Reading Comics with a Numeracy Mindset

David Lewkowich

Given the uncommon nature of such an exercise, reading comics with a numeracy mindset involves not only rethinking the status of such texts in relation to literature and art but also considering how such a fusion of literature and art may serve purposes not normally associated with either discipline. As a small caveat, however, I should begin by pointing out that I am definitively *not* a mathematician, and that my interest in numeracy (which some refer to as "math literacy") relates to my history as a high school English teacher, as well as my current position at the university. Nonetheless, in this article I will explore the ways in which—given the demands and expectations of contemporary reading practices, and despite their different histories, disciplinary roots and methods of analysis—literacy and numeracy are often intertwined, and how comics and graphic novels offer a rich context in which to consider these complex interrelations. I will begin by describing some of the relevant preoccupations of contemporary literacy, after which I will briefly describe what comics are and how they work. I will then refer to the local jurisdiction in which I teach and examine how numeracy has been defined in several provincial curriculum documents. Last, I will discuss how these descriptions relate to what we encounter in the pages of comics and graphic novels.

Literacy as a restless search for meaning

In the dynamic and changing field of literacy studies, contemporary contexts of meaning-making increasingly position the individual reader as part of unstable, constantly shifting networks of communication (virtual, actual etc.), where the linguistic (or, the word as spoken and written) is only one of myriad forms of expression. In this enlarged communicatory context, possibilities for legitimate expression include movement, spatial design, digital text, posture, image, dress, gesture, sound, performance etc. Although language arts education is still largely concentrated on the disciplinary centres of reading, writing, speaking, listening, viewing and representing, it also deals with finding new ways to problematize and actualize questions of human subjectivity in the face of a changing life and a world in flux. Cohn (2016) describes the innately interactive nature of literacy as a restless search for meaning: "humans communicate through different modalities—whether through speech, bodily movements, or drawings—and can combine these expressive capacities together in rich and complex ways" (p 304).

Recognizing that we are *subject to* as well as *subjects of* language, key to this search for meaning in the contemporary era is a recognition that language, as we traditionally conceive it, may sometimes compromise the very thoughts we are otherwise endeavouring to express (Zoss 2009). As such, literacy is no longer only determined and legitimized by such traditional products (the essay, the story etc.) that we can see and touch; rather, it is also that which cannot be spoken, captured or traced with any absolute certainty. Though he writes from an admittedly different conceptual location, psychoanalytic theorist Bion (1989) powerfully describes the necessity of looking beyond traditional structures of comprehension: "To limit ourselves to the observation only of what we understand is denying ourselves the raw material

on which present and possibly future wisdom and knowledge might depend" (p 52). Thus, a study of future-oriented literacy practices, including the reading of comics, depends not only on what we know but also, more importantly, on what we do not.

To consider a brief example of reading as an indeterminate practice, let us look at a page from Michael DeForge's *Big Kids* (2016), as shown in Figure 1. Before I even begin considering the narrative, I read these panels as a series of spatial relations. In particular, I may be drawn to the shapes and semiotic gestures on this page that will likely indicate the story to come: the changing representational forms, spatial relations, the protagonist's unfamiliar sense of embodiment, the fact that the colour scheme shifts quite radically mid-page etc.

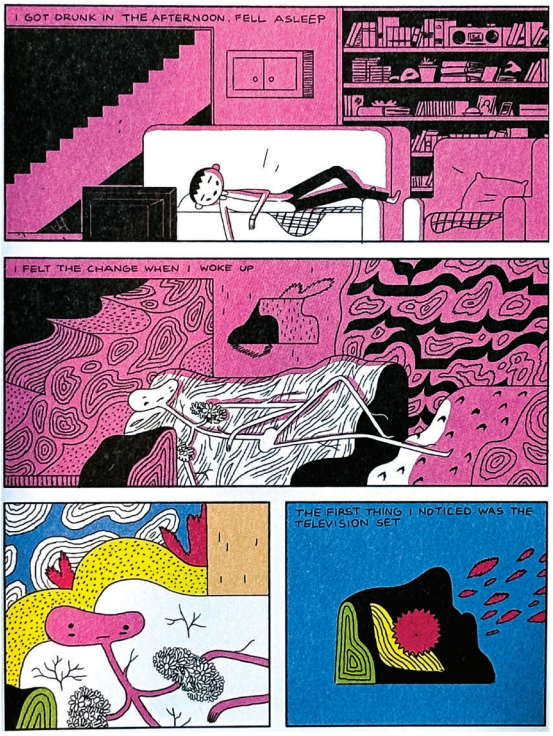

Figure 1: Unfamiliar embodiment in *Big Kids*

As a reader, even if I am trying to read the narrative in a logical, linear fashion, I cannot unsee what I have already seen, and my quick reading of the page as a whole will inevitably inform the more detailed reading to follow even though my conscious mind is not necessarily focused on the specific details of the comic. This is only a brief example, but we can already see how literacy and numeracy (in this case, spatial relations), and qualitative and quantitative understandings and impressions, are inevitably intertwined on the comics page. This subsequently affects the broader experience of reading. Therefore, ways of being and becoming subjects of literacy that may have been once considered peripheral, oppositional or unnecessary are now regarded as potential sites of individual and collective meaning-making. It is in this context that I will discuss considerations of numeracy in relation to comics art.

Comics and reading

But first, I will briefly consider the question: what *is* a comic? McCloud (1993) describes the form as "Juxtaposed pictorial and other images in deliberate sequence, intended to convey information and/or to produce an aesthetic response in the viewer" (p 9). Building on this definition, Eisner (2000), who initially employed the term "graphic novel," describes comics most clearly as "sequential art," which means that one image follows another to tell a narrative. Such a definition also usefully distinguishes comics from other artistic creations (like drawing and painting), which are typically more static in nature, involving isolated, standalone images. For Eisner (2000), then, comics are "an 'art of communication' more than simply an application" (p 6). Thus, at its most fundamental, sequential art deploys images in a recognizable order for the purposes of storytelling or sharing information.

Of course, there are many other ways we can define comics, and turning specifically to such concepts as time and space (which both appear to bridge the qualitative and the quantitative), Groensteen (2007), another influential comics theorist, describes comics as a language while also noting "the relational play of a plurality of interdependent images [as its] unique ontological foundation" (p 17). Just as language builds words and meaning from isolated letters, sounds and phonemes, the language of comics arranges isolated images in particular ways to communicate meaning. As a relational practice, comics are therefore not only an "art of fragments, of scattering, [and] of distribution," but also "of conjunction, of repetition, [and] linking together" (p 22). In essence, in this view, comics as an art form involves separate representations coming together with the intent and effect of telling a unified story.

However, in telling this story, several (often unspoken) rules are set, determining the reader's experience. Thinking back to the example from *Big Kids* (see Figure 1), the page is divided into a series of different boxes. These boxes are referred to as panels, which are generally understood to represent a frozen moment in time (though as we will see in what follows, such frozen moments are not the entire story). What we can say, however, is that time is represented spatially in comics, which also implies, as McCloud (1993) writes, that "in the world of comics, time and space are one and the same" (p 100). It is also usually taken for granted that the reader (at least in the western tradition) approaches the page much as they would a regular words-based text, moving from left to right and from top to bottom. However, comics narratives do not necessarily move in this way, and the author may play with the reader's expectations of spatial logic to tell a story that makes a different kind of sense. Importantly, we should also recognize that since comics always involve a confluence of modalities and ways of reading, they can "mean in multiple ways simultaneously" (Cates 2010, 102). Thus, the reader's approach to the comics page can never be predetermined. Even from moment to moment, a single reader will read differently and for different reasons.

In the text, most comics readers will also recognize different forms of thought bubbles and speech balloons. Their different shapes subsequently indicate different qualities of expression and different meaning-potentials. Words may be sung in chorus, yelled or whispered, spoken simultaneously by multiple characters, spoken from a distance or close up, while others may indicate internal dialogues. However, the number of things that appear on the comics page that characters themselves are not able to see are especially important as these are meant instead as indications and information for the reader. This is a significant difference between comics and film: from words on the page, to motion lines, to emanata (which are lines and squiggles that resemble motion lines but actually describe a character's emotional state), the reader is expected to think about all these elements together and simultaneously. Even the borders of panels communicate tone and temporality, where, for instance, squiggly, rounded edges may be used to describe a shift to memories and dreams.

Figure 2 shows an image from Chris Ware's *Building Stories* (2012). In this example, space is clearly used to represent time, and considering this artist's insistent use of repetition, droning, persistent noises and slow, heavy movements, the tone of this piece appears controlled, deliberate and collected. In emotional terms, with so many panels where nothing actually seems to happen, time appears to stand still; instead, the images elicit feelings such as boredom, sadness and fatigue. Indeed, as one commentator has remarked about Ware's style, "time moves sluggishly, and displays its sluggishness" (Samson, cited in Groensteen 2013, 155). The author's use of repetition—of colour, movement and image—lends the page a note of predictability, precisely measured. A reader's experience of reading will always be predetermined by their initial encounter with the text, which may rely on their knowledge of numeracy to condition their overall reading experience.

Figure 2: The tone of time in *Building Stories*

What is numeracy?

To clarify what numeracy means and why it matters at all in relation to comics art, especially in the context of teaching and learning, it is important

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to define it. As described in numerous policy documents in Alberta, where I teach, numeracy is defined as "the ability, confidence and willingness to engage with quantitative or spatial information to make informed decisions in all aspects of daily living" (Alberta Education n.d.b). If we look at the corresponding definition for literacy, the main difference between these concepts should be immediately clear. Literacy is defined as "the ability, confidence and willingness to engage with language to acquire, construct and communicate meaning in all aspects of daily living" (Alberta Education n.d.a). Taken together, numeracy involves quantitative and spatial information in the exact same way that literacy involves language. However, it needs to be emphasized that though they are both foundational and necessary concepts, "the underpinnings of literacy and numeracy are [fundamentally] different" (Alberta Education n.d.b).

Put simply, the conceptual foundation of numeracy is mathematics, while the conceptual foundation for literacy is language. As these curriculum documents further emphasize, since we exist "in a data-driven society ... [it] is critical that our students be *both* literate and numerate" (Alberta Education n.d.b). With respect to the relationship between these concepts, we may also note that neither definition actually suggests a set of precise skills or knowledge, but rather an "ability, confidence and willingness." (Alberta Education n.d.a). This appears to stress the importance of using knowledge in various contexts, rather than just possessing such knowledge in abstract or academic terms. To further clarify our understanding of numeracy, we can characterize *quantitative information* as anything that can be measured or indicated in terms of an amount, a quantity or a number, and *spatial information* as that which relates to the material location of, and relationships between, objects, people and places.

Given this focus on measurement and spatial relations, numeracy fits into a discipline such as mathematics, although it is also important to recognize that numeracy and math are not the same thing even if they both draw from the same body of knowledge: "School mathematics begins with the study of numbers, patterns, shape, space, statistics and probability and becomes increasingly abstract as students move up in grades" (Alberta Education n.d.b). Since numeracy emphasizes the importance of context, it involves using mathematical knowledge and understanding with the intent of making informed and personally suitable decisions. The need to think in terms of numeracy—in terms of measurement, amounts and the physical relationships between objects and people—can arise at any moment, in any kind of situation. Therefore, the study of numeracy could potentially apply across the curriculum, from physical education, music, social studies, to English language arts.

Comics and architectural space

As an example of the interdisciplinary nature of numeracy, we may begin by considering how the language arts classroom often involves the study of literary elements and poetic devices (metaphor, imagery, alliteration, irony, repetition etc), not only as stylistic curiosities (though they are that as well) but rather as things that the author does to elicit particular emotional, affective and even cognitive responses in readers. For instance, consider this line from Edgar Allan Poe's "The Raven" (1845): "While I nodded, nearly napping, suddenly there came a tapping" (line 3). We may ask ourselves and our students, What kind of tone or mood is elicited by the author's use of alliteration? In reading comics with a numeracy mindset, we might similarly inquire about how mathematical concepts (or what we might call numerary devices or elements, like shapes, angles, spaces, measurements, distances, time, weight, size etc) may contribute to different meanings and meaning-potentials.

If we look at the example from *Building Stories* again (see Figure 2) and focus only on the spatial organization of the page, the organization of the panels in highly deliberate, grid-like fashion, we could qualify the mood elicited by the author's use of space as prison-like, carceral, inescapable and dysphoric. Thus, the grid itself, or the spatial structure of the page, "contributes significantly

to the meaning within" (Sousanis 2015a). While this connection is hardly surprising, it points to the potential overlap between comics and a field like architecture. Indeed, just as we consider the spatial arrangement of the comics page, we may also ask ourselves about the modes and models of living suggested by architectural structures. For instance, what kind of attitude towards learning does the University of Pittsburgh's "Cathedral of Learning" suggest?[1] Or, if we consider the examples of brutalist-styled libraries in San Diego and Toronto, what is being said about the relations of readers, reading and objects such as books?[2] Undoubtedly, it is also quite difficult to look at a building like Boston City Hall and not think of words like defense, fortress and grid.[3]

Considering the architectural structure of comics, we may think about the following questions: What kinds of values, feelings and experiences are suggested by an artist's organization of buildings and spaces? How do the larger organizational grids on the page prepare the reader for the experience of reading the contents of the panel? What kinds of numeracy devices do we see at work? How are shapes, angles, size and distance being used to communicate the uses that humans make of the cities they live in? Or perhaps, we can also ask about what these comics communicate, in terms of numeracy, regarding the uses that cities make of the humans who live in them? Most importantly, we may inquire, how can we use numeracy to better understand the values and experiences that are made conspicuous by comics?

Discussing the relationship between comics, measurement and architecture, Sousanis (2015a) writes, "In comics, not only are we concerned with what goes on in each frame or panel, but we also need to attend to the size and shape of individual panels, their orientation, and their placement within the overall composition and relationship to other elements of the page. Additionally," he continues, "we might also find intentional use of empty space as well as elements in the liminal space between panels and across panels" (para 3). In other words, just as architecture privileges certain modes of life and living and effectively reduces others to a state of non-existence, when reading comics, we concern ourselves not only with what we see but also with what we do not. As readers, it is thus important to question these spaces and use a critical lens to consider what is not being included and measured, what must surely lie outside the frame. Most importantly, it is necessary to ask why something has been excluded. To address these questions in comics, we need to reflect not only on the meanings that are often associated with literacy and literature but also on those that are more closely related to the fields of mathematical knowledge and numeracy.

Comics and the study of perspective and angles

A slight shift in perspective can emphasize certain relations and characters while diminishing others. For example, readers of all levels could be asked to study the use of mathematical angles in comics, and to subsequently question how their reactions change depending on the angles that authors employ. For instance, in the panel in Figure 3, from the opening page of Seth's *Clyde Fans* (2000), the relation of the city skyline to the reader (or from the point-of-view of an observing character) is somewhere between 45 and 90 degrees. As a low angle shot, this perspective makes the buildings and the night sky appear to loom over the reader, expressing a mood of power, dominance and fortitude. In general, the more the artist pushes such an angle to an extreme, the more exaggerated is this effect of intimidation and power. In this case, we might therefore consider how our reactions as readers would change if the angle was brought closer to zero degrees, making our view of these buildings more level and neutral.

Figure 3: The city's imposing skyline in *Clyde Fans*

In Figure 4, a page from Nick Drnaso's *Sabrina* (2018), a high angle shot reverses the point-of-view of the reader's gaze, so the character in this scene appears vastly diminished, as the reader literally has to look down on them. As the angle used travels below the horizontal or x-axis, the character appears smaller and more vulnerable, which also may prompt the reader to feel emotional discomfort and unease. In cases such as this, the strategic use of perspective and angles creates subtle insinuations about who is submissive or passive in a scene. Even with only a slight angle variation, the reader's reactions can shift, from a neutral reaction to—perhaps—one of fear, menace, pity and foreboding. Even a shift from zero to ten degrees either way may change how the reader interprets the relationships of power within a scene.

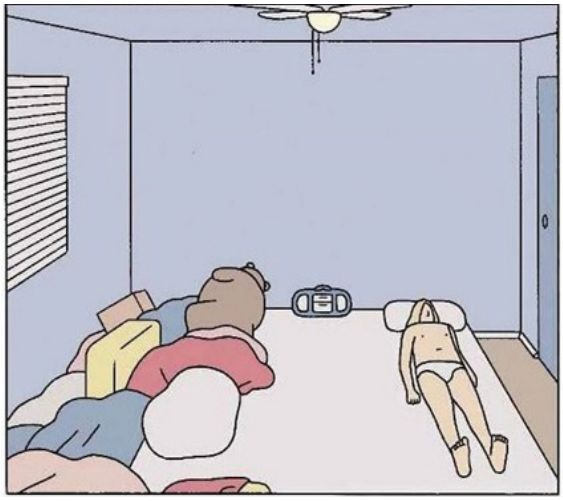

Figure 4: Emotional discomfort in *Sabrina*

Using such methods of numeracy, Connors (2012) describes the use of perspective in comics art as "the position from which an audience is made to view an image, [and] a resource [that] artists use to establish an imaginary relationship between a viewer and the subjects represented" (p 79). Using the graphic novel, *I Kill Giants* (2009), as his mentor text, Connors explores the author's use of angles to create various powerful moods and atmospheres. Apart from angles, Connors also notes how basic shapes (like circles, triangles and squares) play an important role in contributing to the reader's sense of emotional stability or instability. While circles, for instance, often suggest such feelings as comfort and protection, triangles are more likely to appear in scenes with dynamic action, tension and conflict. Squares, on the other hand, may be used to indicate notions of stability, integrity, orthodoxy and conformity. Such sensations, Serafini (2014) notes, are also typically strengthened by using comparative size, prompting readers to think in terms of composition and relation, and how the size, scale and weight of a particular object or character relates to the size, scale and weight of other characters or objects in the scene. In this regard, it seems that when we discuss such concepts as scale and weight, the point is not to clarify the actual weight of an object, but rather to conceptualize weight as a kind of comparative measure that inevitably directs the reader's attention. As with the effects of quantitative measures in general, numeracy as a reading practice never works alone. It always involves a qualitative understanding of the meanings that numerical contents and relations bring to the reading experience.

Comics and the study of time

Teachers are urged to incorporate practices of numeracy in several ways, including encouraging students to understand and manage relationships of temporality and time (Alberta Education n.d.b). In the context of this paper, I will therefore consider how comics can be used to measure and represent the passage of time. We should, once more, make note of the fact that as we read the comics page, we encounter multiple moments of temporal pause and recursivity, and we hardly ever read panels in a purely linear and rhythmically predictive way. "Comics," Sousanis (2015b) writes, "hold sequential and simultaneous modes in electric tension," as "meaning ... is braided together from all the assembled interconnected elements on the page" (Sousanis 2015a, 63). Indeed, given the physically static nature of the printed page, all moments of time may be said to occur simultaneously even though the passage of time may be represented across a series of different panels.

As we read comics, we occupy the unique position of being able to interpret time; even though authors can do certain things to affect our perception of time passing—changing the shape of the panel to indicate a long pause, adding consecutive panels, adding motion lines or letting their art extend to the very edge of the page in what is called

a "bleed," indicating a quality of timelessness—it is still the reader's privilege to determine how time is actually passing. As Groensteen (2013) notes, "In the final analysis, the author proposes but the reader disposes. It is the latter who animates, identifies, punctuates, and brings to life the story in his/her own way" (p 151). Given the primacy of a reader's interpretive acts, I can certainly imagine students being asked to theorize the passage of time across a chapter or even a single page, and then, to defend their theories with reference to the author's artistic choices.

Another way that time is apparent in comics is through the rhythms of reading. Again, such rhythms are never simply a matter of objective measurement but refer instead to the reader's felt impressions of tempo, time and beat. "When the layout is regular," as Groensteen (2013) emphasizes, "so is the beat" (p 138), which refers to the structure of comics that operate according to what is known as the "waffle-iron" grid, such as the example in Figure 5 from Drnaso's *Sabrina* (2018). As this grid affects the meaning of its content, "progression from one panel to the next is smoothed out in compliance with an immutable cadence" (p 138). Such predictable and uniformly organized panels allow readers to enter the process of reading without any fear of confusion. In other cases, however, confusion seems to be intentional, as time and space may be presented and perceived as discontinuous and complex, wherein the rhythms of reading are not immediately predictable. This then adds to the reader's feeling of uncertainty regarding the narrative's temporal qualities. As before, we can pose the question: In terms of narrative and time, how does the author's organizational use of space affect our reading experience?

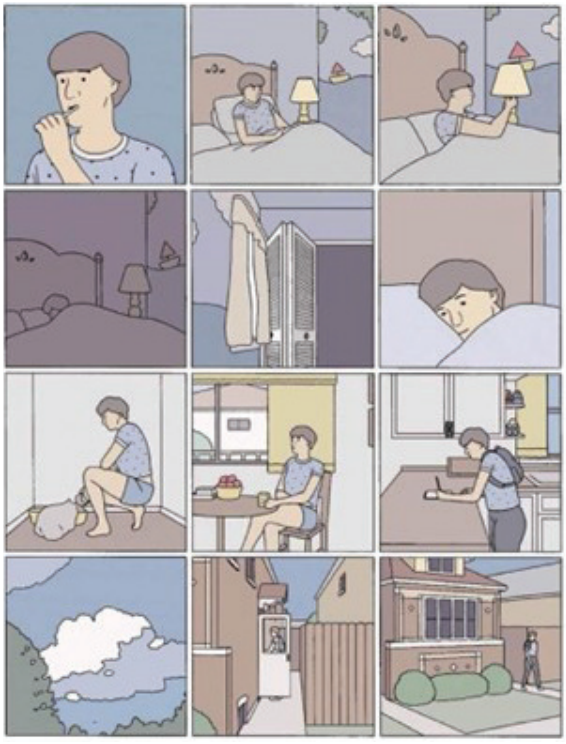

Figure 5: The "waffle-iron" grid in *Sabrina*

Comics and the logic of mapping

Several writers in the field of contemporary geography have suggested that comics and graphic novels "can be used to develop students' geographical competencies" (Peterle 2015, 69) by examining the author's use of a grid. Given their structure as visual texts, comics remain ideal sites through which to consider the relation between cartographical reality (or reality as represented on a map) and lived reality, to which the map (at least in theory) refers. Michel de Certeau (1984), suggesting that narratives can supersede the often artificial divisions in maps, remarked that "What the map cuts up, the story cuts across" (p 129). Given this distinction between the map and story, it may be helpful to consider that comics contain and relate to both. How, we might therefore ask, is the story conditioned by a logic of mapping. Furthermore, how does the map relate to the story? While comics are quite "literally a map of time" (Raeburn, cited in Dittmer 2010, 222), what is most intriguing about these maps is that their narratives are constructed both by what is on and off the page. As Dittmer (p 201) writes, comics involve "the interplay of what is on the page," which he calls *the visual*, with "what is not" (p 228), which he titles the *anti-optical*. For students, this anti-optical element is an especially crucial feature since it suggests that reality is constructed not only by what we can map, measure and catalogue but also by so much more, including stories, desires and everything that readers bring to the comics page. "Simply put," Dittmer tells us, "comic book visualities open [readers] up to uncertainty, tangentiality and contingency by picking apart the linear montage of film ... and replacing this linearity with the more open comic page and the multiple paths through its frames—and consequently opening up to its multiple possible narratives" (p 235).

Reading comics as maps allows us to recognize that *all* visual phenomena can only ever offer a partial view of the reality that is depicted. Such a recognition of partiality and incompleteness is even more important for maps that strive to refer to actual lived reality, and the neighbourhoods, cities and countries we live in. In effect, comics tell us that numeracy is a necessary part of studying visual phenomena, cartographical or otherwise, and that the story that numeracy tells is always inevitably incomplete. This incompleteness needs to be addressed by something else; namely, by another kind of reading that pays attention to the situated contexts of readers' lives.

Conclusion: Reading for the possibility of revision

To reiterate the implications of the understanding of numeracy that have been used to guide this paper—concerned with an "ability, confidence, and willingness to engage with quantitative or spatial information to make informed decisions in all aspects of daily living" (Alberta Education n.d.b)—any meaningful and integrative study of numeracy needs to relate to life in the classroom, as well as to life outside. In regards to the reading experience, we may think of this relationship as follows: How we teach our students to read is also a reflection of how we teach our students to live. By emphasizing the fact that texts contain multiple meanings and meaning-potentials, we allow readers to likewise consider that interpretations of social life are always subject to revisions because they are concerned with perception and context. As Dittmer and Latham (2015) express this possibility in relation to the study of space and time, "the production of new spacings (and therefore meanings) is dependent on our ability to shake free from entrenched patterns of thought and to engage in new routines of thinking about these spaces" (p 442). Thus, by learning to read differently, and from a different perspective, we may also be learning to include new forms of thinking in our living, including the likelihood that our understanding of any space, textual or otherwise, will be limited, flawed and inevitably incomplete. As an interpretive principle for literacy education, this suggestion of an impossibility of expertise may allow readers to think and read beyond the limits of what may appear to be comfortable and secure. In brief, untethering readers from the fetters of disciplinary security may eventually lead them to learn to notice that there is always another way to read.

Notes

1. https://www.tour.pitt.edu/tour/cathedral-learning

2. https://archeyes.com/geisel-library-william-pereira-associates/; https://www.acotoronto.ca/building.php?ID=1604

3. https://architectuul.com/architecture/boston-city-hall

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ABOUT THE AUTHOR

David Lewkowich *is an associate professor in the Faculty of Education at the University of Alberta, teaching in the area of literacy education. His research interests include psychoanalytic theories of teaching and learning, representations of teachers in comics and graphic novels and autobiographical inquiry.*