewed as a way to ease transitions from print to digital: "As computer interfaces become more complex, designers have turned more often to cartoon conventions to enhance usability and ease the learning process" (Horn, 1998, p. 134). However, while certain conventions drawn from comics have been integral to new media interface design, comics works themselves have "resisted complete digital translation most studiously..." (Gardner, 2012, p. 192).

Remediation of comics in digital formats has been problematized by the differing design constraints of print and digital production. For instance, the difference in the portrait (vertical rectangular) orientation of the print comic book page and the landscape (horizontal rectangular) orientation of computer screens can result in interface designs that diminish immersive reading experiences (McCloud, 2006). The limitations on file size and image resolution in the 1990s cemented single-panel cartoons and comic strips as the earliest comics online (Campbell, 2005; McCloud, 2006). The formal association of newspaper comic strips with webcomics leads some researchers to make an analytic distinction from print formats based on the codex: "The aesthetic, and therefore narrative, structures of both daily strip cartoons and on-line web comics are unique unto themselves and barely resemble those of the comic book, trade paperback (which collect a series of comic books) and graphic novel" (Witty, 2010, p. 4). However, there are a number of online comics that remediate the size and shape of print comic books, and these are

generally comics in the process of being created for collection in a single print volume, or else previously printed comics scanned in and posted online. There are also hybrid forms of webcomics that combine the joke-a-day format with the character development and evolving relationships of long form narrative, such as the popular strip *Questionable Content* by Jeph Jacques (McCloud, 2006).

More recently, mobile devices, particularly tablet devices, have been a popular way for people to read comic books. For example, the digital comics reader application Comics by comiXology, through which the few major comic book publishers release digital versions of their print comics offerings, was iTunes #10 top grossing iPad app in 2011, the #3 top grossing iPad app for 2012, and the top grossing nongame iPad app in 2013 (McMillan, 2014). Comics by comiXology and similar applications include a zooming interface that allows the reader to shift between viewing a full page at a time as in a comic book, and viewing one panel at a time, close up. Because the latter view removes the juxtaposition of multiple panels from comics, it becomes what McCloud (2000) describes as the "slice-and-dice" method of digital comics display which, along with the inclusion of multimedia (e.g. animation, audio), produce a narrative temporality that contradicts the core identity of the comics form (p. 215-6).

Naturally, this argument retains the problematics of McCloud's essentialist definitional project. Reading a single panel at a time may not use comics' characteristic juxtaposition of multiple panels, but it still makes use of other forms of reading recognized as characteristic of comics, e.g. static images shown in sequence, containing integrated pictorial and verbal linguistic communication, word balloons, onomatopoeic sound effects, cartoon-style illustration, etc. Additionally, this critique of panel-by-panel reading is mitigated by the ability to toggle back to a view of the full page design. In contrast, adding multimedia like audio or video has greater

potential to override or compete with the sorts of literacy embodied by comics' formal identity. This is because interaction with narrative time portrayed spatially, as in comics, is much different from interaction with narrative time portrayed temporally, as in video or audio. In as much as comics symbolically simulates time with such devices as word balloons, sound effects, and sequential composition, sharing space with multimedia within the same narrative has the potential to destabilize the simulation. The move from spatial to temporal is a major shift in the power relationship between audience and text: from *readers*, who control the speed at which the narrative unfolds, to *viewers*, who lack that degree of control. Perhaps this is why, as comiXology CEO David Steinberger asserts:

Since the advent of the computer people have been trying to 'improve' the comic book reading experience — adding animation, adding sound, adding creator commentary — and it just has never caught on. I think the real value add that digital has for comic books is in delivery" (qtd. in B. Moore, 2011).

Then again, comics on the Web viewed through an Internet browser tend to differ significantly from downloadable digital comics for tablet devices (Salkowitz, 2012). As writer and comics futurist Warren Ellis (2011) notes, digital comics' format is "paygated digital files in a wrapper for delivery to a device" which provides "...the closest digital emulation of the [comic book specialty] store experience," while webcomics are usually released online for free, where they become a broadcast medium, "...surrounded by an expanding sphere of URLs and shortcodes, of RTs and Likes and +1s, and are being opened on desktops and laptops and tablets and phones." But, while webcomics are generally characterized by free content, this has not always been the case. Prior to the popularization of paid content models for mobile and tablet computing, webcomics interstitial nature "invited comparisons" to comic books, where the content was sold, as well as newspaper comic strips, and online entertainment, where content was generally free (Campbell, 2005, p. 140). Thus, there was a great deal of experimentation

during the early-to-mid-2000s with various business models and formats for webcomics (see, e.g. Campbell, 2005; Allen, 2007; Garrity, 2011). During this period Scott McCloud, an early advocate for new models of financing and formatting comics for the Internet, became a polarizing figure in these overlapping areas of webcomics discourse.

The infinite canvas and hypercomics

Scott McCloud casts a long shadow in the research and practice of formal innovation in online comics. In his sophomore non-fiction book *Reinventing Comics*, a collection of twelve essays on potential "revolutions" in comics in the 21st century, McCloud (2000) dedicates the final three chapters to comics and computers, including the issues of digital production, digital delivery and distribution via the Internet, and finally innovations in comics form that take full advantage of online spaces. Many of McCloud's views on the form and monetization of online comics, presented in *Reinventing Comics* and expanded upon in a series of webcomics essays entitled "I Can't Stop Thinking," were controversial among working webcartoonists. As the author who popularized discussions of comics on the Internet, garnering attention from mainstream news media such as *WIRED* magazine and organizing a panel on digital comics at the world's largest comics industry trade show, Comic-Con International, held in San Diego, McCloud drew criticism for advocating new, experimental models of digital comics art and commerce while ignoring the impact of generally more popular webcomics that remediated newspaper comic strip formats and revenue streams (Campbell, 2005, p. 30-32). McCloud's qualifications that he was focusing on long form online comics, as opposed to the short form of strips, did little to quell criticism that McCloud was "ignoring" the reality of webcomics for a

theoretical ideal of online comics in the future (McCloud, 2001). Part and parcel of this conflict between McCloud's notions of online comics as a site for experimentation in the making and selling comics runs the risk of losing money by losing casual readership (Campbell, 2005).

McCloud (2000) was an advocate of micropayments, exchanging small amounts of money for small chunks of content, making, "...the path from selling ten comics to selling ten thousand comics to selling ten million comics is as smooth as ice" (p. 188). While McCloud's notions of a "frictionless economy" between artists and their audience has resonances with popular webcomics that maintain living wages for their creators through a community of fiercely devoted readers, the notion of that economy based on the sale of principally the comics content itself proved untenable prior to the rise of tablet computing.

McCloud's considerations on formal experimentation in online environments are perhaps his most influential thoughts on digital comics, in that they continue to influence online comics creators, programmers, and educators. The final chapter of *Reinventing Comics* is called "The Infinite Canvas," the term which came to be associated with a form of comics that "...does not lend itself easily for straightforward stories... emphasizes spatiality, movement and flow and can make complex use of scrolling to build suspense..." (Kogel, 2013, p. 66). The Infinite Canvas comic has come to be defined by McCloud's (2000) suggestion that the screen be treated like a window onto a larger comic instead of a print page, remediated for the screen (p. 222). For McCloud (ibid.), this means a return to what he identifies as comics' prehistory, extended sequential visual storytelling such as the Bayeux Tapestry or Trajan's Column: "The ancestors of printed comics drew, painted and carved their time-paths from beginning to end, without interruption" (p. 220). For McCloud (2009), the notion of the Infinite Canvas is, despite criticisms to the contrary, intended to make reading a more immersive experience for the reader:

Print cartoonists (myself included) make a constant series of compromises in pacing and design to stuff our stories into pages. We add and subtract panels, restrict size variation, break reading flow, and rarely if ever vary the distance between panels for fear of wasting paper. Without such restrictions, though, every one of those choices can be made *exclusively* on behalf of the *needs of the story*.

As technology improved, the term "infinite canvas" was adopted by a number of artists to generally define comics that incorporated a large size, shape, or unconventional reading path intended to provide the reader with "an uninterrupted flow, a matrix of spatial relations that pulled the reader from the first frame to the last" (Campbell, 2005, p. 115). Early examples of this work, by artists including McCloud himself, usually involve comics images stacked vertically or placed horizontally for the space of several screens, requiring the user to scroll through online storytelling that approximates the continuous reading paths of the sequential visual storytelling in things like tapestries and scrolls. While the idea of infinite canvas comics "has failed to become a widespread technique," it has been adopted by some artists, and inspired programmers to create interfaces that allow people without coding experience to make infinite canvas comics (Kogel, 2013, p. 66). McCloud (2009) posits that, while "such formats are still a poor fit for most readers' day-to-day reading habits," the infinite canvas may still be an idea that will become more popular in the future, as technology and bandwidth improve.

Applications for creating infinite canvas comics have been identified as worth academic attention in the field of digital storytelling, because teaching people to tell stories through such interfaces presents, "...an excellent difficulty/benefits ratio, since it affords many of the narrative possibilities to be found in the moving image domain, as well as some of those provided by traditional interactive media, while remaining within the easier to teach, learn, and share domain of sequential art" (Puentedura, 2010). While this argument provides another example of educators' focus on the use of digital interfaces for simplified comics composition at the expense

of using digitally interactive comics texts as pedagogic resources, it is nonetheless true that working with static visual images generally allows for greater flexibility in aesthetic choices with less technical knowledge than the skills required for creating animation.¹

Although the infinite canvas concept has come to represent a few particular types of digital interfaces and forms of comics composition, the term was never intended to be so specific (McCloud, 2006). However, "infinite canvas" has accrued the limitations of the digital comics composition applications named after it. For example, Keeper and McDevitt (2012) suggest that "when you pull up your favorite Infinite Canvas comic, the whole comic is on the screen all at once." In fact, this is really only the case with the zooming infinite canvas interfaces, such as the Tarquin Engine and Prezi, while with other interfaces, including McCloud's many webcomics, it is more generally true that in an infinite canvas comic, the whole comic is *accessible* via navigation of a single screen, or a single webpage, as opposed to multiple pages hyperlinked to one another.

Because of the ironically limited connotations of the term "infinite canvas," to particular spatial and interface designs, I have chosen "hypercomics" to serve as a more inclusive notion for online comics that take advantage of affordances for information design in a digital environment. Most webcomics are technically hypertextual, in the sense that usually each page or strip of the comic is a single webpage connected by hyperlink to the previous and next page, with the click of the mouse and the loading of the next web page in place of turning a page (Marrs, 2005). Hypercomics, however, is less invested in hypertextual linking per se. For the artist Neal von Flue, an early innovator of infinite canvas style comics, "hypercomics" comes closer to defining what McCloud originally meant with his *Reinventing Comics* chapter title, because "hypercomics" describes a work that "blends visual storytelling with any of the unique

formal properties of computer technology" (qtd. in Goodbrey, 2012, p. 6). The strength of von Flue's definition is in its vagary, its resonance with the concepts of comics and computing without reliance on strict definitional characteristics. Kogel (2013) asserts a similarly broad notion of webcomics as "a screen-based medium sharing many common principles with comics but expanding upon those principles using the systems of the Web" (p. 10). While these definitions focus on the addition of digital affordances to the comics form, Keeper and McDevitt (ibid.) define the concept by what it is not: "Hypercomics: Juxtaposed pictorial and other media in deliberate sequence, intended to convey information and/or to produce an aesthetic response in the viewer, of which, in order to create a printed form, portions must be re-sequenced or removed."

In discussing hypertext as pedagogy, Joyce (1996) argues that reading hypertexts requires "collaboration by the reader... to give meaning to the texts through her constant textual intervention and shaping, her construction of successive interpretive frameworks, and her responses as a reader" (p. 234). Another early adopter and innovator in hypercomics, and the programmer of the Tarquin Engine application, designer and scholar Daniel Merlin Goodbrey, similarly focuses on the forced co-creation of meaning through hypertextual interaction. Goodbrey (2012) approaches defining hypercomics by connecting McCloud's definitions of comics and the infinite canvas with the characteristics of hypertextual literature, or cybertexts, described by Aarseth (1997). Thus, a hypercomic is:

...a comic with a multicursal narrative structure. Cursality is the apprehension that there are multiple paths in addition to the one followed... a multicursal maze has many different possible pathways to navigate. Multiple paths through a narrative mean a choice must be made by the reader as to which path to follow. As such, a multicursal narrative foregrounds the importance of reader's choice... the choices made by the reader may determine the sequence in which events are encountered, the outcome of events or the point of

view through which events are seen. Hypercomics... are ergodic in nature... the reader's experience of the work will often be locally unique based on the specific pathway taken and choices made in navigating the comic. This process of navigation requires a non-trivial effort on behalf of the reader... progression comes about as a consequence of intention, deliberate choice or inadvertent action on behalf of the reader... reading a hypercomic can often engender a sense of tmesis... the sense of have skipped over or missed something and relates to the reader's apprehension that their own path through the narrative is one of many different potential pathways (Goodbrey, 2012, p. 1-2).

Recalling Douglas Wolk's (2007) assertion that attempts to define comics 1) produce examples outside the boundaries of the definition, and 2) highlight political biases of the definition's author: 1) Goodbrey's (2012) definition of hypercomics as an instantiation of the multicursal ergodic reading experiences Aarseth (1997) ascribes to hypertextual literature excludes the numerous digital comics that provide a single, linear (i.e. unicursal) reading path, but incorporate other affordances unique to computer mediated communication (e.g. the incorporation of sound or animation, the use of sequences of images overlaid in various patterns on a repeated background); and 2) the majority of Goodbrey's own comics work is multicursal and ergodic, mazes of intersecting panels taking multiple divergent narrative paths.

Goodbrey's description of hypercomics is further problematized by his description of digital comics as necessarily inducing a sense of tmesis. In linguistics, tmesis refers to the interpolation of one word in the middle of another word for effect or emphasis, but Goodbrey, after Aarseth (1997), is drawing on the use of the term by Roland Barthes (1973/1975) to describe the reader skipping or skimming the text of a novel, in contravention to the reading order established by the linear text as composed by the author (p. 14-15). However, Aarseth (1997) argues that while Barthes' notion of tmesis refers to "a fragmentation of the linear text expression that is totally beyond the author's control," reading hypertext is made antithetical to the concept "by controlling the text's fragmentation and pathways," allowing for reading that is

neither linear nor nonlinear, but rather hyperlinear, "...the improvised selection of paths along a network structure" (p. 78-79). Reading hypertext cannot be the subversive or playful act which Barthes refers to as the bliss of the text because hypertext is inherently nonlinear, which can contribute "to a brand of author-imposed disorientation that leads potentially to an antagonistic relationship between narrator and reader" (Ciccoricco, 2007, p. 34). Such antagonistic reading experiences are observable in common critiques of digitally interactive comics as formalist experiments that foreground interface over narrative (see, e.g., Campbell, 2005; McCloud, 2006).

Nonetheless, Goodbrey's conception of hypercomics accurately captures a significant subset of the larger discursive field of myriad and diverse instantiations of comics created for the Web. Furthermore, as a comics creator Goodbrey continues to push at the boundaries of *all* definitions of comics, working on "new mutations and innovations" of digital comics, including:

Game Comics that marry the conventions of the comics medium to those of interactive narrative-based videogames... Sonic Comics that create reactive soundscapes based around the reader's current position in a multimodal narrative... Locative Comics that react to their environment and the proximity of other comic readers... AR Comics that use Augmented Reality to extend physical spaces into the digital world of the hypercomic or extend comic page out into the physical world... [and] Spatial Comics that use installations to extend hypercomics into real-world locations and architectural structures (Goodbrey, 2011, p. 14-18).

Thus, a hypercomic is more complex than traditional notions of hypertext based solely in the electronic reproduction and semantic interconnection of verbal linguistic texts in that hypercomics is primarily defined by its location in digital media, to the extent that hypercomics by definition cannot easily exist in print formats (see, e.g. Keeper & McDevitt, 2012; Kogel, 2013). The caveat implied by "easily" in the previous sentence is that hypercomics can exist in physical space, but in a gallery or exhibition space, what Goodbrey (2011) describes as "Spatial

Comics," above. The overlap of digital and museological spaces in hypercomics creation makes sense in the context of Hayles' (2004) assertion that:

Electronic hypertexts are navigable in at least two senses. They present to the user a visual interface that must be navigated through choices the user makes to progress through the hypertext; and they are encoded on multiple levels that the user can access using the appropriate software, for example, by viewing the source code of a network browser as well as the surface text. As a result of its construction as a navigable space, electronic hypertext is intrinsically more involved with issues of mapping and navigation than are most print texts (p. 83).

Navigation of both the breadth of the hypertextual environment through the interface and what Hayles (*ibid*) refers to as the "depth" of the source code on which that interface is built, parallels the ambulatory navigation of the gallery space, and the pedagogical interactions with informational texts, labels, and gallery tours. Keeper and McDevitt (2012) suggest this is an example of one of the "techniques" of hypercomics creation they identify as "Absorbed Into Other Media," wherein "...a Hypercomics creator wants to make something that is more about environmental experience than about narrative... they begin to focus on pure composition and visual symbolism, they slow the flow and (hopefully!) enhance the aesthetic experience... [and] their Hypercomic has been Absorbed Into Art Installations!"

The dynamics of representational power implied in the notion of absorption are problematic overall, a generalization that fails to account for instances when, e.g., animation is embedded within a single panel of a primarily static digital comic, and oversimplifies the complexity of potential interactions between comics and multiple media. For example, McCloud (2000) also employs the metaphor of absorption, but as a critique of audio and animation overpowering comics' use of two dimensional space to simulate human perceptions of the fourth dimensional. The notion of art installations absorbing hypercomics further problematizes Keeper

and McDevitt's (ibid.) definition of hypercomics as necessarily digital, incapable of being printed without significant editing. While a hypercomic in a museological space may not be printed in a codex, it is still an instantiation of a form supposedly defined by its electronic nature, located in physical materiality, as in printed comics panels or pages hung on a gallery wall. This seeming paradox goes unmentioned by Keeper and McDevitt, but it likely arises from the problematic concentration of their definition of hypercomics as something not-print, unprintable.

Just as hypertexts can be in print and digital (Hayles, 1992), so too can hypercomics be in print, as in comic books constructed with narratives similar to the *Choose-Your-Own-Adventure* paperback series (see, e.g. Goodbrey, 2012). For example, the "cartoonish yet algorithmically complex graphic novel" *Meanwhile* by Jason Shiga creates a print hypercomic through "...an elaborate series of maze-like paths and tabbed pages to help the reader guide the protagonist" through 4,000 potential stories that function as "...a kind of extreme, logical conclusion to the evolution of the codex... an edge case for digital comics," literalized by the creation of *Meanwhile* as an iOS app, the multiple narrative paths explored by touchscreen instead of page turn (Sample, 2012).

Such traversal of boundaries between print and digital become increasingly nontrivial as hypertexts "...mix words with graphics, sounds, images, animation, and a host of other multimedia components," and, as a result, "...the foundational metaphor of the page as a two-dimensional plane mutates... increasingly represented as a topographic area to explore, with layered strata, hidden openings, crosscutting pathways, links between different world levels, and other spatial and temporal unfoldings..." (Hayles, 2004, p. 86). In the case of the majority of online comics, these layered strata include "...the computer screen, the browser page layout, and the comics' layout – whose panels are the final windows to the content" (Marrs, 2005, p. 29).

Kogel (2013), adopting Hayles' Media Specific Analysis in concert with Groensteen's (2000/2009) arthrology framework, identifies in digital comics the foundational strata of code, which can be exploited to add metatextual commentary or otherwise make content more "malleable" than is possible in print. More complicated user interfaces that take advantage of the z axis through zooming interfaces, or layer multiple panels, offer further strata for navigation, interaction, and exploration.

In the case of hypercomics art installations, the topographic metaphor employed by Hayles becomes literalized in the three dimensional physical space of the gallery. In fact, the move from virtual to physically embodied exploratory navigation occasioned by hypercomics in gallery spaces overlaps with the parallel movement of practitioner-scholars in fine arts circles towards the concept of gallery comics. Gallery comics, or installation comics, represent "a challenging new form of art lying between book-based sequential comics and the spacial / wall situation of fine art... a sequential, or quasi-sequential work which both can be read like a book and comfortably viewed as a gallery/museum work" (Brandl, 2006). Gallery comics are created through "...the intentional gathering of such a preponderance of comic art elements in 'made-for-the-wall' art so that audiences instantly sensed the kinship of gallery comics to traditional comics" (Hill, 2007, p. 9). Taken a step further, conceptualizing the gallery wall as the space of the page, and each piece of art in a comics exhibition as a single panel on that page, involves combining the idea of gallery comics with the conceptions of new media art curation as a process of narrative remix, thereby moving from the single installation or gallery comic to the extended exhibition comic, where each curated piece is representative of an instance in the larger, loosely constructed nonlinear narrative of the exhibition as a whole (Duffy, 2009).

Re-remediating hypercomics, moving hypercomics from the Web to the gallery and back, invites conceptualizing digital hypercomics as a virtual exploratory space akin to the pedagogical public spaces of museums and libraries. For example, Taylor (2012) suggests "the relationship of narrative and space and navigable space" in hypercomics can inform methods of information organization and access in digital libraries and archives, infusing virtual "shelf visualization tools" with "spatial navigation common and uncommon to library collections as a way to facilitate different types of interactions with material." I would add to this that envisioning hypercomics not only as a method for the navigation of information through spatial relations, something achieved through the mutable space of the Prezi interface linked to the communicative genre of giving a presentation, but also as a method for narrativizing the navigation of information. In other words, educational hypercomics combine salient characteristics, tropes, and/or reading protocols identified with the comics form with the mutable, multimedia, and hypertextual affordances of design on the World Wide Web, in order to create pedagogical narratives foregrounding particular domain-specific learning objectives.

Kogel (2013) adopts Hayles' Media Specific Analysis to conceptualize comics on the Web as "a process, a mixture between comics and image code," but moves on to also describe webcomics as the processes of archive building and artistic growth (p. 36). Here Kogel refers to the ways in which the low editorial barriers, serialized format, and Web 2.0 asynchronous communication between authors and readers create in the archives of long running webcomics a navigable metanarrative of online socio-cultural interactions producing radical evolutions in visual aesthetic and thematic content, a widely observed characteristic of serialized webcomics (see, e.g., Campbell, 2005; Garrity, 2011). Carter (2011) identifies these archival and interactive aspects as "a powerful tool" for young adult literacy pedagogy in which, "...teachers and

adolescents consider how product and process intersect in new social spaces" through the use of web archives and social media interactions with contemporary comics practitioners (p. 193).

While webcomics archives and Web 2.0 social interactions are among the myriad important and underexplored research topics on comics-related pedagogy in digital spaces, such research is largely beyond the scope of my study. Instead, I bring up this prevalent characteristic of popular webcomics as a point of contrast with educational hypercomics, which do not conform to this common type of webcomic. Hypercomics in general are more consistent with a different type of online comics text:

In the webcomic site, there are also short graphic novels which are structured in an interactive cluster. This "hyper cluster" deploys the various tables that compose the entire story in a slideshow format, through which the user can move forward or backward by virtually acting either on buttons or arrows. So what webcomic readers can actually see on their computer screen is a slot placed in central position in which a single table of the entire graphic novel is deployed. This means that an interactive behavior is required on the part of the user at least for reading the entire story. This kind of interaction is quite different from that required by the printed format of the comic. ...the storyline develops in a series of tables that form a cluster which has a virtual depth. [...]the webcomic implements a kinetic modality and a different way of reading... (Zanfei, 2008, p. 57).

Although Zanfei's use of "graphic novel" and "slideshow" are imprecise comparisons, and the description does not account for zooming interfaces any more than Goodbrey's definition of hypercomics accounts for unicursal digital interactive comics narratives, both converge on the notion of hypercomics as generally discrete (as opposed to continuing, serialized, open-ended) texts.

The notion of hypercomics as finite texts is especially true of educational hypercomics, which are largely finite projects tied to diverse learning objectives, design constraints, and evaluative regimes arising from the specific localized requirements of learning institutions and

other educational stakeholders. In this educational hypercomics are like print educational comics as described by, e.g., Rifas (1988, 1991, 2009); Van Hook (2008); Davidson (2008); Witek (2008): diverse and diffuse, varied in aesthetics, formats, politics, desired learning outcomes, and intended audiences. Nonetheless, these works share a similar impulse towards the creation of a unified pedagogical text for Internet distribution. McCloud (2001) argues that, while learning through the navigation of multiple semantically hyperlinked texts "is a wonderful way to explore information and to follow one's interests," it does not supersede or replace "the idea of an author-centered work," since eventually an online learner researching a particular subject "is going to want an organized, comprehensive treatment of this subject, and an interface that reflects that organization" (qtd. in Hatfield, 2001, p. 74).

Educational hypercomics, in other words, function along an interstice that maintains the authorial paradigm of print texts while surpassing, or at least presenting a significant challenge to, the formal constraints of print reproduction. The latter scoping boundary immediately disqualifies the majority of online educational comics texts, which take the form of downloadable Portable Document Files (PDFs), digitized versions of print works, or works created simultaneously for digital and print reproduction (Jüngst, 2010). The former boundary, the authorial paradigm, excludes comics creation software from the scope of this project. What remains within the scope defined by my use of "educational hypercomics" are online authored texts that address identifiable learning objectives through juxtapositional and/or sequential imagetextual narrative discourse combined with interactivity characteristic of digital environments.

Multimodality, social semiotic analysis, and comics pedagogy

As described above, the study of comics as pedagogy necessitates an understanding of comics as a field of discourse that exists at the intersection of socio-cultural meaning and formal composition, a critical stance contrasting especially with the cognitive linguistic approach to comics studies found in Neil Cohn's conceptualization of visual language. Social semiotics mitigates such dichotomous views of form and social meaning because, "Social semiotics treats all semiotic acts and processes as social acts and processes" (Hodge and Kress, 1988, p. 122). Kress (2003) describes the move from a linguistic to a social semiotic perspective as, "... a move from a concern with form in one mode... to a concern with form-and-meaning in many modes... [and] The move... away from a theory in which form is dealt with separately from meaning" (Kress, 2003, p. 41-2). A social semiotic analytic approach therefore offers a palliative to the intractable ambiguity of educational hypercomics as a field of discourse, because social semiotics is less concerned with essentialist formal categorization than it is with "...*meaning* in all its appearances, in all social occasions and in all cultural sites" (Kress, 2009, p. 2, emphasis original).

This recognition that meaning potentials are actualized by the interrelation of semiotic resources with the socio-cultural contexts in which said resources are used is predicated on M.A.K. Halliday's theory of metafunctions, described in his work on systemic functional linguistics.² Halliday (1978) describes the metafunctions of language as "present in every use of language in every social context" (p. 112). There are three types of metafunction: 1) the *ideational function*, which "represents the speaker's meaning potential as an observer... the content function of language, language as 'about something;'" 2) the *interpersonal function*,

which represents "...the participatory function of language, language as doing something... the component through which the speaker intrudes himself into the context of situation, both expressing his own attitudes and judgements and seeking to influence the attitudes and behaviour of others;" and 3) the *textual function* which "represents the speaker's text-forming potential...", an "enabling function," since "...it is only in combination with textual meanings that ideational and interpersonal meanings are actualized" (ibid., p. 112-113). The ideational function can be further subdivided into experiential systems, wherein, as language is learned, it becomes "a tool for learning everything else," and logical systems, which "extend the experiential power of the grammar by theorizing the connection between one quantum of experience and another" (Halliday, 2006, p. 17). All three metafunctions occur simultaneously in the construction of a text, defined here as "an instance of the process and product of social meaning in a particular context of situation" (Halliday and Hasan, 1985, p. 11). Thus, meaning is created at the interstices of 1) the metafunctional constructions of discourse that organize meaning potentials of various semiotic resources, and 2) the situational contexts that shape and are shaped by said metafunctional constructions.

The theory of social semiotics, and the school of systemic functional linguistic thought from which it is derived, is unique in this insistence on "...direct correlation between the functional organization of language and the organization of context" (Eggins and Martin, 1997, p. 239). These processes, by which resonance between metafunctional construction and situational context specify "a range of meaning potential" is called *register*: "the semantic configuration that is typically associated with the situation type in question" (Halliday, 1978, p. 123). Situational context is therefore described as a semiotic construct, i.e. constructed through systems of meaning making, via three *register variables*:

- field: what the language is being used to talk about;

- mode: the role language is playing in the interaction; and
- tenor: the role relationships between the interactants (Eggins, 1994, p. 52).

These register variables allow for the analysis of the organization of the situational context in which a text is embedded, the context being the "ecological matrix that is constitutive of the text" (Halliday, 1978, p. 122).

While the mode variable of a register of discourse in systemic functional linguistics is taken to be monomodal, i.e. language in the role of spoken or written word, in the theory of multimodality mode is understood more broadly as "a socially shaped and culturally given semiotic resource for making meaning" (Kress, 2009, p. 79). "Multimodal analysis must work with concepts and methods that are not specific to language, or indeed to any other mode, but can be applied cross-modally... [and] necessarily center on the communicative *functions* that can be fulfilled by several or all semiotic modes (van Leeuwen, 2004, p. 15, emphasis original). O'Halloran & Fei (2009) clarify this meaning, and the interrelation of the various terms of social semiotics, when they describe the subject of multimodal analyses as "multimodal phenomena" created through "...choices from semiotic resources (e.g. language, images, music, mathematical symbolism, gesture and movement) which integrate across visual, auditory and somatic (haptic, gustatory and olfactory) modes to construct meaning in the context of their instantiation" (p. 140). Multimodal analysis is thus, "... the work of scholars who have extended the categories and methods of systemic-functional linguistics to visual modes of communication or ones that mix the verbal and nonverbal..." (O'Toole, 2011, p. 193).

Wood and Kroger (2000) assert that verbal and nonverbal features of discourse are "interrelated" and inseparable from each other, necessitating a view of "discourse in the broadest sense" as an integrated "semiotic system," whose "multiple facets and functions" analysis must recognize, and whose interactions can be illustrated although meaning is "constantly shifting

with the context" (p. 63). Like the notions of comics as a social object or systems of meaning, this notion rejects essentialist definitional categorizations:

...we cannot make statements about forms of discourse in general in terms of some set of essential properties. Rather, we must look at the forms as ways that people orient to discourse of a particular sort and further, at the way in which people do so on particular occasions. ...We cannot specify ahead of time that the discourse we look at will be of a particular kind, because the features in which we are interested are matters of orientation rather than essence. The best we can do is to select material that may bear on our questions and to guard against taking its features for granted (ibid., p. 67).

This has been my approach to selecting educational hypercomics texts for this study: compiling a list that does not claim to be comprehensive, but instead is understood as exemplifying the characteristic heterogeneity of this field of discourse, a comparative analysis of the construction of pedagogical discourses through the integration of comics' traditional formal characteristics with the affordances of digital media. Within the semiotic systems of the exemplar educational hypercomics analyzed below, the present study focuses on how modes of meaning making understood to be "comics" function within their respective situational contexts, in terms of institutional origins (e.g. independent author, non-profit organization, government department, etc.), disciplinary paradigms (e.g. math, physical sciences, social sciences, etc.), and desired learning outcomes.

The underlying interest driving this research is in how design choices drawing on semiotic resources of comics and the Internet in particular contexts and on particular occasions communicate representations of teaching and learning in online spaces. Kress (2003) suggests learning is wrought in the creative tension of articulation and interpretation, (e.g. of writing and reading), a process whereby "The resources through which meaning is made are changed in the process of meaning-making, but so is the inner disposition of those who have made that meaning

inwardly in interpretation or outwardly in articulation" (p. 40). The goal of this study is to describe ways in which the designs of educational hypercomics work to insert themselves in this cycle, as multimodal texts that articulate systems of pedagogical meaning in order to open space for transformative interpretation and creative re-articulation.

While social semiotic analysis provides a "descriptive framework" for the systemic interrelations of various modes of meaning making, "In studies of the use of semiotic resources, visual social semiotics can only ever be one element of an interdisciplinary equation which must also involve relevant theories and histories" (Jewitt and Oyama, 2001, p. 138). "Social semiotics is not an end in itself" but rather "a tool for use in critical research," which "only becomes meaningful once we begin to use its resources to ask questions" (ibid., p. 136). In the context of this study, these questions originate from the above intellectual history of comics studies, from the theorization of educational and online comics as collectively hyperinterstitial, and from education science research that implicates comics in teaching critical multiliterate approaches to the interpretation and articulation of e-learning. Research on comics, ICTs, and multiliteracies describes the impetus for analyzing educational hypercomics. Visualized as a space for inquiry, "educational hypercomics" exists at the intersection of the fields of discourse that define this study: comics, Internet technologies, and pedagogy (see Figure 2 in Figures section below). The anti-essentialist, socially constructed approach to definitions of comics form, the marked ambiguity of educational and digital comics within that broader tradition, and the characteristic entanglement of the socio-cultural with the formal that define this space of inquiry all signal the appropriateness of social semiotics as an analytic framework, given its attention to meaning at the overlap of semiotic resources with social situational context.

Figures

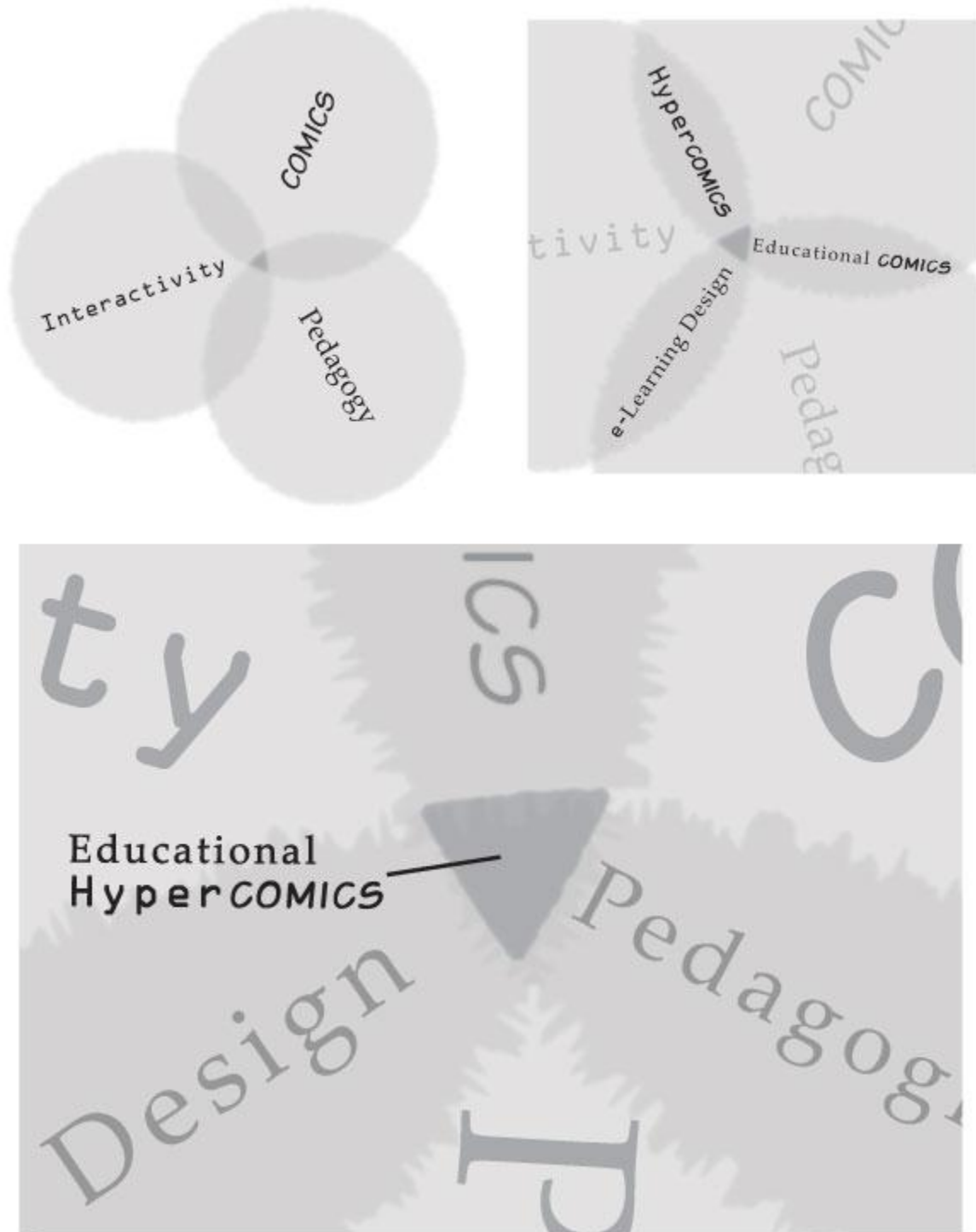


Figure 2: A sequential art visualization of educational hypercomics as the overlap of three discursive spaces whose fuzzy edges represent the heuristic nature of the analytic boundaries that describe socially objectified constructions of meaning.

¹ These infinite canvas comics creation applications, usually based on Flash or Macromedia, include the Tarquin Engine (<http://www.webcomicsnation.com/tarquin/>), Infinite Canvas.app (<http://www.infinitecanvas.com/>), and an iPad application, also called Infinite Canvas (<http://infinitecanvas.appjet.net/>). While not specific to comics, the zooming and rotating presentation software Prezi (<http://prezi.com>) offers similar functionality as the various infinite canvas comics creation applications.

² Systemic functional linguistics is thus named because its practitioners understand language as a system that evolves according to the needs and socio-cultural contexts of its use; that is, systemic linguists are "interested in what language can do, or rather what the speaker... can do with it" as well as, "the nature of language, its internal organization and patterning, in terms of the functions that it has evolved to serve" (Halliday, 1978, p. 16). Systemic linguists assert that the function of language is "to make meanings" which are "influenced by the social and cultural context in which they are exchanged" through a process that is semiotic, i.e. "a process of making meanings by choosing" (Eggins, 1994, p. 2). Language is therefore understood "not as a set of rules, but as a *resource*" with "meaning potentials" realized through the "creative use" of available resources, use that results in continuous modification of said resources (Halliday, 1978, p. 192, emphasis original). It is in its broad adoption of the systemic functional perspective on "resources" that social semiotics departs from the more traditional notion of the sign, famously described by Ferdinand de Saussure (1916/2011) as composed of the "signified," or "concept" that is being communicated, and the "signifier," or "sound-image," the means through which the "concept" is communicated (p. 67). In contrast, social semiotics conceives these "actions and artefacts we use to communicate, whether they are produced physiologically... or by means of technologies" as "resources" instead of "signs" because the former term "avoids the impression that 'what a sign stands for' is somehow pre-given, and not affected by its use" (van Leeuwen, 2005, p. 1).

CHAPTER 3: RESOURCE COLLECTION AND SAMPLE SELECTION

The three educational hypercomics that are the primary focus of this study are drawn from a larger (though far from comprehensive) list of examples. This initial list is comprised of 22 examples of educational hypercomics (See Table 1 in the Tables section below). A number of these examples come out of prior research on pedagogy in digital and museological contexts (see Duffy, 2009; 2010). Other texts in the list were located in research literature on digital comics in education found via education and library science databases, including ERIC, LISA, and Library Literature.

Some hypercomics were located via the online presence of preeminent practitioner-scholars doing work combining comics, computers, and pedagogy. For example, Scott McCloud is perhaps the most well known comics creator and theorist, whose influence on research related to comics created for digital spaces, the field of discourse I have equated in this study with the term "hypercomics," is inescapable. Therefore it is hardly surprising that McCloud often links to the work of artists experimenting with iterations of comics in digital spaces. McCloud is himself the author of a series of six nonfictional infinite canvas comics essays, entitled *I Can't Stop Thinking!* and published online from 2000-2001, that continue the theoretical work of *Reinventing Comics*, embodying the metatextual pedagogical use of comics to discuss comics, in this case the use of digital comics to extrapolate on his theories for comics in digital spaces.

Among those artists McCloud links to are the aforementioned Daniel Merlin Goodbrey, and artist Yves Bigerel. Goodbrey and Bigerel, like McCloud, have created hypercomics that posit, exemplify, and design ways comics can make use of the affordances of digital interactivity; that is, hypercomics about hypercomics, or "metahypercomics" (Keeper, 2012).

This term describes a subset of the list of educational hypercomics, comprised of ten examples: the six installments of McCloud's (2000-2001) *I Can't Stop Thinking* essay series, Bigerel's (2009) two works, *About Digital Comics* and *About About Digital Comics*, Goodbrey's (2001) *Comics Tetrad*, and the metahypercomic created by Keeper and McDevitt (2012), *Understanding Hypercomics*. This final entry was located via entering "understanding hypercomics" as a search query in Google, which seemed a likely play on *Understanding Comics*, based on the influence of McCloud in the field of digital comics studies overall, as well as the fact that McCloud's title is itself a paraphrasing of Marshall McLuhan's *Understanding Media*.

Other practitioner-scholars, Leonard Rifas and Gene Luen Yang, are representative of creators that stepped briefly out of the print tradition of educational comics to create early educational hypercomics, both in 2003. Rifas, working with Seattle Community College web design students, created a hypertextually annotated online comic about lessening individual carbon imprints through increased awareness of connections between home and travel (Luke, 2010). This hypercomic is entitled *Searching For A Home: A Car Smart Comic* (<http://www.scn.org/feetfirst/comics/index.html>). This work continues Rifas' longer tradition of creating and publishing comic books about ecological issues and environmentalist activism (see, e.g., Interview with, 1978; Luciano, 1984; Rifas, 1991). Yang, a high school computer science teacher, gained prominence as a cartoonist in 2006, for his graphic novel *American Born Chinese*, the first graphic novel to be nominated for a National Book Award, and won the 2007 Michael L. Printz Award for outstanding young adult literature sponsored by Booklist and administered by the Young Adult Library Services Association. But three years earlier, Yang created an online tutorial of algebraic factoring in the form of an interactive webcomic as the final project for a Master's Degree of Education, entitled *Factoring with Mr. Yang and Mosley*

the Alien (<http://www.humblecomics.com/factoring/>). This comic employs a Flash interface that simulates classroom interactions by including portions of lessons where readers can choose to insert panels with additional examples of a particular concept.

That both Rifas and Yang created a single educational hypercomic before returning to print comics publication suggests their limited scholarly interest in digital comics compared to, for example, McCloud or Goodbrey. Thus, while scholars and practitioners in the overlap of print comics and education, neither Rifas nor Yang are sources for locating other educational hypercomics. Instead, educational comics researchers in various fields tend to include hypercomics as entries in larger bibliographic overviews. For example, the literature review of education and online comics compiled as an initial phase of the European Union project EduComics (2008) lists several online educational comics, including the educational hypercomics *Factoring with Mr. Yang* and *Mosley the Alien* and the *Feeding Minds, Fighting Hunger* comics from the United Nations Food and Agriculture Organization (http://www.feedingminds.org/cartoon/rtf_en.htm). However, while EduComics (2008) cite "The creation of a new generation of web comics that take advantage of the potentials of hypermedia" as one of two "current trends in using web comics in education," the EduComics project consortium focuses their further research primarily on the second trend, student use of comics composition software for digital content creation (p. 10).

EduComics (ibid.) also lists "Interactive viewers of educational comic books, such as KABAM [sic] by Centers for Disease Control and Prevention USA. (US Department of Health and Human Services) which presents stories with dialogues and asks the student to interact with the book, asking for their opinion which may influence the development of the story" (ibid., p. 10). This example, the *KaBAM Comic Creator*, integrated into the *BAM! Body and Mind*

website, adopts a choose-your-own-adventure approach, presenting a two panel comic strip that poses a problem, with three hyperlinked answers to the problem leading to three potential outcomes (<http://www.cdc.gov/bam/life/kabam.html>).

In his survey of print and digital educational comics about science-related topics Tatalovic (2009) makes note of the educational hypercomics series *Eco Agents Special Unit* as unique, stating:

Although many of the other science comics discussed are available online [as downloadable pdfs], the *Eco Agents Special Unit* series innovatively uses the web platform to its full advantage. Readers have to register in order to access the comics, and as part of registration process they design an avatar which then features in the comic as one of the characters. This presumably enhances identification with the character and helps immerse the reader into the story. As the reader flips through the comic (which has the feel of a book, as the turning of pages is graphically simulated), there are many clickable frames that either provide extra information related to the story, or open up new frames which feature a film, a game or other interactive content (e.g. a quiz) (p. 12).

The above paragraph, and a second providing descriptions of the avatars in greater detail, amounts to the total analysis Tatalovic (ibid.) dedicates to the "innovative" digital platform. While the *Eco Agents Special Unit* site was operational during initial data collection for this study, it has since been taken down and labeled a "discontinued site" (<http://ecoagents.eea.europa.eu/>).

I did locate two full papers in the research literature concerning educational hypercomics; these are two evaluative studies of particular educational hypercomics projects performed in educational institutions. Shipwright, Mallory, Atack, & Demacio (2010) discuss the results of a pilot study of the use of a custom "online graphic novel" called *Citizen Researcher* meant to teach research literacy skills to college undergraduates. Costello & Bliton (2009) describe the design, use, and evaluation of a webcomic called *The Secret in the Cellar*, part of the

Smithsonian forensic anthropology exhibition "Written in Bone". The webcomic incorporates limited animation, along with hyperlinks at the bottom of the page linking to learning activities and photos from artifacts of the real life archeological dig on which the comic is based. In both cases, interviews, surveys, and other evaluative metrics suggest digitally interactive online educational comics had positive impacts on learning experiences for readers from multiple backgrounds and, in the case of *The Secret in the Cellar*, age groups. *The Secret in the Cellar* remains accessible online, publicly available via the Smithsonian website. *Citizen Researcher*, on the other hand, appears to have been available only to enrollees of a research skills course at Centennial College in Scarborough, Ontario. Given these limitations in availability and access, *Citizen Researcher* was left off the final list.

Shipwright et al. (2010) published their study of the use of the *Citizen Researcher* educational e-comic through the MERLOT (Multimedia Educational Resource for Learning and Online Teaching) Journal of Online Learning and Teaching. The MERLOT website also features a database of learning materials. Searching "comics" on <http://www.merlot.org> brings up 22 results, a number of which are digital mathematics learning objects concerned with "conics," and one which is an entry describing another example of educational hypercomics: *Women's Adventures in Science*. Part of "...a National Academy of Sciences project highlighting the work on prominent women scientists for young women," the *Women's Adventures in Science* website (iwaswondering.org) incorporates comics along with "games, science experiments, video... and other activities" about " physics, astronomy, biology, anthropology, geology, genetics, robotics and sociology" (Sweeney, 2006). The comics are biographies of noted women scientists that integrate point-and-click interactions within a Flash animated interface, one of the most common interfaces for hypercomics generally (Keeper and McDevitt, 2012). The *Women's Adventures in*

Science comics are also integrated as a single module in a larger virtual learning environment. In fact, three of the educational hypercomics in this study are part of a component of a larger virtual learning environment, including *Eco Agents Special Unit*, the *Feeding Minds* comics, and *The Secret in the Cellar*. The latter is included as a page on the Smithsonian website for the "Written in Bone" exhibition, while the former and median are embedded in interfaces including other, related, non-comics educational multimedia resources. This organization seems to parallel the tendency, noted by Jüngst (2010), for many educational comics to be one of many components of a larger educational campaign (p. 10).

There are, of course, also hypercomics by single, self-motivated authors, such as the various aforementioned metahypercomics texts, *Factoring with Mr. Yang and Mosley the Alien*, and a Japanese language-learning hypercomic called *Electric Spirit*. Described on its home page as "the web's only Japanese instructional interactive manga," *Electric Spirit* is a ghost story in the style of a Japanese comic whose interface allowed the reader to toggle the dialog balloons between English and Japanese. The interface allowed the reader to change all of the text to one language or another, or alter a single word balloon by mousing over it with the cursor. Mousing over also brought up another balloon containing conversational and linguistic context for the dialog, and a side menu opens lists of study goals. Clicking on particular *kanji* in the manga brought up "a description of the character with notes regarding strokes, readings, and tips for remembering them" (Watkins, 2011). *Electric Spirit* was an educational hypercomic series created in 2005 by artist and interface designer Chris Watkins, for a comic anthology website called BorderWalker, but because Watkins found the innovative design combined with attempting to create comics using a *manga* style of illustration, "...a bit much for one me to handle... I had to put it on hiatus" (Watkins, 2011). In its apparently permanent hiatus, the

Electric Spirit interface "became incompatible with current web browsers," so that only the last completed page of the series, created in Flash, remained online (ibid.).

As of this writing, the last page of *Electric Spirit* appears to have left the Web, with only a broken link (<http://www.chris-watkins.com/electricspirit.htm>) and a video of the interface of the last page being used on Watkins' professional website (<http://chris-watkins.com>). Thus, to a certain extent, *Electric Spirit*, like *Eco Agents Special Unit*, described above, becomes an example of the issues of digital preservation that compound preexisting challenges in research into educational comics presented by the lack of concentrated archival collection in the area. These issues resonate with problematic issues of the ownership of digital media that have arisen with the growing popularity of comics leased through mobile device applications, and the lack of a downloadable digital file kept locally on the user's machine (see, e.g., Stevens, 2012). However, that discussion focuses primarily on intellectual property rights from an economic perspective. The issue of how innovative forms of digital learning can be preserved and archived are a major 21st century challenge for library and information science, but beyond the scope of the current study. Nonetheless, the tendency of scholars to report challenges in obtaining or accessing comprehensive collections of educational comics for the purposes of research highlights the importance of secondary literature as a record of works that may themselves be inaccessible (see, e.g. Rifas, 1991; Jüngst, 2010). It is in the service of this curatorial impulse—along with the salience of the digitally interactive interface that, while no longer accessible, is viewable to an extent—that *Electric Spirit* is included in the initial list of examples in Table 1.

While *Electric Spirit* represents a formal outlier, in the sense that the actual digital learning object is no longer online, the scrolling comic *America: Elect!: The action-packed journey to US election day in graphic novel form* represents an outlier in the context of

production, in that this educational hypercomic was created at the behest of neither a government department nor a nonprofit educational organization, but instead for *The Guardian* website, as a recapitulation of the recent history of the 2012 US Presidential election (<http://www.guardian.co.uk/world/interactive/2012/nov/06/america-elect-graphic-novel>). In *America: Elect!*, static illustrations are given limited animation created through parallax style vertical scrolling, down the page creates the motion of the images (Burgess, 2012). Parallax scrolling, "...originally used in 2D video games where background images moved slower than foreground images, creating an illusion of depth," is, at the time of this writing, a "major trend in web design" (Chang, 2013). The cutting edge design of *America: Elect!* intimates its private sector origins, in the sense that the artists were commissioned to create something in line with broader, popular, market-driven trends in web design and online news reportage.

The last three educational hypercomics texts in the corpus of this study also emerge from a different professional context, e-learning instructional designers creating online training courses for workplace environments. Two of these, *Broken Co-Worker* and *What Would You Do If... Nine Scenarios to Practice and Improve Your Customer Service Skills*, are created for an office environment. The former, *Broken Co-Worker*, is a workplace assertiveness training course that combines audio and video with a comic book layout to present scenarios where the user must choose the actions of the main character in that scenario (<http://www.brokencoworker.com/>). The e-learning course is not intended for actual use—its website proclaims "For Entertainment Purposes Only" (ibid.). Rather, this is a contest entry from instructional design studio eLearning Engaged for the Guru Awards administered by the e-learning software design company Articulate as a way of creating example uses of their Storyline online course creation software (LeStage, 2012). Nonetheless, in its exemplary use of the

Storyline software, the eLearning Engaged designers present an example of the integration of comics elements into a pedagogical framework. It is laid out as an instructional course, listing learning objectives and showing the consequences of various interpersonal choices in a workplace environment. While perhaps not intended as a formal training module, commissioned by a client with organizational training needs, *Broken Co-Worker* nonetheless presents an example of informal asynchronous learning, modeling digital instructional design practices as much as it does assertiveness in workplace interactions.

What Would You Do If... offers a similar example of computer mediated workplace skills training through scenario-based pedagogy, where the user chooses from several options to direct the actions of a character within the e-learning narrative (<http://agile-e.com/images/project-1.swf>). However, this e-learning design was created by Agile-e Learning Design Studio for a paying client: "This project for the County of San Diego was created to help county employees practice and improve their customer service skills... [via] an interactive scenario-based solution..." that integrates word balloons and comics panels to present the user with "...compelling job-based situations with nuanced responses and feedback modelled [sic] on real world consequences" (Thompson, 2012).

The third example of an e-learning training course that employs scenario-based learning and is developed by instructional designers for a client organization is *Connect With Haji Kamal* (World Warfighter, 2010). This digital learning activity was developed by the instructional media design firm Kinection, initially for the blended learning environment of the United States Army Noncommissioned Officers Academy, for the "Senior Leader Course" LSA 2 Rapport Building Across Cultures (ibid.). In the comic, the user is presented with static images and audio placed in a comic panel layout, with some characters talking only in silent word balloons. The

goal of the training module is to, "...help a young lieutenant overcome cultural differences and make a good impression on a Pashtun leader" (Moore, 2010).

Comics are employed in e-learning training modules based on the form's cultural connotations as a form of popular narrative. For example, *Broken Co-Worker's* Ryan Martin describes the comics panel layout as "...a classic, familiar storytelling style, and fits nicely with scenario development" (qtd. in LaStage, 2012). The affinity for comics-as-narrative with scenario-based learning makes sense since "scenarios," as operationalized in user interface design, are "stories about people and their activities," and focusing on scenarios leads to reflective considerations of information needs, use, and organization (Carroll, 1999, p. 2). Agile e-Learning Design Studio head Leslie Thompson (2012) also notes the usefulness of a comics-based design in scenario-based learning, as well as making the *What Would You Do If...* training course more "visually interesting" (online). Despite the implied usefulness of the comics form, these e-learning modules are never described as (hyper)comics themselves. Instead, the common parlance of e-learning training course design for professional contexts describes the use of comics formal elements as a "comic book style" (Gumienny, 2012).

As is observable in an e-learning designer community forum, the notion that comics is "informal" and "not serious" is widespread in the corporate e-learning environment, leading Cathy Moore (2011a) to suggest using the phrase "graphic novel style" to mitigate negative preconceptions. These preconceptions of comics as antithetical to serious topics, along with the notion that a comic book style is primarily a template for visual aesthetics, reiterate the longstanding concerns of American studies of comics in education stretching back to at least the media effects literature of the 1920s. The repetition of these debates among e-learning design professionals serves to underline the vastly differing socio-cultural contexts of this particular

community of practice with the high theoretical model of the metahypercomics in the corpus of this study, the government and non-profit educational comics that focus primarily on comics as an educational resource for children and young adults, and the general audience served by the recent political historical reportage of *America: Elect!* The wide variety of socio-cultural contexts for the production and intended use of the texts, along with the diverse range of informational content and learning objectives, mirrors the heterogeneity of educational and/or online comics overall.

Each entry in this list is coded based on analytic frameworks from research into educational comics and hypercomics, discussed in Chapter 2. Using the typology of educational comics suggested by Eisner (1985) and Jüngst (2010), I note which works in the corpus contain elements of the technical, attitudinal, and/or fact comics categories. Along with the application of this educational comics typology, I identify learning goals and institutional contexts of the respective works, in order to further identify and clarify each work's identity as a pedagogical text. I further enumerate formal digital comics characteristics present in each text, using terminologies suggested by Goodbrey (2012) and Keeper and McDevitt (2012), in order to identify how each work falls into my heuristic definition of "hypercomics." Despite the ontological imprecision of these educational comics and hypercomics typologies—as discussed in Chapter 2—they nonetheless serve to highlight similarities in information organization and interface design strategies employed in these 22 examples, as a starting point for analysis.

Exemplar selection

The goal of this study, social semiotic analysis of the ways in which comics new media combine to construe readers as learners in particular institutional contexts, requires further scoping from the initial list of 22 educational hypercomics. The limitation of number of works studied is necessitated by the robust number of multimodal pedagogical discourses within even a *single* educational hypercomic. The focus of this analysis requires the researcher,

...consider everything that might be important and view the whole as a semiotic system [...] recognizing the multiple facets and functions of the system and attending to how its features can be seen to work together [...] this is not a question of the interaction of variables in the usual way, because their meaning is constantly shifting with the context (Wood and Kroger, 2000, p. 63).

Analysis of multimodal discourses understands forms of communication "as ways that people orient to discourse of a particular sort and [...] the way in which people do so on particular occasions," (ibid, p. 67). A smaller sample size is necessitated by this research design, which demands close attention to the multimodal designs of meaning within complex semiotic constellations of, e.g., static sequential art composition, animation, audio, synaesthetic design of verbal linguistic text (i.e. word balloons), hyperlinking, etc., while simultaneously accounting for the educational institutional contexts within which these designs of meaning are initiated.

As a secondary scoping technique, I disqualified those hypercomics whose subject matter, while related to the broader notion of pedagogy as didactic explication, were not designed for specific learning goals. First, the subset of metahypercomics, while useful as secondary sources of digital comics theory and design, were excised because the work has no learning objectives beyond explicating formal potentials of hypercomics in digital environments. In a broad sense the questions posed by these works are very much my own, but my interests in

the potentials for hypercomics are centered on the use of such resources to achieve learning outcomes outside the comics domain, in contexts socio-culturally specific to teaching and learning. I disqualified *America: Elect* for similar reasons, because as historical reportage the work is not directed towards particular learning outcomes, portraying narrative details of the US Presidential election, but little in the way of context or political economic meaning. In other words, the primary goal of the work is capturing the drama of political theater for the entertainment of a mainstream news-reading audience, offering facts on how candidates performed, and who eventually won. There are no specifically articulated learning goals.

I also disqualified works that were no longer available online, or no longer available for regular use, since the lack of access would obviously severely limit analysis of interface design. These included the *Eco Agents Special Unit* series and the *Electric Spirit* Japanese language learning comic.

From the remaining list of hypercomics works, I have selected three exemplars for comparative analysis: *Factoring with Mr. Yang and Mosley the Alien*, *Secret in the Cellar: A "Written in Bone" Mystery*, and *Connect with Haji Kamal*. One reason these three exemplars were chosen for close analysis is because their variety of course topics parallel the characteristic heterogeneity of the initial corpus of educational hypercomics overall. The subject matter of each comic originates from vastly different disciplines: algebraic factoring for the high school classroom, forensic anthropology for a general audience museum exhibition, and intercultural interaction for a classroom setting where US Army personnel learn to cultivate intelligence assets in Afghanistan. Additionally the different forms of authorship in each exemplar is representative of the types of hypercomics creators found in the larger list: single independent authors (*Factoring with Mr. Yang*); a team of authors and researchers (*Secret in the Cellar*;

Connect with Haji Kamal); and a scenario-based e-learning training course developed by instructional designers for a client organization (*Connect with Haji Kamal*). The various labor relationships—student author (*Factoring with Mr. Yang*); in-house design team combined with work-for-hire contractors (*Secret in the Cellar*); work-for-hire design (*Secret in the Cellar*, *Connect with Haji Kamal*)—and their related educational institutional contexts (secondary education, governmental nonprofit, and vocational/professional post-secondary education), also mirror the various types of institutional origin found in the larger list of educational hypercomics.

Tables

<i>Hypercomic</i>	<i>Subject</i>	<i>Technical</i>	<i>Attitudinal</i>	<i>Fact</i>	<i>Institutional Context</i>	<i>Digital elements</i>
America: Elect!	Journalistic/Contemporary historical			X	Newspaper journalism	Parallax scrolling
Connect with Haji Kamal	CYOA Interpersonal interaction—US Army	X	X		US Military training	Absorbed by other media (audio, video, hypertext), branching narrative
Broken Co-Worker	CYOA Interpersonal interaction—Office		X		Workplace etiquette	Absorbed by other media (video, hypertext), branching narrative
“What Would You Do If... Nine Scenarios to Practice and Improve Your Customer Service Skills.”	CYOA Interpersonal interaction—Office	X	X		Customer service, government office	Absorbed by other media (hypertext), branching narrative
Searching For A Home: A Car Smart Comic	Ecology/Environmentalism		X	X	NPO	Hypertextual annotation
Eco Agents	Ecology/Environmentalism		X	X	EU govt agency	Integrated with games, avatar creator, video, etc., Features remediated comic books zoom feature. User's avatar is inserted into the comic cover and a few panels of each issue

Table 1: List of 22 examples of educational hypercomics formed during initial data collection, labeled by educational discipline, educational comic typology, institutional origin, and new media affordances integrated with the comic form.

The Right To Food	Nutrition, social justice, globalism		X	X	10 international partners and NPO spearheaded by the Food Agriculture Organization (FAO) of the United Nations and the US National Committee for World Food Day	Comics non interactive, embedded in larger multilingual site with each comic linked to a place on a world map
eSpirit	Language learning	X	X	X	Independent Author	Absorbed by other media (hypertext), Flash animation
BAM! Body and Mind: KaBAM Comic Creator	CYOA Health and Moral Instruction		X	X	Government	Branching narrative
The Secret in the Cellar: A Written in Bone forensic mystery from colonial America	Archeology/Forensic Anthropology	X	X	X	Museum	Hypertextual annotation, Flash animation, Slideshow
Factoring with Mr. Yang and Mosley the Alien	Math (Algebraic Factoring)	X		X	Independent Author, HS teacher, Master's Thesis	Infinite Canvas, Flash animation, branching narrative
Women's Adventures in Science	Science, history, biography		X	X	NPO: (National Academy of the Sciences initiative)	Biographies integrated into site with games, interactive timeline, alt- text.

Table 1 (cont.)

Comics Tetrad	Digital comics			X	Independent Author	Infinite Canvas, branching narrative
Understanding Hypercomics	Digital comics			X	Independent Author	Slideshow
About Digital Comics	Digital comics			X	Independent Author	Slideshow
About About Digital Comics	Digital comics			X	Independent Author	Slideshow
I Can't Stop Thinking! (#1-6)	Digital comics			X	Independent Author	Infinite Canvas, Absorbed into other media (hypertext)

Table 1 (cont.)

CHAPTER 4: INSTITUTIONAL CONTEXTS AND INTERFACE DESIGN¹

In his essay on personal computers and education, "No More Teachers Dirty Looks", reprinted in his seminal text *Computer Lib/Dream Machines*, Ted Nelson (1974/2003) critiques "computer-assisted instruction" trends of the late 1960s and early 1970s for perpetuating longstanding classroom practices that shun students' interests and degrade their active engagement. By placing the onus of informational sequencing, choice, and navigation on the computer rather than the user, students were "led by the nose through every subject" (ibid., p. 310-11). Nelson instead proposed "hyper-media", including "hyper-comics", as forms of "branching or performing" presentations, "that grant students autonomy to explore concepts based on their own choices and interests" (ibid., p. 313). It was within the context of this broader critique of educational institutions that Nelson established "the fundamentals of hypercomics", describing "a screen-based, digital medium" featuring "a comic that branches into different pathways based on reader's choice" (Goodbrey, 2012, p. 2).

Nelson's early focus on reader interaction with malleable digital objects proved prescient in identifying design issues for hypercomics creators (see, e.g. McCloud, 2000; Bigerel, 2009a, 2009b; Goodbrey, 2013). But research on the original context of hypercomics design—as digital pedagogy that transcends educational institutional limitations on student engagement—remains sparse. This chapter returns to Nelson's topic, placing the three exemplar educational

¹ Portions of this chapter were previously published in *Networking Knowledge: Journal of the MeCCSA Postgraduate Network*. Duffy, D. (2015). Hyper/Comics/Con/Text: Institutional contexts and interface design in online educational hypercomics. *Networking Knowledge: Journal of the MeCCSA Postgraduate Network*, 8(4). Used with permission and available at <http://ojs.meccsa.org.uk/index.php/netknow/article/view/390/219>

hypercomics within their educational institutional contexts in order to identify ways in which those contexts effect integrations of the comics form with new media.

Comics, consumerism, and educational institutional memory

[...]institutions should not be exclusively identified with organizational entities (for example theatres, galleries, publishing-houses, music labels, etc.), but also with explicit rules (e.g. legal norms, established professions), forms of exchange (markets, social prestige) as well as with implicit conventions (behavioral patterns such as social roles) (Hasitschka, Goldsleger, & Zembylas, 2005, p. 7).

Insofar as comic strips, comic books, and graphic novels are totemic of popular cultural exchange through print mass media and commercial art, "comics" can be considered a cultural institution. For example, in the United States, in the 1920s and 1930s, the popularity of newspaper comic strips, combined with the concurrent adoption of "comic-strip-style advertising", blurred the line between entertainment and information consumption, making comics art "an ingrained feature of American life" (Gordon, 1993, p. 81-82). But ingrained notions of comics as a popular cultural institution also contributes to widespread notions of comics as antithetical to institutions of education, because stereotypes of comics as solely cheap disposable products—simultaneously sold to and harmful for young readers—arise from the conception of comics as commercial product (Groensteen, 2000/2009). But educational comics are generally understood as non-commercial, often distributed to target audiences for free or sold to organizations at reduced cost (Jüngst, 2010, p. 96-97). Because educational comics have been historically placed in opposition to popular comics, "Many comic book fans are repulsed by any comic with even the faintest odor of the classroom about it..." (Rifas, 1988, p. 145).

The use of comics in educational institutions activates tensions between institutional goals and reader reactions:

...each institution has a narrow agenda and particular reason for using comics in the sponsorship of literacy. [...]the use of multimodal literacy that is being promoted has a particular cast to it, a particular inflection that reflects the agenda of the sponsoring institution. However, the readers who are sponsored may comply with or resist such agendas in ways that are often unpredictable to sponsors (Jacobs, 2013, p. 29-30).

Ironically, part of the potential for comics in inciting creative tensions in educational settings grows out of the medium's historical perception by educators as a negative influence on readers.

Within this discourse of "comics" as a cultural institution, both educational comics and hypercomics are outliers, because both types of comics are largely produced outside the editorial regimes, print production and distribution methods, fan and artist communities, and entertainment industry tie-ins so often associated with comics as popular cultural production. Nonetheless, the association of comics and pop culture escapism persists in educational institutions, including the specific institutional contexts of the educational hypercomics analyzed below.

Factoring with Mr. Yang and Mosley the Alien: Classroom in the comics

The impact of historical educational institutional meanings on comics is no more explicit than in the example of *Factoring with Mr. Yang and Mosley the Alien* (Yang, 2003b). *Factoring with Mr. Yang* was created by award-winning cartoonist and high school computer science teacher Gene Luen Yang as part of a final project for a Masters Degree of Education from California State University at Hayward. *Factoring with Mr. Yang* is posted to Yang's website, along with his proposal for the project, *Comics in Education* (2003a). In the proposal, Yang

synthesizes a literature review of education science research on comics-related pedagogy to identify five strengths of comics in education:

1. Motivating: Students have a high affinity for reading and making comics and "Children[...] have a natural attraction to comics."
2. Visual: The imagery in comics is able to embody, anthropomorphize, and explain difficult concepts in understandable ways
3. Permanent: Whereas mediums of communication like film, television, and face-to-face lectures are "fleeting", since the medium controls the passage of time, comics is "visually permanent", allowing the reader to set their own pace.
4. Intermediate: Yang asserts "Comics can serve as an intermediate step to difficult disciplines and concepts", a means of teacher scaffolding. Yang cites the common use of comic books to engage reluctant readers.
5. Popular: Students more readily form personal connections with popular culture and introduction of popular culture in the classroom can help teach "media literacy" (Yang, 2003a).

As a high school teacher and a graduate student in education, Yang's project proposal, and subsequent project, incorporate implicit educational institutional assumptions about comics. Yang's descriptions of "motivating", "intermediate", and "popular", proceed from perceptions of comics as exclusively for children, and as an "easier" type of literacy; a traditionalist educationalist view critiqued by comics scholars as minimizing the form's complex multimodality (see, e.g. Hatfield, 2005; Jacobs, 2007). In contrast, Yang mitigates the rhetoric of comics as 'easy' with attention to the formal complexities of comics, as in the above description

of 'visual permanence' (2003a). Yang explains how attention to such compositional complexities of comics is incorporated into *Factoring with Mr. Yang*:

Because comics are visual and static, past, present and future sit on a page next to each other. This gives the reader control over the rate, and even sequence, of information flow. The comic is structured in such a way that students are encouraged to read both backwards and forwards, returning to earlier concepts for review and moving on to more challenging examples once those concepts have been mastered (qtd. in "Comics across the Curriculum," 2009).

Factoring with Mr. Yang encourages reading backwards and forwards via a Flash animated interface, one of the most common interfaces for hypercomics generally (Keeper & McDevitt, 2012). The hypercomic features two parallel narrative threads in the form of two horizontal rows of comics panels. The top row features Yang's visually minimalist self-caricature lecturing on algebraic factoring. The bottom row features a purple extraterrestrial character named Mosley the Alien that stands in for the student. Throughout the lesson, Mosley is visible in a panel on the left of the screen, pointing to the left, saying, "Can we review a bit?" and in a panel on the right of the screen, pointing right and saying, "Let's keep going!" These panels double as navigational buttons that, along with the keyboard arrow keys, can be clicked to move Mr. Yang's lecture forwards and backwards. In social semiotic terms, Mosley's pointing finger creates a "unidirectional non-transactional rhetorical vector", gesturing out of the frame, directing reader attention (Kress & Van Leeuwen, 1996). Animated panel movements literalize that rhetorical vector, reinforcing linear navigation as a metaphor for learning.

Mr. Yang's lectures vary visually in only small changes in facial expression and the gesture of an arm. Mr. Yang is visible above the waist, in the left of the panel, and occasionally framed in a close up, when transitioning between subtopics in the lecture. In comparison to Yang's art in, e.g. his graphic novel *American Born Chinese*, the visual style of *Factoring with*

Mr. Yang is indicative of the pragmatic nature of educational comics art: single color vector graphics with minimal shading, rendered once, copied, pasted, rescaled and repositioned.

Pedagogical complexity appears when, several times during lectures portrayed in the top row of panels, a third Mosley panel appears on the bottom row, in the middle of the other two.

In this middle panel, Mosley asks for clarification or more examples, gesturing up to the related panel(s) in the top row. Should the reader share Mosley's need for extra help, (s)he can click on this middle panel, causing the rightmost panel to slide right and out of view, making room for more panels that descend into the top thread. In these panels, Mr. Yang recaps concepts from earlier lessons, or provides additional (often more involved) factoring problems and extended discussions of topics, including, e.g., an explanation of why 1 is not a prime number; a hyperlink to a website about prime numbers; an introduction of the concept of variables in algebraic equations (Yang 2003b). Thus, far from being ancillary to the comic, these extra panels take advantage of the potential depth of information and "sense of tactile discovery" that can be incorporated into online comics "understood as malleable image files on the web" (Kogel, 2013, p. 27, 84).

The animation that inserts or removes panels into and out of the top row implies a continual spatial narrative, with the rest of the comic off screen to the right, an example of Scott McCloud's notion of the screen as a window onto an infinite canvas, rather than a digital remediation of the printed page (McCloud, 2000, p. 222). The animated insertion or removal of panels maintains the linear spatial narrative of the top row, reinforcing the tactile aspect of the comic, the click of the mouse granting users control of composition, while simultaneously recalling the mathematical processes of factoring, where numbers and variables are broken down into component parts. This gives the user a sense of control over the sequence of information

flow, in keeping with Ted Nelson's early hopes for educational hypercomics. That sense of interactive control is buttressed by the Mosley character's additional questions, along with Mr. Yang's reactions, which simulate a face-to-face teaching presence often lost or problematized by asynchronous e-learning interfaces (see, e.g. Garrison, 2011).

Like its project proposal, *Factoring with Mr. Yang* juxtaposes attention to unique formal affordances of the medium with traditional educational institutional approaches to comics in the classroom. In one sense, the hypercomic's performance of classroom instruction uses "ubiquitous computing devices [...]to do old-fashioned didactic teaching," which Cope et al. (2010) describe as a counterproductive view of contemporary pedagogy (p. 20). The traditional classroom setting is reproduced, with Mr. Yang in front of a dark green background lit by a light green circle, simple shading that reinforces the materiality of the implied chalkboard. "Implied" because Mr. Yang is never shown writing. Instead, equations appear in a sans-serif font, like the typesetting of a textbook projected onto a chalkboard. The effect is interstitial, somewhere between textbook and classroom lecture, between prose and performance. In short, clearly a form of comics, but comics created in a way that is always referential and *deferential* to traditional formal institutionalized learning.

This design choice builds on the "intermediate" strength Yang ascribes to comics in education (2003a). The "About this site" page describes *Factoring with Mr. Yang* as "designed to be used as supplemental material" assigned as "a tutorial, an introduction to a unit, or a review before an exam" (Yang, 2003b). As information visualization, *Factoring with Mr. Yang* largely remediates transmission models of pedagogy; top down information transfer echoed by the two tier layout, with the alien student visually subordinated to the teacher, a science-fictional visual metaphor for the student's lack of subject knowledge, in the guise of a friendly referent to comics

as popular culture. This is because *Factoring with Mr. Yang* is in a sense autobiographical, in that it is a cartoon self-representation of Yang's persona as a teacher, and of his research as a graduate student in teacher education. The titular "Mr. Yang" is predicated on the author's professional and scholarly experiences with educational institutions. *Factoring with Mr. Yang* reflects those experiences and learned social practices as teacher and student in as much as the hypercomic sets out to simulate roles of teacher and student.

Toh (2009) offers a contrasting example which illustrates the extent to which *Factoring with Mr. Yang* represents traditional pedagogy through innovative means. The approach to using comics to teach algebra described by Toh (ibid.) is shaped by the author's perspective as an education science researcher collaborating with teachers. Based on education science research showing that students learn algebra better when teachers emphasize continuity between algebra and "generalized arithmetic", Toh (ibid), designs the comics as a means to "introduce the language of algebra" rather than using "...the routine way of introducing algebra from the classical textbooks based on procedural approach" (p. 233). These comic strips portray characters, objects, and settings as conceptual visual metaphors, representative of general algebraic concepts (see Figure 3 in the Figures section below). Lacking the autobiographical element of *Factoring with Mr. Yang*, the narrative content of these print comic strips more explicitly embodies mathematical concepts and educational research, as opposed to Mr. Yang's recontextualizing of "classical textbook" taught by solving sample equations.¹

The Secret in the Cellar: Hyperlinks, heterogeneity, and museology

The hypercomic *The Secret in the Cellar* (Smithsonian National Museum of Natural History, 2009a), was created as part of the "popular exhibition" "Written in Bone: Forensic Files of the 17th-Century Chesapeake," which was on display at the National Museum of Natural History from February 7, 2009-January 6, 2014 (Smithsonian National Museum of Natural History, 2009b). A press release lists highlights of the exhibition, including "skeletal remains and artifacts from five 'Colonial Cold Cases,' [...] five stunning facial reconstructions based on actual skulls" and a "Forensic Anthropology Lab allowing visitors to experience firsthand how forensic anthropologists examine human remains" ("Written in Bone: Forensic Files....," 2008).

The hypercomic (labeled as a webcomic on the exhibition website) is Flash-based with a HTML frame containing backwards and forwards navigational arrows and hypertext links that change with each panel/page. Clicking these hypertext links opens basic HTML pages in a new browser window; pop-up window annotations to the comics narrative that provide further context, define technical terms, contain photos of real artifacts referenced in the comic, or present activities that allow "learners to assess case evidence and test hypotheses—essentially stepping into the role of either an archaeologist or a forensic anthropologist" (Costello & Bliton, 2009, p. 5). The hypercomic, whose title page labels it as "Based on a true story," fictionalizes the real life discovery, excavation, and identification of a human skeleton found "buried in the ruins of a 17th-century house cellar" by an intern in "The Lost Towns Project, a team of archaeologists digging up colonial Anne Arundel County, Maryland" (Caputo, 2009). The fictional protagonist of the comic is Ana, a college student learning about forensic anthropology, intended as a figure with which their intended audience would identify, and to which they would aspire (Costello, 2009, p. 5). The non-fiction version of the discovery is also one of the "Colonial Cold Cases," a description of which is linked to at the end of the fictional version.

The design of *Secret in the Cellar* elides the McCloudian comics characteristics of static images in juxtapositional sequence underpinning *Factoring with Mr. Yang*. Instead, with a few exceptions, *Secret in the Cellar* displays one panel at a time within a dedicated browser window, a "reductive" version of the "panel delivery" format, in that it does not take advantage of compositional meanings available through multiple panels juxtaposed in sequence (Goodbrey, 2013, p. 191). In *Secret in the Cellar*, each panel/page appears in place of the last with transitional animations including cinematic zooms, fade-ins, the movement of objects and/or figures into or out of frame, and the delayed appearance of word balloons over the art, visually literalizing the standard implied reading order of the dialog. Like showing a single panel per "page," such inclusion of time-based multimedia (e.g. animation, audio) can interfere with comics' characteristic portrayal of fictive time through static images in compositional space (McCloud, 2000, p. 215-6).² This is because time-based media alter the mode of user interaction: "...for the comic to still operate as a comic, the rate at which information is absorbed must still be set by the reader" (Goodbrey, 2013, p. 195). Animation competes with rather than complements the ways comics make meaning because the goal of comics is "not to make the reader observe motion but rather participate imaginatively in its genesis" (Gunning, 2014, p. 38). McCloud (2006) has similarly critiqued the use of navigational hyperlinks separate from narrative content as "hunt and click" interactions that function as impediments to readers' imaginative immersion (p. 7). Further, the prevalent use of pop-up windows is the Internet definition of interruption, calling attention to the various frames of mediation at play by leaving the comic visible but partially obstructed.

Thus, the salient characteristics of *Secret in the Cellar* as a hypercomic—limitation of compositional space, combining time-based animation with space-based comics narrative

techniques, and requiring readers to navigate multiple ancillary hyperlinks, opening and closing pop-up windows—are all stumbling blocks to readers becoming immersed in the narrative. In most cases this would be seen as inefficient communicative design. But, in *Secret in the Cellar*, designs that interrupt or complicate narrative progression are ideal because they further the didactic goals of the work's educational institutional context. In their assessment of *Secret in the Cellar*, Costello and Bliton (2009) note that the hypercomic's design team purposefully avoided "interesting material [...]extraneous to the learning objectives," subordinating storytelling to pedagogy (p. 4). The ultimate goal of this intricate multimedia combination of comics, animation, hyperlinks, and pop-up windows is not to create immersive narrative, but instead to "move free-choice users to the next level of engagement, from reading to doing[...] from fiction (in this case based on actual events) to nonfiction" (Costello & Bliton, 2009, p. 5). Narrative engagement is secondary; the educational institutional context uses comics and animation to draw attention, but also to temper narrative engagement by redirecting reader focus on didactic learning through interruptive hyperlinked articles and activities.³

Like *Factoring with Mr. Yang*, *Secret in the Cellar* positions comics as an intermediate step into more complex (in this case, real life scientific) concepts. *Secret in the Cellar* is also similar to *Factoring with Mr. Yang*, in terms of target demographics, using comics to create "educational material about archaeological work aimed at a younger audience" (Swogger, 2012). Both hypercomics emerge from educational institutional contexts, but Yang's positions as a cartoonist, teacher, and graduate student all present opportunities for individual expression and achievement. As a result, *Factoring with Mr. Yang* presents a more visually unified aesthetic, and a navigational design that focuses primarily on comics as a means of simulating a single

form of classroom interaction, remediating the pedagogical model of the teacher-as-expert transmitting information to the student-as-novice.

As an e-learning resource occasioned by a museum exhibition, *Secret in the Cellar* garners vastly different institutional support and expectations. The comic was created by "a team of three instructional designers, two subject-matter experts, two illustrators (one for storyline images and one for scientific illustrations in the activities), a Flash developer and a basic HTML developer", a team that included Smithsonian staff, employees from large government subcontractor Booz Allen Hamilton, and individual subcontractors (Costello & Bliton, 2009, p. 6). The hypercomic's creation was further informed by "formative evaluations" from focus groups of students grades 7-12, used to edit the comic's script and rough drafts of the art during early design stages, before educational activities and annotations were incorporated (ibid., p. 4). Within this institutional context, involving input from a variety of stakeholders, the educational hypercomic takes on a visually diverse, multiplicative design, combining hand drawn, digitally rendered comics illustration with photorealistic scientific illustration with actual photos with quizzes, polls, and text-only articles. Interface design is equally multifarious, as reader control of navigation competes with the animations that punctuate the appearance of each panel/page. Reading forwards is encouraged, as in the progression of a museum tour, with each animation functioning as an introduction or reveal of the next page and its attendant hyperlinks, while reading backwards is frustrated, or at least less fluid, requiring users to relinquish control while receiving no new information in return, unless they click on a hyperlink previously unexplored.

The multimedia multimodal multiplicity of *Secret in the Cellar's* design mirrors preeminent exhibition design strategies characterized by "museums' attempts to engage visitors actively in the communication process," through the use of "...a range of now fairly familiar

strategies [...] such as the use of questions on text panels, providing alternative levels of information or routes, and using various forms of interactivity" (Macdonald, 2007, p. 154). The various questions, polls, articles, photos, and scientific illustrations linked to each panel/page of *Secret in the Cellar* function as digital recreations of those museological strategies, exhibitions staged along the margins of the slightly fictionalized comics narrative told in the center of the HTML frame. *Secret in the Cellar* is itself an alternate level of information, displaying virtually the practices, tools, and artifacts of forensic anthropology the "Written in Bone" exhibition showed physically. Indeed, as one reviewer of the exhibition makes explicit, *Secret in the Cellar* functions as, "... a web comic that virtually relays all of this information to those who are unable to visit the exhibition personally" (Chhaya, 2010). Thus it is unsurprising that the museological heterogeneity of the exhibition should be replicated virtually in the design of the hypercomic. But that same close identification with its institutional origins leaves *Secret in the Cellar* open to share in critiques of the museum, and the exhibition.

Cohen (2009), for example, critiques the exhibition's assumptions about identifying "ancestry" from skeletal remains:

The exhibit... presents three skulls in a row as characteristic of European, African, and Native American "ancestry," respectively. Nowhere do labels clarify any difference between "European" and "white," "African" and "black," or "Native" and "red." One case study even conflates the terms, describing an "African" body from a burial site "where whites and blacks are buried side by side." Although a rising tide of anthropological research denies significant correlation between biological or skeletal data and identification of "race" or "ancestry," "Written in Bone" refuses to distinguish between place and race. [...] historians will find it [the exhibition] dangerously ahistorical. It applies contemporary demographic categories without regard to period constructions of identity. Visitors move into the section of case studies after learning to identify seventeenth-century people as either African, European, or Native American.

Thus, the exhibit erases individuals of mixed ancestry and notions of cultural adaptation and teaches visitors that identity is biologically rather than culturally or socially constructed (ibid., p. 779-80).

Although Cohen (ibid.) never mentions the comic, *Secret in the Cellar* reproduces this portion of the exhibition as an Activity—hyperlinked to the 16th panel/page—that uses a combination of scientific illustration, photos, and text, leading up to a checklist where one can guess the ancestry of the person to whom the photographed skull belonged (see Figures 4 and 5 in the Figures section below). The checklist includes a "Check Your Answer" button that, when toggled on, marks the "correct" and "incorrect" ways of identifying skeletal characteristics as racial indicators, using green checks and red X's, a visual semiotics that encodes the activities of guessing race based on bone structure as if having a level of objective certainty on par with the answers to an elementary school spelling test (see Figure 6 in the Figures section below).

My point here is not to affirm or discount Cohen's overall critique as an accurate depiction of forensic anthropological viewpoints on skeletal data and ancestry; research into such anthropological data is beyond the scope of the present study. Rather, I present Cohen's critique to exemplify intricate ways in which the museological context shapes the cultural, narrative, organizational, and compositional design elements of the educational hypercomic. Whatever sociocultural and scientific assumptions pervade the exhibition, the comic reiterates and reifies those assumptions within its narrative.

It is worth noting that part of Cohen's critique is couched in the exhibition's close connection to popular culture:

The exhibition is partly sponsored by the History Channel, which airs several programs that employ forensic scientists to "solve" historical mysteries. The orientation video promises museumgoers a "real life CSI," in which "bones are read" to "fill in history with such great detail that it goes beyond any records we have available" (ibid., p. 778).

Nonetheless, Cohen admits to the "successes" of the exhibition in "...engaging with people of the past in emotional and tactile ways beyond the scope of most history books and exhibits" (ibid., p. 780). In this manner, Cohen's review of "Written in Bone" resonates with the institutional tensions (between popular and academic cultures, between entertainment and education, between fiction and non-fiction) that similarly characterize the shifting meaning of comics in education.

Connect with Haji Kamal: The US Army, interpersonal training, and Agile e-learning

Like *Secret in the Cellar*, *Connect with Haji Kamal* (World Warfighter, 2010) is an educational hypercomic created using Flash, by a design team, with input from multiple stakeholders, for a learning institution tied to the US government. Also like *Secret in the Cellar*, *Connect with Haji Kamal* is based on an actual event, in this case a conversation between an inexperienced US army lieutenant and an Afghan elder. However, *Connect with Haji Kamal* has a more narrow use than *Secret in the Cellar*'s function as an online comics narrative vehicle for much of the same information found in the "Written in Bone" exhibition. In contrast, *Connect with Haji Kamal*, "is the homework part of a lesson plan that includes in-class discussion about how to build rapport across cultures [...] part of a much larger effort in the Army to strengthen soldiers' cross-cultural and peacekeeping skills" (Moore, 2010). *Connect with Haji Kamal* was initially designed for the "Senior Leader Course" LSA 2 Rapport Building Across Cultures (World Warfighter, 2010). The course is taught at the "US Army Intelligence Center of Excellence (USAICoE), Military Intelligence Noncommissioned Officer Academy" located at Fort Huachuca ("Fort Huachuca," 2016). Since then the training module has been used in the US

Military Academy at Westpoint, Army Intelligence schools, and NATO training centers (Kinection, 2015).

Like *Factoring with Mr. Yang*, *Connect with Haji Kamal* is envisioned as supplemental material, reinforcing concepts taught during class sessions, functioning within a broader syllabus. Because the primary learning objectives of the work are to "model specific rapport-building behaviors and inspire class discussion" (Moore, 2013). This built-in potential for class discussion means that, as a promotional video posted by the design firm Kinection (2015) describes, *Connect with Haji Kamal* can be used by "individual learners, small groups, and even large classroom environments." So, while the target audience is specific to Western military education contexts, *Connect with Haji Kamal* exhibits, like all three exemplar hypercomics, flexibility in terms of ways in which it can be integrated into classroom settings.

Kinection is an e-learning instructional design firm whose clients include "corporations, government departments, universities, and non-profits"("About Us"). The World Warfighter Culture and Language Training Program, of which *Connect with Haji Kamal* is one component, is funded by a US Army SBIR (Small Business Innovation & Research) award through the Army Research Lab (World Warfighter, 2016). Thus, at its foundation, Kinection's design of *Connect with Haji Kamal* and World Warfighter is a continuation of longstanding collaborations between the US Military and education science:

...the US military has a tradition of using specific theories and development models to guide instructional design activity. During the 20th century, the US military offered instructional designers numerous opportunities to contribute to the knowledge base of the discipline. [...] Military actions that required the massing of troops from a civilian population also required that those troops receive training for their new roles. In peacetime, military personnel must receive training on a variety of highly technical, demanding, and dangerous tasks for which public school and college has not prepared them (Brown and Green, 2015, p. 13).

One way in which this tradition in US Military funding and support for instructional design has evolved in the 21st century is to use ICTs to create scenario-based training exercises related to interpersonal interaction, because, "Training—especially in complex or difficult domains (e.g., interpersonal skills)—is often unable to keep pace" with the increasing complexity of modern warfare (Campbell, Hays, Core, Birch, Bosack, & Clark, 2011, p. 9). As Caligiuri, Noe, Nolan, Ryan, and Drasgow (2011) note:

These skills are especially important in the current environment of counterinsurgency and stability operations. Soldiers are operating in areas of the world where the U.S. has had a limited history of engagement from which an understanding of cultural norms and acceptable behavior might arise (p. 20).

To address that need for military training in "difficult domains," a number of instructional designers turn to virtual learning environments. For example, Campbell et al. (2011) created virtual characters for soldiers training to be officers to interact and mentor. Kim et al. (2009) created a game-based environment where soldiers can use simulated social interactions to hone "the ability to effectively negotiate with people of different cultures" (p. 289). *Connect with Haji Kamal* is one of a number of projects funded by the military using game structures, narrative design, and digital characters to address crucial but deficient needs for training in interpersonal and cross cultural interactions. The game-based design and the desired learning outcomes of *Connect with Haji Kamal* fit within preexisting paradigms of instructional design by outside contractors for US military training contexts.

In addition to its impetus arising from the training needs required of contemporary US Army actions, *Connect with Haji Kamal* is also shaped by specific US Army personnel, and their interactions with members of the Kinection design team. Similar to the organizational approach of the *Secret in the Cellar* design team, Kinection employs a mix of artists, writers, instructional and software designers, and uses a design process that includes the target audience and one or

more SME (Subject Matter Experts). And both *Secret in the Cellar* and *Connect with Haji Kamal* are based on actual events. However, while the *Secret in the Cellar* team only incorporated their audience's reactions to the story elements—and not to the hyperlinked ancillary photos, articles, and activities—the learning objectives of *Connect with Haji Kamal* require input in both the story, (i.e. the social interaction), and the didactic content, (i.e. cross-cultural rapport building). Indeed, because it simulates social interaction to teach social interaction, the narrative and didactic elements of this educational hypercomic are inextricable. Those multimodal design elements are also inextricably connected to the experiences of the designers' target audience. In fact, even the use of the comics form comes out of interviewing soldiers:

In focus groups about their training preferences, soldiers made clear that they prefer video. However, that wasn't in our budget or timeline, so we went with the soldiers' second best, graphic novel illustration. The images are comic-ified photos (Moore, 2010).

In addition to focus groups about training preferences, *Connect with Haji Kamal* instructional designer, Kinection subcontractor, and training design consultant Cathy Moore (2013) describes the early step as an exhaustive interview process, with reference to, "Our (many!) interviews with soldiers..." Elsewhere, in a comment on an e-learning blog review of *Connect with Haji Kamal*, Moore (2012) elaborates on some of the other interactions with soldiers that went into the design:

Other scenarios in the project... done in PowerPoint or even in text-only printouts, with instructions at each decision point to turn to page so-and-so. These lower-tech versions, and the discussion about the Haji Kamal scenario, were done in face-to-face sessions with soldiers [...] the intellectual challenge of a branching scenario is far more important than the media it's produced with. With the soldiers, the text-only, printed scenarios seemed to generate as much discussion and debate as did the multimedia ones.⁴

The extent to which soldiers in conversation with the Kinection design team gave input to *Connect with Haji Kamal* at every step of the design process is indicative of Kinection's

instructional design philosophy, which is described as "an iterative design and development model based on Agile methodologies" ("About Us"). Agile methodologies began as a "community-oriented approach" to software design philosophy that developed in reaction to traditional, rigidly sequential models "...so complex and prescriptive that many software companies have large manuals describing their methodology in detail and even go to the extent of requiring forms to be filled out if anyone wishes to deviate from the prescribed method" (Douglas, 2006, p. 29-30). While agile methodologies functions as an "umbrella" term for "a complicated but vibrant ecosystem" of several software development communities, shared core principles include adaptive over predictive practices, and a people-centered approach that involves all stakeholders—including end users—as early as possible in the design process (Fowler, 2005). This philosophy, based around group interaction and iterative design, has migrated to other fields, including instructional design, to meet the demands of organizations seeking "...faster and more efficient ways to train their employees and improve on-the-job performance" (Pappas, 2015). In e-learning development, agile methods are "usually associated with iterative processes" in order to "compress development time," and value "tangible deliverables" for e-learning courses and content (Arshavskiy, 2014).

Thus, the design of *Connect with Haji Kamal* emerges from these institutional influences: the training needs and budgetary allocations of the US Army; the preferences and experiences of US Army soldiers; and the instructional design philosophy and practice of workplace training and e-learning developers. It is out of the latter domain that the design characteristics of branching pathways and scenario-based training also emerge. *Connect with Haji Kamal* designer Moore (2011b) describes scenarios as "...suitable for teaching soft skills, such as having difficult conversations, overcoming buyers' objections, and leading a team through change," because

these skills, "don't have as much information that requires memorization, and they have more grey areas to give the stories depth." Because "decisions made in early scenes affect later scenes"

branching scenario training helps people "practice skills" such as:

- Recognizing and challenging their own assumptions
- Recovering from mistakes in a long or complex process
- Navigating extended, ambiguous situations
- Deciding when to stop gathering information and act (Moore, 2013).

Soldier interviews early in the design process of *Connect with Haji Kamal*, "suggested that one challenge they faced was their western perspective of 'We're here to help you, so let's get down to business,'" and so the training scenario needed to give soldiers, "...practice recognizing when that perspective was hurting local relationships and, importantly, practice recovering from mistakes" (ibid.). Thus, "To follow the 'good' paths [through the branching scenarios], you need to see things from Haji Kamal's point of view, show respect and patience... apply cross-cultural skills... discussed in class" while "making more ethnocentric choices" results in endings to the story where the user is unsuccessful in establishing rapport with the Haji (ibid.). In this way, the Agile methods of instructional design, and the complexity of drafting a branching narrative also draws influence indirectly from social institutions in Afghanistan, insofar as the training scenario simulates and models social interactions culturally appropriate to the region—as understood by soldiers, instructors, and military intelligence.

Yet, within this intricate network of institutional influence, *Connect with Haji Kamal* displays a much more unified design than *Secret in the Cellar*—closer in cohesiveness of visual aesthetic to *Factoring with Mr. Yang*. In part that is owing to the more cohesive integration of the target audience into the design process, owing to Kinect's adoption of Agile methodologies, as described above. The cohesive design is also owing to the narrower focus of

the learning objectives for *Connect with Haji Kamal*, tasked not with replicating the scientific knowledge embedded in a museum exhibition, but rather with tacit and learned skills taught in concert with directed classroom discussion. Also, because *Connect with Haji Kamal* portrays the use of cross-cultural skills "at a tactical level" (Kinecton, 2015), the progression of the hypercomic integrates all didactic information as a part of the scenario. Rather than placing informational elements on the periphery of the narrative, the information is embedded in the user's control over the narrative's progression—imparted by whether or not the user proceeds to a successful or unsuccessful outcome. And, finally, the means by which *Connect with Haji Kamal* is able to integrate the comics form with audio, animation, and interactivity in a cohesive design also emerges out of the scenario's hypertextual, choose-your-own-adventure, and game-based elements, which I will expand upon in Chapter 5.

Institutional evaluation and the evolution of educational hypercomics

The institutional contexts of all three exemplar educational hypercomics require some form of assessment and evaluation after their initial deployment among target audiences. Because *Factoring with Mr. Yang* was primarily a final project for receiving a Master's degree in Education, the assessment is decidedly positive, i.e. Yang received the degree. And, more generally, Yang's work as both a graphic novelist and an educator has resulted in him being named Ambassador for Young People's Literature by the Library of Congress (see, e.g., Gustines, 2016). But the educational contexts that led to the creation of *Factoring with Mr. Yang* do not require or support more granular evaluation of this one particular work.

On the other hand, the more substantive processes of evaluation in the realms of museology, US Army education, and the e-learning design industry, identify positive learning

outcomes at the level of the specific digital resource. Webmetrics measuring time spent on different parts of *Secret in the Cellar*, for instance, "...all point strongly to the Webcomic as a motivating tool for user initiative in seeking additional learning experiences on the same topic" (Costello & Bliton, 2009, p. 9). Learner feedback on *Connect with Haji Kamal* revealed "70% of the players said that they were looking forward to discussing the game in class the next day, and instructors reported that the activity 'prompted the majority of the discussion' and encouraged soldiers to share their own experiences" (Moore, 2010). Additional external metrics of success also exist for both exemplars: *Secret in the Cellar* was awarded the 2009 Gold Award by the United States Distance Learning Association (Smithsonian National Museum of Natural History, 2009a), while *Connect with Haji Kamal* continues to be used in multiple military training contexts (Kinecton, 2015).

Institutionally mandated evaluative measures can also present an opportunity to complicate educational institutional assumptions about comics pedagogy. During the creation of *Secret in the Cellar*, the design team "focused exclusively on a teen audience without much consideration for adult groups" (Costello & Bliton, 2009, p. 2). However, data from a survey linked to on the last page of the comic found that "the youngest audiences [...] had lower perceived learning experiences and thought somewhat less of the Webcomic relative to older students and older others" (Costello & Bliton, 2009, p. 7). While the museum adopted the traditional educationalist assumption that comics primarily appeal to young audiences, the comic's connection to a general audience exhibition implicates a broader range of audience demographics. The routine data collection regime of the museum, in turn, allowed for findings that call that institutional assumption into question.

Figures

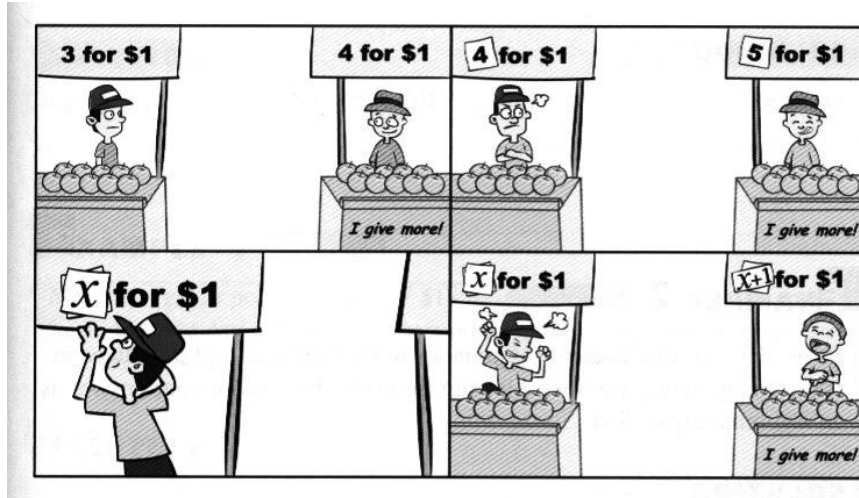


Figure 3: An example comic strip on the language of algebra (Toh, 2009, p. 234).

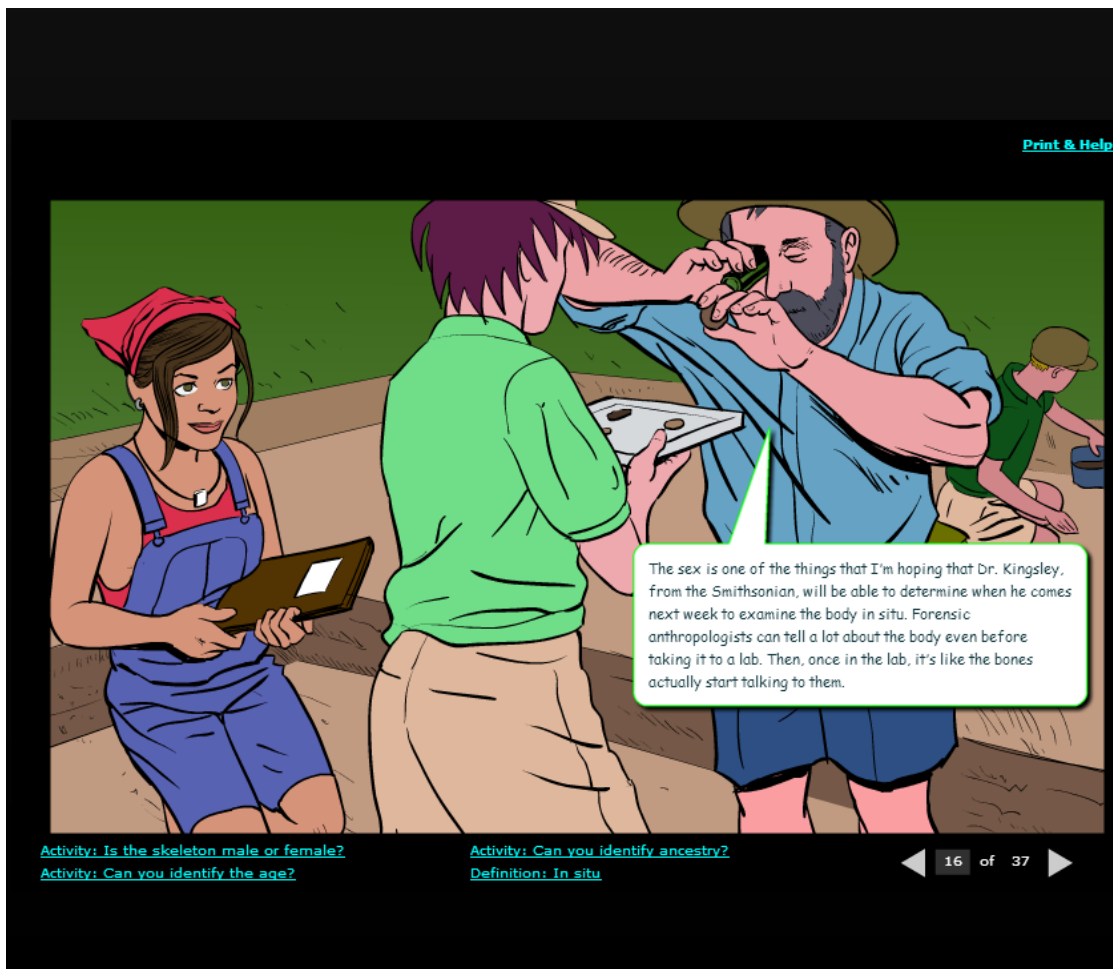


Figure 4: Panel/page 16 of *Secret in the Cellar*, with the hyperlink "Activity: Can you identify ancestry" opening in a new window the worksheet displayed in Figure 5 (Smithsonian National Museum of Natural History, 2009a).

Activity: Can You Identify Ancestry?

Print Article

The bones of a human skull express inherited features from one generation to the next. Many of these features have developed in response to evolutionary processes, including adaptation to the environment. Since certain anatomical features are found with greater frequency in certain populations, their presence or absence are clues to ancestry.

Forensic anthropologists determine the ancestry of a skeleton by examining the morphology, or shape, of the skull and by taking measurements of the skull vault (cranium) and face. By comparing these results with data from populations worldwide, scientists can evaluate that individual's relationship to a world group.

Because only three main ancestral groups were represented around the Chesapeake Bay in the 17th century - American Indian, European, and African from the sub-Saharan region - the features from these three groups can be used to compare with the skeletal remains in the cellar. Figure 4 depicts European, American Indian, and sub-Saharan African skulls.



Figure 4. Skulls from different ethnic groups. (Source: Smithsonian Institution)

European

Figure 4 depicts the characteristics of a European skull. Individuals with European ancestry tend to have straight facial profiles and narrower faces with projecting, sharply angled nasal bones, and these features:

- Long and narrow face
- Slipping eye orbits
- Large nasal spine
- Narrow, high nasal opening
- Sharp inferior nasal border



Figure 5. European skull characteristics. (Source: Smithsonian Institution)

American Indian

Figure 4 depicts the characteristics of an American Indian skull. Individuals with American Indian ancestry have a high occurrence of the following features:

- Wide face and short, broad cranial vault
- Large prominent cheek bones
- Nasal opening flared at the base (heart-shaped)
- Rounded eye orbits
- Large teeth with shovel-shaped incisors

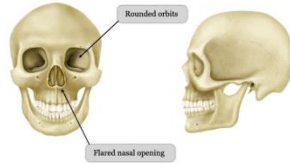


Figure 6. American Indian skull characteristics. (Source: Smithsonian Institution)

Sub-Saharan African

Figure 4 depicts the characteristics of a person from sub-Saharan Africa. Individuals with sub-Saharan African ancestry tend to show greater facial projection in the area of the mouth, wider distance between the eyes, a wider nasal cavity, and these features:

- Facial prognathism (facial forwardness)
- Smooth and depressed inferior nasal border
- Wide nasal chamber
- Smaller nasal spine
- Rectangular eye orbits
- Large teeth, wrinkling of molars

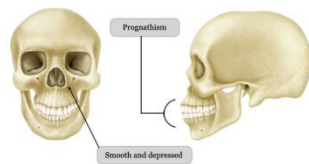


Figure 7. Sub-Saharan African skull characteristics. (Source: Smithsonian Institution)

Evidence of Ancestry in the Skeleton Being Examined

Examine the skull of the skeleton in the cellar in Figure 4 and select an ancestry group that you think depicts each feature of the skull - American Indian, European, or sub-Saharan African.



Figure 8. Skull of the skeleton in the cellar. (Source: Smithsonian Institution)

Feature	European	American Indian	Sub-Saharan African
Shape of cranial vault and face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Facial Prognathism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cheek bones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eye orbit shape	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nasal opening shape	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What was this person's ancestry?

Check Your Answer Reset

Smithsonian National Museum of Natural History
 This page is part of the Smithsonian, The Secret is the Cellar, Hologram, an educational resource from the Written in Bone exhibition February 2019 - 2021.

Figure 5: A resized screen capture of the ancestry identification activity (Smithsonian National Museum of Natural History, 2009c).

Feature	European	American Indian	Sub-Saharan African
Shape of cranial vault and face <i>The long and narrow face is a European feature.</i>	<input checked="" type="checkbox"/> ✓	<input type="checkbox"/> ✗	<input type="checkbox"/> ✗
Facial Prognathism <i>This feature is absent, a European feature.</i>	<input checked="" type="checkbox"/> ✓	<input type="checkbox"/> ✗	<input type="checkbox"/> ✗
Cheek bones <i>The prominent cheek bone feature is absent, so this is likely a skull of European or sub-Saharan African ancestry.</i>	<input checked="" type="checkbox"/> ✓	<input type="checkbox"/> ✗	<input checked="" type="checkbox"/> ✓
Eye orbit shape <i>The eye orbit shape is slanted, a European feature.</i>	<input checked="" type="checkbox"/> ✓	<input type="checkbox"/> ✗	<input type="checkbox"/> ✗
Nasal opening shape <i>The nasal opening is narrow and high, European features.</i>	<input checked="" type="checkbox"/> ✓	<input type="checkbox"/> ✗	<input type="checkbox"/> ✗
What was this person's ancestry? <i>This person was most likely of European ancestry.</i>	<input checked="" type="radio"/> ✓	<input type="radio"/> ✗	<input type="radio"/> ✗

Figure 6: Detail of the checklist at the bottom of the ancestry identification activity, with the "Check Your Answer" button toggled on (Smithsonian National Museum of Natural History, 2009c).

¹ The "Introduction" section of *Factoring with Mr. Yang* does include a three panel sequence using visualizations of conceptual metaphors. Mr. Yang relates the story of his cousin Rodney, whose actions are illustrated inside orange panels, overlapping the green space where equations usually appear. Mr. Yang uses Rodney's failed attempts to eat "possibly the biggest gumball in all of existence" in one bite, rather than breaking up the gumball, to illustrate the general point that "Large things are easier to handle if you break them up into smaller pieces," as one does with factoring. But no concepts specific to algebra are taught using this approach to storytelling.

² see, also, Chapter 2, p. 46

³ I will describe in greater detail the ways in which this interruptive media design pedagogical meaning in Chapter 5.

⁴ I address the narrative complexity of the branching scenario design of Haji Kamal in greater detail in Chapter 5. It is quoted here to illustrate the extent to which soldier input was incorporated into the instructional design, throughout the pre- and postproduction of *Connect with Haji Kamal*.

CHAPTER 5: PEDAGOGY IN REMEDIATION & NAVIGATION¹

Owing to "...rhetorical effects that continue to shape our conceptual media borders, both in scholarly discourses and in popular ones [...] the discussions of what is considered prototypical to print comics, to digital comics – and to comics' relation between technology and compositional features in general – will only become more contested in the future" (Wilde, 2015, p. 9). Nonetheless, there are particular characteristics that are generally associated with uniquely digital interactive forms of comics, what I have labeled in this study as "hypercomics." As with the earlier discussion of definitions of comics, these characteristics of hypercomics are not exhaustive definitional tenets, but rather, those characteristics commonly associated with digital interactive comics forms in related research literature (see Figure 7 in the Figures section below). Naturally, these descriptive characteristics are present in various combinations, in various constellations of multimodal meaning making resources, in all three exemplar educational hypercomics (see Figure 8 in the Figures section below). And all of these characteristics relate to two central issues in the study of digital comics: remediation and navigation (see Figure 9 in the Figures section below). The ways in which the three exemplar educational hypercomics make meaning through socially inflected multimedial design remediate print comics and employ digital forms of navigation that specifically construe readers as learners.

¹ Portions of this chapter will also be published in the edited volume *The Future Past of Comics*. Duffy, D. (forthcoming). Teaching hypercomics: Comics as information organization in digital pedagogy. In J. Gardner (ed.), *The Future Past of Comics*. Columbus, OH: The Ohio State University Press. Used with permission.

Figures

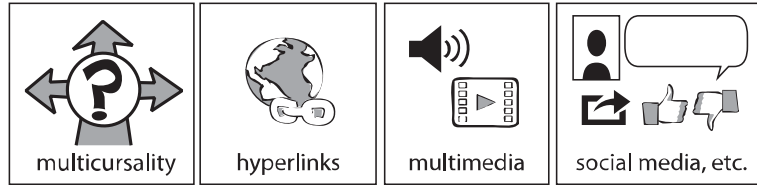


Figure 7: Iconic visualizations of major identified characteristics of hypercomics (see, e.g., Goodbrey, 2012; Keeper and McDevitt, 2012; Jacobs, 2014; Wilde, 2015; Chapter 2, above).

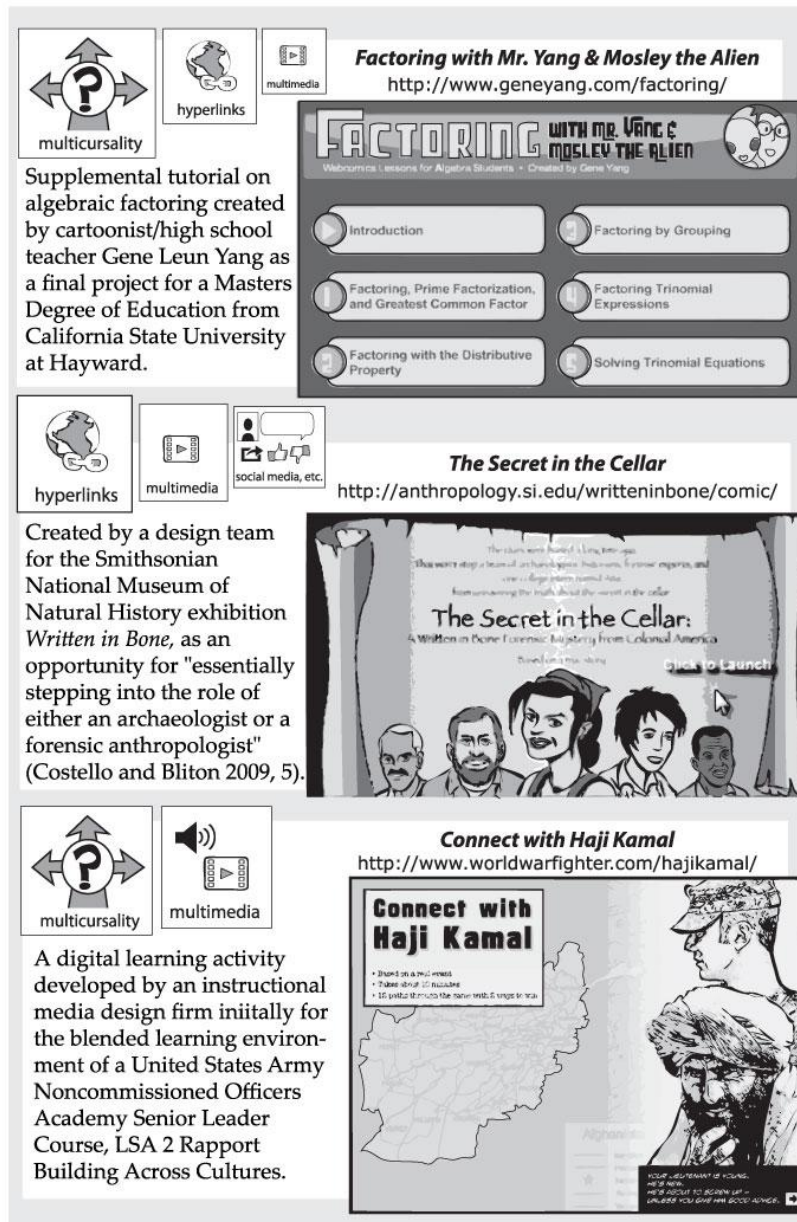
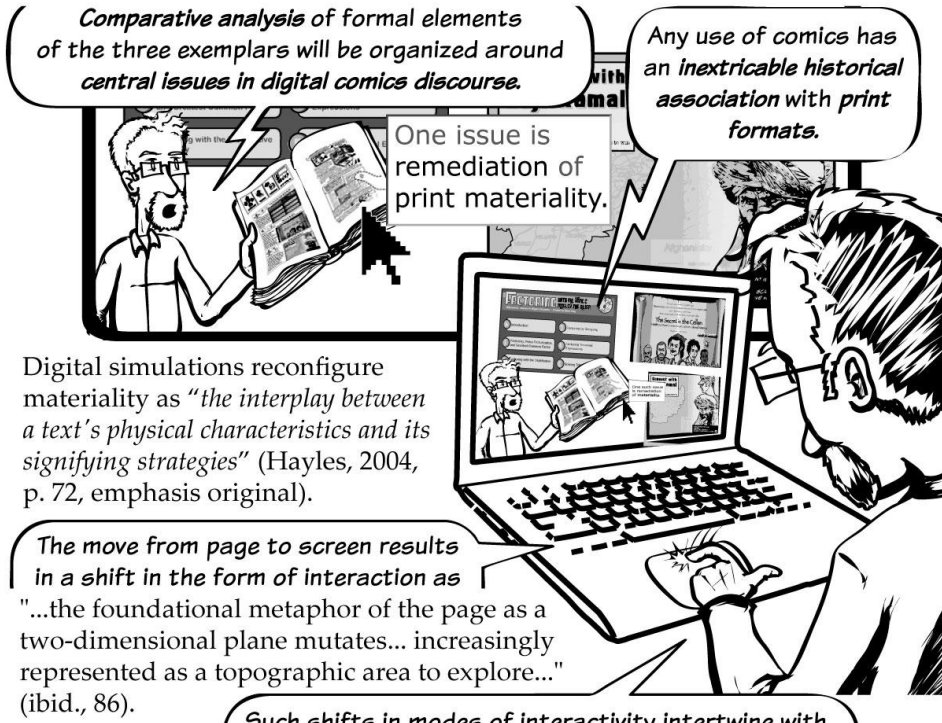


Figure 8: Diagrammatic representation of the three exemplar hypercomics, including titles, URLs, brief descriptions, digital recreations of images from their respective home pages, and applicable hypercomics characteristics—their icons sized to represent their relative contributions to the overall multimodal design of the exemplars.



Remediation of materiality and spatial composition as design resources for making meaning are important to the identity of comics in digital media.

Remediation relates digital comics to the history of comic strips and comic books, and "it is important to place webcomics as part of comics history to understand how they use and change the medium..." (Kogel, 2013, p. 14).

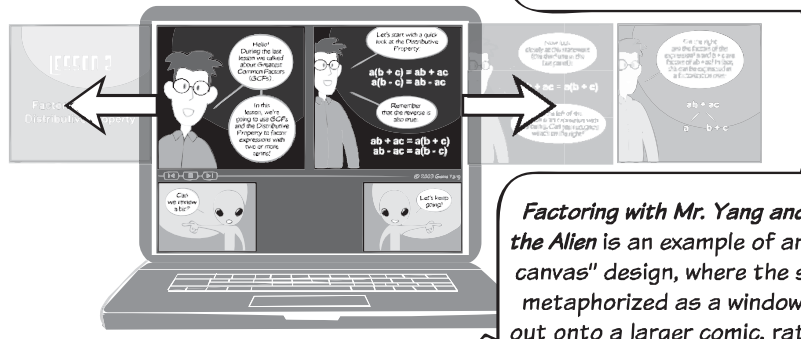
Meanwhile, as spatial composition is the primary means of communicating the passage of narrative time in comics, "...for the comic to still operate as a comic, the rate at which information is absorbed must still be set by the reader" (Goodbrey, 2013, p. 195).

Remediation of materiality and spatial design are thus key to the ways digital comics can **construe readers** as learners of critical multimodal and information literacy skills (Jacobs, 2014).

Figure 9: Imagetextual analysis of ways remediation and navigation construe readers as learners in the three exemplar hypercomics.

All three works discussed here make use of a Flash animated interface, a common choice in hypercomics design (Keeper and McDevitt, 2012).

But each comic *employs animation* in very different ways, and within vastly different *spatial compositions*.



Factoring with Mr. Yang and Mosley the Alien is an example of an "infinite canvas" design, where the screen is metaphorized as a window looking out onto a larger comic, rather than as a remediation of the printed page (McCloud, 2000, p. 222).

It is also an example of animation being "...used to suggest the movement and rearrangement of the pre-existing panels as the direct result of reader interaction... to affect the meaning of the content within the panel or of the panel's relationship to other panels in a sequence" (Goodrby, 2013, p. 193).

The Secret in the Cellar, in contrast, uses limited animation within each of its panels, panels delivered one at a time from within a static HTML frame.

Every time the reader clicks to the next panel/page of the comic, the image appears with zooming, fade-ins, and/or small movements of static drawings into the final, completed image.

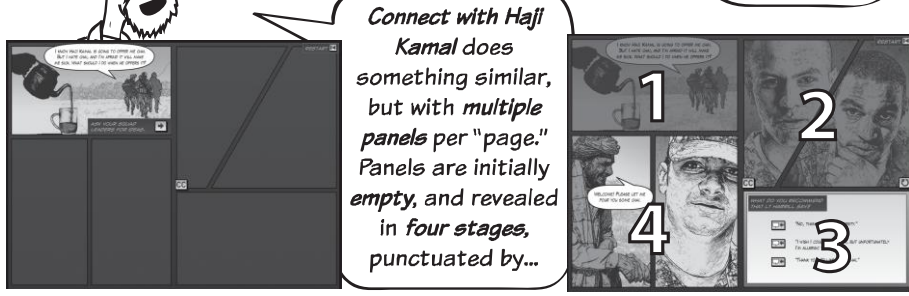


Then each text caption or word balloon on the panel/page...

...appears over the image...

...one after the other...

...reinforcing the implied reading order of each unit of text.



Connect with Haji Kamal does something similar, but with multiple panels per "page." Panels are initially empty, and revealed in four stages, punctuated by...

Figure 9 (cont.)

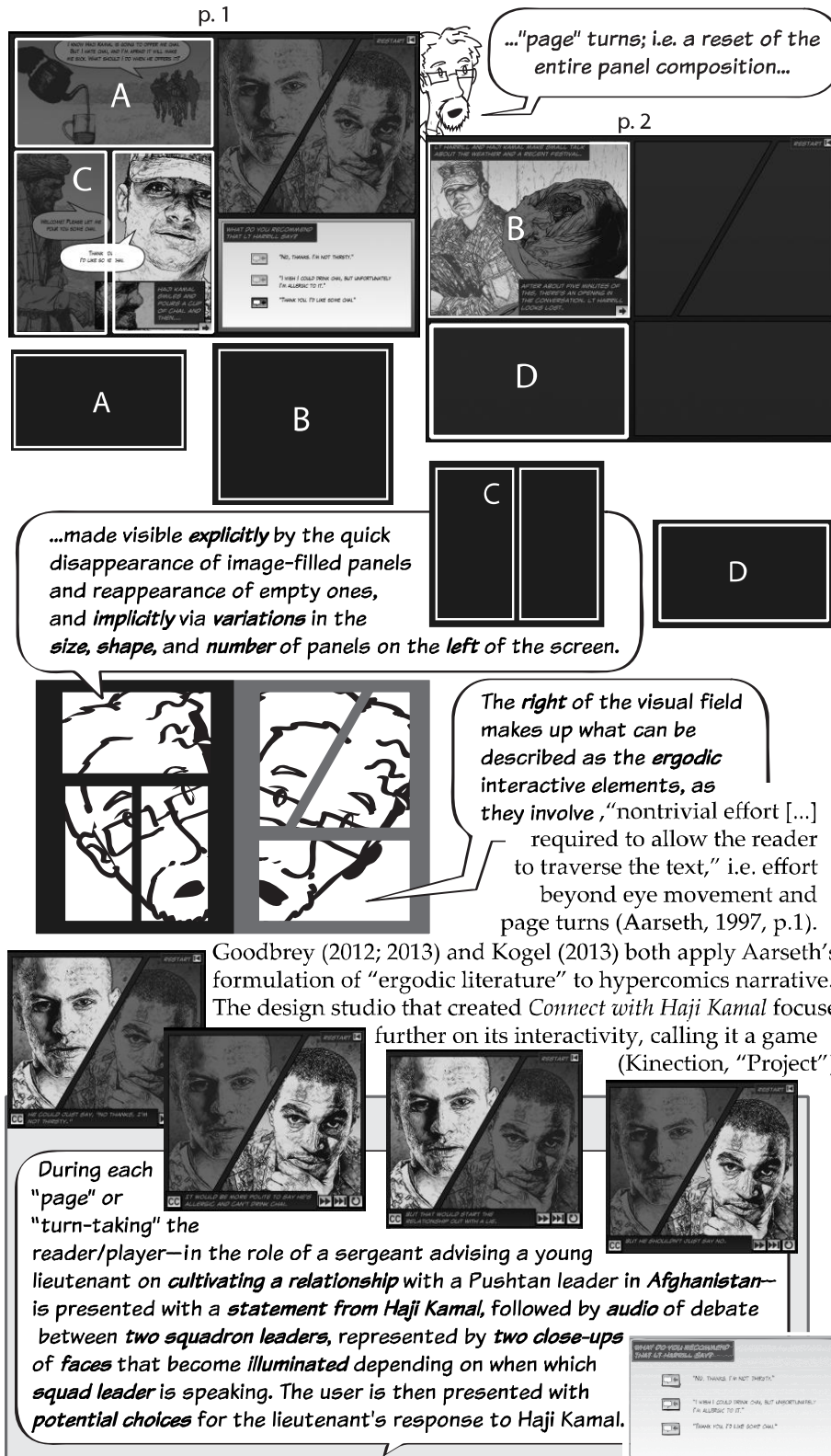
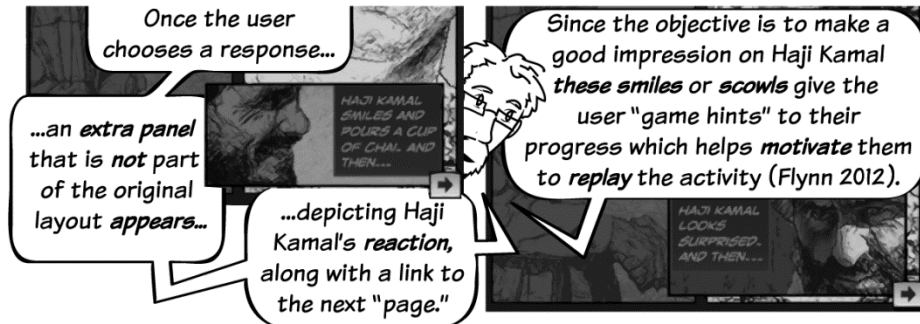


Figure 9 (cont.)



Like the other images of each “turn” in the game, this panel is an example of what Goodbrey (2013) dubs the “panel delivery” method of digital comics design, where reading paths of remediated print page designs are suborned to the (dis)appearance of panels anywhere on a single screen. Interestingly, *Connect with Haji Kamal* uses both techniques: the uniquely digital panel delivery to depict a single turn in the conversation, and the remediation of turning a print “page” to signal the move from one round of the game to the next.

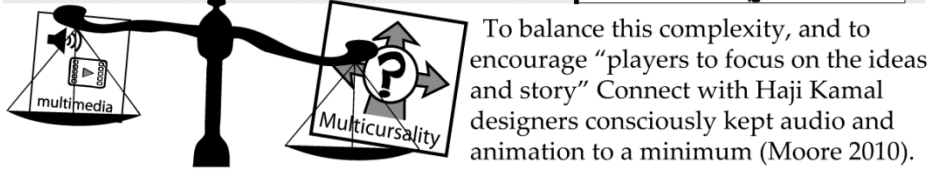
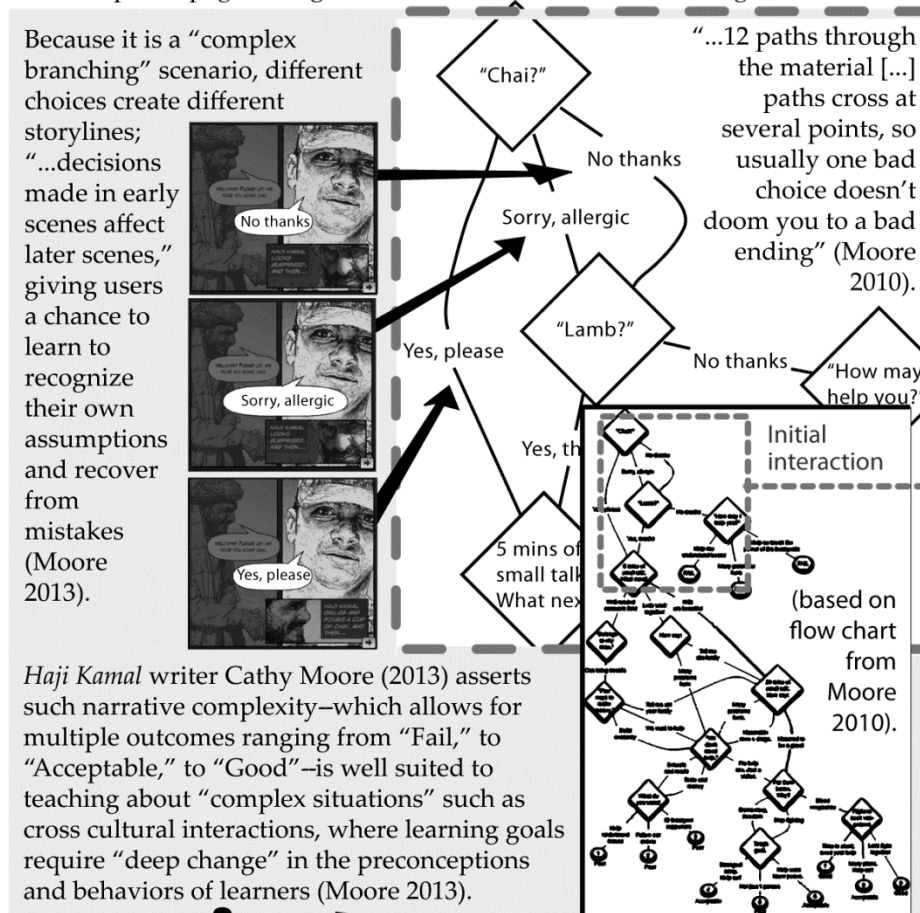
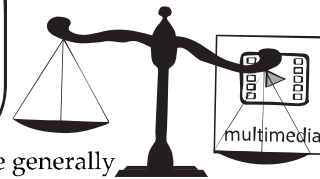


Figure 9 (cont.)

Secret in the Cellar also employs the panel delivery design, but with primarily one panel per click forward, rather than the multi-panel composition of each “page” of *Connect with Haji Kamal*. *Secret... hews closer to a “slideshow format” where “the user can move forward or backward by virtually acting... on buttons or arrows” implementing a different “kinetic modality” in reading* (Zanfei, 2008, p. 57).

And while both *Secret...* and *Haji Kamal* make use of minimal amounts of multimedia, the animation in *Secret...* is, comparatively, more intrusive than the lighting and audio effects in *Haji Kamal*.



Time-based media like audio and animation are generally construed as antithetical to the comics form, which traditionally operates by using spatial composition to allow the reader to infer the passage of narrative time from one panel to the next (McCloud, 2000; Bigerel, 2009; Goodbrey, 2013).

Taken on its own, the lighting of particular panels of *Haji Kamal* is not particularly disruptive of reader control of narrative time since it is an example of animation “...used to provide a level of visual continuity to changes in the page layout” without affecting reader control of the rate of information (Goodbrey 2013, 193).



In *Haji Kamal*, the lighting functions primarily to lead the reader along (what would be in print) a counterintuitive reading path.

Aesthetically, this highlighting accentuates the preexisting lighting rendered as shading in the photo-realistic images.



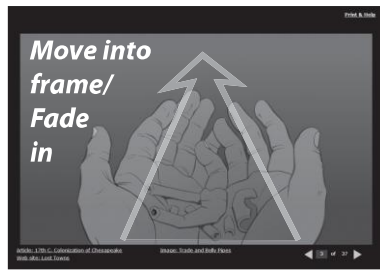
Animation in *Secret...* on the other hand, happens *within* the panels, in ways that *contravene* the diegetic reality of the illustrations.

For example, the first page/panel opens by *zooming in* on the first image, two anthropologists at work. While introducing the characters with this animation adds a cinematic element...



...the zoom-in also shows us *more of the background* than is visible in the final illustration, highlighting the *lack of background details*. The narrative authority of a caption box that locates the scene at an *archaeological dig* is at odds with the *blue rectangle over a green rectangle*, shorthand grass and sky colored by digital gradients, at odds with the figures' *black ink outlined flat colors*.

Figure 9 (cont.)

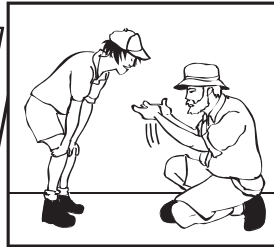
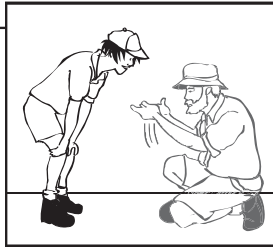
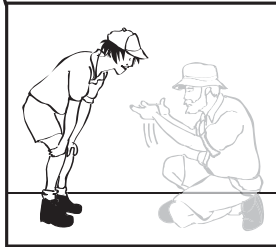


The second page/panel is similarly at *aesthetic cross purposes*. The motion of the image—a drawing of the kneeling anthropologist's hands holding a find that enters the bottom frame and moves up to the center—has an analog in naturalistic physical motion: the kneeling anthropologist extends his hands to show his colleague what he has found.



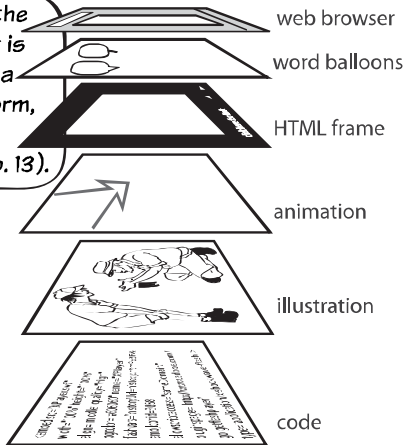
But this is *paired with an effect* that decidedly *negates* that naturalistic animation.

As they rise to the center of the frame, the hands also *fade in*, from transparent to opaque, over a dark green background, which, if taken as a *literal narrative representation*, implies the kneeling anthropologist briefly becomes invisible.



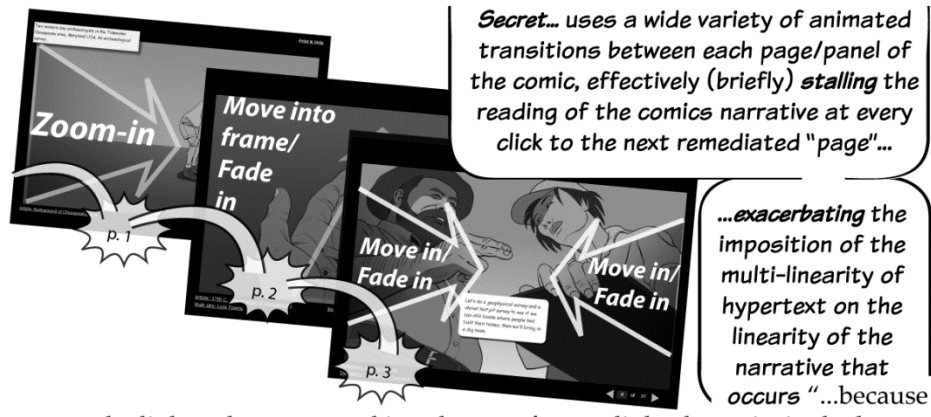
To be clear, I do not mean to critique these aesthetic choices as "bad" or "good" design choices, nor am I especially interested in how time-based media, "...prevents us from labeling these mixed-media forms comics [...] comics are to be read according to individual pacing... and allow for [...] reading-processes that vary from the sequence of the images themselves (for example, by re-reading earlier or later images)" (Dittmar, 2012, p. 89).

Concerns over whether the *entirety of the work* is or is not "comics" assumes a *stable definition of the form*, which is "impossible" (Groensteen 1999/2006, p. 13).



Analysis of digital comics is as concerned with the *strata of interface, multimedia, and coding* within which the *juxtapositions of static image, text, and sequence* often associated with comics is *embedded* (Marrs, 2005; Kogel, 2013).

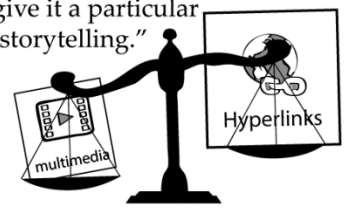
Figure 9 (cont.)



the link to the next panel is only one of many links that exist in the layout of a webpage in which a webcomic is embedded" (Jacobs 2014, ¶ 19).

The imposition of **multimedia temporality on reader immersiveness** in digital comics has been routinely dismissed as "fancy gimmicks that negate sequential art in it's core" (Bigerel, 2009a). While McCloud (2010) argues that looped animation or audio is the exception, since it maintains the static nature of narrative time within the panel, he is more adamant that: "The point isn't whether or not we want to give it a particular label or not, but whether a given comic works as storytelling."

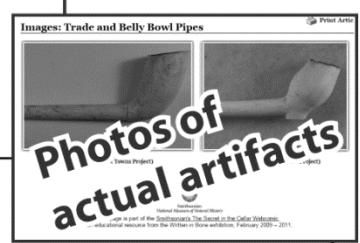
However, in the educational comics, artistic narrative expression is typically a **secondary goal, the means to the end of information dissemination** (e.g. Jüngst, 2010).



The designers of *Secret...* describe the need to avoid "interesting material" like character details, that would be "extraneous to the learning objectives" of moving readers from the fiction of narrative to factual didactic information (Costello et al., 2009, p. 4-5).



Similarly, the use of animated transitions **frustrates** reader immersiveness at each screen, effectively **pausing** the reader's progress through the narrative...



...to encourage attention be paid to the **non-fictional educational content** provided by **hyperlinks** that **annotate** each panel/page.

Figure 9 (cont.)



In both *Secret in the Cellar* and *Connect with Haji Kamal*, the incursion of time-based multimedia into the traditionally spatial representations of time in comics results in a disjunct of narrative temporality. But the design of meaning in comics responds to the organizational model of the network (Groensteen, 1999/2006, 146).

While that disjunct is viewed as undesirable by those who understand comics as primarily a mode of literary, artistic, creative narrative expression, it is precisely those *liminal spaces*—where the *networked* visual, textual, and compositional meanings of comics *connect* with other media—that create opportunities for *critical pedagogical intervention*.

In *Secret...* the hyperlink annotations *precede* the next panel of the comic, *remaining present* throughout the animation--

--framing each image both *literally* and *contextually*, via the *linked content*.

All linked *informational content* opens in a *pop-up window*, literally and figuratively--

In *Haji Kamal*, the *disjunct* between time-based and space-based representations of time also *interrupts* the comic narrative, but in a way that *fits naturally* into the work's mechanics as a *game*.

-- *foregrounding* educational content over the cohesion of narrative moments.

The *static visual representations*, the use of animation to *augment preexisting lighting effects*, and closed captions that transcribe the spoken words in a font reminiscent of *comic book lettering* all reinforce the *connection between spatial and time-based media*, while the information granted by the audio informs the decision that reveals the final panels of the page/turn in the lieutenant's conversation with Haji Kamal.

In a sense, the squad leaders' audio functions as an aspect of *game navigation*.

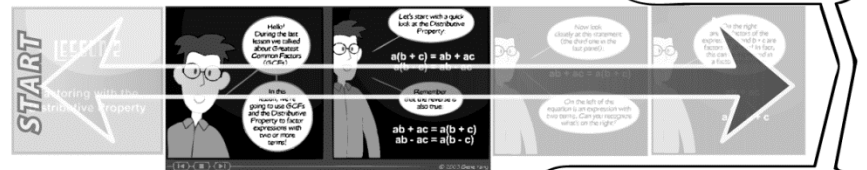
Figure 9 (cont.)

Factoring with Mr. Yang and Mosley the Alien also incorporates its characters into navigational aspects of interface design. While Mr. Yang occupies the top row of the comic, lecturing in panels that slide along a bi-directional horizontal vector, visible two at a time the bottom row features static panels of Mosley that double as navigational buttons.

Can we review a bit?

Let's keep going!

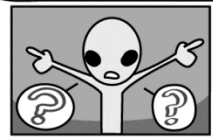
Like Haji Kamal, Mosley codes social cues as representations of learning progress...



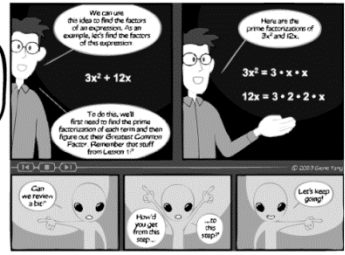
...but, while the Haji Kamal's emotions function as feedback on user input...

...Mosley functions as an avatar for the user.

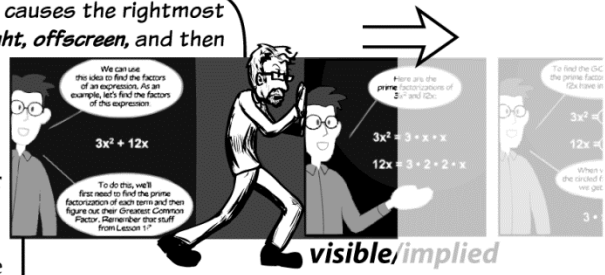
This becomes even more apparent when a third Mosley panel/button appears at various points in the six comic strip lessons...



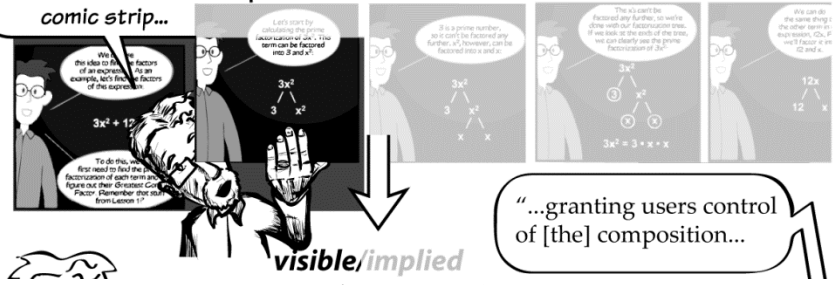
...with Mosley asking Mr. Yang for greater clarification or more examples.



Clicking on this Mosley causes the rightmost visible panel to slide right, offscreen, and then additional panels to descend from above. As I have noted elsewhere, this animation: "...maintains the linear spatial narrative of the top row, reinforcing the tactile aspect of the comic" as a remediated comic strip...



visible/implied



...granting users control of [the] composition...

visible/implied

Figure 9 (cont.)

visible/implied

...while simultaneously recalling the mathematical processes of factoring, where numbers and variables are broken down into component parts" (Duffy, 2015).

$ab + ac$
 $a \quad b+c$

"...as soon as there is a choice between differently shaped reading paths, these shapes can themselves become sources of meaning [...] The shape of the reading path itself conveys a significant cultural message" (Kress & van Leeuwen, 1996, p. 219).

8pt Bold Italic

Unlike the animated transitions in *Secret...*, which draw attention to their own artifice and encourage nonlinear reading of embedded pedagogical resources in more traditional formats (e.g. prose, maps, photos, scientific illustration)...

...the combination of animation and interactive design in *Factoring...* serves to further involve the user in the comic itself.

"...it is not possible to change perspective or gaze in an image without changing both what is represented in the image and the way in which it interacts with the viewer. Perspective and gaze work interpersonally in the pictorial systems because they imply a location of the viewer in an extension of what is represented" (Matthiessen, 2007, p. 20).

While in *Secret...*, characters tend to gaze at *each other*, the squad leaders in *Haji Kamal*, Mr. Yang, and Mosley all gaze out at—and thus address—the reader *directly*.

The two pairs also address *each other*, with the two squad leaders debating each others' advice, and Mr. Yang lecturing Mosley, and Mosley responding.

But, while one can decide whether to apply either squad leader's advice in directing the lieutenant on what to say next to Haji Kamal, there is *no addressing* the squad leaders. Mosley, in allowing the reader to *alter the shape and length of Mr. Yang's lecture*, allows for a simulation of student/teacher interaction.

Figure 9 (cont.)

Hypertext is pedagogical since it requires "collaboration by the reader... to give meaning to the texts through her constant textual intervention and shaping, her construction of successive interpretive frameworks, and her responses as a reader" (Joyce, 1996, p. 234).


Low (2012) argues that comics is, similarly, "...an extremely suitable medium for readers in twenty-first century schools" since "...each gutter in a piece of narrative sequential art presents a distinctive challenge (large or small) to the reader, and cumulatively, the superset of all gutters in a work gives readers the task of coauthoring the entire narrative using their own inferences" (p. 376).

The use of hypermedia in education is advocated as a means of giving learner's control: e.g., control of the sequencing of information, of which informational content is included, and the modes of meaning making through which that information is represented (Scheiter & Gerjets, 2007, p. 287).

In addition to the aspects of remediation and spatial composition highlighted in these three educational hypercomics...

...each work incorporates multiple forms of navigation control and text that explains the user interface.

The variety and sometimes redundancy of these navigational elements reinforce the expectation of learner control of the digital environment.



Factoring with Mr. Yang and Mosley the Alien

The occasional middle Mosley button functions as a toggle, allowing users to add or subtract additional panels from the top row at any point.

Connect with Haji Kamal

Ever-present "Restart" button starts over the conversation with Haji Kamal.

Squad leader audio controls:

- skip one squad leader's audio
- skip all audio
- replay audio
- closed captions on/off

Secret in the Cellar

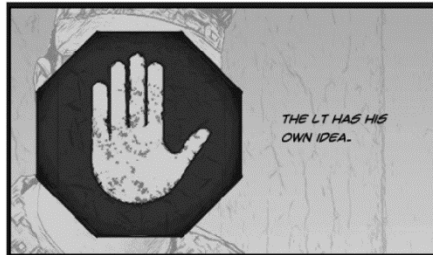
explanatory text for hypertext annotation

<< Click the link for additional information

page/panel navigation buttons

2 of 37

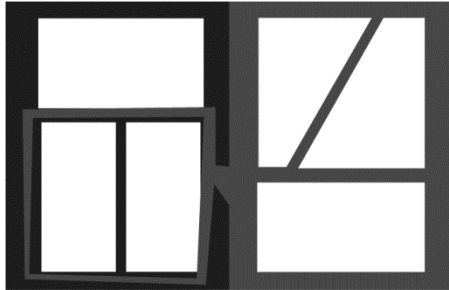
In some ways, these navigational elements seek to reinstate some of the reader control of information flow lost to the inclusion of time-based media (as in the buttons that allow the audio in *Haji Kamal* to be skipped.)



But another of the multiple narrative paths of *Haji Kamal* makes explicit what the animated transitions in *Secret...* imply: Learner control of information in hypermedia is by no means a given, nor a panacea for multimodal pedagogy.

Figure 9 (cont.)

In this path through *Haji Kamal*, the lieutenant "has his own idea," and says something other than what the user chooses. In the sense of a traditional game this might be seen as *cheating*, violating the established pacing and rules of the activity. *Pedagogically*, though, it makes sense: the user is training not only in cross cultural communication, but also to function as an officer in a military conflict, where events may *not transpire in constant or predictable ways*.



In terms of the way in which this narrative moment *construes readers as learners*, throughout the hypercomic the *compositional affordances of comics* are used to code the *left of the screen as displaying comics' space-as-time narrative*, and the *right of the screen as the area for displaying ergodic, interactive content*.

But this use of the compositional affordances of comics also allows for that pacing to be *disrupted*, in this case by the character that seemed to be an *avatar under control of the reader* becoming an *autonomous element*, calling attention to the *automated processes* of the digital learning environment that the reading processes of comics and the design of graphic user interface elements both usually work to *obfuscate* behind the sense of *learner control*.

Hatfield (2005) describes comics as defined by interwoven "tensions" wrought in part by the co-presence of words, images, along with compositional and narrative meaning making (p. 36).

In educational hypercomics, where comics are juxtaposed with and incorporate animation, audio, and branching narratives, *temporality* and *learner identity* are also in tension. The move between space-based and time-based media shifts attention, as the *reader becomes the viewer or listener becomes the reader again*.



But, unlike other multimedia digital environments, educational hypercomics *call attention* to these moves between narrative temporality in ways that work to *highlight pedagogical content*, and *position the learner* in relation to that content.



Whether *animating panels via hyperlinked aliens to cast users as active participants* in a simulated math classroom lecture, using *animation within panels to push user attention to non-fictional annotations*, or *establishing a relationship between comics reading and game playing*, only to *contradict that relationship*, all to *present users with an authentically complex socio-cultural scenario*, these are all works that draw on comics' *interstitial qualities* to compose multimodal interactive e-learning designs which *recognize and engage with the complicated and shifting identities* of 21st century learners.

Figure 9 (cont.)

CHAPTER 6: CONCLUSION—LEVERAGING LIMINALITY¹

Much of this study has been concerned with the mutable, indistinct-at-the-edges meanings of educational hypercomics—digital born works created in and for pedagogical contexts, outside of (but influenced by) discourses surrounding comics as either popular culture or a literary art form. The heuristic adoption of the term "educational hypercomics" from the many contested definitional constructs for intersections of comics, education, and information communication technologies was self-reflexively documented, for the purposes of contextualizing the label as my particular navigation of the various, sometimes overlapping or contradictory socially constructed meanings ascribed to terms related to comics, learning, and ICTs. These meanings remain fluid, dynamic, shaped by ever-shifting cultural, social, and technological discourses, moving like weather patterns over the topographic maps of linear and nonlinear fictive temporality that comics create.

...differentiation [between analog and digital comics] may come from self-imposed limitations derived from new points of comparisons, which rely less on semiotic or material dimensions [...] If there is an "actual" feature common to all kinds of digital comics, it might be their higher degree of flexibility to choose their own forms and limitations (Wilde, 2015, p. 8-9).

In this study I have referred to this high degree of flexibility as hyperinterstitiality, the characteristic "in-betweenness" of what is recognized as comics (see Figure 10, in Figures section below), intensified further by the multimedia capabilities of computer composition and the interconnectedness of ICTs networked via the World Wide Web. This hyperinterstitiality is in fact a rare point of agreement between literacy education scholars. Despite historical shifts in

¹ Portions of this chapter will also be published in the edited volume *The Future Past of Comics*. Duffy, D. (forthcoming). Teaching hypercomics: Comics as information organization in digital pedagogy. In J. Gardner (ed.), *The Future Past of Comics*. Columbus, OH: The Ohio State University Press. Used with permission.

educationist sentiments concerning the impact of comics on literacy—as well as coincident shifts in how critical literacy skills are defined—all of these researchers understand comics as liminal in its relationship to literacy (see Figure 11, in Figures section below). Undertaken through the hybrid lens of social semiotics and educational and digital comics research, the comparative analyses in this study of *Factoring with Mr. Yang*, *Secret in the Cellar*, and *Connect with Haji Kamal* explicate ways in which the combination of comics and digital multimodal design resources serve to operationalize comics' hyperinterstitiality—pedagogical uses of the liminal nature that allows the comics form to "point to our experience in a way that lets us fill in the gaps for our own context" (Quinn, 2005 , p. 167).

The impetus for this study was to wonder if, as the literature reviewed in Chapters 1 and 2 suggests, comics is a useful means of bridging print and digital literacies in multimodal literacy pedagogy, what is the role of comics within digital learning environments? The initial corpus delineated in Chapter 3, from which the three exemplars were drawn, illustrates that salient characteristics of the comics form can coexist with the digital affordances of new media in ways that, while calling into question definitional meanings of the term "comics," nonetheless work to make e-learning resources navigable and engaging. The ways in which these constellations of comics, multimedia, and digital interactivity organize and take shape are impacted by the educational institutional contexts from which they arise, and the ways in which meaning making resources are designed to construe readers as learners.

In all of these cases, the comics form is chosen primarily from expectations about which types of multimodal communication with which target audiences will identify. These expectations may be based on interviews with the target audience, as in the case of *Connect with Haji Kamal*, or on a more general sense that the comics form indexes popular culture, and

popular culture interests young people, as in the cases of *Factoring with Mr. Yang* and *Secret in the Cellar*. But, while Gene Luen Yang is an artist/practitioner, and thus well versed in the complex meaning making affordances of comics as a communicative form, the design teams behind *Secret in the Cellar* and *Connect with Haji Kamal* are less aware of these potentialities.

For example, the *Connect with Haji Kamal* team chose comics more because it was more cost- and time-effective than the soldiers' first choice, video. Costello and Bliton (2009) note that the "visual storytelling" form was employed because it makes reading comprehension "easier" (p. 6), echoing the traditional education views of comics as simplified print literacy critiqued by, e.g., Hatfield (2005) and Jacobs (2007). Costello and Bliton (2009) are nonetheless inclined to consider the specificity of media interactions generally—the design team chose to avoid audio so as not to interfere with the pace of reading (p. 6). But, beyond describing *Secret in the Cellar* as a webcomic, Costello and Bliton (ibid.) discuss design solely in the more generic terms of "visual storytelling," ignoring specific elements of comics composition like the roles of juxtaposition and sequentiality.

Nonetheless, in both cases, the respective design teams discovered unexpected pedagogical benefits to the comics form. For example, the survey data compiled by the National Museum of Natural History, described at the end of Chapter 4, revealed the wide appeal of the comics form to older museum goers, and not just the target demographic for which *Secret in the Cellar* was designed. Moore (2011a) notes the usefulness of comics in avoiding logical inconsistencies that would be made problematic by different media choices: Haji Kamal only speaks in word balloons, meaning the character's dialog did not need to be translated or transcribed in Pashtun. Comics' synaesthetic design of sound allows for the character to "speak" in English, to maintain focus on learning to build rapport across cultures, but the liminal meaning

of text in a word balloon allows the language to implicitly exist somewhere between spoken words and translated subtitles, whereas a video of an actual Afghan elder who speaks primarily English would be an explicit test of suspension of disbelief, an unnecessary distraction for an e-learning resource meant to simulate real life situations.

The study of educational hypercomics also illustrates how the liminal nature of digital comics literacy can problematize basic assumptions surrounding the comics form. The accepted notion of comics as essentially narrative, for example, is purposefully disrupted to pedagogical ends in all three exemplars. In *Factoring with Mr. Yang*, the assumption that a comic strip will be an unbroken chain of panels in sequence illustrated by the author is upended when one presses the middle Mosley button, inserting new panels into the sequence. As noted in the previous chapters, the comics illustrations carry the narrative weight of *Secret in the Cellar*, but the overall design conspires to interrupt, disrupt, and qualify those narrative experiences with annotative hyperlinked non-fictional information. In *Connect with Haji Kamal*, the narrative outcome is derived from user choice, but the order and meaning of that narrative progression is determined not by those elements that would be traditionally described as comics (pictures in frames, words in balloons, etc.), but by the ergodic elements of audio debate from the squad leaders and the multiple choice mechanism by which users advise the lieutenant what to say in the next comics panel.

In other words, the predominant focus of narrative storytelling in comics gives way to the interstitial. Those aspects of the three exemplars that work pedagogically to move the reader from a passive observer to an (inter)active learner all involve not only the use of the comics form as it has been traditionally understood through print technology, but also the purposeful intervention into that form by digital elements. Whereas, in the McCloudian notion of closure,

the gutter between each panel is the space in which the reader imagines lines on paper becoming motion in time and space, in educational hypercomics the gutter, the space before the next panel or page in the sequence, is the place where reader input is directed not only towards reading the next moment in the narrative sequence, but also towards compositional spaces whose informational content can only be accessed through digital interaction and exploration.

Educational hypercomics provide an example of ways in which the experimentation in digital comics with the inclusion of new media affordances like audio, animation, and hyperlinking, is considered not as either aiding or distracting from the reader immersion in the story, but rather understood as a means of organizing disparate informational components into a unified e-learning resource. Placed within their educational institutional contexts, such digital interactive comics prove to be adept at making multimodal meanings that remediate print comics tropes in ways that, while they may detract from full aesthetic engagement with the story, do so in order to engage readers as active participants in the didactic informational elements of the work. By leveraging comics' liminal nature to create means at the level of the interface of moving between narrative and didactic elements—between reading and learning—works such as the educational hypercomics analyzed in this study indicate that the comics form is far more flexible in its ability to incorporate digital multimedia than even the most ardent comics futurists recognize. Far from anxiety over comics losing its identity as a "medium" in its migration to digital spaces, educational hypercomics indicate ways in which pedagogical contexts of educational institutional settings can expand the sequential, juxtapositional, imagetextual, and synaesthetic capabilities of the form in ways that inform innovative 21st century instructional design philosophy.

Figures

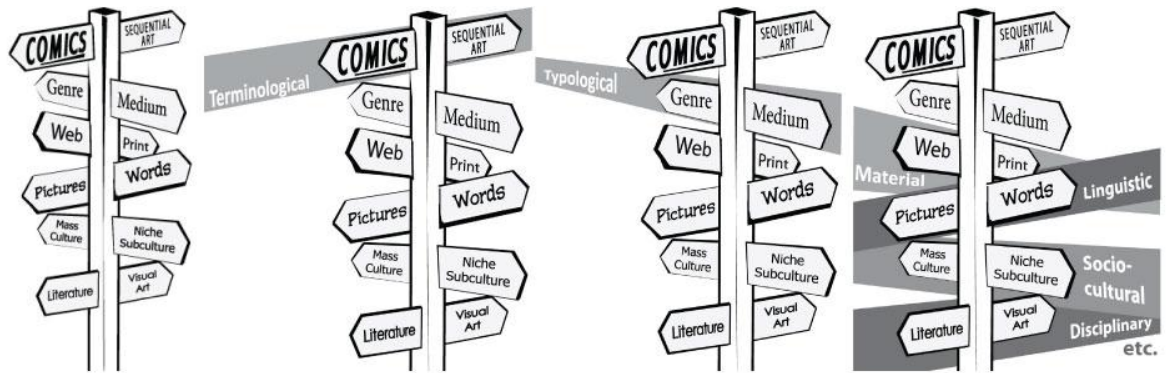
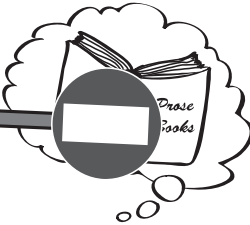


Figure 10: A sequence exploring the visual metaphor of comics as an interstitial form existing at the intersection of multiple contested meanings and contexts.

In fact, the interstitial nature of comics, and its comparison with the communicative affordances of contemporary, culturally predominant media, has long shaped views and research on relationships between comics and literacy.



For instance, anti-comics critiques of the 1940s and 1950s accused the pictures in comic strips and books of "ruining" children's ability to pay attention to works that are exclusively prose, especially those prose works canonized as "good literature" (see, e.g. North 1940; Mulberry 1943; Legman 1948; Wertham 1954).

In reaction to the popularity of comic books among young people, and the attendant popularization of such anti-comics sentiments, "the relations of comics to education and educational method" became a primary focus of comics research during this cultural historical moment (Sones 1944, 232).

Thus, a persistent subject of education and library science research on comics answers anti-comics critiques on their own terms, asserting the usefulness of the medium to lure reluctant readers into eventually reading culturally canonized prose texts (see, e.g., Schoof 1978; Wright 1979; Dorrell & Carroll 1981; Brenner 2006; McTaggart 2008).

■ = varying cultural contexts

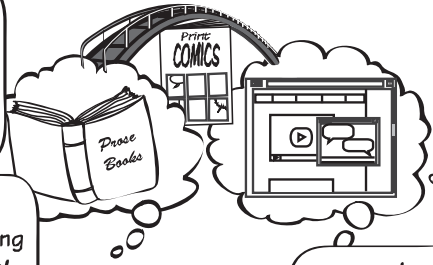


As Dale Jacobs (2007) notes, this view of comics as "debased or simplified word-based literacy" ignores the complex multimodal literacy required by the form (21).

In all of these instances, comics is portrayed as not just interstitial, but liminal.

Whether comics is discussed as impeding or aiding traditional prose literacy...

...or as sponsoring critical multimodal literacy skills aligned with digital media...



...comics is always located at the threshold between forms of literacy.



Figure 11: An imagetextual analysis illustrating how educationalist theories on comics and literacy all tend to view comics as liminal.

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