Emergent Learning and Interactive Media Artworks: Parameters of Interaction for Novice Groups

Marta Kawka
Griffith University, Australia
Kevin Larkin and **P.A. Danaher**
University of Southern Queensland, Australia

Abstract

Emergent learning describes learning that occurs when participants interact and distribute knowledge, where learning is self-directed, and where the learning destination of the participants is largely unpredictable (Williams, Karousou, & Mackness, 2011). These notions of learning arise from the topologies of social networks and can be applied to the learning that occurs in educational institutions. However, the question remains whether institutional frameworks can accommodate the opposing notion of "cooperative systems" (Shirky, 2005), systems that facilitate the creation of user-generated content, particularly as first-year education cohorts are novice groups in the sense of not yet having developed university-level knowledge.

This paper theorizes an emergent learning assessment item (Flickr photo-narratives) within a first-year media arts undergraduate education course. It challenges the conventional models of student–lecturer interaction by outlining a methodology of teaching for emergence that will facilitate student-directed and open-ended learning. The paper applies a matrix with four parameters (teacher-directed content/student-directed content; non-interactive learning task/interactive learning framework). This matrix is used as a conceptual space within which to investigate how a learning task might be constructed to afford the best opportunities for emergent learning. It explores the strategies that interactive artists utilize for participant engagement (particularly the relationship between the artist and the audience in the creation of interactive artworks) and suggests how these strategies might be applied to emergent generative outcomes with first-year education students.

We build upon Williams et al.'s framework of emergent learning, where "content will not be delivered to learners but co-constructed with them" (De Freitas & Conole, as cited in Williams et al., 2011, p. 40), and the notion that in constructing emergent learning environments "considerable effort is required to ensure an effective balance between openness and constraint" (Williams et al., 2011, p. 39). We assert that for a learning event within a Web 2.0 environment to be considered emergent, not only does there need to be an effective balance between teacher-directed content and student-directed content for knowledge to be open, creative, and distributed by learners (Williams et al., 2011), but there also need to be multiple opportunities for interaction and communication between students within the system and that these "drive the emergence of structures that are more complex than the mere parts of that system" (Sommerer & Mignonneau, 2002, p. 161).

Keywords: Educational institutions; emergent learning; interactive art; media arts; knowledge; novice learners; Web 2.0

Introduction

Williams et al. (2011) investigated how the introduction of Web 2.0 technologies in tertiary education has generated the challenge of creating learning environments that are less teacher-led and instead relate to content creation by learners. Institutions face the dilemma of learning occurring outside the classroom context. This may be particularly symptomatic in the training of preservice education students who are often enculturated into existing models of teaching and learning. Emergent learning, as an alternative pedagogy, suggests that there are silent experts within a student cohort, and that it is worth exploring what benefits these individuals can bring to the community. Williams et al. (2011) suggest that alternative models of education can be explored which use the connective potential of Web 2.0 technologies:

> . . . learning which arises out of the interaction between a number of people and resources, in which the learners organise and determine both the process and to some extent the learning destinations, both of which are unpredictable. The interaction is in many senses self-organised, but it nevertheless requires some constraint and structure. It may include virtual or physical networks, or both. (p. 41)

Williams et al. (2011, p. 39), in suggesting an emergent learning framework, maintain that in constructing emergent learning environments "considerable effort is required to ensure an effective balance between openness and constraint." They articulate the difference between prescriptive learning and emergent learning. In prescriptive learning, knowledge is predetermined for the learners. In emergent learning, the knowledge is open and is largely created and distributed by learners themselves. We are proposing an educational approach which can self-organize; the learning activity is not bounded by specified outputs but rather

is organic, growing with the input provided by the learners. Depending on the specific characteristics of the student cohort (for example, first-year students vs. fourth-year students), the organic space for growth can be to some degree "shaped" by the educational context provided by the lecturer.

The notion of emergent learning environments is also recognized by social network proponents. Shirky (2005) presents an argument concerning the power of the institution versus the power of online social collaboration and suggests a "change in equilibrium" of learning as institutions come under pressure from social networking. Shirky is interested in how groups are organized by an external agent or self-organized and how varying levels of co-ordination affect group outputs. He refers to this notion as "coordination costs" and suggests two options: (a) use the institution to coordinate the group, and (b) build cooperation into the infrastructure. In the first option, the institution has the responsibility to enforce goals and to maintain the structure, and it is exclusionary (some people are excluded in order to build a professional class). Institutional managers have to plan strategically how to create and coordinate the groups. By contrast, in the cooperative infrastructure model, the approach is to create an opportunity for group effort and then deal with the outcome as it occurs. The cooperative infrastructure model also supports the standard 80/20 rule of contribution. This standard suggests that in group contexts 20% of the individuals within the system create much of the output whilst 80% of individuals create very little, at least in terms of quantity. In an unconstrained system, anybody can contribute as much or as little as s/he chooses. It is often the case that institutions highly value the 20% output of individuals who create a lot and discount the work of individuals who contribute less regularly. By contrast, in a cooperative system, contributing a little is acceptable if the contribution is worthwhile.

Cooperative systems include open-source file sharing. Basically, these are systems where experts find one another and share their knowledge, distribute their knowledge, and gain knowledge about their shared practice. This schema may be appropriate for a self-interested, self-motivated group of experts. However, these ideals are problematic when we are talking about an educational institution where it is not acceptable to contribute as little or as much as you like and where expertise is less likely to be distributed evenly across a group. Here the institution may be an obstacle as institutionalized education is not designed to operate in a social networking format. The hidden discourse of a higher education institution supporting the use of social sites (the education as "fun" discourse) is the fear of not attracting a clientele that now has an increased range of learning options. Cooperative systems are highly appropriate for groups of experts, but what about groups of individuals who are not experts, for example some first-year students who may have trouble engaging with course material and who treat university learning very pragmatically (students are "pressured consumers of higher education who often engage with their studies in ruthlessly pragmatic, strategic, and tactical ways" [Selwyn, 2007, p. 88])? The central question of this paper is how can an emergent learning environment, which aims to have knowledge created and distributed by learners, be formed for a non-specialized pragmatic cohort of students such as first-year education students?

Interactive Artworks: Conceptualizing the Relationship between Artist and User

In the collaborative practices of interactive artists, the viewer of the artwork is transformed into a *participant* who is "actively involved in the construction of the artwork, its design, content, and behaviour" (Weibel, 2008). By exploring the relationship between the participant and the artist in an interactive artwork, we may gain some insight that will further an understanding of the nature of the relationship between the teacher and the student in the context of an emergent learning environment. Interactive artists do not create a product but a "framework" where the viewer is allowed to "play" with the artwork (Shaw, 2008). In this framework a viewer can explore the artwork, rearticulate it, and reform it, and thus the artwork becomes a performance, dependent upon the particular person who happens to be performing the work (Shaw, 2008). Furthermore, audience participation in an interactive artwork is integral to the work, and without the audience there simply is no artwork. Bosma (2006) contends that the relationship between the audience and the artists is one where the artist "uses" and "guides" the audience within the work and in this way manipulates how the artwork is interpreted. The work is designed to be experienced by the user, so the work is said not to possess meaning but rather to afford meaning in its relationship with the audience. Thus, meaning is generated only in the moments of interaction (Feingold, 2002).

Interactive artists' artistic strategy is the provision of an experience for the viewer/participant/audience. The focus of interactive art is on the articulation of meaning through the work; meanings are not static and predefined but co-created in the process of interaction. What interests us in this context, and what remains to be further articulated, is the pedagogical significance of such encounters. What does the artist gain from the participant? What does the participant gain from the artist? To begin to answer these questions a conceptual model of interactivity of artist/user control is proposed.
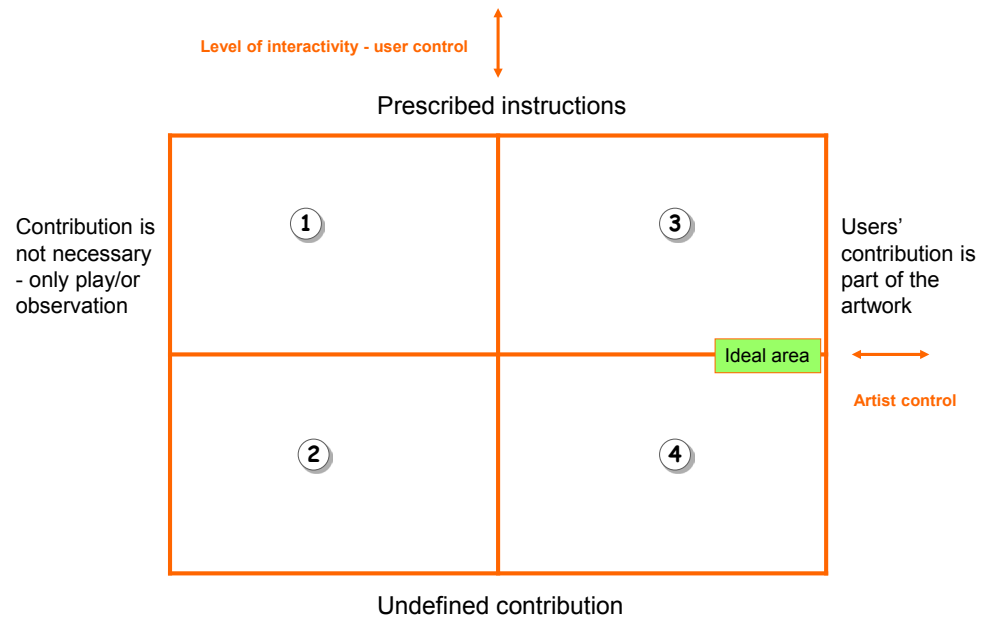
Figure 1. "Interactive space" visualization (Kawka, 2009).

The above visualization represents the relationship between the audience and the artist, conceptualized as existing within the dialectic of artist control versus user control. The positioning of the "ideal area" on the figure is not meant to qualify the artworks as successfully interactive, but rather to place the focus on the participants and to question at what point the participants begin to feel a sense of agency and collaboration with the artist.

In Quadrant 1, the interactive environment provides the user with an opportunity to make selections from predefined choices. Users do not contribute to the creation of the work as responses are not collected; they simply play or observe others interacting. It is far from the ideal position as the participant does not derive a sense of collaboration or sharing in the creative process. The interactive sound installation *Audiobar* (Jacobsen, 2006–2008) is an example of this type of interaction. In this work, users can combine bottle-like artifacts to generate combinations of sounds; however, these are not stored to become a component of the work.

In Quadrant 2, participant contribution is undefined. This means that there is no prescribed set of objects to be clicked and users can generally contribute anything that they want within the context of the environment. In this quadrant, users interact with the work, but their interactions do not form part of the artwork. An example of this style of interaction is Zack Lieberman's *Gesture Machines* (2000). Users make drawing gestures with their mouse on a web interface. The interface reacts to the gestures by creating various responses to the marks made on the digital canvas. Here users play with the work, but their interactions are

not stored or recorded.

In Quadrant 3, the participants interact with set parameters of the work and their contributions are stored to become components of the work. An example is Shaw's *T_Visionarium* (Bennett, 2008). In this work, participants enter a video clip database environment. Participants can select the video clips, rearrange them, and link them to create their own clips, which are then stored in the database. The storage of user-created video clips gives the sense that participants are contributing to the creation of the work. However, participants cannot just put anything into the system; they are interacting with what is already available to be interacted with.

In Quadrant 4, the participant experiences a sense of contributing to the work. However, because of the emphasis on undefined contribution, there is a sense that the artist does not care about the quality of participant contributions but only that such contributions can occur. An example is Andy Deck's *Open Studio* (1999), where visitors encounter a drawing software interface accessed on the Web. Using the available tools, participants can draw anything they like, and their movements are stored for later access. In this sense, when compared to *Audiobar,* the work is more collaborative as users' contributions are retained.

In the ideal area of the visualization we could situate a work like *A-Volve* (Sommerer & Mignonneau, 1994–1997). In this work, users contribute to an interactive environment by creating a creature that will survive within a virtual water habitat. In the relationship between the artist and the participant, the user control is somewhere between prescribed instructions and undefined contribution. With the possibility of creating their own creatures, users are not being manipulated through predetermined constructions. However, they can create a creature only from the available software tools, which means that there are limits to the undefined contribution. In relation to the artist's control, the users' creations are completely subsumed as part of the work rather than their merely viewing the results of their actions. There is a sense of ownership as users identify with the creatures they have created that become part of the artwork habitat. In terms of sharing the creative process with the artist, the participants are removed from the initial stages of creation. However, it may be claimed that in some sense the work is guiding them through creative product generations as they learn to design items that will be useable in a fictitious domain. When compared to *T_Visionarium* or *Open Studio*, *A-Volve* provides a more collaborative encounter as participant contributions become part of the work and they feel that their contributions are somehow significant to the existence of the work.

In terms of real collaboration, the examples discussed above suggest that a number of elements need to coincide to generate the ideal area (Figure 1) for the participant in an interactive artwork. The primary element is the utilization of the participant's contribution, which becomes a significant part of the work. However, a second element is required. The contribution cannot be anything the participant desires as this would mean that the experience of sharing the creative process is removed. This total freedom cannot be realized as it would indicate total absence of thought on the part of the artist who had created the initial work. A common feature of many interactional relationships between the artist and the

participant is that the relationship is largely mono-directional as the artist does not interfere with the work once it has been created. The real value of an interactive work is in the extent to which the artist has considered how the interactive process will occur. Artworks that rely on the audience to follow a predetermined sequence of events, where the artist has pre-specified the route to be taken, are not interactive artworks as "this is not interactivity; it is an interactive-style activity. There's nothing participatory about it" (Rushkoff, as cited in Stallabrass, 2003, p. 62). Genuine interactive artworks are those that provide "mutual and simultaneous activity on the part of both participants, usually working toward some goal" (Stone, as cited in Stallabrass, 2003, p. 63). Such genuine artworks exhibit qualities such that when participants are interacting, they have an impression of infinite choices and alternative paths are created at the point of interaction. This has been termed "second-order interactivity" (Couchot & Hillaire, as cited in Hansen, 2005, p. 153): whereas "first[-order] interactivity understood human–computer interactions on a stimulus–response or action–reaction model," and focused on the control of communication, second order interactivity deals with notions of "self-organization, emergent structures, networks, adaptation and evolution."

Krueger (as cited in Cameron, 2005, p. 18) contends that the evaluation of the work should be based on the quality of the interaction, "which may be judged by general criteria: the ability to interest, involve and move people, to alter perception, and to define a new category of beauty." Apart from the necessary engagement, the audience members make judgments about the quality and the success of the work as an interactive artwork.

Interactivity as a Form of Emergent Learning

In the preceding section the nature of interaction in artwork was visualized in Figure 1 in terms of the parameters of artist control versus participant freedom. Interactive artworks that afford collaboration with the artist and allow a sense of agency were identified as genuine sites of interaction and located in the ideal area of Figure 1. Genuine interaction depends on the extent to which the artist has considered how the interaction will occur. The artist of an interactive artwork provides a framework which guides the audience, draws the audience in, and allows the audience to explore, rearticulate, and reform the work. The participation of the audience is integral to the meaning of the work. Multiple meanings are formed in the interaction of the audience with the work. The separation between the artist and the user is reduced in an interactive artwork, and there is a perception of infinite choice and alternative pathways during the process of interaction.

We now investigate how the above interactive art practices can be applied in a pedagogical context where a framework for student interaction is used to encourage student learning. Increased interactivity in interactive art practice facilitates the emergence of meaning from the participants, rather than a stimulus-response model; these notions can be applied also to designing for emergence in learning tasks for students. The educational framework suggested here is presented as a "proof of concept" in the sense that it has not yet been used in practice with students. It will be trialed with students in the second half of 2011. The key

difference between interacting with an interactive artwork and interacting within a learning environment is likely to be the quality of the interactive encounter and the quality of the contribution. Interaction in a learning environment necessitates the provision for *learning*. Students cannot simply opt not to interact as they need to demonstrate knowledge to be awarded a grade. Prior to investigating the notion of demonstrating knowledge within an interactive Web 2.0 task, we first outline the learning task in terms of the emergence/prescription dialectic (see Figure 2).

The learning task in question is situated within a media arts preservice teacher education course. According to the Australian Curriculum, Assessment, and Reporting Authority (2010, p. 5), "Media Arts is the creative use of communications technologies to tell stories and explore concepts for diverse purposes and audiences." To learn about the core content of this art form, students create media arts texts and lesson plans incorporating the media arts texts they create. The learning task suggested here is the creation of a particular media arts text, a photo-narrative, which students will create and share via Flickr. A photo-narrative is a sequence of photos that tell a story in the narrative genre (Picture 1).

Picture 1. Example of a media arts character photo-narrative (6 photos) (Kawka, 2011).
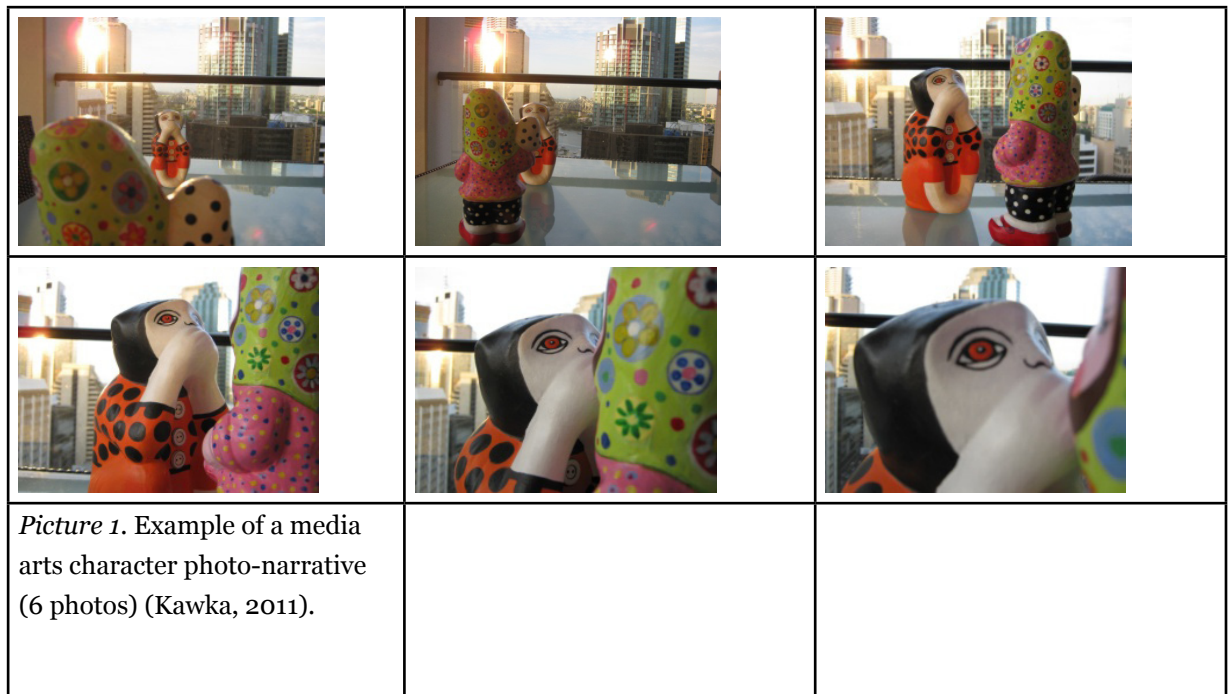
Flickr is selected as it is a Web 2.0 photo-sharing platform; it is an easy platform to use on an individual basis; and it caters to the increase in complexity that emerges through the interaction of multiple users. Our intention is to create an interactive online learning space that will increase in complexity as students interact with it. As students upload information and respond to one another's works, the information is transformed, "creating an interconnected, open-ended system featuring phased transitions toward more complex structures" (Sommerer & Mignonneau, 2002, p. 161). In this sense, Flickr is an ideal platform that will demonstrate levels of emergence versus prescription.
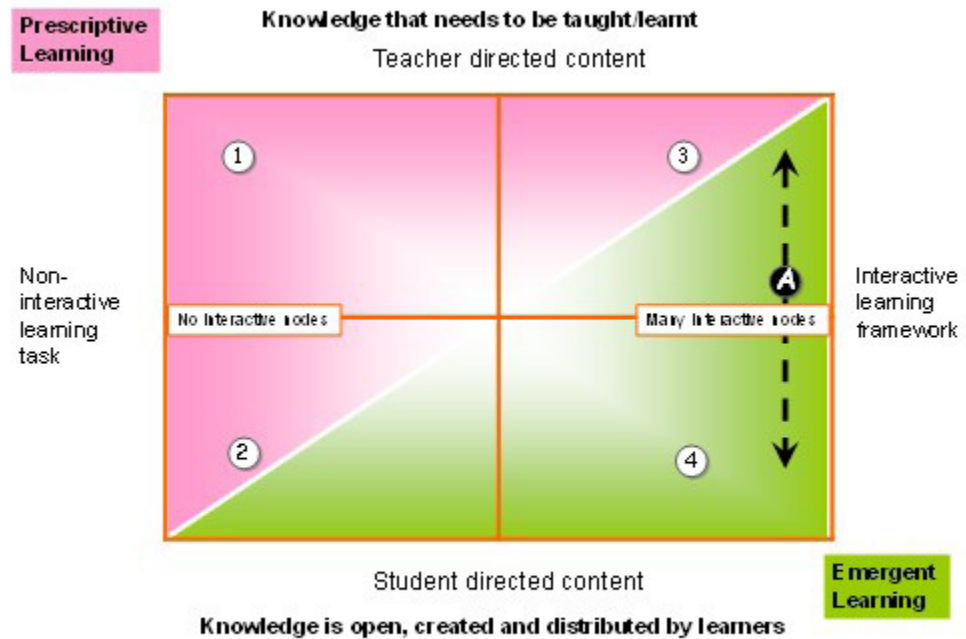
Figure 2. Emergent learning environment matrix.

Earlier in this paper, Figure 1 was presented as a means of mapping the control versus freedom dialectic for selected interactive artworks. We now adapt this conceptualization to map the nature of learning that can take place in a Flickr photo-narrative learning task. Figure 2 is a theoretical space that can be used to illustrate how a teacher might construct a learning task within an emergent learning environment. Following Williams et al. (2011), we describe emergent learning in contrast with prescriptive learning. Both can be further described in terms of how knowledge is maintained. In emergent learning the knowledge is open, created, and distributed by the learners. In prescriptive learning, the knowledge is largely predetermined for the learners. The question that emerges from these parameters for us is what will count as knowledge in our educational context? We now define the parameters of the matrix and provide specific examples of how a task might look in each of the quadrants and argue that the ideal area within an emergent learning environment sits along a continuum as indicated by the gray area in Figure 2. We theorize that this is the location on the matrix that allows knowledge to be "open, created and distributed by the learners."

The matrix has two knowledge parameters, "Knowledge that needs to be taught/learnt," including teacher-directed content and "Knowledge is open, created, and distributed by learners," including student-directed content, and also two interactive parameters, which we described earlier. The key knowledge that students need to gain from the course is the core media arts content as described by the Queensland Studies Authority, including using words to change interpretation of visual images, sequencing visual images to construct a narrative text, using different media shots and lighting to communicate a particular mood,

and creating media texts for a specific purpose for a particular audience (Queensland Studies Authority, 2008, p. 2). It is therefore assumed that this is the knowledge that students need to learn and that they will need to demonstrate their level of knowledge in the completion of the learning task. This core body of knowledge that needs to be learned is directly related to the matrix parameters of "teacher-directed content." When the learning is teacher-directed, the teacher provides material that specifies exactly what the students have to do in the task; for example, the set task is to be completed in a set order at a set time using a specific template. However, despite the directed nature of this activity, teacher-directed content is not a contradictory parameter in an emergent learning environment. That is, it does not necessarily imply prescriptive teaching practices. It may in fact be a necessary component, particularly if we are applying the notion of the interactive artist creating the framework for interaction. In this context the teacher is responsible for the authorship of the learning task that guides students via a sense of shared creativity. The teacher-directed content parameter needs to be particularly strong for a non-specialist, novice group of learners such as first-year students.

The "Knowledge is open, created, and distributed by learners" parameter is related to student-directed content. The students here would be responsible for creating the content of the learning task and they would specify what knowledge needs to be learnt. However, as we will be dealing with a novice group of learners with limited knowledge regarding course content, it is difficult to foresee their completely driving the learning in the course. Thus, the student-directed content may still involve a minimal amount of teacher input to initialize the process.

In the interactive learning framework parameter, the task is defined as being a holistic, interactive item (the system that will emerge and grow in complexity). All the students contribute to generate a shared media text. The text grows in complexity over time as a result of student interaction. This is the parameter wherein the students derive a sense that they are working toward the same goal as the teacher and there is a perception of multiple pathways during the process of interaction. Another feature of the interactive learning framework is the number of interactive nodes. This means that students do not interact only once with the system, but instead keep returning to provide multiple interactions with the system. In contrast to this is the non-interactive learning task. Here individuals create a text that is not interactive. Students may see what other students have done, but they do not engage with one another to any great extent. Students may not feel any agency over the direction of the entire system as they are provided with the opportunity for only one interaction. The interaction of these four parameters thus divides the matrix diagonally into "emergent learning" and "prescriptive learning" relative to student/teacher and interactive/non-interactive.

We now demonstrate how the matrix might be used to "ensure an effective balance between openness and constraint" (Williams et al., 2011, p. 39) in constructing an emergent learning environment. Each number on the matrix denotes a particular version of the same task when the four parameters interact. We then suggest an ideal position on the matrix (identified as A in Figure 2), dependent on context, which will best foster emergent learning.

1) Teacher-directed content/non-interactive task

In the task of creating a photo-narrative on Flickr, students are asked to create six photos. They are provided with a template for structuring their narrative which includes concepts to be covered. Students have to use a set number of different camera angles to tell their story. They are provided with a character to tell the story and are directed to a specific location where the photos are to be taken. The photos are then uploaded and descriptions are written. Students are assessed on their application of media techniques in the construction of their story. The task is teacher-directed as the teacher specifies all the content that needs to be covered. The task is non-interactive as students do not record their interactions with one another as part of the activity.

2) Student-directed content/non-interactive task

For the content to be largely student-directed in the Flickr photo-narrative learning task, students may select their own characters to photograph. As teacher input is limited at this point, the resultant demonstration of appropriate media strategies may not be robust. Students might create photo-narratives using particular media techniques and present them in an educational way. In this context, students view the various narratives and in so doing learn about a range of media strategies. In this sense knowledge is created and distributed by the learners. The teacher is still necessary to provide the initial impetus (and we can predict that the more effective the teacher guidelines the more effective the student presentations of the knowledge that they impart to others). As students do not interact with one another at this point or write comments about the presentations that they watch, this is a non-interactive learning task.

3) Teacher-directed content/interactive learning framework

In this scenario, the activity is interactive (let's say one interaction node) and also tightly directed by the constraints set by the teacher. The task might involve students selecting their own characters and following production procedures wherein media techniques are learned and applied in creating photo-narratives to upload. To afford interaction with others, students leave their texts open for contributions (for example, not providing an ending to the story). Students then select a photo-narrative for which they will create an ending. This task includes an element of randomness as students complete one another's stories. The stories contribute to a system of texts related to one another. However, one interaction with the system limits the level of complexity that can emerge in the system.

4) Student-directed content/interactive learning framework

Within this learning framework, students regulate how they will contribute to the task. There is limited teacher input and students may respond to others, but it is not specified in what manner students respond to one another. They may decide to respond once, or not at all, or can continue responding to one another on a regular basis as the interactive nodes

are limitless and grow as students continue to interact. This activity resembles many of the features of social networking. Even though something may evolve out of this process, it is also possible that this "something" will have little or no educational value. If students are able to do anything, this may not result in the generation of the knowledge that students need to learn to meet the prescriptions of the course. As no parameters are set for the level of contribution expected, it is conceivable that there will be little or no contribution from students. Therefore greater teacher direction in the task might be necessary and students might be encouraged to create photo-narratives that are designed to teach primary school students about media techniques and that are to be available for other students to interact with. Knowledge is still created and distributed by learners as students teach one another as part of the learning task. Although interaction occurs with minimal teacher intervention and knowledge is created and distributed by learners as the interactions are not perpetuated (by teacher direction), we do not consider that emergent learning has occurred as the learning outcomes are not emergent or complex, but expected.

A) Teacher- and student-directed content/interactive learning framework (multiple interactive nodes)

As was established above, a movement toward an emergent environment conducive to learning falls between teacher direction and student direction. At Point A, the version of the activity shares many of the features of Quadrant 4 in Figure 2; however, the difference is the presence of teacher-facilitated opportunities for numerous interactions with the system throughout the completion of the task. Accompanying the increased opportunities for interaction is the likelihood of increases in complexity within the system. At Point A the teacher creates the process or framework within the system that will facilitate the interaction.

The following photo-stream task is an example of how this might look. The students are asked to create a photo stream depicting the secret life of toys. Students identify their own character which will be the basis of the photo-narrative (a creature toy, for example). Students take a photograph of their character, selecting an appropriate shot type to match the character's personality, and then write a description of their character and upload the photo and description to their Flickr account. They then take a variety of shots of their character for other students to use in the next task. Students then select another character's photo stream and create a narrative about the two characters meeting (this begins the emergence of randomness, depending on the choices that students have made). Some characters might become popular because they have featured in many joint stories. The next interaction might involve making contact with another person, where a joint narrative is constructed and uploaded. Subsequent interactions might involve creating specific media tasks for others or creating galleries or favorites of particular shot types and meaning elements.

In the example provided above, the end result of the learning is the generation of an emergent network created via the use of various stories, meaning categories, and repositories of media concepts. It is undetermined at the outset what this network of stories will look like, and the complexity emerges from the number of interactions in the system. Various mean-

ing themes might be identified depending on how students have constructed their toys in their narratives. In terms of the defining factor of an emergent learning environment, knowledge in this activity is open, being created and distributed by learners. The knowledge still needs to be defined and maintained by the teacher for the learning outcomes for this particular course. If the course involves a largely specialized cohort with a large body of knowledge (for example, a masters-level course for media arts teachers), the knowledge parameters could be open. With a first-year cohort, with limited knowledge about the subject matter and the requirement to gain a particular set of knowledge in the course, the knowledge parameters may need to be largely closed. In this instance the activity will be more tightly controlled by the teacher. The teacher, as the master artist of the system, will set up the interaction nodes at the outset and provide students with a map to follow throughout the tasks that have to be completed. Clear criteria are set for how the work will be assessed (for example, contribution to the network, specified number of interactions, media techniques utilized). Once the training wheels have been established, the interactions can become more student-directed. Knowledge can then be jointly created and distributed by the learners, within a system that is complex, unexpected, and emergent.

Conclusion

The ongoing development of contemporary technologies presents multiple challenges and opportunities for learners and developers of learners alike. Certainly there is considerable potential for learners to benefit from the networks of knowledge and skills made possible by those technologies (Sims, 2008). Yet for those benefits to be realized, learning developers and instructional designers must enact principles and practices that facilitate forms of learning that move away from traditional assumptions of content prescription and linear delivery (Irlbeck, Kays, Jones, & Sims, 2006). Furthermore, those involved in the design and delivery of learning must become increasingly sensitive to learning that emerges from their students rather than imposing learning outcomes upon them.

This paper has elaborated one possible approach to implementing such principles and practices, based on bringing into closer alignment elements of emergent learning and interactive media artworks. Our use of Flickr, a sophisticated Web 2.0 technology, enhances the opportunities for connectivity, whereby learning is enhanced by the largely informal connections students make with one another. At the same time, the open and organic nature of Flickr does not limit the potential connections students can make as is likely to be the case with wikis or blogs created as part of many learning management systems (for example, Blackboard, Moodle) in use in higher education. The focus has been on design for learning directed at maximizing connections by means of articulating specific parameters of interaction for groups of novice learners, here exemplified by first-year education students. Figures 1 and 2 have encapsulated our contention that the interplay between contemporary technologies and emergent learning creates many pedagogical possibilities, but that those possibilities are inevitably constrained by such issues as learners' degrees of existing knowledge and educators' dispositions to engage wholeheartedly with emergent learning. We look forward to trialing the framework outlined here with our students, both to learn

from their experiences with the framework and to refine the framework as appropriate for potential future applications.

References

Australian Curriculum, Assessment, and Reporting Authority. (2010). *Shape of the Australian curriculum: The arts* [draft]. Retrieved from http://www.acara.edu.au/verve/_resources/Draft+Shape+Of+The+Australian+Curriculum+The+Arts-FINAL.pdf

Bennett, J. (2008). *T_Visionarium*. Retrieved from http://www.icinema.unsw.edu.au/projects/t_visionarium/

Bosma, J. (2006). Art as experience: Meet the active audience. In T. Corby (Ed.)*, Network art: Practices and positions* (pp. 24–39). New York: Routledge.

Cameron, A. (2005). Dinner with Myron Or: Rereading artificial reality 2: Reflections on interface and art. In J. Brouwer, S. Fauconnier, A. Mulder & A. Nigten (Eds.), *aRt & D: Research and development in art* (pp. 10–27). Rotterdam, The Netherlands: V2_Publishing/NAI Publishers.

Deck, A. (1999). *Open studio*. Retrieved from http://artcontext.net/act/00/openStudio/

Feingold, K. (2002). The interactive art gambit. In M. Reiser & A. Zapp (Eds.), *New screen media: Cinema/art/narrative* (pp. 120–134). London: British Film Institute.

Hansen, M. B. N. (2005). Embodiment: The machine and the human. In J. Brouwer, S. Fauconnier, A. Mulder, & A. Nigten (Eds.), *aRt & D: Research and development in art* (pp. 150–165). Rotterdam, The Netherlands: V2_Publishing/NAI Publishers.

Irlbeck, S., Kays, E., Jones, D., & Sims, R. (2006). The Phoenix rising: Emergent models of instructional design. *Distance Education, 27*(2), 171–185.

Jacobsen, M. (2006–2008). *Hørbar/Audiobar*. Retrieved from http://www.mogensjacobsen.dk/art/hoerbar/

Kawka, M. (2009). *Play, the university, and everything....* (Unpublished doctoral dissertation). Griffith University, Brisbane, Qld, Australia.

Kawka, M. (2011, April 14). *Dudu in the city* [Flickr Photostream set]. Retrieved May 6, 2011, from http://www.flickr.com/photos/sfod/sets/72157626541890168/

Lieberman, Z. (2000). *Gesture machines*. Retrieved from http://www.theremediproject.com/projects/issue12/systemisgesture/index.html

Queensland Studies Authority. (2008). *The arts knowledge and understanding – Years 3–9*. Brisbane, Qld, Australia: The State of Queensland, Queensland Studies Authority. Retrieved from http://www.qsa.qld.edu.au/downloads/early_middle/qcar_el_arts_kau.pdf

Selwyn, N. (2007). The use of computer technology in university teaching and learning: A critical perspective. *Journal of Computer Assisted Learning*, *23*(2), 83–94.

Shaw, J. (2008, January 10). *Mornings with Margaret Throsby* [Radio Broadcast]. Australian Broadcasting Corporation, Classic FM.

Shirky, C. (2005). *Clay Shirky on institutions versus collaboration*. Retrieved from http://www.ted.com/talks/lang/eng/clay_shirky_on_institutions_versus_collaboration.html

Sims, R. (2008). Rethinking (e)learning: A manifesto for connected generations. *Distance Education, 29*(2), 153–164.

Sommerer, C., & Mignonneau, L. (1994–1997). *A-Volve*. Retrieved from http://www.interface.ufg.ac.at/christa-laurent/WORKS/FRAMES/FrameSet.html

Sommerer, C., & Mignonneau, L. (2002). Modeling the emergence of complexity: Complex systems, the origin of life and interactive on-line art. *Leonardo, 35*(2), 161–169.

Stallabrass, J. (2003). *Internet art: The online clash of culture and commerce*. London: Tate Publishing.

Weibel, P. (2008). *User art _ Nutzerkunst: YOU_ser: The century of the consumer exhibition*. Karlsruhe, Germany: ZKM, Centre for Art and Media. Retrieved from http://www02.zkm.de/youser/

Williams, R., Karousou, R., & Mackness, J. (2011). Emergent learning and learning ecologies in Web 2.0. *International Review of Research in Open and Distance Learning, 12*(3), 39–59. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/883/1686

Athabasca University