Developing Asynchronous Online Courses: Key Instructional Strategies in a Social Metacognitive Constructivist Learning Trajectory

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Abstract

This qualitative, design-based research study resulted in a proposal for a comprehensive set of best instructional practices immersed in a learning trajectory, outlining the tools, processes and the content development for online asynchronous, text-based learning in graduate level professional development courses. The outcome provides a rich description of essential instructional strategies for merging the tools, processes and the content development in a social metacognitive constructivist instructional framework. The learning trajectory presents an explanatory framework that interweaves social, teaching, and cognitive presences towards the engagement of a virtual community of learners to expand their individual and shared knowledge through learning tasks and tools. The trajectory identifies a process for moving from “informal ideas, through successive refinements of representation, articulation, and reflection towards increasingly complex concepts over time” (Confrey & Maloney, 2012).

Introduction

What types of educational experiences do students expect? What makes a good course? Faculty raised these questions with the graduate students at our institution. The strongest response was the desire for courses that engaged students in discussion and debate about important ideas. They wanted small group activities for expanding their understanding. They also indicated such interactions happen in face-to-face courses, but definitely not in online courses. The intensity of their position was stunning for, as graduate students in education, they were engaged in the study of essentials in the design of coursework for continuing teacher professional development programs for the current teacher workforce.

The current teacher workforce is less prepared for incorporating new and emerging technologies as learning tools in their content areas primarily because they have learned without the use of these technologies. The challenges require that they think outside their traditional views of how content is learned and communicated. As a result, more and more teachers are searching for professional development programs that can be structured around their work lives (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). Today's distance education offers avenues that provide them with access for repurposing their views on learning their content with technology (Guliar & Loring, 2008). These asynchronous, text-based opportunities do appear to limit their opportunities for meaningful discussions.
The question is how to design effective asynchronous experiences that engage teachers as students in meaningful, rigorous discussions and interactions to support their learning.

Often online programs do focus on content delivery over establishing a social presence that our graduate students desire (Anderson & Dron, 2010). Learning online is viewed as independent study rather than educational discussions and collaborations. Teachers describe discomfort engaging in discussions in online courses with people they do not know. As noted in the literature, distance education students feel less supported in areas of communication, interactions with the instructor, and interactions with other participants in the courses (Galusha, 1997; Shea, Li, Swan, & Pickett, 2005; Song, Singleton, Hill, & Koh, 2004).

Recognizing the limitations in how students communicate and interact in online learning environments, online teacher education course designers are challenged to identify and implement effective learning trajectories to develop, enhance, and ultimately transform teachers’ knowledge for teaching with technologies (Niess & Gillow-Wiles, 2013). Borko (2004) describes this process of identifying high quality teacher change programs as beginning with studies in a single site while exploring relationships among teachers as learners in specific learning trajectories. Confrey and Maloney (2010) define such a learning trajectory as:

A researcher-conjectured, empirically-supported description of the ordered network of experiences a student encounters through instruction (i.e. activities, tasks, tools, forms of interaction and methods of evaluation), in order to move from informal ideas, through successive refinements of representation, articulation, and reflection, towards increasingly complex concepts over time (p. 968).

This five-year design-based research endeavor guided the identification of an online learning trajectory toward developing, enhancing, and ultimately transforming teachers’ knowledge and skills for teaching with technologies. The effort resulted in identification of a hypothesized online learning trajectory, a model for learning that highlights an ordered network of experiences where teachers are able to communicate and interact as they expand their knowledge for teaching with technologies.

**Learning in Asynchronous Online Contexts**

The initial research effort was concerned with the feelings of isolation and loneliness that literature describes. Lave and Wenger (1991) and Wenger (1998) challenged educators to recognize the importance of social participation and active involvement in a learning environment, indicating that learning in a community is essential for effective learning. This challenge directed our attention toward the establishment of learning communities.

Digital technologies available for online programs have both constrained and afforded the use of representations, examples, analogies, demonstrations and explanations to facilitate more in-depth access to the subject matter (Groth, Spickler, Bergner, & Bardzell, 2009). Since the early 2000s, significant work drawing from a variety of learning perspectives has clarified how such digital technologies can be used to re-conceptualize teaching and learning (Chyung, 2007; Gabriel, 2004; Garrison, Anderson, & Archer, 2001; Guilar & Loring, 2008; Preece, Maloney-Krichmar, & Abras, 2003; Riverin & Stacey, 2008).

In 1999 Garrison, Anderson, and Archer introduced a framework conceptualizing an online learning environment as a dynamic relationship of three presences: social, cognitive, and teaching. Developing and supporting a social presence leads to meaningful community member participation and educational experiences that result in meaningful learning (Garrison & Cleveland-Innes, 2005; Hill, Song, & West, 2009; Kinsel, Cleveland-Innes, & Garrison, 2005; Rourke, Anderson, Garrison, & Archer, 1999; Swan & Shih, 2005; Sung & Mayer, 2012). Engaging a cognitive presence with an active social presence elevates the community interactions to a higher level, beyond social and low-level cognitive exchanges, to a level where students are “cognitively engaged in an educational manner” (Garrison & Cleveland-Innes, 2005, p. 135). Teaching presence focuses on the design of the educational experience, developing the structure, organization, and presentation of course content, activities, and assessments. The teaching presence supports and facilitates the development of both the social and cognitive presences, leading to the fulfillment of the educational goals and outcomes (Garrison, Anderson, & Archer, 1999; Garrison & Cleveland-Innes, 2005).

Garrison and Cleveland-Innes (2005) described the importance of engaging learners in active roles in online environments where they build understanding, making sense of new information and ideas. They described a virtual community of learners (that they called a community of inquiry) for integrating these social, cognitive, and teaching presences toward higher order learning with the potential to engage learners in critical reflection and discourse (or critical inquiry). They claimed “the reflective and collaborative properties of asynchronous, text-based online learning are well adapted to deep approaches to learning (i.e., cognitive presence)” (p. 145).
Akyol and Garrison (2008) directed attention to understanding the process and integration of these three presences in online courses as supporting a more collaborative and social constructivist learning approach. Chiu (2008) interjected a metacognitive view suggesting that “social metacognition” helps “group members monitor and control one another’s knowledge, emotions and actions” (p. 422). In a social metacognitive constructivist framework, social metacognition extends the ideas to increase “the visibility of one another’s metacognition” and improve “individual cognition, resulting in reciprocal scaffolding and greater motivation” (Chiu & Kuo, 2010, p. 322).

Sztajn, Confrey, Wilson, and Edgington (2012) connected the ideas on learning trajectories as basic teaching guides for instructional decisions, suggesting that a social metacognitive constructivist learning lens adds the metacognitive aspect to the instructional decisions framed in a learning trajectory for an online course. Our challenge was to design and describe online instruction that engaged teacher participants in a social metacognitive constructivist environment within the “contextual factors including workload and time constraints, type of learning evaluation, opportunities for metacognition, a shifting of the learning management to the students along with instructor explanation, enthusiasm, and empathy” while focusing on higher order learning (Garrison & Cleveland-Innes, 2005, p. 138).

Design and Development of a Researcher-conjectured Learning Trajectory

To design courses for an online master’s program, we, as researchers and instructors, relied on this social metacognitive constructivist framework to engage the participants as a community of learners, where they collaborated about their explorations, research, and reflections on their own thinking and their students’ thinking and learning in mathematics and science with appropriate technologies. We relied on the design-based research methodology because of its strength in connecting “interventions to outcomes through mechanisms” that led “to better alignment between theory, treatments, and measurement…in complex realistic settings like the classroom” (Hoadley, 2004, p. 204). Using this research methodology (Barab & Squire, 2004; Brown, 1992; Cobb, diSessa, Lehrer, & Schauble, 2003; Collins, 1999), we formulated and improved multiple instructional strategies through design and refinement analyses. Our work focused on “designing and exploring the whole range of designed innovations” where we explored possibilities for instructional strategies for the graduate asynchronous online program that resulted in “contextualized theory” identified as a researcher-designed and empirically supported learning trajectory (The Design-Based Research Collective, 2002, p. 5, 8). Three key questions guided the exploration and examination of the online environment:

- What instructional strategies are essential for facilitating the development of a functioning community of learners?
- How are the social, cognitive, and teaching presences managed to support a deep approach to learning?
- In what ways do the online community of learners’ instructional strategies engage participants in high levels of learning (e.g., cognitive gains)?

Overall, 59 graduate students assented to participate in this ethics-approved research project as required in compliance with our institutional policies, federal and state laws and regulations. With their approval, we gathered data for describing their coursework, in particular: course syllabi and their enactments in Blackboard (our online course management system); all participant products and interactions (including Discussion Board interactions and discussions, unit/weekly products, unit/weekly reflective essays and reflective learning community essays); and multiple interviews upon course and program completion. These data sources supported the identification of rich descriptions of the instructional strategies within the social metacognitive constructivist learning environment. We used electronic case course portfolios (Meyers, Chappell, Elder, Geist, & Schwidder, 2003) to track the participants’ interactions and progressions. Analysis of multiple participant reflections provided the knowledge and community of learners’ engagements while examining the impact of the shared knowledge of the community and its impact on their emerging individual knowledge as they engaged in the instructional activities. Interviews supplied their reflective thinking about their learning with specific identification of the tasks and resources influential in their thinking as well as their reflections on the impact of the community of learners on their knowledge growth.

The cross case analyses of the iteratively-developed multiple course presentations in the program identified and documented successful patterns in the instructional activities, tasks, tools, forms of interaction and methods of evaluation. Analysis and comparison of multiple course cases at the conclusion of each instructional period clarified the social, cognitive, and teaching presences as well as how the instructional strategies were useful in the assembled learning trajectory. Successive refinements in the courses based on the analyses revealed essential features for an online learning trajectory framed by the social metacognitive constructivist lens (Chiu & Kuo, 2010). The iterative nature of the design-based research produced a rich description and clarification of the instructional activities, tasks, tools,
Iterative progression of potential learning trajectory elements. Over the five-year period, we designed, delivered, and revised (based on effectiveness in accomplishing the learning outcomes) six required graduate courses and nine elective graduate courses. The program is a Master of Science in mathematics education and science education. The program guides K-12 in-service teachers in developing their thinking, knowledge and skills for engaging their students as critical thinkers and creative producers of knowledge and understandings in teaching and learning mathematics and science. The content for each course focuses on developing and extending their understandings and skills with multimedia technologies; the intent is to engage the teachers as students in ways where they take advantage of technological features and capabilities to support students’ learning in mathematics and science. The identified learning trajectory elements thus reflect the participants’ experiences in constructing and enhancing their knowledge for teaching mathematics and science with technologies - their technological pedagogical content knowledge (TPACK) (Niess, 2005, 2008; Mishra & Koehler, 2006; Pierson, 2001; Thompson & Mishra, 2007).

This design-based research effort initially concentrated on the cognitive presence of the online courses by updating and scaffolding the content. Most of the courses had been taught in face-to-face environments but had not been recently updated. The mapping of 21st century academic references and research findings to include key concepts steered the scaffolding to incorporate successive refinements of increasing complexity. Attention to the cognitive presence of the courses identified key questions for each major section or unit, thus framing the desired outcomes and instructional presentations in Blackboard.

When examining participants’ cognitive development in the revised courses, issues surrounding the social presence surfaced, with participant comments such as: “I felt totally on my own and isolated when I got stuck.” The existing research literature (Garrison & Anderson, 2003; Garrison & Cleveland-Innes, 2005; Kinsel, Cleveland-Innes & Garrison, 2005; Swan & Shih, 2005) promoted the idea of a community of learners. Thus, the design-based activities studied mechanisms for establishing social inclusiveness through such a community. Norms for learning advanced the innovation: “Although this class uses an online, asynchronous mode, we hope to establish a learning community such that you can share ideas and support each other as you are exploring the course ideas.” The norms proclaimed the importance of multiple avenues for communicating with other participants. Course tasks encouraged sharing information and working collaboratively in the preparation of individual position statements on the key questions for each of the units. Aside from the Discussion Board in Blackboard, all participants activated and shared their Skype addresses for further communication. Eventually, some participants added Google Chat. Participants’ comments reflected the usefulness of the social engagement.

That [Skype] added a whole new element to communication… you don't have to sit and wait for an e-mail response… with Skype it's like, “Oh, she's online! … And it was perfect, because you don't want to wait a whole day [like from email] for a response... It was very helpful.

With an improved social presence in the online environment, we then redirected the research examination toward the teaching presence with this question: What instructional strategies support the social interaction of a community of learners? As indicated by Garrison and Cleveland-Innes (2005), interaction is not enough. We noted that the instructors remained at the center of the instruction despite the community actions. For example, at the conclusion of a specific unit, while the participants (even after interacting with the community of learners) submitted their positions on the key questions, the instructor concluded the unit by sending a compilation of ideas and providing additional ideas in response. This action effectively placed the instructor in the role of knowledge delivery. The research questions then shifted to identifying instructional strategies placing participants at the center where they interacted around the key ideas in the process of constructing the ideas rather than waiting for instructor approval and interaction with “the answer.”

As teacher educators, we favored constructivist pedagogies and the multitude of research evidence on the value of engaging students in group work (Good & Brophy, 2004; Richardson, 2003). Thus, our next significant instructional innovation explored participants’ interactions in small cooperative or collaborative group structures. The iterative research design identified specific tasks and group structures that led to deep engagement with the concepts as well as improving the learning activity in the community. The analysis identified an important process for consideration in the learning trajectory, that of the interactive nature of shared and individual knowledge. Participants’ reactions clarified the importance of this dynamic:

- The shared knowledge obtained was much more than what my own individual knowledge would have resulted in had I worked on these topics independently. In both small groups, we followed the process of expressing our ideas, negotiating on the shared...
knowledge obtained, and constructing a response to the task.

By the time this collaborative investigation into the meaning of literacy came to an end, there were 106 postings, and I had severely altered and expanded my limited individual knowledge. I was surprised.

Another instructional strategy we examined with small group structures incorporated the 5 E's (engage, explore, explain, elaborate, evaluate) instructional model (Bybee, 2009) for framing inquiry activities (Edelson, 1999, 2001). This constructivist approach facilitated the process of conceptual change while engaging participants in inquiry where they assumed ownership of their learning. Exploration and questioning led the investigation into worthy questions, issues, problems or ideas. Participants asked questions, gathered and analyzed information, generated solutions, made decisions, justified their conclusions and took action. The model placed the participants at the center of the learning and the instructor as the task designer and facilitator. As one participant noted after her 5 E’s structured inquiry engagement:

The temperature probes, in conjunction with a social networking site, Blackboard discussion forum, allowed us to participate in engaging inquiry lessons, developing our technological knowledge, while communicating with our peers to develop deeper understandings of technological pedagogical knowledge and how to incorporate these tools into our classrooms integrating both mathematics and science.

Another student described her investment in the community interactions in the small groups in the process of gaining ownership of the ideas in the course:

In light of what I have learned … I decided to challenge myself to structure a unit in which every lesson involved cooperative groups… I was quite impressed with how well they worked together overall, and especially by some of the insights that individuals had and were then able to share with the group in a way that the whole group felt ownership.

Garrison and Cleveland-Innes (2005) claimed that the “reflective and collaborative properties of asynchronous, text-based online learning are well-adapted to deep approaches to learning” (p. 145). Reflection is the “active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends” (Dewey, 1933, p. 9). Adult learners, in particular, come to learning with prior knowledge and understandings that impact how they make sense of new ideas in their educational situations. According to von Glasersfeld (1991), they need to “step out of the stream of directed experience, to re-present a chunk of it, and to look at it as though it were direct experience, while remaining aware of the fact that it is not” (p. 47). Therefore, as part of the design-based research strategies, we consistently asked the participants to reflect on their learning in the online environment. As we analyzed their responses, we noted the importance of reflection as a tool for their developing knowledge. They needed to unpack their ideas and rebuild them given the new information.

Initially, the instructional activities required the participants to reflect on the content through weekly essays on the key questions. This expectation grew to include weekly essays on the community of learners where they reflected on their own learning and how the community impacted that learning. Their reflections provided valuable evidence of their deep learning. This additional metacognitive perspective has also gained acceptance in the research literature (Akyol & Garrison, 2011; Chiu & Kuo, 2010). By the culminating year of the design and ultimate identification of the learning trajectory, the courses were framed within a social metacognitive constructivist context.

Over the final year of the design-based research effort, we clarified and confirmed a proposed learning trajectory for the online courses. The focus of the analysis verified essential components and their interactions in the design. The result was a proposal for a learning trajectory that established a community of learners enhanced by social metacognitive constructivist learning strategies in an online community (Garrison & Akyol, 2012).

Proposed Online Learning Trajectory

The iterative, cross course analysis over the final year identified four primary results:

1. A supportive community structure in the online learning trajectory is an essential component for student achievement. This community structure supports individual knowledge as well as group or shared knowledge construction framed in a social metacognitive constructivist learning perspective.
2. A functioning, supportive online community of learners requires purposeful instructor actions in both the design of the course and
the facilitation of the activities. Instructor actions are framed and supported throughout the social, cognitive and teaching presences theoretical construct.

3. Technology needs to be introduced early in the course, as both a tool for collaboration and a teaching and learning tool. With this graduate program, the initial courses focused on building the participants’ facilities for working with the tools for communication and collaboration while concurrently exposing them to the tools for teaching and learning within the context of the course concepts.

4. Creating a community of learners and a body of shared content knowledge are neither separate constructs nor separate endeavors. The creation of one requires the creation of the other and dynamic interactions with it.

Examples of best practices from the courses observed during the culmination research year not only verified the individual components of the learning trajectory but also confirmed their interactive dynamic. Figure 1 presents the researcher-conjectured, empirically-supported learning trajectory consisting of three primary components: (1) tools or the necessary tools for learning; (2) learning processes or the processes for using these tools for learning; and (3) learning content or the learning outcomes.

Figure 1. The researcher-conjectured, empirically-supported online learning trajectory.

Content. The obvious place to begin in the development of an online course is with identification of the content. The overall course goals and learning outcomes define the flow from informal ideas through successive refinements to more complex ideas. Two structures for content development evolved for scaffolding the cognitive learning tasks from naïve to complex with more conceptually challenging expectations. In both cases, the content begins with introductory ideas and moves toward higher order thinking, thus increasing the cognitive load toward more sophisticated understanding. Key questions frame each of the content descriptions. These questions direct the scaffolding for the content development.
In one model, each unit engages participants in developing parts of a final project. In one course using this model, teachers designed mathematics and science spreadsheet problems for their specific teaching levels. During the final course project, they merged their created problems into a curriculum and described how students would build knowledge through explorations with these problems.

In a second model, each unit includes individual products or process expectations. Figure 2 describes the flow of the content with increasingly sophisticated multimedia technologies for engaging students in becoming critical thinkers and creative producers of their own knowledge and understandings in mathematics and science. The content in this course began with participants’ explorations with PowerPoint as a communication tool, one with which they were familiar. Their technological sophistication increased with the exploration of probeware to gather data for mathematical and scientific examinations. They engaged in hands-on experiments with the temperature probe, exploring mathematics and science ideas in much the same way as their students might. The next technology focused on their design of web inquiry learning activities. This step increased their sophistication with technologies as well as with inquiry instruction. By this point, the participants were ready to explore the multitude of science and mathematics applications available on the Internet and design instructional plans for incorporating the applications in their own classroom. Finally, the technology challenge moved to a more collaborative Web 2.0 tool. Google Docs engaged the participants in a collaborative process that culminated in the design and development of a single document, thus creating a representation of the shared knowledge. At this more sophisticated level, the participants now considered the impact of shared knowledge on the development of their individual knowledge.

**Figure 2.** Content flow for developing teacher knowledge in teaching with technology.

**Tools.** A critical component of the learning trajectory was the early introduction of the tools for the course, for collaboration as well as for teaching and learning throughout the course. Two important tools emerged for these asynchronous, text-based online courses—a community of learners and reflection.

**Community of learners.** Learners in online courses are actively building understanding and making sense of the new information and ideas through primarily asynchronous avenues. Establishing a community of learners in this environment required actions that resulted in
Purposeful instructor actions in both the course design and facilitation initiated the social presence that revealed the learners as real persons in the community. Best practices suggested that this introductory task was framed with the communication technologies available in the course. We organized the class in small (2 or 3) collaborative groups to identify digital images that communicated a message about themselves as persons. The small group became a ‘respected other’ (Bandura, 1982) to evaluate how well the image communicated. Everyone posted their images to the discussion board, challenging the others to decipher the message in the image. The large group discussion fostered relationships among the participants, facilitating the community of learners’ engagement towards a common goal (Garrison, 2006; Garrison & Akyol, 2012; Shea & Bidjerano, 2010). Throughout the engagement, all the learners interacted with each other around the image communications. One learner indicated that these introductions “helped us find common ground with one another, and helped us get to know one another so that we would be comfortable working together through the course.” On the importance of changing this introductory task in different courses, she added: “People’s introductions changed and people became more comfortable in what and how they shared about themselves.” Beyond facilitating the development of personal relationships, participants recognized that the repeated introductions provided a sense of continuity as new members joined the program.

Once the community of learners was initiated, purposeful and regular tasks that required community activity were essential for maintaining the community emphasis. As learners became more familiar with each other (and comfortable with the process of moving between small and large group engagement), the focus of the activities transitioned away from the familiar (themselves) to the new and unfamiliar (the course content). Organizing learners in small collaborative groups initiated them as a community. The tasks for the small groups and the composition of the group members needed to be altered minimally with each major unit topic. Some groups were commissioned to cooperate in the development of a single group response or as a collaborative group where each member developed an individual response based on the interactions and work in the group. Other groups were asked to operate as study groups, where members were responsible for individual tasks in the process of developing a group response. Members in some groups were given roles, such as discussants, respondents, or consolidators, for completing analysis and synthesis of important questions. The consolidators posted a compilation of the analysis and synthesis to the discussion board for interaction with the whole community. This effort effectively moved the participants to the center of the learning rather than incorporating instructor confirmation of the learning.

Attention to assigning students to groups based on similar backgrounds was less important than simply varying the compositions of the groups. The key was to assure that every student interacted with every other member of the community in meaningful ways throughout the course. This intentional mixing was not lost on the participants, with one commenting, “You mixed people up so that you would work with different people… it forces you to interact with different people.”

Employing a text-based, asynchronous discussion forum as the primary communication medium in the small groups as well as the whole class discussion boards definitely limited the development of a free-flowing exchange of thoughts and ideas. The extended time between posting and receiving a response contributed to feelings of isolation where the learners were not able to identify if another member of the community was currently available for discussion. This feeling of loneliness was partially alleviated through the addition of instant messaging technologies, such as Skype and Google Chat. These types of technologies helped the learners identify who was available no matter what time of the day or night. The isolated feelings that participants initially voiced included the sense of being “alone at midnight with no one available for asking questions.” The addition of Skype proved to be an important instructional strategy for supporting the community. The learners were able to search at any particular time, ask questions and share files with others. Rather than just specific virtual office hours, the instructors were also available for discussion with single or multiple learners – in the evenings after school hours.

Another technology that supported the small group activities was Google Docs. This technology facilitated the small group collaborative writings, where each member used a different pen color to input ideas into the evolving document. Instructors were not involved unless the document was shared with them. Interestingly, with the addition of this technology, the learners began reporting the use of this technology for engaging their own students in their classrooms. In essence, the addition of new and emerging technologies had multiple advantages when developing teachers’ TPACK. As learners they gained experiences critical for developing their knowledge for teaching with these technologies.

Reflection. Another essential tool in the online learning trajectory was the engagement of the learners in reflective activities. Critical reflection supported the cognitive presence throughout the proposed online learning trajectory. We consistently integrated reflective activities in three primary ways: content reflective essays, community engagement reflective essays, and peer reviews.
In each content unit, we challenged the learners to illuminate their thinking in content reflective essays. The intent was that they develop reflective essays, integrating their thinking about the questions rather than simply responding to each question individually and that they support their claims with the readings and actions during the week. Again, we organized small groups for engagement in discussions with classmates to help them reflect on the ideas. These continued interactions supported them in freely discussing their ideas and understandings of the concepts. The reflective nature of the discussions, sometimes initiated by the instructors and other times by participants, helped them learn: “...the online interactions with my fellow students were of a discussing thoughts nature, talking about our take on this or that, just hashing out what we were learning about.”

In addition to the weekly essays focused on the course content, the learners individually reflected on the community engagement, their role in the engagement, the impact of the various instructional activities and the discourse that occurs in the discussion boards and small group discussion. Some typical questions we posted in the assignment included:

- How did this collaborative experience support the development of a description of you as an educational professional?
- How did this collaborative experience help the development of your reflective essay?
- What were the advantages and challenges you experienced in meeting the outcomes for this week?

Again, rather than responding to questions individually, the challenge was to integrate the response into an essay that reflected on the entire set of questions.

A third reflective practice engaged the learners after they worked on a particular assignment for multiple weeks and needed input from a different pair of eyes. We organized them for maximum exposure to multiple points of view: Learner A reviewed learner B, learner B reviewed learner C and learner C reviewed learner A. Not only did this review help them improve their own work, it caused them to rethink their own efforts on the assignments. As one student noted: “I found it especially beneficial to read and review the work of my peers. In reviewing the work of another with the purpose of providing feedback, I was forced to more critically analyze the paper than I would when just reading the work … an outside reviewer could point out sections that needed clarification and pose questions that caused me to reflect on whether I made my intent understood … when you are working on explaining your ideas, it is hard to step outside of your own knowledge constructs to see how someone who does not have your same background knowledge understands your points.”

Processes. A second major component of the online learning trajectory involved the development of processes for using these tools for learning. Two primary processes emerged: inquiry and shared/individual knowledge development. Through the incorporation of these processes, the social and cognitive presences were actualized in the social metacognitive constructivist framework. The actions of the instructors, purposefully designing and implementing the course, reinforced the teaching presence.

Inquiry. Designing inquiry-based activities in each unit using the 5 E’s instructional model supported learners by providing important experiences for negotiating the content (Bybee, 2009). The learning tools and inquiry learning processes supported the learners in transitioning “from informal ideas, through successive refinements of representation, articulation, and reflection, towards increasingly complex concepts over time” (Confrey & Maloney, 2010, p. 698).

The inquiry process engaged participants in constructing their understandings, where they took ownership of their learning, starting with questions and exploration leading to investigating worthy questions, issues, problems or ideas. They asked questions, gathered and analyzed information, generated solutions, made decisions, and justified their conclusions. The resulting actions interwove multiple technologies, instructional approaches, and content topics through multiple units. With this process, we designed and framed the tasks to purposefully engage them in communicating with multiple technologies, such as presentation software and videos. Throughout this process, the participants consistently engaged in thinking and reflecting about the dynamic interactions among content, pedagogy and technology that emerged from the tasks in their online learning experiences (Roberts, 2002; Wheatley, 1992).

Shared/individual knowledge development. Lave and Wenger (1991) challenged educators to focus on the importance of social participation and active involvement in a learning environment recognizing the importance of the interactions of individual and groups in a variety of activities. Through these designed activities, the participants were active in social metacognitive ways, such that the “group members monitor[ed] and control[led] one another’s knowledge, emotions and actions” in ways that increased “the visibility of one another’s metacognition” and improved “individual cognition, resulting in reciprocal scaffolding and greater motivation (Chiu & Kuo, 2010, p. 322). In essence then individual knowledge and group knowledge merged to build a shared community knowledge resulting in higher order learning.
Relying on a community of learners and learner reflection as learning tools required the participants to fluidly move between group and individual knowledge building to create understanding that more clearly reflected their world view with respect to the course (Dunlap & Lowenthal, in press; Rientes, Tempelaar, & Lygo-baker, 2013; Swan, 2001). This understanding needed to be integrated with their existing knowledge base as well as be accessible as a platform for building new knowledge in the social metacognitive engagement, where they as a group shared their understanding and thinking (shared metacognitive knowledge) and, based on this understanding, renegotiated their understanding (shared regulation) (Hacker, 1998).

The dynamic interaction between developing shared knowledge and individual knowledge was framed by how the participants functioned as a learning community and how they valued metacognitive reflection (Garrison, 2006). The small group collaborative/cooperative activities as well as large group assignments were purposefully structured to reinforce community relationships. While inquiry framed the instructional strategies, the small groups engaged at a virtual workbench to develop ideas and concepts leveraged through the social metacognitive relationships. These ideas and concepts were then brought to the larger community for a more thorough review and integration into the commonly held body of shared knowledge (Magnusson, Palincsar, & Templin, 2004).

Reflective activities in the dynamic between building individual knowledge and shared knowledge (Hodes, Pritz, Kelley, & Foster, 2011; Yukawa, 2006) engaged the participants in considering their thinking on learning in a community, developing and designing higher order thinking and inquiry instruction, learning about and with new technologies, and sharing their knowledge in a manner that enhanced their individual knowledge (Hershkowitz, Hodas, Dreyfus, & Schwartz, 2007; Puntambekar, 2006; Shea & Bidjerano, 2010).

Three primary modes of communication recognized this dynamic interaction of knowledge building. The participants built shared knowledge from their individual knowledge through discourse in the discussion forums. This activity enhanced their individual knowledge, voiced through weekly individual reflective essays using word processing technologies (the first mode). Yet, they often used screen capture videos (Jing) as a second mode to communicate their developing ideas as well as their final reflections. In several instances, the participants assembled ‘drafts’ of their emerging projects, posted the drafts on the discussion board for the third mode, and invited all members of the class to help them with the developing ideas. As one student said: “This process of constantly building a body of shared knowledge was invigorating and increased both my engagement in our community of learners and my enjoyment of it.”

**Essential Ingredients for the Online Learning Trajectory**

Grouping was revealed as important to the success of the social metacognitive constructivist learning trajectory for online learning. Groups of size 2 or 3 worked best with the expectation that groups share their developing ideas with the whole class. Time was provided for the group participants to develop their ideas. While the instructors could read the progress of the group, they did not interact and engage with the groups unless specifically asked. Their voice interfered with the group knowledge development and quickly moved the discussion from student-centered to instructor-centered. Varying group membership, tasks, and expectations was important for the development of the community’s shared knowledge.

Literature on facilitating interaction in online educational environments suggested the importance of assessment in the activities, guiding students in developing an understanding of what was important in the course; in other words, “what is assessed is what is valued…” (Swan, Shen, & Hiltz, 2006, p. 45). This claim implied that to establish patterns of engagement in the online community of learners, assessed activities were essential where learners interacted in ways analogous to the behaviors that supported the community of learners in face-to-face learning experiences (Collins & Halverson, 2010; Swan et al., 2006). With the goal of initiating interactions leading to participants forming meaningful relationships, assessment of engagement was an essential foundational instructional strategy. Regardless of the structure of the task, assessed interaction and engagement was essential.

Throughout the research, we designed, tested and revised scoring rubrics for all tasks in each course with explicit expectations for participation and interaction. The rubrics detailed the assessment criteria for not only the academic aspects, but also criteria for the interaction or engagement aspects of the assignments. These interaction assessment criteria centered on the quality of the engagement or interaction rather than the frequency or length (Ho & Swan, 2007). Figure 3 exemplifies some criteria for these expectations.
Beginning each course with this assessment norm was both positive and productive. In describing how she thought clear expectations influenced her participation behaviors, one student indicated that, “Clearly presented expectations and loss of points motivated individuals in participating.” She added that in another professional development program in which she had participated, there was “No required participation, so my engagement was pretty minimal,” while having, “…weekly interactions that you were required to do and respond and communicate, required participation” and helped her “feel connected.” This feeling of connectedness was at the heart of creating the relationships necessary for the development of the online community of learners. “The quality of the community was entirely dependent on how involved each person was in whatever online collaborative it was.”

After introducing assessed engagement, the research efforts framed the next steps in re-designing the online courses. Swan, Shen, and Hiltz (2006) found assessment of collaborative activities essential for the success of the instructional strategies. Their research illustrated the relationship between assessment and community building, indicating “it is terribly important to clearly communicate assessment procedures to students through course documents available at the beginning of a course and accessible throughout it, and through ongoing and timely feedback using the criteria outline in these documents” (p. 56). Combining assessed collaborative activities with clearly defined assessment criteria, we re-designed the online program coursework to meaningfully support learners’ interactions through collaborative activities where a detailed assessment rubric was part of each assignment. This new element of structured collaboration increased participant interaction and furthered the development of the online community. In the view of the participants, “the cooperative group felt like each person had a goal and responsibility and to make it come together, everyone had to do their part.” Through these activities, they felt that their “collaboration, was to create something that you wouldn't be able to create on your own.”

<table>
<thead>
<tr>
<th>Learning Community Activity</th>
<th>7-6</th>
<th>5-4</th>
<th>3-1</th>
<th>0</th>
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</thead>
<tbody>
<tr>
<td><strong>Interaction in the Community Discussions</strong></td>
<td>Consistently participated in the Learning Community during the week; consistently provided ideas, feedback and questions in the “discussions” to help others in understanding ideas as well as to build own knowledge. Engaged others in talking about specific ideas. Evidence of deepening the learning for all through the discussions.</td>
<td>Participated in the Learning Community activities throughout the week; provided ideas, feedback and questions in the “discussions” focused primarily on preparing personal responses. Limited discussion of specific ideas but some evidence of a deepening of understanding both for author and for classmates.</td>
<td>Limited participation in the Learning Community activities throughout the week; provided few ideas, feedback and questions in extending the “discussions.” Not active in the group discussion. No discussion of specific ideas.</td>
<td>Not acceptable</td>
</tr>
<tr>
<td><strong>Reflection</strong></td>
<td>Responses reflect a deep understanding of how all of the materials affect and are affected by the context of one’s own teaching AND student’s learning. Makes connections with substantive and meaningful references to activities and tasks during this week.</td>
<td>Responses include the context of one’s own teaching AND student’s learning. Makes connections with substantive and meaningful references to activities and tasks during this week.</td>
<td>Responses omit the context of one’s own teaching OR students’ learning OR connections with substantive and meaningful references to activities and tasks this week.</td>
<td>Not acceptable</td>
</tr>
</tbody>
</table>

*Figure 3. Scoring guide criteria for community of learners’ interactions and reflection.*
Perhaps the most important recognition about this learning trajectory was that the tools, processes and scaffolding the content are dynamically intertwined. Rather than focusing on them independently in the course design, their interaction pushed the content development. With the first class, the community of learners was established and reflection happened — both within the context of the content development. The tasks were inquiry-based and emphasize shared knowledge. The instructional strategies were employed (1) to help develop understanding and knowledge, (2) to initiate and facilitate the development of an online community of learners, and (3) to introduce the value of reflection on both the content and the community actions. While these strategies were individually useful in facilitating an online community of learners, the use of all three as a complete package resulted in the most effective course design that facilitated a meaningful online educational experience. Through a consistently applied set of instructional tasks and strategies with assessed engagement where the participants had opportunities for discussion, reflection, and a variety of interactions, the learners were able to develop comfort and trust. The increased comfort and trust level allowed them to form relationships where interaction and engagement were motivated by more than a desire for grades. As one of the learners reflected:

At first I didn't want to do it because I was too busy doing other stuff, then I did it because I had to. Then I started seeing the value in it to the point where I was getting on to see what people had to say. I would even sneak it during my work day, what are people saying, what are people talking about right now? As I got to know people better, I became more comfortable and less formal. I think that it started carrying itself and some of that was that social feel. In a strange way, it had some of that social network feel to it a little bit.

This shift in motivation for engagement reflected the transition from the learners feeling like they were alone in their efforts in the program to feeling like they were part of a community of learners. Another student indicated, “it was a score, something I had to do initially; then it kind of developed into, I know these people, what is an idea they might have, what are they thinking about?” The relationships formed through continued interactions supported the participants in freely discussing their ideas and understandings of the concepts. During these discussions, sometimes initiated by the instructors but most times by the learners, they felt they learned the most.

In Conclusion

From focus groups and individual interviews, we realized that our initial course designs resulted in reproducing the same problems revealed in the literature - issues of student dissatisfaction, feelings of isolation, perceptions of a disconnection with course content, and a lack of instructor involvement. In response to these shortcomings, we relied on the research literature in search of direction for best practices for effective instructional designs. While the literature provided a building body of research describing theoretical frameworks for the interactions between teachers, learners, and content, few studies described the impact of specific online instructional strategies. From the existing literature in combination with the research literature focused on face-to-face course design, we used this design-based research effort to identify a proposal for an online learning trajectory that incorporated a set of best instructional practices. In this proposed framework, continued instructor monitoring and mediation of a consistently utilized set of inter-related instructional strategies was critical to initiate and facilitate the development of a functioning community of learners. The instructional strategies (assessed engagement, collaborative activities, peer-review as an assignment component, intentional small and large group design, and the incorporation of new and emerging technologies to support free-flowing discussions) were all effective individually in helping to stimulate interaction leading to a higher level of learning and toward the enhancement of the participants’ knowledge development—a deep and meaningful approach to learning through the program expectations. Alone, none of these strategies or structures had the same impact as implementing them together as a complete trajectory where the strategies were utilized from beginning to the end of each course. The findings of this research reinforced the importance of instructor actions in creating online educational experiences where the participants interacted within a community to share knowledge and reflect on the content.

The cumulative findings resulted in the identification of a proposal for a comprehensive set of best practices through a learning trajectory outlining the tools, processes and the content development for online programs. This trajectory evolved through the research on the design of a graduate teacher education masters degree. The generalizability of the trajectory requires future research. However, these findings demonstrate the strength of the social metacognitive constructivist lens in supporting online discourse leading to a strong cognitive presence (Garrison & Cleveland-Innes, 2005) throughout the trajectory.

References


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