FOSTERING HIGHER-ORDER THINKING WITH TEXT AND VIDEO IN ONLINE LEARNING: BY DESIGN

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Abstract

As higher educational institutions grow their online course offerings, it is important to understand the capacity and impact multimedia can have on learning within online environments. To provide further depth of understanding, this study specifically explored the integration of graphics, audio, and/or video to foster higher-order thinking for the enhancement of interaction and engagement. Using case study methodology, the research focused on the integration of multimedia in support of an online graduate course. The intentionality of the design and facilitation required students to step out of their text-based comfort zone to create videos as part of their discussion forum experience. From the analysis of the data, the discussion of the findings focused on the nature and scaffolding of the intentional integration of text, audio, and/or video and the impact this design has on student cognition and metacognition. The article concludes with a discussion of limitations and directions for future research.

KEY WORDS: online learning, multimedia, cognition, metacognition, design, higher education

1. INTRODUCTION

With the continued advancement of multimedia integration in learning management systems (LMS), online learning can further enrich environments by embracing combined usage of text, graphics, audio, and/or video (i.e., multimedia). By incorporating multimedia, the student learning experience is enhanced and provides opportunities for multiple means of engagement. That is, students can interact with their learning in various, or diverse, ways. In these types of technology-enabled learning environments, both students and instructors have access to, and can make decisions for, how and why they use the

technology. Using these technologies, students may select to watch a video to gain content knowledge, provide audio or video feedback to accompany student assessment, and/or create videos to demonstrate their knowledge and skills. Robust learning occurs through the intentional design and purposeful integration of multimedia.

The purpose of this article is to share findings from a single case study that investigated the intentional use of multimedia design integrated in an online graduate course. In this case study, text and video were purposely integrated into course content, asynchronous discussion forums, and in the instructor's formative and summative assessments. Drawing on the data and the literature, three recommendations for practice are provided to support enhanced integration of multimedia that support deep learning in online environments. The article concludes with a discussion on the limitations of the study and directions for future research.

2. ONLINE DESIGN FOR MULTIMEDIA

The seven foundational elements of teaching originally proposed by Chickering and Gamson (1987) are still relevant in today's online learning environments: contact between students, reciprocity, active learning, prompt feedback, time on task, communication of expectations, and diversity of learning approaches. Together, these elements highlight the importance of interaction in learning in both face-to-face and online environments. However, to achieve these foundational outcomes, online teaching design requires the implementation of intentional, front-end planning and design.

The research literature provides evidence that purposeful online teaching design can provide students with active learning opportunities for positive student perception and motivation (Khan et al., 2017; Prunuske et al., 2016; McCarthy, 2017; Sit and Brudzinski, 2017). Furthermore, online teaching design can incorporate different teaching pedagogies while still addressing active learning (Khan et al., 2017). While there are many parts of the online learning experience that influence students' perceptions on their learning, the impact of teaching design is still a prominent factor of influence.

Online learning is commonly defined as having a minimum of 80% of instruction and content offered online (Allen and Seaman, 2013). Current trends across the United States indicate that there is an increase in the number of online course offerings in higher education (Allen et al., 2016). Similarly in Canada, there is a "strong annual growth rate in online environments and most institutions playing an active role in offering online and hybrid learning" (Bates, 2017, p. 2). Bates' national Canadian study indicated continued growth over five years with "approximately 10% per annum in universities and 15% in colleges outside Québec" (Bates, 2017, p. 17). Together, these findings support the understanding that, "more learners and educators see [online learning] as a viable

alternative to some forms of face-to-face learning" (Adams Becker et al., 2017, p. 18). This suggests that as we continue to increase the amount of online course offerings, it is important that they also take advantage of the affordances of technology to support robust online learning for all students.

Technology can afford many opportunities for students. For example, the technology enabling online learning offers greater accessibility and more flexibility for the student learning experience (Johnson et al., 2014) than its face-to-face alternative: "Today's learners are using multimedia on a daily basis" (Pastore, 2016, p. 3020). As such, contemporary online learning environments need to embrace interactivity by providing students with the rich learning and capacity enhancements enabled by multimedia.

Mayer (2012) describes multimedia learning taking place when the student has the opportunity to learn by way of various formats such as static (text and images) and dynamic (video and audio) interactions. These opportunities provide students with active learning, which may also involve additional activities beyond the mono-directional multimedia interaction (i.e., student to student, student to instructor, or student to content interaction). Specifically, multimedia presentations include "words (such as narration or onscreen text) and graphics (such as illustrations, photos, animation, or video)" (Clark and Mayer, 2011, p. 466).

> Multimedia presentations can encourage learners to engage in active learning by mentally representing the material in words and in pictures and by mentally making connections between the pictorial and verbal representations. In contrast, presenting words alone may encourage learners especially those with less experience or expertise—to engage in shallow learning such as not connecting the words with other knowledge. (Clark and Mayer, 2011, p. 71)

Multimedia in online learning environments can be found in many forms. It may include videos, podcasts, infographics, concept maps, and synchronous and/or asynchronous communication as ways of engaging in, and representing, learning. Furthermore, multimedia can be part of the assessment practice. For example, individual audio and/or video responses may accompany text-based rubrics completed by the instructor.

Enhanced learning experiences can take place when communication goes beyond mere text-based communication. As noted by Vonderwell (2003), text-based correspondence can be misinterpreted given the lack of visual cueing and expressions. The use of images, audio, and video within synchronous or asynchronous forums brings additional layers of richness that can impact students' cognitive and affective domains. Online learners, according to Toomey (2013), "have potential access to a wide selection when choosing materials for their own learning. Given this potential variety, considerations of what

motivates learner selections and how these selections may correspond with innate learner characteristics may be useful in order to better inform instructional design" (p. 1599).

In their research on student perceptions within an online practicum experience, Wilcox and Lock (2017) argued there is a need for a "shift in understanding of what makes a rich practicum learning experience in an online environment supported through synchronous and asynchronous communication tools" (p. 206). It was found that students critically needed "to foster greater engagement in learning" (p. 205). Engagement in learning is achieved when the course design provides students with opportunities for active learning. That is, intentionality in the design of the learning and purposeful facilitation and scaffolding by the instructor is required to effectively integrate technology for increased student engagement in learning.

As stated in Johnson and Lock (2018), the purposeful integration of multimedia in online environments "can provide a greater forum and depth to learning in terms of the design and facilitation of both the learning tasks and assessment processes and practices" (p. 1543). Research studies have identified various supportive ways to integrate multimedia into online course designs; for example, Dringus et al. (2010) found the use of mini-audio presentations not only influenced student participation and motivation, but also led to students being more present in the course. Similarly, Park and Bonk (2007) suggested the combined use of audio, video, and text fosters a greater connection and sense of community among students and the instructor in online courses. Seckman (2018) evidenced a sense of presence for nursing students when evaluating the use of interactive video communication that helped support the connection and sense of belonging between students and instructors. Together, these research examples suggest that the integration of multimedia in teaching design can influence student learning and associated perceptions.

However, changing one's teaching design is knowingly complex. Instructors will need to address how to incorporate multimedia. Some may need to learn the basics of how to use new technologies. While it may seem that such changes would require increased work load, studies suggest that when integrated appropriately, instructors can integrate multimedia use for better efficiencies in student feedback (Cann, 2014), and students can increase their performance outcomes when using video of peer-to-peer feedback (Hsia et al., 2016). Together, the use of multimedia helps undergird teaching presence in the online course area. Teaching presence is important in both face-to-face and online course design. Student survey responses regarding instructor feedback provide evidence that online students want instructors to be more present in their course areas and use individual feedback (Martin et al., 2018). Furthermore, they indicate that they want to know

their instructors and identify video introductions as helpful in "building instructor connection" (Martin et al., 2018, p. 62).

The positive outcomes of multimedia integration cannot be ignored; this suggests it is a conduit for supporting and strengthening teaching design in the online environment. It is suggested that as instructors address intentionality of multimedia integration in their online course design, students will have further opportunity to engage in learning opportunities that are more effective and learner-centered.

3. CONTEXT

The graduate course, *Inquiry and Society*, was part of a 12 course Masters of Education online program in design-based learning at a Western Canadian university. Students enrolled in the program are generally K-12 educators. This online program offers flexibility, as well as having a theory-to-practice focus. The instructor of *Inquiry and Society* built on her first iteration of the course from a year prior. The instructor restructured the second iteration of the 13-week course to start with an overarching topic (i.e., inquiry through discussion), which provided the through-line for interactivity for the duration of the semester.

In this fully online course, interaction was purposefully integrated throughout the course design. Using the institution's online course delivery model of three, two-hour synchronous sessions over a semester, synchronous sessions also included large and small group discussions led by both the instructor and students. Additionally, the interactive whiteboard, along with its application sharing, was used during the synchronous sessions. The course was taught within a LMS supported by an ethos of students-as-active-participants central to its design. As such, the course design used scaffolding as a mechanism for integrating technology in content learning, learner assessment tasks, and approaches to formative feedback.

3.1 Ethos of Online Learning

In this graduate course, the majority of students were classified as millennials. It is common among millennials to use video conferencing technologies such as Skype and Facetime, in their personal life (Keengwe et al., 2008). This transcendence of social exchanges over distances by way of technology has permitted the development of multiple teaching and learning perspectives. As such, the instructor held an ethos of online learning that identified technology as both a supportive tool for learning and a community-building mechanism. She envisioned the use of image-based video with audio as a contributor for building community and trust among students. Mindful of the gap between her students' use of technology for personal activities versus academic activities, the instructor modeled and mentored students in this ethos throughout the course. That is, the instructor did not

use video and audio technology as an add-on to learning or teaching, but rather as a consistent thread in the learning experience itself. For example, the instructor used video in her course content teaching areas as well as in discussion posts and feedback assessments to students.

3.2 Scaffolding as Adoption Mechanism

The design of the course was developed by initially identifying the main course objectives. All content and learning activities were created in alignment with the course's outcomes. The instructor's use of a backward design approach (i.e., envision the goal and then allocate the items that lead to the goal) allowed for detailed scaffolding in both content development and learning activity development. A visual map was created by the instructor that outlined the alignment of the course objectives with its content and learning activities, along with the strategic placement of multimedia (e.g., graphics, audio, and video) content in the course. The instructor then placed a thematically related graphic into each LMS content page to support students in making linkages with their weekly readings (Johnson and Lock, 2018).

In the first week, the reading included an article that highlighted the use of an in-class journal club. The article explored how a teacher used a journal club activity in a face-to-face class to help support students in discussion and topic exploration (Tallman and Feldman, 2016). The instructor used this article as a springboard for her online students to understand the importance of dialoguing with each other. For example, online asynchronous discussion posts explored not only why the journal club activity was an effective teaching tool for the teacher in the article, but it probed how this type of discussion depth could happen in the online learning environment. This activity established the groundwork in relation to expectations of meaningful interaction in the discussion forum. This activity helped students to position themselves to think about technology as a structural support rather than as an "add on" to learning. The journal club exemplar set the stage for the rest of the course in terms of exploring ways that teaching can influence various parts of society.

The use of multimedia as an interactive tool was scaffolded throughout the course. Often, the instructor used a modeling technique to provide students with an example of how to use particular multimedia technologies, and then asked students to try it for themselves. For example, when students accessed the online course shell, they were given the opportunity to watch the instructor's welcome video. The short three-minute video gave students an overview of the instructor's background, the course goals, and the importance of community interaction in learning online. Within the video, the instructor encouraged students to post their own video introduction. To support students in completing this

activity, a 30-second video provided a "how-to" guide on using the video within the discussion forum in the LMS. This approach was designed to help establish students' comfort in using the technology.

Scaffolding was also used to prepare students for receiving video feedback. To begin, the instructor provided weekly video announcements. These videos gave students opportunities to "meet with" the instructor informally as she highlighted various items surfacing from the weekly asynchronous discussion forums. To build rapport with the students, her weekly videos also addressed various issues that emerged (e.g., such as how to overcome student isolation and how to create student support networks). "Through the use of video, it was hypothesized that students would become accustomed to seeing and hearing the instructor through the video use. In addition, the design of the introductory discussion forum was used as a low-stakes model for students to get acquainted with submitting a video as their initial discussion opener" (Johnson and Lock, 2018, p. 1545). Furthermore, students submitted project proposals six weeks into the course. The instructor provided each student feedback to his/her proposal through individual feedback videos. Screen capture was used so that students could see the item the instructor was discussing, see the instructor when in a picture-in-picture mode, and hear the instructor's voice as she commented on the proposal. The instructor's support through a scaffolding process was designed to model and encourage students' use of various multimedia in this graduate course.

Overall course content also undergirded the importance of multiple forms of media. The course was built across 13 week-based modules that used multiple forms of media to present and examine the topic. The instructor made videos, created associated text items, and provided graphics that supported the course readings. The instructor's multimedia scaffolds and purposeful progression of content in the course were designed to support a healthy opportunity for students to use various forms of media, particularly video, as part of their engagement in this online graduate learning experience.

4. RESEARCH DESIGN

A case study methodology provides an opportunity to study a bounded system that has a unique unit of analysis (Merriam and Tisdell, 2016). As described previously, the course *Inquiry and Society* was studied given the purposeful integration of multimedia in an online course design. Of the 11 students in the course, three consented to participate in the study. Having the students (n = 3) and instructor (n = 1) participate in the study provided multiple perspectives on the use of multimedia in teaching and learning within this particular course context. The goal of the case study research was twofold: 1) explore how the intentional use of text and video influenced student learning (i.e., acquisition of

knowledge) within a community of learners; and 2) investigate the impact of interactions using multimedia in the students' communications on cognition and metacognition. The research question focused on the learning tasks (assignments) specifically designed to enhance interaction and engagement. That is, how can the integration of graphics, audio, and/video foster higher-order thinking? To conduct the study, ethics approval was received from the University's Conjoint Faculties Research Ethics Board.

At the end of the course, data were collected from individual interviews with the students and instructor and from the online asynchronous discussion postings in the LMS. From the 13-week course, we have purposefully selected 5 weeks of discussion postings (Weeks 1, 3, 5, 8, and 13) for analysis. These selected weeks provide examples of the nature of the discussions that involved the students and instructor using both text and video for interaction. For example, in Week 3, all students were required to create a video for their initial response to the weekly discussion question. This was followed up by the instructor using video to respond back to the students.

The online asynchronous discussions in the LMS (i.e., text and video based) for the selected weeks (Weeks 1, 3, 5, 8, and 13) were analyzed using the Henri (1992) five-dimensional content analysis model (i.e., participation, social, interaction, cognitive, and metacognitive dimensions) that involves communication in computer conferencing. Each participant's text and video posted in the discussion forum was the unit of analysis or meaning unit used for coding within Henri's framework. Rourke and Anderson (2004) drew on the Bereiter and Scardemalia (1987) work making the assertion that "one cannot say anything about students' cognitive or metacognitive skills based on how many times they formulate a proposition that proceeds from previous statements" (Rourke and Anderson, 2004, p. 7). The validity of the content analysis with Henri's coding protocol is that the coder uses it to identify specific behavior in the unit of analysis. Both authors had used Henri's framework for coding data with other research. For this particular study, the authors initially coded data together to ensure inter-rater reliability. This was followed by each individual coding the data and then comparing the coding. Discrepancies in the coding were then resolved through discussion and negotiation.

The Saldaña (2013) two-stage process for qualitative research was used for the data analysis of the interviews. In the first cycle, codes were assigned using words and/or phrases drawn from the interview responses. In the second cycle, the *in vivo* coding process was used, where words or phrases were recorded as codes (Miles et al., 2014). The interview data were manually coded by the authors.

5. DISCUSSION OF THE FINDINGS

From the analysis of the two data sources, two themes are discussed in the following sections.

5.1 Intentional Integration of Text, Audio, and Video

The expectation of using multimedia in their online graduate program was new to the students. The students were half-way through their online program when they took this particular course. This was the first time they were expected to deeply engage with audio and/or video as part of their learning experience for their course assignments. As noted in her interview, a student commented on how it was hard at first to create the video and it required her to have numerous takes before she submitted the video. She remarked that this activity put her "outside of my comfort zone," yet she found that she quickly became confident in creating such videos. In addition, the instructor established expectations in relation to the scholarly nature of the work. In an online reflection by one student,

> More than anything else in this course, I appreciated the high expectations for our scholarly discourse and critical reflection of the articles. I also appreciated that [instructor] provided extra sessions which allowed us to learn new skills to reach those high expectations.

Both in the design and implementation of the learning assignments, the instructor was intentional in terms of how and why audio and video were to be used. The instructor scaffolded the design of the learning task, and the purposeful integration of multimedia, to develop confidence and competence in the task. She provided opportunities for the students to use video, as well as the option to continue to use it. For example, the design of the discussion questions was created to provoke higher-order thinking with the use of both text and video. In the first week of the course, the instructor designed the online environment with an expectation to use video for responding in the discussions. The students were required to talk about the journal club reading and its application in their own practice. In comparison, in Week 13, the discussion question asked students to recall their initial thoughts regarding the course topic and encouraged them to reflect on the transformation of their learning and ideas at the end of the course. Overall, the instructor designed the discussion questions to provide a range of responses, where students could select the use of text or video. As reported by one student, "It was extremely challenging to express my reflections in 3 minutes or under. I have so much to say…"

Online postings for Weeks 1, 3, 5, 8, and 13 were selected to be analyzed using Henri's five dimensions (Henri, 1992). Week 1 included the introduction in which students had the option of using video. In Week 3, students were required to post their initial response to the question using a three-minute maximum video. Other than these two activities,

students were given the option of using video in their responses. Selecting to analyze Weeks 5, 8, and 13 provided an opportunity to see if video continued to be used, as well as to observe the cognitive and meta-cognitive levels of the postings in the text or video forum.

Table 1 shows the number of text- or video-based postings per participant in the study for the selected five weeks. From this snapshot, both students and instructor tended to use more text-based communication. Using Henri's framework, it was evident the majority of the postings were rated at the cognitive level (Henri, 1992).

TABLE 1: Frequency of participants' online discussion forum postings based on selected weeks

Participant	Media	Participative	Social	Interactive	Cognitive	Metacognitive
Student 1	Text	38	0	7	26	5
	Video	3	1	0	1	1
Student 2	Text	16	1	7	8	0
	Video	10	1	1	5	3
Student 3	Text	18	1	6	9	2
	Video	5	1	0	1	3
Instructor	Text	59	7	19	33	0
	Video	30	3	2	23	2

The instructor was purposeful in how she used video to support student learning, as well as to model practice. She used video feedback on drafts of a major assignment or provided video that accompanied the rubric for the final product of their work. From the interview data, the instructor felt that the video assessment provided increased social and teaching presence. At the start of each week, the instructor posted a video that introduced the topic, and shared examples and critical questions that helped guide the examination of the topic. She perceived that there was a greater human or personal connection given when including video. A student commented that the instructor videos created a greater personal presence and that people became more comfortable working with the instructor. The bulk of instructor videos were in Weeks 1 and 3, which was part of the purposeful practice to model interactive expectations for students. In Weeks 8 and 13, the instructor continued to use video but not at the same frequency given earlier when she was setting expectations and modeling the practice for students (see Table 1).

Through the structure of the weekly learning modules and the nature of the major assignments, the instructor created multiple ways for the students to engage with the topic. She sought to motivate students to inquiry and deepen their understanding through design principles that fostered various ways to engage in learning.

5.2 Impact of Multimedia Interactions on Cognition and Metacognition

The instructor designed the discussion questions to focus on higher-order thinking (e.g., metacognition), for which the majority of the students responded accordingly. The nature of the major assignments was designed for students to take what they learned and discuss it in terms of their own teaching and learning practices. Multiple means of presentation (Meyer et al., 2014) in their discussion questions facilitated by the instructor set them up to carefully examine theory in practice. For example, as can be noted from Table 2, in the first few weeks the responses ranged from being scored as interactive, cognitive, or metacognitive. Over the weeks, there was a greater shift toward cognitive and metacognitive thinking, which aligned with the nature of the questions be asked. For example, in Week 13, students were asked to reflect on their pedagogical transformation in relation to technology integration. Two out of the three students' discussions were scored at the metacognitive level and the other student's discussion was scored at the cognitive level. When examining the content of the messages, the instructor-led questions resulted in students thinking and sharing about their own learning but they also directed their responses to their colleagues. One student had metacognitive responses in the discussion thread that were directed to both the instructor and another student. This example reflects how the students were interacting with the instructor, peers, and content at a higher cognitive level. One student commented that the video "does enhance the connections with my peers" and she found that her classmates "really tried to make those videos engaging, which was pretty neat and definitely added to our bond." From a metacognitive posting, a student shared the following reflection of the impact of experience in this course:

> This course's content was scaffolded in an amazing way that allowed me to build on my knowledge through the weekly discussions. In preparation for this post, I was reflecting on what makes this course different from my other ones and my answer to that was that this course about inquiry was taught through inquiry. That might seem like something trivial, but trust me, to me it is not! …going through this course, I benefited a lot from [instructor]'s modelling in how she led this course, and provided us with prompts and great formative feedback, all of which link back to my understanding of what inquiry and society are. This course truly challenged me in so many ways where sometimes the answers to some of the weekly questions led to even harder questions that led to more complex problems.

TABLE 2: Number of student text and video postings in selected weeks

Week	Students (*n* = 3)	Participative	Social	Interactive	Cognitive	Metacognitive
Week 1	Text	14	1	8	5	0
	Video	8	0	0	4	4
Week 3	Text	17	0	3	13	1
	Video	2	0	0	1	1
Week 5	Text	12	0	2	10	0
	Video	2	0	0	1	1
Week 8	Text	16	0	3	11	2
	Video	1	0	0	1	0
Week 13	Text	12	0	4	4	4
	Video	1	0	0	0	1

The instructor modeled, and provided, a number of supports to help the students develop confidence and competency in using multimedia, especially video, in their discussion postings. Among the students, the instructor created an awareness of the various digital tools they could use in this online course to both engage in their learning as well as express their new understandings and insights. From the three students' postings and interview data, it is evident that video was not the dominant form of communication, yet it was an option.

One of the three students was more consistent in using video for online discussion forums. She developed a comfort in expressing her understanding and questioning of the readings through video. In the interview, this student acknowledged the gradual process of developing confidence in using video. Initially, she described how she included many things along with citing in the video. However, as time went one she learned to present key ideas or points in the video and then to continue writing about what was discussed in the video in the discussion forum. For this student, the video was a complementary tool she used with the text-based discussion forum. The video was intentionally used to present the key ideas or points and then she elaborated on them in the writing. She found it natural or "easier to talk about it in a daily conversation" where she could "use body language, I can use my hands, I can actually show things in the video." She was able to show comparisons by having items side-by-side and pointing to them for people to see. Reflecting on this

experience, this student remarked how “we were looking forward to each other’s videos as a cohort and some of us got so creative in creating the video. It was fantastic.”

The Week 8 discussion sparked a high level of intellectual engagement. For Student One, two out of eight discussion postings were scored at the metacognitive level. In the analysis of the content of these postings, she extended what was discussed that drew on the literature by reflecting on the impact to her own teaching practice and beliefs. The discussion question for the week generated a personal statement of response. This is an example of the “what” of learning, or multiple means of presentation, as noted in *Universal Design for Learning: Theory and Practice* (Meyer et al., 2014).

6. RECOMMENDATIONS

Three key recommendations emerge from this study with regard to the use of multimedia to support students in online learning environments. First, it cannot be assumed that students will embrace the opportunity as well as have confidence and competence in using various media in their online learning. Students, as noted by Johnson and Lock (2018) “may be users of technology for personal and social purposes—however, it does not address digital skills for learning” (p. 1547). When designing online learning where students are expected to use various media, it is critical they have access to support and scaffolding in the selection and use of various forms of multimedia, which may or may not be part of the LMS. Yet, it involves more than having access to the technology and how-to guides. It requires understanding the affordances and how to use principles of “good” design to create effective and meaningful messaging using the technology. For example, students in the study needed to learn how to craft an articulate message within a three-minute time limit. Developing a deeper understanding of how to present and represent understanding using various media is complex and may be outside of the course learning objectives. Yet, if instructors are expecting students to use various media, what role do they play in teaching students to be effective creators using the technology?

Second, conditions need to be created in online learning where students are being challenged to think critically, problem-solve, analyze, and synthesize. From the nature of the questions being asked in the online discussion forum, and the expectations of major assignments, how are students being given opportunities to engage in higher-order thinking and metacognition, and why? Specific to the design in online environments, instructors need to carefully plan and assess what they are expecting in terms of student learning. As they work through the design and development process, they also need to consider what roles technology plays in supporting students in the learning. For example, technology may provide students with various means of representing and communicating their understandings of the course content. Furthermore, as they reflect on the course

experience, how well did the design meet the expectation in terms of students engaging in higher-order thinking and metacognition? Reflecting on instructional practice and examining the data as we have done in this study, provides a healthy opportunity to learn from the experience, as well as determine the next steps in the refinement of the work.

Third, instructors and instructional designers need to further explore the various ways in which multimedia help students foster deep learning. The following critical questions will help guide this exploration. In what ways is course content being presented? Are students gaining information and understanding through both static and dynamic formats and through text, images, audio, and video? What and who are making the decisions with regard to the nature of the media being used for student learning in online environments? Furthermore, the use of intentional design can strengthen how students are empowered to represent their understandings and skills in meaningful and purposeful ways and how students are learning to be creators and producers using multimedia to show case their learning. Such exploration will help to formulate enhanced learning environments to meet the learning needs of all students.

7. DIRECTIONS FOR FUTURE RESEARCH

First, the small sample size provides only the experience and perspectives of four people. There is a need to study the experiences of more people to develop a better understanding of how the intentional use of multimedia by both students and the instructor is influencing learning and metacognition. Studying students, instructors, and instructional designers from various programs and institutions will provide greater understanding of what factors related to the use of multimedia impact student learning, as well as metacognition. Second, as a greater number of higher educational institutions are offering online courses, it becomes more feasible to explore the following questions. How are they designing the learning using multimedia; and are students expected and given greater opportunity to select various media to present and represent their learning? If so, how are they developing and applying principles of design to craft well-articulated messages; and what types of strategies and approaches are being used to support the capacity development of students as users and creators of multimedia as part of their learning experience? Such investigations should generate insights to inform practice.

8. CONCLUSIONS

It was evident in this study that the instructor designed and created conditions and encouraged the use of video. Through her actions and supports she championed the notion of using video in both student learning and in their assessment. Yet, there was student reluctance to engage beyond the minimum of what was required in terms of using various media in the course; they appreciated having access to various forms of media for

gaining information but were limited in what they did with technology as part of their learning experience. This tension or gap needs to be further explored.

The growing use of online programs offered by higher educational institutions provides a great opportunity to design, develop, and facilitate robust learning strategies that embrace the potential of interactive and multimedia environments for student learning. As instructors and instructional designers create learning experiences, careful consideration needs to be given to the nature of the learning with, and from, multimedia. Also, how to shift student thinking about why and how they use various forms of technology for their own learning as well as how to develop the capacity of learners to confidently engage in using various media as an integral component of the learning experience need to be explored.

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