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Teaching and Learning in a Web 2.0 Environment: Three Case Studies

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In this paper we offer an analysis of Web 2.0 affordances based on three case studies of using Web 2.0 tools in three distinct settings: in teaching mathematics for elementary preservice teachers, in a Masters of Education graduate course, and in a poetry mentoring project that brought preservice teachers in Canada together with elementary students in Tanzania. Our analysis focuses on two Web 2.0 affordances: collaborative knowledge construction and multimodal communication.

Keywords: Web 2.0, collaborative knowledge construction, multimodality, online learning

INTRODUCTION

The Web 2.0 paradigm views a website not as a static read-only page but as a dynamic read/write environment (such as a wiki) where users interact and co-generate content and experiences. In addition, with the steady growth of bandwidth, the mode of Web 2.0 interaction and the content generated are increasingly multimodal. In this paper we analyze our online teaching experiences while using Idea Construction Zone (ICZ), an eLearning platform which offers two Web 2.0 affordances: collaborative knowledge construction and multimodal communication. We offer three cases of using ICZ in three distinct, fully online settings: in teaching mathematics for elementary preservice teachers, in Masters of Education courses, and in a poetry mentoring project that brought preservice teachers in Canada together with elementary students in Tanzania.

We see ourselves in a state of transition, moving away from text-based, content-oriented online courses and towards multimodal and collaborative knowledge construction environments. Our goal in this paper is to use our experiences as a basis for

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developing an emergent conceptualization of teaching and learning in Web 2.0 environments.

CONTEXT

We teach at faculties of education that have embraced technology and online learning. The Faculty of Education at the University of Western Ontario has approximately 5000 fully-online students in its Continuing Teacher Education Program, an online Masters of Education Program, and instructors use online learning to augment its Preservice Teacher Education Program. The University of Ontario Institute of Technology is a laptop university, where ICT use is ubiquitous, and all classrooms and common work areas are outfitted with both wired and wireless access. However, despite this technological immersion, both universities primarily use Web 1.0 online learning platforms. In this context, ICZ was developed by the first author as a way of pushing the boundaries of what might be incorporated in an online learning environment. ICZ supports collaborative knowledge construction through peer editable postings (where a user chooses to make a posting editable by others) and synthesis postings (where multiple postings may be selected, combined and edited into a single posting, with the original authors credited). ICZ also supports multimodal communication through rich text postings, the embedding of multimedia within postings (such as, drawings using the ICZ draw tool, audio recordings, videos using a webcam, as well as images and Flash shockwave files), as well as hyperlinking. Although ICZ was used in all three cases that we present in this paper, our research focus and research claims are not about ICZ, but rather about two Web 2.0 affordances: collaborative knowledge building and multimodal communication.

COLLABORATIVE KNOWLEDGE CONSTRUCTION

Web 2.0 environments (like wikis) entrust their users as co-authors or co-developers and tap into their collective intelligence. Such environments fit within the social constructivist paradigm which views the building of new knowledge as a social and as a collaborative activity. How is knowledge constructed socially? Scardamalia and Bereiter (1994) note that socially constructed knowledge requires intention. Scardamalia (2002) suggests that without an intentional goal of new learning or the creation of new knowledge, a collaborative environment fosters ‘shallow constructivism’, where the focus shifts to activity rather than knowledge building. Wenger (1998, 2000, 2007) has coined the phrase ‘communities of practice’, which he defines as “groups of people who share a concern or a passion for something they do and learn to do it better as they interact regularly.” Unlike Scardamalia and Bereiter, Wenger notes that “this definition allows for, but does not assume, intentionality: learning can be the reason the community comes together or an incidental outcome of members’ interactions.” Levy (1997) suggests that technology itself is an actor in the collaborative process. Levy sees technology not simply as a tool used for human intentions, but rather as an integral component of the cognitive ecology that forms when humans collaborate in a technology immersive environment. Borba and Villareal (2005) add that humans-with-media form a collective where new media also serve to disrupt and reorganize human thinking.

Working in educational settings, we appreciate the value of a group of students being intentional in their learning. However, we also know from experience that intentions change and evolve as a result of the cognitive ecology of the group and that sometimes initial intentions change in ways that cannot be predetermined or anticipated. That is, a

group of students might start working together based on a certain goal that becomes transformed through their interactions and learning and becomes a different goal. We also have experienced first hand the disruption and reorganization of our thinking as we have used and *thought with* technology. For example, using a wiki in our online teaching is a very different experience than using WebCT. Using a wiki does not only disrupt and reorganize our thinking about how we organize online 'discussion'; it also becomes *a tool to think with* about other aspects of our online teaching such as our course content, our evaluation practices, our roles as instructors, and generally what constitutes knowledge and how it is or should be created in an online environment.

MULTIMODAL COMMUNICATION

In contrast to the increasingly multimodal nature of the Web, many school experiences, especially in such subjects as mathematics and language arts, continue to rely on discourses that are monomodal or bimodal (in cases where diagrams or graphs are employed). Kress and van Leeuwen (2001) suggest that in a digital environment "meaning is made in many different ways, always, in the many different modes and media which are co-present in a communicational ensemble" (p. 111). Hughes (2008) suggests that the Web is also becoming a "performative medium". This is evident in the multimedia authoring tools used to create online content, such as Flash, which often use performance metaphors in their programming environment. For example, you program on what is referred to as the "stage", you use "scenes" to organize "actors" or "objects" and their relationships, and you control the performance using "scripts". The Web as a performative medium is also evident in the success of portals like YouTube. Hughes suggests that the new media that is infusing the Web draws us into performative relationships with and representations of our "content". To use new media is to in part adopt a performative paradigm.

The shift from text-based communication to multimodal communication is not simply a quantitative change. It is not just a case of having more communication modes. We see it as a qualitative shift, analogous to the change that occurred when we moved from an oral to a print culture. We also believe that our understanding of what this change implies is emergent and not fully conceptualized or articulated.

AN ANALYSIS OF WEB 2.0 AFFORDANCES BASED ON THREE CASE STUDIES

Below we analyze and discuss (a) the collaborative knowledge construction, and (b) multimodal affordances of Web 2.0 tools through data collected from three cases of teaching and learning in ICZ. Each of these cases was a separate research project and data was collected with permission from the participants. For each of the cases a content analysis was conducted of the online discussion content (Berg, 2004) (for the students who agreed to participate in the study) and themes were identified. As the data was in electronic form, representative online discussion statements were copied and pasted into a new document, under each of the themes identified. Some statements contained hybrid ideas and were included in more than one category. In the second stage of the content analysis, the online discussion content was analyzed once more with the final set of categories, to verify the integrity of the data organized under each category. Then, descriptive statements were added to each category, to capture the essence of the themes identified. As the content analysis progressed, the themes that emerged were organized under global categories. For this paper we focus our attention on themes that relate to

collaborative knowledge construction and multimodal communication, and we organize our discussion of data from the three case studies using these two themes.

COLLABORATIVE KNOWLEDGE CONSTRUCTION

CASE 1: MATHEMATICS-FOR-TEACHERS

The mathematics-for-teachers course facilitated collaborative knowledge building in two ways. First, online activity and discussion was problem-based rather than content-based (Gadanidis, 2005). Each course module started with a mathematics problem being posed rather than a content to be read, practiced and mastered. As discussion progressed, content was added as needed by the instructor and by the preservice teachers to shed light on mathematical relationships. This problem-solving approach helped preservice teachers feel more comfortable engaging with mathematics, a subject that many of them tended to fear and avoid. As one preservice teacher commented, “By using activities such as the Fermi questions, math becomes less rigid and restrictive. It becomes a subject to explore. It also becomes comfortable. If you are not filled with anxiety about getting the "right" answer, you become free to enjoy and embrace the concepts. We need Fermi questions, oh yes, we do!”

Second, the online course made extensive use of wiki-postings (in discussing specific concepts, problems and questions, as well as in the final projects presented by the preservice teachers) and synthesis postings (which preservice teachers used to identify and discuss themes they noticed in each of the modules). Preservice teachers were initially hesitant to edit the ideas of others when using a wiki or a synthesis posting. There was both a sense that it might be “rude” to change someone else’s text and a sense of tension or loss at the idea that someone else might edit their own text. As the course progressed, they became more comfortable using wiki and synthesis postings; however there remained a sense of apprehension about violating the sanctity of others’ texts. One strategy that helped ease preservice teachers’ hesitation was that postings to be edited were posted twice, one version of which was not editable and thus offered an enduring and a readily available representation of the original work. Also, when editing one another’s work, preservice teachers used text color and their initials to indicate where changes were made and the identity of the editor.

A persistent theme in the comments shared by preservice teachers was their new appreciation of the benefits of the collaborative learning they experienced in the course. The two comments below are typical of the views expressed by the preservice teachers.

> If I were given this assignment to complete on my own I wouldn't have learned so much! Reading everyone's experiences, ideas, websites, etc. really enhanced how much I was able to get out of this module. I think this demonstrates how important it is to collaborate with ideas, and share experiences.

> The most important thing I learned so far is how important is to share ideas/experience with others! In this course, I thought I would learn from ONE professor, but instead of one, I learned from many.

What caused preservice teachers to experience this course as a collaborative space? Was it the open-ended problem situations, or the role of the instructor, or the collaborative affordances of a wiki environment? Although it is difficult to identify a single, most important factor, it is fair to say that all factors complemented one another in supporting a collaborative learning environment.

CASE 2: ONLINE MASTER'S OF EDUCATION COURSES

Although the graduate classes under study were different – one was titled "Narrative Inquiry", and the other was titled "Place as Curriculum", both classes started with an assignment to write a poem, and furthermore, to "play with" and "edit" these poems in the first week of class. The complete assignment was to write a poem from the model offered by Ella Lyon in her poem "Where I'm From".

The students enjoyed the writing assignment, despite their resistance to poetry ("I haven't written a poem since grade 7"). Even though the editing process was not fully engaged, the students were delighted with their efforts to comment on each others' poems and to receive comments on theirs. The rules were simple. We used different colors to identify ourselves, but also included our names at the end of each line we contributed. All the editing tools (strike through, delete and change) were available to us. The original poem or paragraph, however, remained intact at the top of the posting, and could be contrasted with the edits. Their ability to edit each others' poems was limited. They found it difficult to actually change a word in another student's poem. Student B wrote:

> I find it a difficult task to make suggestions to A's poem. Without a personal connection to the author's experience through dialogue, photos or some shared knowledge, how can I change the words without changing the harmony of her experience, emotion or vision?

This student's use of the word *harmony* is interesting. Does B believe an individual's experience comes packaged with a given set of words in a given order? B's underlying assumptions might be that *one's writing is personal, and is connected to voice and individual expression*. But even if B is correct and the poem has one *true* expression, it would be interesting to see how the poem itself, as an artifact in the world, or as other (call them *false)* expressions, could change when changes are made to the words and order. Student C wrote:

> Interesting that you bring up the point about editing/evaluating peers versus evaluating students. I teach online courses for a university and I still have reservations about "editing" and evaluating those who are essentially my peers. It definitely helps that I can hide behind my computer screen!

Student C makes a distinction between editing and evaluating but sees both as difficult. C makes the distinction between the students who are her age (and so are her peers), and between the students and herself as an instructor. It's interesting that she sees the peer relationship as just as problematic as the power imbalance between instructor and student. Her comments demonstrate a resistance to comment on the work of one's peers, an area that has traditionally been the work of the instructor.

The student comments show something of the gap an instructor must help her students bridge if wiki technology is to be used to the fullest. Below are two examples of poems shared and edited.

#1. Where I'm From, by Student D

I am from garlic,
from dishrags and dish-pan-hands.
I am from ~~endless~~ jars of tomato sauce
we are the loud voices
that are actually happy.

I am from ~~these~~ people--
blessed with the vine--
glowing like a perfectly ripe tomato.

#2. Poem, by Student E

I'm from ~~grease used on~~ machinery grease. *what do you think? it's maybe a bit more direct?*
Sounds of tractors hum in dust clouds.
potatoes are burning *very good -- very tangible smell !*
dishes are banging
Endless fields isolate. *how do they isolate? is somebody in the tractor cab?*
Too hot! The well is dry again *such a real problem isn't it.*
smells of hay and straw
I'm from tobogganing with frost bite.
searching for baby mice *great detail*

The reader will notice that the changes in poem #1 – two words removed – are minute and at an almost mundane level. In the poem #2, the peer rearranged the first line, and added a number of "reader response" type of comments. Most of the peer comments on poems were at the level of content (Students typically wrote such things as*: I love the memories and emotions you evoke. I also fondly remember the Pop Shoppe bottles. Cream soda was my favorite*.)

Another critiquing task in the narrative course involved students submitting a paragraph from an early draft of their final papers. They were to choose one small paragraph that they felt worked and contributed (or would contribute) to the final paper. The idea was to encourage their peers to describe what they understood, saw and felt as they read the paragraph, and to generate ideas, and, where possible, to suggest alternate phrasing or words. To demonstrate the resistance to this idea, we provide not the student assignments, but, rather, the students' silent resistance implied in the instructor's comments to convince them otherwise. The assignment originally appeared as follows:

> The plan is to spend week 8, October 30, to offer editorial suggestions in honing a piece of "life writing" (memoir, autobiography etc.) Some of you have already submitted small pieces of such text, and this will be your opportunity to provide specific, direct, supportive feedback using all the features of wiki that we have available to us. The goal is to become aware of language styles and effects in our life writing, as directed by Dillard, Robertson and Morrison – the week's readings. It's also an opportunity to get feedback regarding the "critical context" in which you are placing your life writing.

A deep textual silence ensued. The instructor responded with:

> Remember to use this week to *try out* a piece of writing that you might possibly include in your paper. Student A, for instance, might provide one of the stories from her teacher interviews, and give us an idea of the questions that she might ask, or the critical framework in which she might place these stories. For instance, the paper might (eventually) be a discussion of the ways these stories could be taken up as narrative research (i.e. what does Krall say, what does Buss say, etc) and what would this contribute to a larger understanding of teacher mentoring. How or why is it important to include these stories? As a researcher

> soliciting such stories, what do you need to pay attention to (here you can include many aspects of this week's readings)....

The students, however, continued to submit proposals, i.e. outlines of the main thrusts of their projects. The instructor responded with a reminder:

> You don't need to submit a proposal. The idea is to look at something small to get a better idea of what you actually have in terms of narrative and how it might be improved, enhanced.

In reviewing these online classes, there emerges an awareness of the importance of making experience (in this case, the act of writing) tangibly real. All writing is composed of the materials of nouns, verbs, phrases, point of view, tone, diction, and so on. The first step is to realize that the materiality of language can be manipulated; indeed, that it invites play. Halliday (2006) says that such pedagogy "provides an aesthetic orientation to the products and processes of written composition…embraces development [and] is anti-didactic" (p.30). This sense of development of writing skill is something we value in drama education, when we teach students to begin examination of any artifact or content by asking two questions. The first is *what do we know*, i.e. what is observable, and second, *what do we want to know*. It seems that at the graduate level we too quickly jump to the second question without fully considering the *what* (the text) that is in front of us.

The second author is often asked why she uses poetry in her learning environments. Her many years' work as a teaching-poet (Hoogland, 2005, in press) reveals that learning to write scholarly papers has many similarities (such as authorial resistance) with other forms of writing such as prose and poetry. In reflecting on this case study, the next syllabus incorporated poetic strategies, along with a few strategies for slowing down the process and thereby minimizing the students' risk. Students must be given the opportunity to talk about making changes toward a more democratic classroom – if they aren't comfortable in talking about it, the change will not happen.

Here are four preparatory exercises for students to practice employing a writer's gaze, within groups of no more than three people. The first has to do with word play in which the students are given just the words (not the order) of a published poem for them to create their own poems (invite comment on the variety, choices, to see that the same words can result in such different performances. Second, students are provided with a poem with either nouns or verbs missing[1] (again, a published poem) for the same kind of conversation, but with this difference – student A has a go at it, then student B, then student C. In this way they practice changing each others' text in a predetermined order, without the personal investment in the poem. Again, engage conversation about how it feels to change somebody else's work. Third, students are given a short published poem and are asked to respond to it ONLY in ways that change the poem, and without accompanying explanation. This puts the onus on the writer of the piece to discern why the change was made and how it helps or hinders the intent and meaning of the piece of writing. In this instance, the discussion stems from the changes themselves, rather than from the justifications accompanying the changes, and so the students must try to understand why the others made the changes they did, and how it serves the poem. This tests the strength and soundness of the change, rather than the conviction of the argument.

[1] See Janette Hughes' Poetry Project for a more detailed examination of this strategy and its effects. http://faculty.uoit.ca/hughes/research.htm

Fourth, students engage with writing their own "I Am From" poems. When the poems are written the students work in pairs and practice giving each other either restricted or full permission to make changes – just to see what each feels like – all the while keeping the original version at the top of the same page. Or, students are asked where in the poem they themselves might want to make some changes, and if possible, have a partner suggest changes by actually striking out words and substituting new ones. Note they continue to work in their triads for this first time that they "edit" their own text; this would hopefully enable a more trusting and open conversation. Next, the triads would open up the poems to the whole group. All this by way of encouraging people to not just comment on ideas but also form.

Many if not all methodologies and theoretical approaches to research involve writing. Eventually all students must be willing to hold up their writing for examination to others – even if that other is a sole instructor. The wiki feature of the ICZ environment can make the classroom a more creative, writing-focused, laboratory – a *research site* where work is ongoingly open to revision, restatement, and rethinking by the individual and/or the group. The students can gain skill as writers who understand the materials of their art form, and that their responsibility goes beyond their private investments in their work *to the work itself*. This is the first step, we believe, in gaining the critical distance integral to good research.

CASE 3: POETRY MENTORING PROJECT

The online poetry mentoring project brought together a class of 27 preservice teachers from the University of Ontario Institute of Technology and two classes of approximately 50 grades 4-6 students from an international school in Tanzania, East Africa. In the online mentoring project, we have promoted meaningful dialogue between students and teacher candidates in an attempt to extend student learning and deepen understanding.

The literature on mentoring suggests that productive partnerships are established through the development of trust and understanding and that both mentors and mentees benefit enormously, both academically and socially, from a positive mentoring relationship (Jonson, 2002; Kortman & Honaker, 2002; Lipton & Wellman, 2001, 2003). In addition to the learning benefits for the Grade 4-6 students, we anticipated positive learning outcomes for the teacher candidates as well. It was expected that their experience as mentors would help consolidate the teacher candidates' knowledge and skills as they began to teach, guide, advise, motivate, validate and act as role models for their mentees. They also had opportunities to reflect on their educational philosophy and practice, and experience the kind of personal satisfaction one feels in helping another achieve a goal.

Although the teacher candidates were excited to begin the project, they also approached the venture with a certain amount of trepidation. Only a few of the teacher candidates had some prior experience with "social software". Some of them had read blogs, and a few reported that they had blogged previously. None of them had experience with wikis and they were initially quite tentative. They used words such as uneasy, resistant, unsure, uncomfortable, uncertain, hesitant, nervous, anxious, afraid, vulnerable, and exposed. However, they recognized the importance of understanding how new technologies like wikis are reshaping the social environments of their students and they were "willing" and "eager" to learn more and to begin interacting with their mentees. The teacher candidates were also feeling tentative about the focus on poetry for the project. In their initial reflections on their feelings about poetry and the prospect of teaching poetry earlier in the course, many of them reported negative schooled

experiences with poetry. As students of poetry they felt that it was "challenging, intimidating, boring and limiting" and they were "frustrated" with what they felt was an adherence to "structure, rules, and constraints". They shared stories of having to "endure line-by-line dissection", "endlessly hunting for the 'right' message" and having their creative work "arbitrarily marked". These comments support the existing body of literature around students' resistance to poetry (Andrews, 1991; Benton, 1999, 2000; Pike, 2000) and my decision to centre the mentoring project on poetry was due in part to those comments. It is not surprising, given their own experiences with poetry, that many of the teacher candidates feel anxious about the prospect of teaching poetry themselves. In fact, several teacher candidates expressed concern about it:

> In regards to teaching poetry, I believe my attitude and lack of knowledge of poetry will be the biggest barrier to overcome.
> I already am not confident with my own poetic abilities; I think I would lack confidence in the classroom when teaching the subject.

It made sense, then, to immerse the teacher candidates in poetry and poetry teaching in a multimodal learning environment where they might experience poetry in a new way. The teacher candidates joined me in the desire to ensure that their own students would have a more positive experience with poetry. One teacher candidate wrote, "I know that my own intellectual experiences regarding poetry were generally boring, so I am driven to ensure that my students won't have a similar experience."

Prior to the commencement of the project, when asked to reflect on the pedagogical potential of wikis in the classroom, the majority of the teacher candidates viewed the process of writing in a wiki in very traditional ways. They initially saw it as a transfer of the medium of writing into a digital space as an alternative to pen and paper. Although some commented on the potential of writing for an authentic, extended audience where they could communicate with people across the world without the usual temporal and spatial barriers, some of them viewed the project as an "updated form of penpals". They also initially focused on the wiki postings as writing "products" and expected polished writing and perfect use of conventions ("We should team the steps to spell checking by cutting and pasting into a word document first or have there [sic] wiki posts in a writing program and transfer it to the wiki".) Ironically, this posting, with its own spelling error, was posted in the professional development section they were using for reflection. Although this teacher candidate identified wiki writing as a "non-traditional way of writing" that "will motivate students to write", she imposes a traditional writing philosophy upon it, rather than viewing it as a hybrid form of communication, one that blends oral and written modes and focuses on work in progress.

MULTIMODAL COMMUNICATION

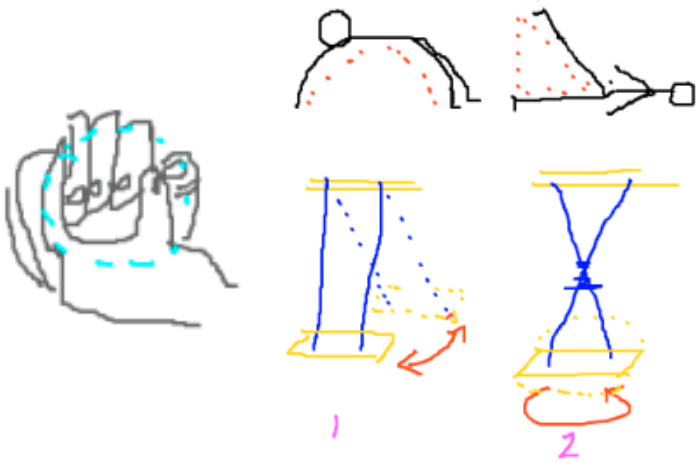
CASE 1: MATHEMATICS-FOR-TEACHERS

The multimodal communication affordances of ICZ made the mathematics-for-teachers course a visually inviting place. For example, preservice teachers used the drawing tool to embed drawings within their postings and to help illustrate their ideas. Figure 1 shows the drawings by three different preservice teachers where they depict hidden or invisible shapes in the world around us.

Does multimodal communication make a difference in an online learning environment? It certainly made a difference for me as an instructor. Each time we enter the ICZ environment and open the postings of students in Case 1, we are drawn to the

drawings they created, the images they embedded, and the way they decorated their writing using the rich text editor. For us, this gives the online course a playful, inviting feel. This is especially important in a mathematics course aimed at teachers who identify themselves as math phobic.

Figure 1. Drawings depicting 'hidden' shapes in our world.



Haney, Russell and Bebell (2004) note that drawings offer a fresh glimpse into students' minds and also help put math phobic students on a more equal footing with an expert mathematics instructor. The visual nature of course postings was noticed by the preservice teachers and this stimulated discussion about the role of drawings and visualizations in mathematics education. One preservice teacher captured the gist of the discussion with this comment:

> In many of our responses, pictures have helped us to explain or clarify our meanings, and we have often used examples that are concrete – things we can see in our imaginations, like city streets or railroad tracks, for example, to illustrate parallel lines. It seems that math as we have been practicing it is easier to communicate with images. Is this because, by some fluke, we're all incredibly visual individuals, or is it because there is a sort of freedom in pictures that allows for better explanation than terminology? Is there more "scope for the (mathematical) imagination" in the visual representations we have been using?

Multimodal communication does make a difference in an online learning environment. And, this difference is not only in terms of having *more* ways of communicating; it is also a qualitative difference in the ideas that are communicated. This is especially true for the activities in the online mathematics-for-teachers course, which focused on ideas (like parallel lines and hidden shapes) that have readily visual and tactile representations.

CASE 2: ONLINE MASTER'S OF EDUCATION COURSES

Case 2 reminds us that just as the canvas and paints are understood as the material of visual art, so is language – its multimodal dimensions and conventions – understood as

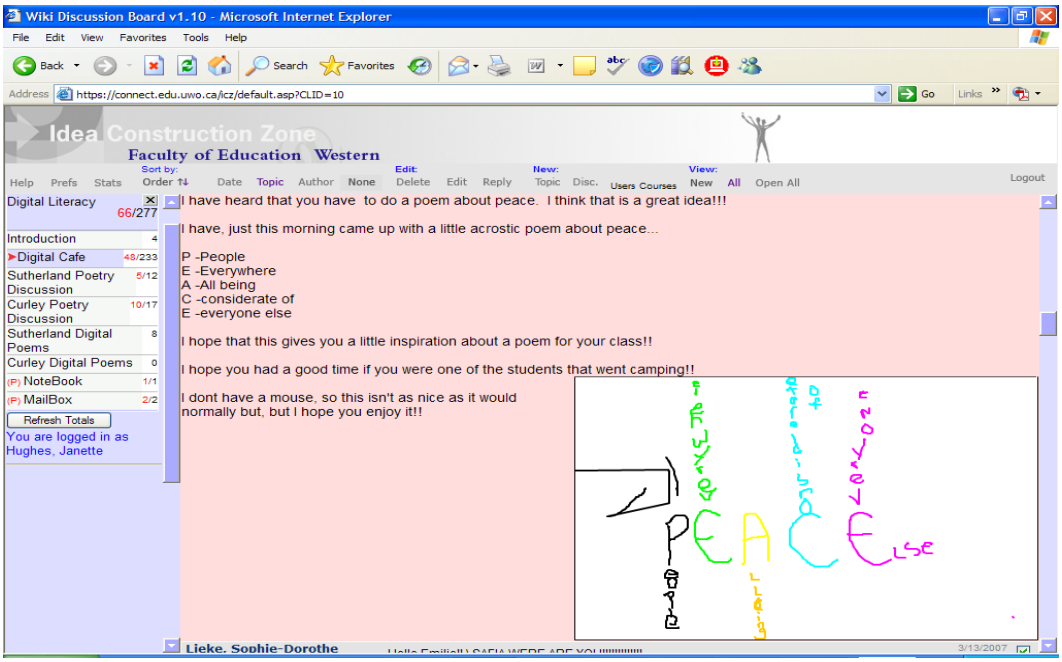
the material of writing. Writerly actions (literary conventions, diction, style, and so forth) on the screen or the page perform in various ways to create various effects. Taking the time and effort to "discern and interpret what is made visible" will serve students in that they will gain skill as readers and interpreters of others' as well as of their own work at levels deeper than that of content alone.

CASE 3: POETRY MENTORING PROJECT

Using Lipton and Wellman's (2003) continuum of the mentoring relationship as a framework, we explore how teacher candidates use the multimodal features of ICZ in their roles as mentors in three key areas: offering support, creating challenge, and facilitating vision.

The Drawing Tool. Many of the teacher candidates used the drawing tool to introduce themselves to their mentee and to begin to establish a relationship with them. A number of them chose to include colorful self-portraits or pictures of nature, snowy landscapes and drawings of snow people. Students in Tanzania responded with drawings of their own which tended to feature flowers, mountains and the sun. They eased into the relationship with casual talk about the weather, living in Canada and Tanzania, where they lived previously (many of the students came from other countries to Tanzania, primarily from Europe), family and respective interests. Although this seems a rather natural way to begin working collaboratively online, it also reflects their intuitive understanding of the social nature of learning. Rather than viewing language and literacy as something we have or don't have, it is viewed as a social practice that is culturally, historically and geographically situated, despite the fact that the wiki allows us to break down special barriers.

Figure 2. How to create an acrostic poem



After introductions and getting to know each other a little better, the teacher candidates began to move into the project goals of reading, writing and discussing poetry. Although some teacher candidates continued to use the drawing tool to add "social drawings" to their wiki posts, most of them began to use the drawing tool in pedagogical ways. This teacher candidate uses the drawing feature to demonstrate how to create an acrostic poem (Figure 2). Because the drawing tool takes practice, and is initially tricky to use neatly, the teacher candidates and the students were learning together. There is something endearing and childlike in the way all the drawings were turning out and there was a lot of joking about the quality of the drawings from teacher candidates and students alike ("Yours is better than mine!"). This level playing field helped to create a safe place for the students because they realized that their mentor was a novice at this game as well. The use of drawings added an element of play to the project that might not have existed without them.

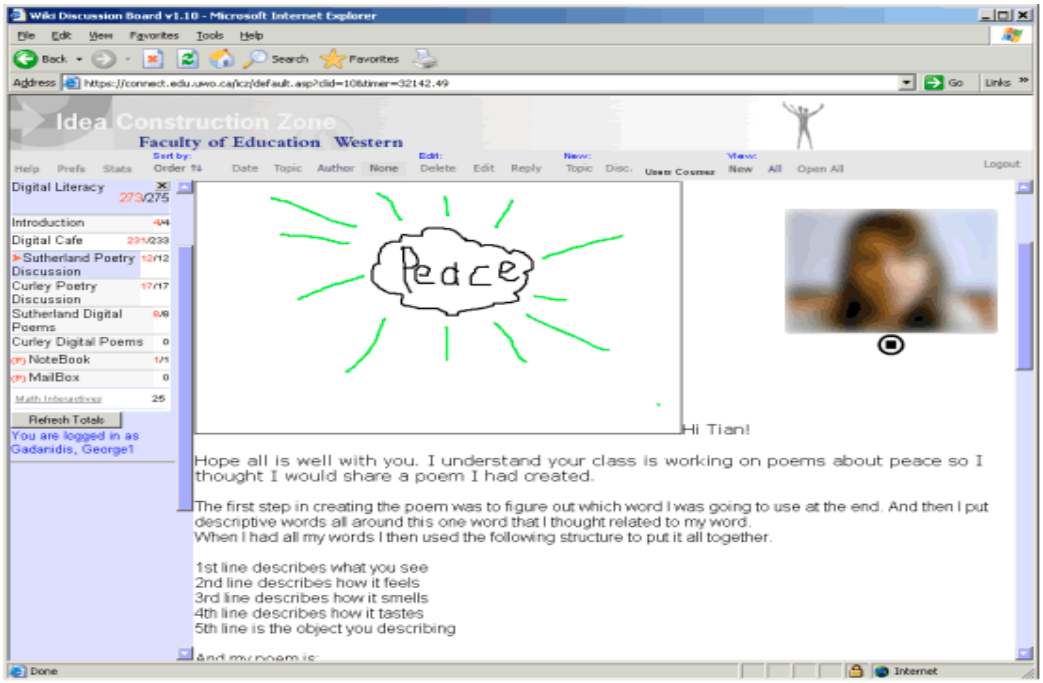
While their initial use of the tool was to build connections with their mentees, the teacher candidates were able to adapt the drawing tool for different purposes and began to use it to provide models and resources to focus and support student learning. For example, two teacher candidate mentors used the drawing tool to demonstrate the use of a graphic organizer in the prewriting stage. One teacher candidate drew a picture of a coyote that was described in a poem she was reading with the student and suggested that the mentee could refer to the poem for a description of a coyote since a coyote was perhaps not within the realm of the student's prior knowledge, living in Tanzania. In this way, she made a real link between the text of the poem and the image, using the drawing tool. As the project progressed, the drawing tool was often combined with other multimodal tools.

The Video Tool. Teacher candidates also used the video tool early on in the project as a way of building a connection with their mentees. There was an initial reluctance to try the video tool, despite the fact that the instructor had demonstrated it in class and it was very easy to use with the webcams that were available for them to use. Their concern was not technology related, but rather "looking silly" on video. However, as soon as one teacher candidate posted a video message as part of her second contact with her mentee, there was a flurry of student activity asking mentors to do the same because they wanted to see their mentors. A couple of the teacher candidates responded to their mentee's requests by attaching a photograph rather than a video; however, every teacher candidate eventually did use the video tool in their mentoring and many of them relied more heavily on the video capabilities than on text. The video tool was most often used to provide information or to model a reading of a poem for the students. For example, one teacher candidate explained that facial expression is important when "performing" a reading of a poem and then she demonstrated by reading "a happy poem" with a lively voice and a smile. When text was included with the video clips, it was usually to provide a preview of the content in the clip and to add additional information related to an activity that the mentor was explaining.

Most often the video tool was used to demonstrate how to read or perform a poem. The students in Tanzania were creating poems about peace for a "Drums for Peace" celebration at their school and one of the mentors' goals was to provide support and guidance through the process of writing a digital poem. The digital poems were created using Photostory, and in preparation for the students' oral reading of the poems to accompany their chosen images, the mentors wanted to emphasize the importance of a strong reading. The mentor shown in Figure 3 recorded a video clip of herself talking about a poem that she created. She reads the poem and talks about the choices she made (in terms of the words and the performance of the oral reading). She included print text as well, providing the student with specific guidance so that the student can also write a

poem in this format if she chooses. The mentor effectively models the oral reading, engages in goal-setting with her mentee and creates the next challenge in the learning process.

Figure 3. Mentor using video to talk about her poem



The Audio Tool. Many of the teacher candidates also used the audio tool on its own to demonstrate how a poem might be read aloud effectively. Sound, or music as poet Molly Peacock (1999) calls it, is essential to poetry. In one case, a mentor recorded two readings of the same poem to offer a comparison for the student and to illuminate the idea that every reading is a performance and an interpretation. The mentor includes the text of the poem in the posting so that the student can follow along as he listens to the video clip. The mentor points out how punctuation and line-breaks offer the reader cues as to how the poem should be read aloud. Some poets pause at the end of each line in order to emphasize the first word in the next line, while others read through the lines and pause according to punctuation. Cadences in the language also steer an oral reading. Long words lengthen or extend the lines while monosyllabic words do the opposite, just as repeated use of long vowels serve to elongate words and slow the reader down and repetition of short vowel sounds speed the reading up. The choice of words themselves, as well as how they are positioned in a line, helps determine how they will be read. Through the use of the audio recording, the reader/listener should begin to notice that when a poem is read aloud, choices the reader makes (in tone of voice, emphasis, pauses) can affect the listener's understanding of the poem and this understanding is essential for students preparing to record their own oral readings. This mentor sets high yet achievable expectations and guides her mentee using concrete examples, adding depth that would not exist through an explanation in print alone.

DISCUSSION

The Web has shifted from text-based, read-only communication with slow dial-up access to multimodal, read/write communication with fast broadband Internet connections (Sprague, Maddux, Ferdig & Albion 2007). The result is not simply a quantitative change: it is not just a case of having more communication modes or faster communication. Read/write, multimodal communication offers a qualitative change, analogous to the change that occurred when we moved from an oral to a print culture. However, our understanding of what this change implies for online education (and education in general) is emergent and not fully conceptualized or articulated. The three case studies we presented above offer glimpses into what is possible as well as some of the obstacles to be overcome. We discuss the themes that emerge from the case studies in the context of collaborative knowledge construction and multimodal communication.

COLLABORATIVE KNOWLEDGE CONSTRUCTION

It is interesting that in all three cases, there was some resistance to using the read/write features of a wiki. This is not uncommon in initial uses of wikis (Grant, 2006). The resistance was greatest in the online graduate course, where students had difficulty allowing themselves to edit the work of others. The dominant experience in graduate courses is that students write their papers in private and that only confidential suggestions for improvement come from the instructor. In addition to this tradition, there are also issues about ownership of ideas. When a student's paper or poem is edited by peers, is that paper or poem still the original student's work? Plagiarism and the scholarly need to acknowledge sources are especially important issues in graduate work. However, we perhaps need to made explicit in our graduate courses that peer editing is the norm in scholarly writing. For example, when a scholarly paper such as the present paper is submitted for publication, it is reviewed by peers, and their comments and suggestions, written in the margins, in summary statements, or in the case of electronic submissions sometimes in the text itself, come back to the authors. Such comments and suggestions are a learning experience for the author(s) and some are incorporated in the final version. It should be noted that the final version of the paper typically does not credit the reviewers (whose identity is kept confidential from the authors) and the original authors retain ownership of the final work. Also, a number of ideas emerge from the three cases for helping students feel more comfortable with the peer editing process in a wiki. These include, (a) maintaining a copy of the original work as well as the edited work, (b) giving students experiences with editing the work of someone who is not part of the course, (c) using word play activities where students rearrange a jumbled poem or where students add nouns and verbs that have been removed from a poem or paragraph, and (d) using group assignments where 2-4 students submit a single piece of work created in a wiki.

In all three cases, the wiki feature was an integral component of the pedagogy used. It was not an add-on and it was not just a tool for discussion. It reflected the instructors' goals for creating a community of learners in a democratic classroom where typical hierarchies were blurred. However, the wiki feature was also instrumental in co-creating this pedagogical direction. The wiki feature became an idea or a pedagogical structure with which the instructors *thought* pedagogically. As one instructor noted, "The wiki features have made me aware of the limitations of my pedagogy, and have encouraged the shifts in perspective and teaching represented in this paper". The wiki feature supported the following pedagogical goals: (a) it helped shift the view of mathematical ideas as rigid to a view of mathematical ideas as flexible, fuzzy and negotiable; (b) it helped create critical distance for students' ideas; (c) it helped students realize that the

materiality of language can be manipulated and can indeed invite play; and (d) it helped students slow down, linger and attend more deeply to ideas of mathematics and of poetry.

MULTIMODAL COMMUNICATION

Kress (2003) argues that very soon the screen will govern all of our communication practices and language use. Students will understand language use within an electronic medium. As Pahl and Rowsell (2005) point out, "Language is not, and clearly will not be, printed texts with incidental images, but instead texts of all kinds with colour, different fonts, on monitors or mobile phones with sound, gesture and movement" (p. 4). Students growing up with constantly evolving new technologies have been referred to as "digital natives" (Prensky, 2001) and "millennial students" (Howe & Strauss, 2000). Unlike their teachers who have had to learn to use the Web as a new tool (like a second language), students are growing up "digirate" or digitally literate with the Web (Pack, 1996). They are accustomed to using various kinds of media and technology outside of the classroom, which allow them to communicate in multimodal ways; however, schooled practices are still typically reliant on print text. Using multimodal communication (which is pervasive on the Web but not in school) allows students to use and refine their out of school literacies. This was certainly the case for the elementary school students in the mentoring project case.

In the mathematics-for-teachers course and in the poetry mentoring project, multimodal communication played a significant role. In the mathematics case, the use of drawings, images and rich text created a visually inviting discussion area, helping dispel some of the preconceptions of preservice teachers of what mathematics is and what it looks like. In the poetry case, drawings, rich text and audio and video postings helped lift poetry off the traditional printed page. In both cases, the use of drawings helped level the playing field between expert and novice. The use of drawings also added a playful element to poetry and to mathematics.

The ICZ video and audio tool, which was developed recently and used only in the poetry mentoring project, helped add a human dimension to the poetry by making possible poetry readings by mentors and by students. It also helped create stronger bonds among students and mentors. Once the first video was posted, students started asking for their own mentors to post videos.

A LOOK AHEAD

Our thinking about online education has been disrupted and reorganized as we have used and thought *with* the technology of Web 2.0. For example, using a wiki in our online teaching is a very different experience than teaching in a physical classroom. It is also very different from using Web 1.0 tools. A wiki challenges our thinking about how we organize classroom interaction: it also becomes a lens that changes how we see other aspects of our online teaching, such as course content, evaluation practices, our role as instructors, and generally what constitutes knowledge and how it is or should be constructed in an online environment. The changes in our view and practice of online education were the result of our immersion in an online environment with Web 2.0 affordances. In a review of online education, Sprague et al (2007) suggest "that so-called 'early-adopters' of technology may have made up the majority of faculty and students who have so far been involved in the online education phenomenon" (p. 158). It will be interesting to look back ten years from now and see whether the Web 2.0 phenomenon is

also limited mostly to the "early-adopters" or whether it pervades online education. In our case, we can no longer imagine teaching online without Web 2.0 tools.

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