Using Multimedia Feedback to Enhance Cognitive, Affective, and Psychomotor Learning

By

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We accept the thesis as conforming to the required standard

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Abstract

Providing high-quality assessment feedback for learners is one of the most important activities faculty can do to positively affect learning. Recent advancements in information, communication, and multimedia technologies present opportunities for us to examine how, when, and where we provide assessment feedback. Yet, a scan of the academic research literature shows that technologies are used widely for teaching in higher education, but not necessarily for assessment.

This exploratory study utilized an inductive, naturalistic inquiry approach to investigate student perceptions of receiving assessment feedback in digital multimedia format. Findings revealed that students reported positive effects on their cognitive, affective, and psychomotor learning through what they perceived as regularly occurring student-faculty interaction. Although this study had a relatively small and homogeneous sample, these findings indicate that providing digital multimedia assessment feedback asynchronously, online, has the potential to enhance faculty-student interactions, while contributing to student learning, satisfaction, and motivation.

Keywords: multimedia, student, assessment, feedback, cognitive learning, affective learning, psychomotor learning, Bloom’s Taxonomy
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Chapter One: Introduction

Assessment feedback provides critical information that is fundamental to the process of learning (Fenwick & Parsons, 2000). Although time consuming, providing well-crafted and timely feedback can be one of the most influential activities that an instructor does in terms of improving student learning (University of Winchester, n.d.). In the context of blended or fully online courses the quality, format, and timeliness of assessment feedback becomes increasingly important when considering that learners may have limited or no direct physical access to their peers or instructors. In these instances, the emphasis of using multimedia technologies for communication, collaboration, and sharing resources with learners becomes critical (Vlachos, 2009, p. 192).

It has been argued, “feedback affects student learning more than any other variable, including the teaching” (TESTA, n.d., para. 9). As a result, Davies (2010) purports that “decisions about assessment and feedback lie at the heart rather than at the periphery of the curriculum design process” (p. 10). As our world shrinks due to the proliferation of information and communication technologies, decisions regarding technology and assessment feedback need to consider and include issues of method, mode, delivery, and access.

The structure of this thesis document consists of an introduction, a review of selected literature, description of the study methodology, research findings, discussion and implications for practice, summary, and conclusions.

The intention of this thesis is to outline the implications, limitations, research methodology, and rationale for investigating the effect of providing learner assessment feedback, asynchronously, using multimedia technologies. Exploring and understanding digitally recorded multimedia, on perceived cognitive, affective, and psychomotor learning in a blended delivery
course offered in a university, centre for continuing education setting is the goal. The intent of this introductory chapter is to establish context and provide a lens through which the remaining chapters should be viewed. This will be accomplished by exploring the purpose and research question of the study followed by a contextual description of the theoretical, practical, and political rationale. The chapter will conclude with a series of definition of terms found commonly throughout education research literature and this thesis in addition to an outline of the limitations and delimitations of this research project.

**Purpose**

The purpose of this research is to explore and understand the experiences and perceptions of students enrolled in an introductory web site design course at a Canadian University’s Centre for Continuing Education, who received assessment feedback in digital multimedia format that included visual screencasts and audio voice-over in a blended delivery course. Courses that are designed and delivered blended integrate the opportunities and affordances of both face-to-face classroom and distributed online learning environments and resources (Garrison & Vaughan, 2008). To date, there has been a great deal of research investigating instruction and assessment in higher education (Maki, 2004). Similarly, there has also been a great deal of investigation into online learning; most prominently in the literature are comparisons between online and traditional teaching and learning approaches (Russell, 2001). In addition, researchers such as, Mayer (2003, 2008), have written extensively on the design, development, and implementation of multimedia for achieving positive learning outcomes in online and/or traditional approaches to instruction. However, there is little academic research available that has studied the effects of using different assessment feedback formats and techniques, such as multimedia, in blended
delivery courses. This project is part of the requirements for the completion of a Master of Arts Degree in Learning and Technology at Royal Roads University.

Research Question

This research journey began with the exploration of a broad inductive question -

*Does providing assessment feedback, in digital multimedia format, affect student perceptions of cognitive, affective, and psychomotor learning?*

Theoretical Rationale

The key aspects of this research project include teaching and learning, technology, assessment, and feedback. Most specifically, it involves the use of technology in teaching and learning and how it is used to provide assessment feedback. In recent years, the advancements and integration of technology in society have been unrelenting. At the same time, adoption of these technologies in higher education has been much slower and restricted mainly due to administrative and research activities (Garrison & Vaughan, 2008, p. 10). Garrison and Vaughan (2008) point out, “significant technological innovations in teaching and learning have been confined to addressing issues of access and convenience” (p. 10). Despite slow adoption rates thus far, the integration of technology in teaching has the potential to impact beyond the administrative function of teachers and learners. The process of providing assessment feedback is one area where technology can positively affect teaching and learning. Moreover, the greatest benefits of blended courses are access and flexibility (Graham & Dzuiban, 2008). Davies (2010) purports, “there is considerable potential for multimedia technologies to make feedback richer and more personal and for a wider range of learner skills and attributes” (p. 9). Thus, the significance of this research is that it contributes early to an evidence-based discussion regarding the potential impact of using multimedia for assessment in higher education. The following
section will outline my teaching philosophy, the learning theories that support my course design rationale, and a taxonomy of educational objectives used in the methodological design of this study.

**Teaching philosophy.**

“Our perspectives on learning matter: what we think about learning influences where we recognize learning, as well as what we do when we decide that we must do something about it - as individuals, communities, and as organizations” (Wenger, 2009, p. 214). As outlined earlier, the purpose of the study is to understand the experiences and perceptions of students in a university setting, who receive assessment feedback on assignments in digital multimedia format. As an educator who approaches teaching and learning from what MacKeracher (2004) refers to as a participatory-liberatory philosophy, I believe that knowledge is developed relative to the contexts and lived experiences of individuals who construct it. In this perspective, learning is relational, collaborative, co-operative, subjective, and integrated, and the learning process should be co-negotiated between learner and instructor. The purpose of learning and education is for personal growth, critical thinking, social and political awareness, and the organization and maintenance of social, ethical, and democratic institutions (McKeracher, 2004, p. 22). Thus, the experiences and stories of research participants contributed to an understanding of whether or not providing feedback on learner assessment in multimedia format affected cognitive learning, affective learning, and psychomotor learning in an undergraduate university setting.

**Bloom’s taxonomy of educational objectives.**

Bloom’s Taxonomy of Learning Objectives (1956) “is designed to be a classification of the student behaviors which represent the intended outcomes of the educational process” (p. 12). Thus, learning outcomes assist educators and instructional designers in specifying a destination
at which learners should arrive during or after a learning experience and provide a benchmark for assessing learners’ actual behaviours and abilities against the intended behaviours and abilities. From a learners’ perspective, well-crafted learning outcomes communicate what is expected of them in order to be successful. When classifying learning objectives Bloom and colleagues (1956) do so in terms of cognitive learning, affective learning, and psychomotor learning.

Cognitive learning, affective learning, and psychomotor learning are three domains defined within Bloom’s Taxonomy of Educational Objectives (Bloom, 1956). People learn in different ways and at different levels so Bloom and colleagues (1956) categorized the differences in terms of knowing (cognitive), feelings and attitudes (affective), and skills (psychomotor) (Clark, 2010). Within each domain, there are sub-divided levels of learning that form a continuum from the most basic to the most complex. “Of course, some units of learning may occur in more than one domain at the same time” (BCIT’s Learning Resource Unit, 2003, p. 4).

**Cognitive learning.**

The Cognitive domain of learning refers to intellectual skills and activities and is the most commonly referenced domain in higher education. Revised in the mid-nineties by a student of Bloom’s, David R. Krathwohl, the cognitive domain (Figure 1) includes six permeable levels that refer to one’s ability to remember (lowest), understand, apply, analyze, evaluate, and create (highest) in an educational environment (Anderson & Krathwohl, 2001).

**Affective learning.**

The Affective domain includes emotional aspects of learning, such as attitudes, motivations, values, and feelings (Krathwohl, Bloom, & Masia, 1973). Aspects of affective learning often, but not always, involve engagement with the actions, beliefs, behaviours, products, and cultures of other people and places. Growth in this area is a result of personal judgments regarding the acceptance, valuing, and integration, or disregard, de-valuing, and opposition to new and perhaps conflicting realities, experiences, and environments (Krathwohl, Bloom, & Masia, 1964). The affective domain of learning (Figure 2) is divided into five permeable sub-section including: receiving (lowest), responding, valuing, organization, and internalizing (highest).
In socio-constructivist learning environments, the cognitive and social/affective aspects of learning are highly connected. According to Dewey (as cited in Garrison, Anderson, & Archer, 2000) cognitive and social aspects of learning cannot be separated without dire consequence (p. 92). Garrison et al. (2000) posit “collaboration is seen as an essential aspect of cognitive development since cognition cannot be separated from the social context” (p. 92).

**Psychomotor learning.**

The third and final domain in Bloom’s Taxonomy of Educational Objectives is the Psychomotor domain. The psychomotor domain includes physical aspects of learning such as “movement, coordination, and use of the motor-skill areas” (Clark, 2010, para. 7). Physical aspects of learning are generally measured in terms of speed, accuracy, stamina, procedure, and technique (Clark, 2010) and this domain is sub-divided into seven permeable sections. From
lowest to highest, the levels of the psychomotor domain (Figure 3) are: perception, set, guided response, mechanism, complete overt response, adaption, and organization (Simpson, 1972).

![Psychomotor Domain Diagram]


When written, classified, and categorised effectively, learning objectives provide a road map for educators, instructional designers, and learners. For educators and instructional designers, objectives set clear goals or benchmarks for what needs to be taught, and therefore they narrow the scope of potential and appropriate instructional strategies. From a learners’ perspective, objectives set clear expectations for what is expected of them and help them self-evaluate when, or if, they are successful at meeting those goals.
Theories of teaching and learning.

Conversation, and modeling are integral aspects of my teaching style, the design of the course in which this study takes place, and the methodology of this research project. In this context, several models and theories of teaching and learning, such as social learning theory, socio-constructivism, and active learning, support the use of conversation and modeling.

Active Learning.

"I see and I forget, I hear and I remember, I do and I understand“ (Quotationspage.com, n.d.). This age old saying outlines the tenants of active learning. More recently Edgar Dale (1970) described a similar concept in what he called Dale’s Cone of Experience. Dale’s Cone of Experience posits “students do not learn merely by looking: they learn by becoming creatively involved” (p. 99). Ideally, students should be actively and creatively involved through the stimulation of multiple senses such as seeing, hearing, touching, smelling, and tasting (p. 98). Subsequently, the percentage of what one remembers increases as we become more actively involved in the process (Garrett, 1997). Unlike many educational principles or strategies, active learning does not depend upon one theory. Rather, it encompasses a range of concepts that promote a shift from didactic, lecture style teaching to a competency based model where the focus is on measuring learning outcomes. Socio-constructivism and social learning theory lie at the epitome of active learning by espousing that effective learning has interactive, collaborative, and individual components and is constructed in social and cultural contexts (Berger, 2002).

Socio-constructivism.

“Constructivism is an approach to instructional design based on the assumption that learners generate knowledge structures in their own minds” (Morrison, Ross, Kemp & Kalman, 2011, p. 474). Higgins, Hartley, and Skelton (2002) describe learners from a constructivist
perspective as “makers and mediators of meaning within particular learning contexts” (p. 53).
Beginning in the 1960s educators and instructional designers began subscribing to a new
learning theory called Constructivism. This movement was a departure from cognitive learning
theory which focused primarily on mental processing - thought process, memory storage,
information retrieval, information loss, and use of language. Since constructivism assumes that
learners must engage with the learning process to create their own knowledge and understanding,
it is an ideal theoretical approach to use when working with intrinsically motivated learners.
Constructivism can increase motivation and relevance by allowing learners the opportunity to
draw on their own personal and professional experiences, develop common understandings by
sharing stories, insights, and critical learning moments with peers, and apply learning to their
own personal and professional contexts (Bates & Poole, 2003, p. 161). When leveraged in
online, blended or “networked learning” (Bates & Poole, 2003, p. 160), a constructivist approach
to teaching and learning is supported by educational researchers.

The concept of socio-constructivism, as applied in this setting, expands upon the
constructivist approach by emphasizing the importance of social context of learning, in addition
to collaboration, and negotiation between and among classmates and the instructor (Hickey,
1997, p. 175). In a socio-constructivist environment learners develop knowledge and
understanding through a combination of their own experiences and the shared experiences of co-
learners. In recent years the ubiquity of the internet has contributed greatly to the concept of
social learning by facilitating learners’ seemingly unlimited access to people, information, and
resources outside of formal learning environments via the World Wide Web. Central to socio-
constructivist learning environments are activities and assignments that model and scaffold
learners in their understanding and performances (Hickey, 1997, p. 176).
Social Learning Theory.

Modeling is also a key concept in social learning theory. Social learning theory is similar to socio-constructivism in that the social context plays a pivotal role in the learning process. The difference is that social-constructivism focuses primarily on the cognitive aspect of learning whereas social learning theory incorporates tenants of behaviourism. Behaviourism is a learning theory which prescribes that learning occurs through the repetition of behaviours and activities that are rewarded or punished through positive and negative reinforcements (Skinner, 1984).

From a behavioural perspective learning is measured by observable performance(s) (Ely, 1999, p. 107). The primary principles of social learning theory posit that; people learn by observing others receive feedback, in the form of reward or punishment, for their behaviours; people learn by modeling behaviours to others; and that observing others perform tasks will limit or reduce fear and inhibitions of performing new behaviours or tasks (Morrison, et al., 2011, pp. 387-388).

Community is a key component of social learning. Humans are social creatures who belong to myriad communities throughout their lives, such as work, family, school, sports, music, dance, special interest, faith, etc. In the course that was studied for this thesis, students were encouraged to engage with the membership of a community of learners in the classroom while they were apprenticing into a community of web designers and working professionals where learning occurs through contributions to the practice of these communities (Wenger, 2009, p. 213). The importance of these communities in education and active learner involvement within them cannot be understated. “In spite of curriculum, discipline, and exhortation, the learning that is most personally transformative turns out to be the learning that involves membership in these communities” (Wenger, 2009, p. 212).
Conversation and modeling are integral aspects of my teaching style, the design of the course that was studied for this thesis, and the methodology of this research project. From a participatory-liberatory perspective, conversation, modeling, shared experiences, reflection, and active learning are all key aspects of learning, growth, and development. “Through social intercourse, through sharing in the activities embodying beliefs, he gradually acquires a mind of his own” (Dewey, 1916, p. 145).

**Practical and Political Rationale**

Socio-constructivism and social learning theory form the theoretical underpinnings of the *Building a Web Site* course design, which was studied for this thesis. The course consisted of two major topics, extensible hypertext markup language (xhtml) and cascading stylesheets (css), and had three learning outcomes. The first outcome was for students to understand and explain the purpose, components, and functions of the xhtml and css programming languages (cognitive learning). The second outcome was to demonstrate competency in planning, designing, and developing standards compliant web sites (psychomotor learning), while developing an appreciation for the intricacies and technical aspects of web site design and development was the third outcome (affective learning).

Classes in the *Building a Web Site* course were comprised of a review of the previous week(s), a lecture, and a lab component. A quick review of the previous week occurred at the beginning of each class for the purpose of answering questions and clarifying any lingering misunderstandings or misconceptions. The review was also used to segue into a new lecture and for bridging existing knowledge with new concepts that were covered that week. Lectures were delivered in a narrative style and were relatively short in length. The lab component immediately followed the lecture. Learners were encouraged to ask questions, and share stories associated
with their learning throughout the lecture and lab. Lab activities were designed so that the entire class worked collectively through a process of application and experimentation of concepts covered in the lecture, course readings, and online resources. As the course instructor, I demonstrated the application of concepts on a computer, via data projection, while asking learners to guide me and help me make decisions throughout the process. My intentions were to verbalize the thought processes as we progressed through the activities and I expected students to do the same when making decisions so that learners began to understand the what, why, where, when, and how of web design.

Each week between the 4th and 10th classes, students were expected to complete and hand in an assignment or a quiz. There were 5 assignments, all of which were submitted asynchronously, outside of class time, through a dropbox folder in the technology mediated learning environment. Each assignment was based upon the materials, concepts, and activities, covered in the previous class, thus allowing students the opportunity to learn and experiment in class and then re-apply their learning to an individual assignment throughout the following week. The assignments were scaffolded throughout the term so that each one built upon the previous. Thus, the feedback I provided on assignments was returned to students at least four days prior to the next assignment due date and was intended to feed-forward so that learners could integrate corrections and improvements from past assignments into future assignments. The two programming languages covered in the course were extensible hypertext mark-up language (xhtml) and cascading style sheets (css). The first and second assignments focused on xhtml and they were followed by an xhtml quiz in the sixth week. Subsequently, assignments three, four, and five covered css and its integration with xhtml to create and format web pages. They were followed by a css quiz in week eleven. Quizzes were taken electronically, via the learning
management system and are programmed to provide instant feedback regarding student performance. Subsequently, learners were expected to spend the last 4 weeks of the semester creating a culminating project that integrated everything covered in the course into a final project web site. The learning activities, resources, assignments, quizzes, and final project were all designed and positioned so that one scaffolded into the other and so that learners cycled through the rungs of the cognitive, affective, and psychomotor domains of learning with Bloom’s Taxonomy of Educational Objectives (Bloom, 1956) throughout the semester.

Dialogue, modeling, and narrative were integrated components of classroom activities in the *Building a Web Site* course. Classroom activities were what Wenger (2009) refers to as “focused learning” (p. 214) and it was recognized that focused learning experiences are not always those in which we “learn the most, or most deeply” (Wenger, 2009, p. 214). Rather, that fiery bursts of learning occur most often outside of the classroom, when learners are engaging with the content in a personally meaningful way. Thus, a natural extension of the course design was to investigate ways of integrating social, narrative, and modeling aspects into assessment feedback that learners receive outside of the classroom. Therefore, I began to investigate whether incorporating the benefits and richness of visuals and voice with the reflective asynchronous aspects of text-based learning will contribute to student perceptions on learning, and satisfaction in a blended learning environment.
Definitions & Terminology

Definitions for technical and genre specific terminology that are used in this thesis are provided below.

**Technology mediated learning environment.**

The term *mediate* is defined as “bring[ing] about an agreement of solution” (Oxford Dictionaries, 2011), or “acting through an intervening agency” (Merriam-Webster Dictionary, 2011). Therefore, a technology mediated learning (TML) environment can be described as an environment in which technologies are used to intervene in the facilitation of learning, communication, collaboration, and distribution of resources between and among teachers, learners, administrators, experts, and community members. TML environments are facilitated synchronously (real-time) and/or asynchronously (distributed) over the internet due to its ubiquity in most Western societies.

**Blended learning.**

“Blended learning is a coherent design approach that openly assesses and integrates the strengths of face-to-face and online learning to address worthwhile educational goals” (Garrison & Vaughan, 2008, p. x). This approach to teaching involves rethinking one’s course design to optimize student engagement while replacing traditional classroom contact hours with online work (Garrison & Vaughan, 2008, p. 5). Within the scholarship of teaching and learning literature, blended courses have also been referred to as *hybrid, distributed,* and *mixed mode* (Bates & Poole, 2003, p. 116).
**Learning management system.**

A learning management system (LMS) is a course authoring software system that facilitates the design, development, and delivery of web-enhanced, blended, or online courses (Bates & Poole, 2003, p. 109). The Desire2Learn © (D2L) learning management was used in this study due to its implementation and organizational wide adoption at the university.

**Dropbox folder.**

A dropbox folder is a feature in most commercially available and open source learning management systems that provides a convenient, online, location for students to submit individual or group assignments. The flexibility of this tool enables learners to submit assignments at a time and place that is outside of regularly scheduled class. Likewise, the dropbox empowers instructors to collect, grade, and provide feedback for learners asynchronously. According to Desire2Learn © its Dropbox tool “gives clients the ability to manage submissions, provide written or audio feedback, markup documents, and grade or assess assignments using rubrics, all from a single location” (Desire2Learn, n.d.).

**Multimedia.**

Multimedia is defined as “using more than one medium of expression or communication” (Oxford Dictionaries, 2010) or “using, involving, or encompassing several media” (Merriam-Webster Dictionary, 2010). Assessment feedback was provided to learners in this study in a multimedia format commonly referred to as a *screencasting* that incorporates instructor voice (audio) and a visual of the students work, accompanied by external text comments. Bates and Poole postulate; “it is the combination of different media within a single technology (multimedia) that give technology its strength in teaching and learning” (Bates & Poole, 2003, p. 59).
Summary

This chapter provided an introduction to the purpose, context, rationale, and theoretical underpinnings of a research project aimed at answering the following question. *Does providing assessment feedback, in digital multimedia format, affect student perceptions of cognitive, affective, and psychomotor learning?* In addition, the practical and political rationales were presented along with a view of the limitations and delimitations of the study.

The next chapter outlines a review of selected academic literature associated with elements of effective assessment feedback, how assessment feedback processes are best integrated into course design, and the benefits and challenges associated with providing feedback in digital multimedia formats.
Chapter Two: Review of Selected Literature

According to Gaytan and McEwen (2007): “future research studies should be designed to explore more innovative, efficient, and effective instructional and assessment techniques for the online environment” (p. 131). The following literature review will look a sub-set of assessment feedback for the purpose of identifying principles of effective feedback, how feedback processes are best integrated into course design, benefits and challenges associated with different feedback formats, and how to improve the practice of integrating media based feedback in assessment. I will begin by framing the review with the contextual problem and research questions.

The Problem

“Providing feedback on assignments is one of the most time-consuming things tutors do” (Gibbs, n.d., p. 1). Although time-consuming, thoughtful and well-constructed feedback can “affect student learning more than any other variable, including the teaching” (TESTA, n.d., para. 9). However, assessment feedback is only useful if learners take notice of it. Research studies found that the majority of students who received assessment feedback tried to utilize comments when working on future assignments (Higgins, et al., 2002; Hyland, 2000). Thus, it seems appropriate that an educator would investigate ways of providing feedback to learners that are effective, timely, and meaningful while remaining manageable within a course schedule and his or her workload (Brown, 2004; Gibbs & Simpson, 2004).

The Question

The primary research question of this study is: Does providing learner feedback, in digital multimedia format, affect student perceptions of cognitive, affective, and psychomotor learning? It should be noted that I did not expect students to be familiar with or relate to the concepts of cognitive, affective, or psychomotor learning. Rather, students were asked whether
receiving assessment feedback in multimedia format would affect their perceptions of the instructor, their learning, their relationship with peers, and their relationship with the instructor.

Secondary questions where used to guide the literature review.

1. What is effective feedback?
2. How are assessment feedback processes best integrated into course design?
3. What are the benefits and challenges associated with providing feedback in different formats?

**What is Effective Feedback?**

Technology has been embraced in higher education as a means of communicating with learners, providing resources, and managing administrative aspects of learning. Yet, limited research has investigated the use of information and communication technologies for providing assessment feedback. Thus, considering the relative availability, acceptance, and ease-of-use of many technology tools it seemed appropriate that one might investigate student perceptions of using multimedia software tools for providing “e-feedback” (Denton, Madden, Roberts & Rowe, 2008) online and asynchronously for students enrolled in a blended undergraduate, continuing education course. This research project is a result, at least in-part, of recommendations made by Ice, et al., (2010) who, after researching the efficacy of providing audio and text-based feedback, suggested that similar research needs to be conducted on “combined written and audio feedback” (p. 127). However, before we investigate feedback modalities one must first determine the qualities that contribute to effective feedback in general.
The ways in which students are assessed contribute greatly to the quality of their learning (Higgins, et al., 2002, p. 53). Associated with the assessment process are the ways in which students receive feedback on their learning. “Providing feedback on student papers is an important assessment effort” (Stern & Solomon, 2006, p. 23) and it has been argued that the single most positive influence on student achievement is feedback (Brown, 2004; Denton, et al., 2008; Gibbs & Simpson, 2004). Despite the importance and ostensibly straightforward process of providing feedback, many teachers are unsure of how to provide effective information to learners (Stern & Solomon, 2006). In fact, the variability of assessment feedback in both quality and quantity has been noted by many (Connors & Lunsford, 1993; Higgins, et al., 2002; Stern & Solomon, 2006; Denton, et al., 2008; Walker, 2009) in educational research literature. These reports suggest that the tone of tutor feedback can often be judgmental, authoritarian and detached while the style and presentation are often coded, illegible, or difficult to understand. Providing assessment feedback is different from providing information. “Its purpose is to affect learning rather than to transmit knowledge” (Nortcliffe & Middleton, 2008, p. 48). Thus, in order to provide feedback that is useful we must first understand the qualities that contribute to effective feedback.

**Principles of effective feedback.**

What is effective feedback? By performing a review of the selected academic literature, the following eight principles are identified as being key ingredients for formative feedback on individual assignments.
1. Provide positive comments in addition to corrections.

2. Focus feedback on course, program, or discipline specific outcomes and competencies.

3. Identify patterns of weakness, errors, or strengths rather than focusing on every error.

4. Provide feedback in a timely manner.

5. Personalize the feedback.

6. Ensure feedback is legible and/or audible.

7. Do not focus on the mark.

8. Two-stage or multi-stage feedback works better than one-stage feedback.

1. **Provide positive comments in addition to corrections.**

   The first principle is to *provide positive comments in addition to corrections*. Feedback that learners find useful focuses on what students can do and how their work can be improved, as opposed what they did not, or cannot do (Zinn, 1998, as cited in Stern & Solomon, p. 26). Comments should focus on inventiveness and creativity, and evaluation of assignment goal achievement(s), while adding questions to inspire further student queries (Higgins, et al., 2002; Stern & Solomon, 2006). “Theory suggests that formative feedback should be encouraging, as it fosters deep learning” (Denton, et al., 2008, p. 487). Evaluators should think of comments in assessment feedback as the stepping-stone to a new conversation with a learner rather than the final statement of a lingering monologue (Nicol & Macfarlane-Dick, 2006, p. 208).
2. **Focus feedback on course, program, or discipline specific outcomes and competencies.**

The second principle is to focus feedback on course, program, or discipline specific outcomes and competencies. Narrow the scope of assessment to identity the most important concepts or skills (Higgins, et al., 2002; Nicol & Macfarlane-Dick, 2006; Stern & Solomon, 2006) and use rubrics to avoid normative tutor judgments (Gibbs, n.d.; Gaytan & McEwen, 2007, p. 129). Often referred to as ‘criterion based’, outcomes focused assessment measures student knowledge and performance against predetermined standards, learning outcomes, and competencies rather than against each another (Fenwick & Parsons, 2000, p.39).

3. **Identify patterns of weakness, errors, or strengths rather than focusing on every error.**

The third principle involves identifying patterns of weakness, errors, or strengths rather than focusing on every error. Focusing on patterns helps reduce the possibility of overwhelming students (Higgins, et al., 2002; Stern & Solomon, 2006, p. 26). Nicol and Macfarlane-Dick (2006) recommend limiting feedback to three comments if the expectation is that students will act upon them (p. 208) and grouping errors into patterns will help facilitate this approach. Moreover, tutors should make sure comments on those patterns are forward-looking by suggesting ways in which errors can be fixed or avoided rather than simply pointing them out (Gibbs, n.d.; Nicol & Macfarlane-Dick, 2006).

4. **Provide feedback in a timely manner.**

& Macfarlane-Dick, 2006). “If feedback is not timely, students might not make the effort to go back to the assignment, which may seem distant and remote” (Higgins, et al., 2002, p. 55). Gibbs and Habeshaw (1993) state that a few weeks after an assignment has been submitted, students have moved onto another topic and “have neither the time nor the interest to take feedback to heart” (p. 95). Thus, if feedback is to be effective, it must be received by learners at a time when it is possible for them to apply changes to their work, not just soon after it was submitted (Nicol & MacFarlane-Dick, 2006, p. 208).

5. Personalize the feedback.

The fifth principle is to personalize the feedback. Personalizing feedback contributes to teacher immediacy, which enhances closeness, while reducing perceived psychological distance between individuals (Oomen-Early, Bold, Wiginton, Gallien, & Anderson, 2008, p. 269). Teacher immediacy contributes to the social and human presence within learning environments which, according to Richardson and Swan (2003), has a positive effect on learner performance and satisfaction for students in courses that are enhanced or facilitated exclusively through the use of technology mediate learning environments. Personalizing feedback also contributes to positive student-faculty interactions, which is an important factor in student motivation and involvement (Chickering & Gamson, 2001). Furthermore, Mayer’s (2003) e-learning personalization principle purports that using a conversational style to personalized messages will prime appropriate cognitive process, which has a positive effect on student learning and motivation. Students will perceive formative feedback negatively if it is too impersonal (Higgins et al., 2002, p. 56).
6. Ensure feedback is legible and/or audible.

Principle six requires that feedback is legible and/or audible. This may seem like an obvious point but in a study conducted by Higgins, et al. (2002), 40% of student respondents indicated that written feedback received was difficult to read. If an instructor is going to take the time to provide feedback, one should take all steps possible to ensure that it will be understood and, therefore, used. Denton, et al. (2008) suggest that feedback was perceived as having greater value when provided in a structured, electronic, word-processed file as opposed to hand written. Similarly, if feedback is to be provided via recorded audio or multimedia, a tutor should ensure that s/he speaks clearly, at a moderate pace, and there is some inherent structure to the feedback so that it is easily scanned and understood. When recording media, ensure the recording compressions settings will produce an acceptable sound quality while producing files that are as small and accessible as possible (Rotheram, 2008).

7. Do not focus on the mark.

To mark or not to mark? The seventh principle is, do not focus on the mark. If an assessment is formative in nature, it is possible to provide assessment feedback that does not include a grade. Gibbs (n.d.) suggests:

the feedback-only option … has … the greatest impact and which encourages students to read and think about the feedback and perform better. When there are marks and feedback students often read the mark and throw the feedback in the bin. (p. 2)

When assessments are summative in nature a grade will, in many instances within the structure of formal higher education, need to be provided. In these instances one can provide feedback and the grade at different times and/or in different formats. Researchers
suggest that separating grades and feedback can involve the student more and it provides a greater administrative flexibility if the moderation of grades is required after the fact (Gibbs, n.d.; Nicol & Macfarlane-Dick, 2006; Rotheram, 2008).

8. **Two-stage or multi-stage feedback works better than one-stage feedback.**

The eighth and final assessment principle is that *two-stage or multi-stage feedback works better than one-stage feedback.* Incorporate a process-centered approach to assignments. Requiring learners to submit multiple drafts of assignments that scaffold into one another (Gibbs, n.d.; Higgins, et al., 2002), while providing on-going feedback throughout the process. “Ideally multiple assignments in a course should be designed to be linked so that there is a natural multi-stage feedback process going on, feedback on each stage contributing in a deliberate way to the next assignment” (Gibbs, n.d., p. 3).

When building a house, baking a cake, or writing a book, the quality of the end product is dependent on the quality of its ingredients, knowledge and skill of its creator, and integrity of its structure. Creating feedback is no different. Although the focus of this research is to investigate learner perceptions when receiving feedback in a specific media format it is equally important that high quality feedback is provided to learners, regardless of format. Thus, if the ultimate goal is to provide feedback for learners that is read/watched/listened, perceived as valuable, and used as a means for improving learning, then instructors require a thoughtful, informed, and systematic approach to creating it. The research literature indicates that learners perceive assessment feedback negatively unless it is timely, voiced positively, is personal, unbiased, legible/audible, and specific regarding how their work can improve. Thus, the aim of the eight principles provided herein, is intended to act a guide or framework for tutors to effectively provide
formative information that “has the capacity to turn each item of assessed work into an instrument for the further development of each students’ learning” (Hyland, 2000, p. 234).

**How Are Assessment Feedback Processes Best Integrated Into Course Design?**

Understanding how to provide effective assessment feedback is a critical skill for educators. However, integrating assessment and feedback into course and curriculum design is an essential aspect if instructors are to provide feedback and students are to have the opportunity to make use of it. Another important aspect regarding the successful implementation of assessment and feedback strategies is the philosophical outlook of instructors who ultimately do the work. Due to the complexity of the subject, teaching philosophies are not discussed here but it is worth noting that curricula, assessment procedures, and teaching methods should be aligned (Biggs & Tang, 2007) if courses are to be delivered as intended.

One of the first steps in the instructional design process is to identify instructional objectives. Often referred to as learning outcomes, instructional objectives provide a road map for instructional and evaluation strategies (Bloom, 1956; Morrison, et al., 2011, p. 16). Assessment instruments must set high expectations, require time-on-task, and have a clear and direct link to cognitive, affective, and/or psychomotor objectives (Chickering & Gamson, 2001). Gaytan and McEwen (2007) recommend incorporating a variety of assessment and instructional strategies within an online course. Examples of different assessment strategies include, but are not limited to; quizzes, self-tests, assignments, presentations, projects, peer-assessment, self-assessment, weekly review, usability testing, and group work. This sentiment is echoed by others (Gibbs, n.d.; Nicole &
Macfarlane-Dick, 2006; TESTA, n.d.) who recommend using a number of regularly occurring tasks and assignments that require sufficient effort and are distributed throughout time and across topics.

Other recommendations found throughout the literature suggest that coursework is a more effective means of measuring learning than examinations. Specifically, coursework is said to produce higher grades, increase student satisfaction and retention, and be a better overall predictor of long-term achievement than examinations alone. A study by Gibbs and Simpson (2004) found that “modules with 100% coursework had an average mark 3.5% higher than modules with 100% examinations, and there were three times as many failed students on modules where there were only examinations” (p. 6). They also found that students prefer coursework because they consider it fairer and it allows for more autonomy over their learning and schedules (p. 7). Moreover, high stakes examinations are found to negatively impact motivation and they encourage a surface approach to learning (Nicol & Macfarlane-Dick, 2006, p. 210). Finally, increased time-on-task achieved through ongoing assessments provides opportunities for students to “progress in their sophistication” (TESTA, n.d., p. 2) and has a better effect on long-term performance (Gibbs & Simpson, 2004, p. 7).

A key aspect of scaffolded assessments is the integration of feedback that is fed-forward (TESTA, n.d., p. 2). It could be said that feedback that is fed-forward has both eyes on the horizon as opposed to the rear-view-mirror. Forward looking feedback provides ideas or suggestions on what students might do differently in the future, in order to improve their understanding and performance (Gibbs, n.d.), and this is especially beneficial when future assignments allows them to do just that.
Integrating assessment strategies into course and curriculum design that align with the teaching philosophies, instructional objectives, and a variety of course work assignments and examinations is a complex, yet essential, process for educators to undertake. Another piece to the complex puzzle involves an analysis of the benefits and challenges associated with different feedback formats.

**Benefits And Challenges Associated With Different Feedback Formats?**

“The electronic delivery of feedback is of obvious value, as it can facilitate rapid communication between tutor and student” (Denton, et al., 2008, p. 488). Thus, electronic feedback, or “e-feedback” (Denton, et al., 2008), has the potential to contribute to communication and feedback efficiencies. Moreover, e-feedback also opens the possibilities regarding format and modality. The following section outlines the benefits and challenges associated with providing assessment feedback electronically, in text, audio, and multimedia formats.

**Electronic text feedback.**

“Socially and emotionally, face-to-face oral communication is a rich medium” (Garrison, et al., 2000, p. 90). However, when we transfer learning experiences and environments to a blended or purely online text-based delivery the overall feeling has the potential to become formal and impersonal (Moreno & Mayer, 2000). Researchers (Garrison, et al., 2000) purport that despite the loss of visual communication cues; the reflective nature of asynchronous text-based learning environments encourages reflection and critical thinking while improving communication skills (p. 90).
Providing textual feedback electronically is similar to providing text feedback on paper but if offers several advantages. The two most obvious benefits of electronic text are legibility, and efficiency. First, providing electronic text can contribute greatly to the efficiencies of communication. When sending feedback through email or electronic dropbox a tutor can provide feedback asynchronously, outside of class. Denton (2001) found that emailing feedback to learners contributed to improvements in students’ report writing skills over a 2-week period. “Students receive a commentary on their work as soon as marking is complete, and do not have to wait until the next taught session, as is normally the case” (Denton, et al., 2008, p. 489).

Utilizing electronic text also facilitates transparency through the use of rubrics and statement banks, which help structure feedback, and helps students and tutors “engage explicitly with assessment criteria” (Denton, et al., 2008, p. 489) rather than attempting to uncover the “hidden curriculum” (Gibbs & Simpson, 2004, p. 4). Finally, typed text is also more legible than handwritten text. Word processing software facilitates the use of organizational templates that make feedback malleable, editable, and easier to create for tutors while being easier to read and understand for learners.

Despite advances in teaching and learning technologies, text-based feedback is the norm in higher education (Higgins, et al., 2002, p. 54). However, “textual feedback, particularly in the context of a blended or online course, can lack rich detail and tone” (Using feedback to promote teaching presence, 2009). Furthermore, greater tutor workloads and increasing student enrolments in higher education has resulted in reduced face-to-face time with tutors (Higgins, et al., 2002). With an aim of providing richer feedback and improving student-faculty interactions one can look to other media formats.
Audio feedback.

More and more educators are posting video and/or audio-recorded lectures in virtual learning environments or learning management systems (Nortcliffe & Middleton, 2007, p. 1). Since students are becoming accustomed to using resources in these formats, it seems appropriate that one might explore their use in providing assessment feedback. Some academics are already doing just that. For example, researchers (Ice et al., 2010; Nortcliffe & Middleton, 2007; Oomen-Early et al., 2008, Rotheram, 2008) reported favourable results on instructor workload and learner perceptions, performance, and satisfaction when providing assessment feedback in recorded audio format. These research initiatives found that academics were able to provide greater clarity when using audio compared to text (Davis, 2010; Nortcliffe & Middleton, 2007), and achieve workload efficiencies when providing audio assessment, under certain circumstances (Davies, 2010; Rotheram, 2008). Students consistently reported that receiving feedback in a recorded audio format provided an added degree of meaning and personalization to the comments (Nortcliff & Middleton, 2008), while increasing one’s ability to understand nuance (Ice et al., 2007). Furthermore, human voice increases social presence (Ice et al., 2007; Reeves & Nass, 1996) and motivation. Davies (2010) supports this when writing; “to become effective in regulating their own learning, learners need to be engaged... and motivated” (p. 12). These findings are all in-line with aspects of the 8 principle of effective feedback outlined earlier. Ice et al. (2007) reported that “26 out of 31” (84%) of student respondents indicated a preference of audio feedback over text in an end of course survey and these findings are supported by Oomen-Early et al. (2008).

Using recorded audio for providing assessment feedback does have its challenges. Three critiques found in the literature are related to clarity (Queen Margaret University, n.d.; Rotheram,
Regarding clarity, audio files must meet a minimum acceptable sound quality (Rotheram, 2009). “Poor quality audio feedback is like illegible handwritten feedback” (Queen Margaret University, n.d.) - if it is not understood, it will not be used. Next, audio files can take longer to download because they are generally larger than text files. Thus, accessibility may be compromised for students with low-bandwidth internet access and they may become frustrated with this format. In addition, audio files are not easily searchable or scan-able in the same way that electronic text is (Queen Margaret University, n.d.) and individuals with a physical or psychological hearing impairment may not benefit from audio feedback without synchronized captions or sign translation (McCarron, 2012). Finally, Rotheram cautions that, although valuable, audio feedback should not be used at the expense of face-to-face time (2008).

Despite its challenges academics found that audio “feedback can be more visceral and impactful than carefully chosen written phrases” (TESTA, n.d., para. 34) and they were able to provide “greater clarity than possible when working with the constraints of written feedback” (Nortcliffe & Middleton, 2007, p. 1). Providing audio feedback has also proven to be more time efficient than text, under certain circumstances (Davies, 2010; Nortcliffe & Middleton, 2007; Rotheram, 2008). Research finds that audio feedback is especially beneficial when accompanied by text (Clark & Mayer, 2003; Mayer, 2008). The next section, investigates the use of multimedia for incorporating text, audio, and visual into one multi-sensory feedback experience.

**Multimedia feedback.**

Researchers have reported positive results from providing learners with assessment feedback in recorded audio feedback, as opposed to text. However, Ice et al. (2010), Oomen-Early et al. (2008), and Simonsson, Kupczynski, Ice, and Pankake (2009), indicate that students
prefer a combination of visual mark-up and audio when receiving feedback on what Stern and Solomon (2006) refer to as micro-level evaluation comments (Table 1). The micro-level category captures technicalities in writing assignments such as word “choice/phrasing; missing words and pieces; grammar/punctuation; spelling/typos; technical style, and reference/citations” (Stern & Solomon, 2006, pp. 29-30). When considering the introductory nature and technical focus of the *Building a Web Site* course the micro-level category in Stern and Solomon’s (2006) model aligns well with the type and scope of feedback specific to technical style, syntax correctness, and information organization required when teaching and learning computer programming languages such as extensible hypertext markup language (xhtml) and cascading style sheets (css). When learning a new language there are different character sets, rules, and syntax that must learnt and internalized before one can become proficient in using the language. Thus, much of the activities, and therefore the assessment feedback in the Building a Website course focused on the correct application and repetition of fundamental, micro-level, syntax rules.
Table 1

*Types of Micro-Level Evaluation Comments on Written Assignments*

<table>
<thead>
<tr>
<th>Type of Comment</th>
<th>Categories</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Micro-level     | Word choice / Phrasing   | Awk
|                 |                          | Wordy
|                 |                          | (wrote in a new word and crossed out one of students)                     |
|                 | Missing Words & Pieces   | Add sentence                                                            |
|                 |                          | Word needed                                                             |
|                 |                          | (wrote in a word/phrase)                                                |
|                 | Grammar / Punctuation    | Noun/verb agreements                                                    |
|                 |                          | Deleted commas                                                          |
|                 |                          | Fixed grammar                                                           |
|                 |                          | Frag                                                                     |
|                 |                          | Run-on                                                                   |
|                 |                          | Verb tense                                                              |


Multimedia allows the integration of voice, text, and demonstration through a process similar to video called *screencasting*. Screencasting allows tutors to record their computer screen as they provide text mark-up on student work while explaining and rationalizing the mark-up. There is little research on providing assessment feedback in multimedia format. However, one study by Hase and Saenger (1997) investigated the effects of providing assessment feedback in video format and they reported the experience as being highly effective in enabling communication techniques that are not possible through other mediums. Moreover, cognitive learning theory tells us that in order for deeper approaches to learning to take place, the cognitive processes in the learner must first be primed. Recent cognitive psychology research supports the notion that cognitive priming can occur through conversation: “learners work harder to understand material when they feel they are in a conversation with a partner” (Clark & Mayer,
In his personalization principle, Mayer (2003) posits that speaking in the first person, using recorded voice in a multimedia learning environment will create a feeling of conversation - promoting motivation (p. 145). In support of the inclusion of multimedia in instruction Mayer (2008) developed a series of multimedia principles. Table 2 outlines elements of those principles such as the Temporal Contiguity principle, Modality principle, Personalization principle, and the Voice principle.

Table 2

<table>
<thead>
<tr>
<th>Principle</th>
<th>Application</th>
</tr>
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<tbody>
<tr>
<td>Temporal Contiguity</td>
<td>Present narration and text or graphics at the same time and in the same place rather than placing the narration before or after the text or graphics.</td>
</tr>
<tr>
<td>Modality Principle</td>
<td>Animations with narrated voice-over are more effective than animations with text.</td>
</tr>
<tr>
<td>Personalization Principle</td>
<td>Conversational style within text and narration promotes learner engagement and motivation.</td>
</tr>
<tr>
<td>Voice Principle</td>
<td>Human voice is more engaging and personalized than computer-generated voice.</td>
</tr>
</tbody>
</table>


Elements of the Mayer’s (2008) Principles of Multimedia Design help inform the development of effective feedback when using multimedia. Although personal formative assessment feedback is not designed or developed with the intent of becoming re-usable course content, it is developed as assessment for learning rather than assessment of learning. Thus, many of Mayer’s principles provide a framework or guide in its development. For example, the Temporal Contiguity Principle posits that presenting narration and associated graphics or media
at the same time, reduces cognitive load in learners, as opposed to providing audio comments at the beginning or end of student’s work (Mayer, 2008). The Modality Principle suggests that animations with narration are more effective than animation with text as they leverage two human sensory channels, visual for text and pictures/graphics/animations, and auditory for voice, effects, and music. By utilizing two sensory channels we maximize both senses without overloading either (Clark & Mayer, 2003; Mayer, 2003, Mayer, 2008). The Personalization Principle promotes that conversational style in text or narration promotes motivation because learners work harder to understand material when they feel they are in a conversation with someone (Clark & Mayer, 2003). Finally, the Voice Principle promotes that “people learn better when the narration is spoken in a standard-accented human voice than in a machine voice or foreign-accented human voice” (Mayer, 2008, p. 45). Learners are more likely to accept recorded narration as a social-conversation when it is presented in a human voice, encouraging motivation, as purported in the personalization principle (Mayer, 2008).

Much like audio feedback, providing assessment feedback in multimedia format also presents accessibility and scan-ability challenges. Regarding accessibility, multimedia files take longer to download than audio and text, due to their relatively large sizes. Therefore, multimedia files require either more time or a higher-bandwidth internet connection to download. Thus, students with low-bandwidth internet may become frustrated if they are not provided with more accessible feedback modality options. Similar to audio, multimedia files are not easily search-able or scan-able in the same way that electronic text is and individuals with visual, auditory, or psychological impairments may not benefit from the multi-sensory experience.
**Improving Practice**

*Sounds Good* was a research project, led by Rotheram that investigated the use of digital audio for providing assessment feedback in higher education. The project spanned two phases in 2008 and 2009. Based on their findings Rotheram (2009) presents a series of recommendations for improving practice that can be applied to both audio and multimedia feedback. Based on Rotheram’s (2009) work I have outlined recommendations that include how to structure feedback, administrative and technical considerations, and how, or if, one can save time in the process.

Time on task is an important issue regarding the formulation and provision of assessment feedback, as it can be one of the most time consuming activities tutor does (Brown, 2004). When creating audio or multimedia feedback don’t expect to save time in the short-term (Rotheram, 2009). Rather, it takes time to develop comfort and familiarity with a new process. The length of time it takes to create feedback also depends on a number of variables such as, how fast one speaks, the efficiency of one’s typing, and volume of feedback provided. Multimedia feedback should be presented in conversational style, as per Mayer’s (2008) personalization principle. Therefore, don’t waste time re-recording feedback. “Spoken language naturally includes self-correction, pausing and repetition so instructors have found that a polished performance is not necessary. What matters to students is the clarity, immediacy and personal quality of the feedback they receive” (Davies, 2010). Even if providing audio or multimedia feedback takes more time to develop, learners may benefit more greatly from richer feedback, which could save you and your colleagues time in the long run.
Technical aspects of providing feedback in different formats need to be considered. When possible, choose software or technologies that are simple, accessible, and easy to use. Rotheram (2009) recommends using a handheld digital audio recorder, rather than a microphone plugged into a computer when providing audio feedback. In this scenario, ensure the device records in mp3 format and is easily connected to a computer, via Universal Serial Bus (USB) connector. Store files on a secure, password protected server to ensure privacy and confidentiality and test the links to ensure students can open them. Many students will not be familiar with receiving feedback in formats other than text so inform students on what to expect and provide instruction on how to open the feedback. Provide links to software readers, such as Adobe Flash Player, or Adobe Reader when needed. Finally, test this process thoroughly before making it operational and get your Information Technology (IT) department involved if necessary.

Regarding the audio and visual quality of feedback, aim for a minimum acceptable sound and image quality and use a universally accepted file format, such as mp3 for audio or mp4 for multimedia, to ensure users can play them on their own computers and personal portable devices. Recording audio at 32 kilobytes per second (kbps) in mono will keep files sizes to a minimum while retaining a quality similar to what one might hear on an AM radio station. Similarly, recording screencasts at 12 to 15 frames per second (fps) will produce good visual quality while producing decent quality animations (Halpern, 2012). Finally, backing-up files is an important step in preparation for a catastrophic hard drive failure.

Maintaining administrative organization is a key aspect to providing assessment feedback electronically. Regardless of the files type(s), one must use a consistent naming convention while saving files in an organized way so that files are not sent to the wrong learner. Furthermore, one
must ensure that academic administration, quality-assurance, and technical support teams are aware and accept that you are providing feedback in non-traditional format(s). To maximize learning, recommend to students that they have a copy of their work with them while they view or listen to the feedback. Finally, when grades are provided with feedback, record them separately to maximize administrative control should changes need to be made in the future.

When structuring recorded feedback, start with the eight principles of effective feedback. Once the principles have been addressed one should keep the recordings relatively short; focus comments on themes while mentioning areas specific to only the intended learning outcomes of the assignment. Prior to recording one should read over the assignment and assessment details carefully, and then review the student’s work while making written of mental notes regarding strengths and challenges associated with the outcomes. Next, start recording, using the pause button regularly to build the feedback in chunks. When complete, review the recording to ensure the audio and/or visual is clear, and your sound is approachable and enthusiastic. It is a good idea to invite comments back from students once they review the feedback in order to encourage further dialogue about the assignment or the feedback. Finally, compress the audio or multimedia files so that they will be easy for the learner to receive and open.

Summary of Literature Review

This review of the selected literature suggests providing high quality assessment feedback for learners can have a positive influence on learning that is greater than anything else a teacher does (TESTA, n.d., para. 10). Regardless of modality, effective assessment feedback should provide positive comments in addition to corrections, focus on specific outcomes and competencies, identify patterns rather than focusing on every error, be timely, be personal, be
legible and/or audible, not focus on the mark, and be provided in two or more stages so that learners have the opportunity to apply feedback in a meaningful way.

In the context of blended and online learning, information and communication technologies have the potential to expand instructors’ tool-set for providing rich assessment feedback. Specifically, the selected literature reports positive outcomes regarding student learning and satisfaction in addition to instructor workload efficiencies, under certain circumstances, from providing assessment feedback in formats such as electronic text, audio, multimedia, and combinations thereof.

The next chapter outlines the research context, and methodology that was used to investigate the primary research question of this study: Does providing learner feedback, in digital multimedia format, affect student perceptions of cognitive, affective, and psychomotor learning?
Chapter Three: Methodology

The primary objective of Scholarship of Teaching and Learning (SoTL) research is to improve student learning (Hutchings & Shulman, 1999, para. 1). Thus, this study is best described as an exploratory SoTL project with an aim of improving student learning experiences. A naturalist inquiry approach guided the research process based on the assumption that meaning is a socially constructed phenomenon influenced by interactions with the world in which we live (Lincoln & Guba, 1985).

This exploratory study was an iterative, inductive, situated collection and analysis of data designed to test my ideas and methods, while investigating their implications (Maxwell, 2009, p. 227). Qualitative data was given priority within a sequential mixed methods design approach (Creswell, 2009). Thus, my intent was to explore the social phenomena that occur when students receive assessment feedback in multimedia format without any specific expectations at the outset of the study. Quantitative data was captured through online surveys for the purpose of identifying changes in perceptions over the period of one academic semester. Individual interviews were used to capture qualitative data for the purpose of developing an understanding of the attitudes, perceptions, and experiences held by the study participants relative to the cognitive, affective, and psychomotor learning that occurred throughout the study (Maxwell, 2009, p. 227).

Research Context

I have been teaching foundational technology courses in post-secondary education settings for the past eight years. Most recently I have been teaching an introduction to web site design course for the Web Design and Development (WDD) Program at McMaster University, Centre for Continuing Education (CCE), called 294-004, Building a Web Site. A recent initiative
at McMaster CCE involves the investigation and integration of blended learning to course design and delivery as a means of making courses more flexible and accessible to adult learners.

Garrison and Vaughan (2008) describe blended learning as the “thoughtful fusion of face-to-face and online experiences” (p. 5). Through my work as a student and practitioner of creative arts, technology, and education, I became interested in the utilization of multimedia, as opposed to text alone, for the purpose of providing students with formative assessment feedback. My intentions with this approach were to provide personalized, timely, and rich feedback that students can feed-forward to future assignments (Gibbs, n.d.). This feedback was provided asynchronously, online, through a dropbox folder in the LMS (Desire2Learn) as opposed to face-to-face during class, with an aim of maintaining, or increasing, a sense of cognitive, affective, and psychomotor learning in the course. Aspects of this study include the careful consideration of the instructional setting, providing assessment feedback, course design, study participants, ethics, data collection, and analysis.

**Instructional setting.**

The study was conducted in the *Building a Web Site (294-004)* course. *Building a Web Site* is a foundational and prerequisite course in the Web Design and Development (WWD) program at McMaster University (Web Design & Development Course Descriptions, 2008). As a result, it is usually the first course taken by students. Thus, the course contributes greatly to first impressions of the program, the Centre for Continuing Education, and the University in general for many learners.

Although advertised as a “Lecture” in the McMaster University calendar, the course is designed upon active learning principles. “Active learning involves providing opportunities for students to meaningfully talk and listen, write, read, and reflect on the content, ideas, issues, and
concerns of an academic subject” (Meyers & Jones, 1993, p. 6). As such, the course included lab work, active experimentation, scaffolded assignments, online learning activities, self-assessment, peer-assessment, group work, proposal writing, presentations, and a culminating final project.

Prior to this research study, I taught the Building a Web Site course for five consecutive semesters. Over the five semesters, I have continually revised the course using social constructivism and active learning principles. Student assessment feedback was an area of intense revision and included findings from formative, summative, and confirmative course evaluations.

Incorporating principles of active learning in the instructional design of the Building a Web Site course was a strategic decision guided by my personal philosophy of teaching and the values of the McMaster University Centre for Continuing Education (CCE). The value statement of the CCE is: “to develop human potential, foster workforce learning and enhance careers” (About the Centre for Continuing Education, 2008). These values align with my belief that “the ideal outcome of any teaching or learning situation is mutual respect, dignity, and empowerment” (Gould, 2010). I believe that learning relationships should be co-negotiated, practical, empowering, and relevant to learners. Thus, the decision to embed principles of active learning, social learning, and constructivism into the Building a Web Site classroom is intended to support the acquisition of practical career and life skills.

Classes in the WDD program take place in the evenings. Learners who enrol in the program are adults ranging in age from 18 to 70+ years who are motivated to take the course for a variety of reasons including second career training, job skill upgrades, and personal interest. The majority of learners work full-time or are actively looking for work. For many learners the Building a Web Site course is either their first experience in a post-secondary academic setting,
or their first experience in a post-secondary academic setting in a very long time. *Building a Web Site* is a fourteen week, 3 unit course that involves 3 hours per week of “classroom” time. The McMaster University Registrar recognizes courses in the WDD program as having an academic equivalence of a 3 unit, level 2, undergraduate course.

**Study participants.**

Face-to-face learning activities in *Building a Web Site* took place in a small computer lab that seats a maximum of 18 learners. In the Fall 2011 academic semester there were initially 16 course registrants. Out of the 16 registrants, two dropped the course within the first few weeks due to personal or professional conflicts. One student remained enrolled in the course throughout the semester but only attended four out of 14 of classes and neglected to submit any of the assignments, quizzes, or projects despite several prompts from the instructor to either engage oneself in course activities or to drop the course.

Participant demographics, obtained in pre- and post-course surveys, revealed that the majority of participants (44%) were between the ages of 26 to 35 years, and the gender mix was roughly equal (4:5). Table 3 shows the participants gender and Table 4 shows the age of participants.

Table 3

*Gender of participants (from pre- and post-course surveys)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>5</td>
<td>56</td>
</tr>
<tr>
<td>Male</td>
<td>4</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 4

Age of participants (from pre- and post-course surveys)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-25</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>26-35</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>36-45</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>56+</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9</td>
<td>100</td>
</tr>
</tbody>
</table>

Pre- and post-course surveys revealed that two participants (22%) had previously taken an online or blended course, and only one participant (11%) had received assessment feedback in multimedia or audio format prior to this study. Table 5 shows participants’ prior experience taking online or blended courses and Table 6 shows participants’ prior experience receiving assessment feedback in either multimedia or audio format.

Table 5

Previous experience taking blended and/or online courses (from pre- and post-course surveys)

<table>
<thead>
<tr>
<th>Experience</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>zero</td>
<td>7</td>
<td>78</td>
</tr>
<tr>
<td>3 or more</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 6

Previous experience receiving assessment feedback in audio or multimedia format (from pre- and post-course surveys)

<table>
<thead>
<tr>
<th>Experience</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>zero</td>
<td>8</td>
<td>88</td>
</tr>
<tr>
<td>3 or more</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>100</td>
</tr>
</tbody>
</table>

**Ethics.**

Both the Royal Roads University and McMaster University research ethics boards approved the design of this research project to ensure the ethical treatment of participants (Appendices A and B). I used a third party recruiter, named Nadine Ogborn, to solicit, recruit, and liaise with research participants throughout the Fall 2011 academic semester, due to my conflicting dual role as graduate student researcher and course instructor. Nadine’s role also involved the distribution and collection of online surveys and solicitation of participants for post-course interviews.

Nadine made an informal presentation, outside of class time, in the third week of the academic semester, as a means of recruiting research participants. Recruiting participants in a face-to-face session avoided the need to solicit or collect personal contact information of potential participants. Rather, we collected contact information from only individuals who provided participatory consent during the consent form (Appendix C) signing and collection process. Research participants who completed both the pre- and post-course surveys were entered in a draw to win an iPod Shuffle, valued to $49.00 CDN.
I selected the third week of the semester for recruitment in light of the fact the many of the learners were either new to post-secondary academics or were returning after an extended period of time. Thus, I allowed a period in which learners could acclimate to the post-secondary setting and their role as learner. This timing was also necessary because learners submit the first course assignment in the fourth week of the semester. Therefore, the research design required that participants enrol in the project and complete the pre-course survey prior to submitting the first assignment. At the end of class on the third week I advised learners that the class was over and Nadine invited them to stay and learn about the research project initiative. I was not present during the presentation, the subsequent question and answer period, or during the enrolment process. As a result of using a recruiter, I did not know which students did or did not participate in the study during the Fall 2011 academic semester.

In order to maintain anonymity, Nadine removed any personal identifiers and sent me the raw survey data in a pure-text digital format for analysis. At the end of the semester, after I submitted all student grades to the McMaster Registrar’s office, Nadine invited participants to an optional face-to-face focus group discussion or personal interview. I recorded interviews to ensure accurate transcriptions could be created. Anonymity was lost to the five participants who chose to participate in the interviews.

Course design.

A post-modernist’s pedagogy “engages teachers in gathering students’ perspectives on various classroom-based problems and questions” (Rodgers, 2006, p. 212). When applying this approach to research it becomes the researcher’s obligation to solicit experiences, perceptions, and stories of teachers and learners. Thus, priority was given to a narrative method approach for the purpose of gathering stories, perceptions, and experiences of learners who receive feedback
in multimedia format as part of the assessment and evaluation strategies in a blended learning
course.

Regarding the ‘effectiveness’ of feedback modalities is essentially an ostensible
proposition; that is, students themselves are arguably the best judges of what sort
of feedback is most useful to them. Hence, self-report is clearly a valid, if not the
most valid, measure of the efficacy of feedback modalities. (Ice, Swan, Diaz,
Kupczynski, & Swan-Dagen, 2010, p. 121)

The original research design included the solicitation of instructors and students at a
community college, located in Hamilton, Ontario, Canada, where I work full-time as an
Instructional Technologist in the Centre for Teaching and Learning. However, due to limited
funding (i.e. no funding) and tight time-lines set out by the Master of Arts in Learning and
Technology program at Royal Roads University, I opted for a Scholarship of Teaching and
Learning (SoTL) research design that involved the students enrolled in a course in which I teach
at McMaster University. Considering the time-line and budget constraints, this approach seemed
more manageable and cost effective as the original plan would have required the purchase of
software licenses for capturing feedback. Instructors would have also required ongoing software
training and user support throughout the duration of the study.

One aspect that prompted me to pursue this project is due to the fact that much scepticism
exists in my workplace regarding the benefits, or values of leveraging a blended approach to
teaching and learning. As the educational marketplace becomes increasingly competitive
(regionally, nationally, and internationally), the role that educators and institutions of higher
education play in order to remain competitive and attractive to learners becomes increasingly
important and complex. Thus, researching tools and approaches that have particular impact for
blended and online modes of delivery is gaining importance. While Mettetal (2001) purports that findings of SoTL research is not required to be generalizable the results of this study will, nonetheless, contribute to the knowledge base regarding the benefits and challenges of leveraging multimedia, information, and communications technologies for the purpose of providing rich, meaningful, and timely feedback for learners (p. 7).

**Providing assessment feedback.**

Assessment feedback was provided to learners in the *Building a Web Site* course in three different formats; text alone, audio with text, and multimedia with text. In all cases, I used text to provide general summative comments regarding the overall quality of work submitted and grades were provided separately from the formative and summative comments via rubrics. Another similarity between the feedback modalities is the methodology in which it was crafted. In all instances every effort was made to ensure that the 8 principles of effective feedback, outlined in chapter two of this thesis, were adhered to in the development and delivery of assessment feedback. Regardless of format, when assignments were assessed and the feedback uploaded to the LMS, a course announcement was made, via the *News* tool within the learning management system, advising students that grades and feedback were available via the dropbox folder. Since the learning management system is web-based, a hyperlink was embedded into the news announcement that linked users directly to the specific dropbox folder, thus increasing usability and the likelihood that learners would pay attention to the feedback. An example of news announcements is provided in Figure 4.
The Building a Web Site course consists of 11 individual assessments. Four of the 11 assessments involved either automated feedback (quizzes), self-evaluation (participation), or peer-evaluation (presentation). The remaining seven assessments require instructor feedback and are the focus of this research. The seven assessments of interest were all submitted online, asynchronously, to individual dropbox folders located within the learning management system. The assessments include five small assignments that scaffold into one another throughout the semester, a written project proposal, and a final project web site. All of the learning activities, their relative due dates, evaluative weights, and associated feedback modalities are outlined in
Table 7. A variety of feedback modalities were used in order to provide learners the opportunity to compare and reflect on the differences. The different modalities and the processes for creating and delivering them are outlined herein.

Table 7

*Assessments and Associated Feedback Modalities*

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Relative Due Date</th>
<th>Assessed By</th>
<th>Feedback Modality</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1 - HTML</td>
<td>Week 4</td>
<td>Instructor</td>
<td>Multimedia with Text</td>
<td>10%</td>
</tr>
<tr>
<td>Assignment 2 - HTML</td>
<td>Week 5</td>
<td>Instructor</td>
<td>Multimedia with Text</td>
<td>10%</td>
</tr>
<tr>
<td>Quiz 1 - HTML</td>
<td>Week 6</td>
<td>Automated</td>
<td>Text Only</td>
<td>5%</td>
</tr>
<tr>
<td>Assignment 3 - CSS</td>
<td>Week 7</td>
<td>Instructor</td>
<td>Multimedia with Text</td>
<td>10%</td>
</tr>
<tr>
<td>Assignment 4 - CSS</td>
<td>Week 8</td>
<td>Instructor</td>
<td>Text Only</td>
<td>10%</td>
</tr>
<tr>
<td>Project Proposal</td>
<td>Week 8</td>
<td>Instructor</td>
<td>Audio with Text</td>
<td>10%</td>
</tr>
<tr>
<td>Assignment 5 - HTML &amp; CSS</td>
<td>Week 9</td>
<td>Instructor</td>
<td>Text Only</td>
<td>10%</td>
</tr>
<tr>
<td>Final Project</td>
<td>Week 14</td>
<td>Peer &amp; Instructor</td>
<td>Verbal (Peer) &amp; Multimedia with Text (Instructor)</td>
<td>20%</td>
</tr>
<tr>
<td>Quiz 2 - CSS</td>
<td>Week 11</td>
<td>Automated</td>
<td>Text Only</td>
<td>5%</td>
</tr>
<tr>
<td>Project Presentation</td>
<td>Week 14</td>
<td>Peers</td>
<td>Text Only</td>
<td>5%</td>
</tr>
<tr>
<td>Participation</td>
<td>Week 14</td>
<td>Self</td>
<td>Text Only</td>
<td>5%</td>
</tr>
</tbody>
</table>

*Multimedia feedback.*

Multimedia format was chosen for providing learner assessment feedback on the first three assignments and the final project. To accomplish this, I used screencast software called Adobe Captivate © in order to record computer screen activity with an audio voice-over. There are many different software options for recording screencasts, such as Camtasia, Jing, SnagIt,
and Wing, for example. I used Adobe Captivate © in this project due to its availability, ease of use, and the fact that I am very familiar with it from having used it in the past. A sample of the Adobe Captivate © software interface is presented in Figure 5. One of the main functions of Adobe Captivate © is to create digital movies of the activities that occur on a computer screen, including mouse movement and menu activities, much like pointing a video camera at a computer monitor and recording the action while speaking into a microphone. Recording quality and audio compression settings can be adjusted in Adobe Captivate © in order find a balance between minimum acceptable visual and sound qualities with files sizes that are accessible. To achieve this balance I adjusted the screen recording frame rate from the default setting, 30 frames per second (fps), to 12 fps. A frame rate of 30 fps is equivalent to the National Television System Committee (NTSC) used in analog television broadcasting throughout North America and other Western countries. Since the recordings did not require fast or ongoing animation, I could reduce the fps without drastically reducing the overall visual quality. In fact, experience has taught me that reducing the fps increases the over playback quality for end users. When recorded at 30 fps the visual aspect of the multimedia often begins to lag behind accompanying audio, causing dissonance between the visual, the audio, and the user. Similarly, the audio recording quality was reduced from the default, 128 kbps at 44.1 kilohertz (kHz), to 32 kbps at 11.025 kHz, in mono, to reduce the overall file size while retaining a minimum acceptable sound quality. The benefit of using screencast software is that one can quickly and easily publish recordings into a variety of file formats that are compressed and web-friendly.
Figure 5. Sample of Adobe Captivate © software interface used for providing assessment feedback in the Building a Web Site course.

Rationale for using multimedia screencast software as opposed to recording audio only was so that I could view learners work on my computer and talk about the work - its strengths, and challenges - while interacting with it directly. Adding a visual element to the feedback is supported by academics (Ice et al., 2010; Oomen-Early et al., 2008) who suggest that students prefer a combination of visual mark-ups, text comments, and audio feedback. By using a third-party browser plug-in called FireBug I was able to open, manipulate, and demonstrate changes to the xhtml and css code of student’s work without making permanent changes. This was accomplished for the purpose of demonstrating what valid xhtml or css code looks like (e.g. correcting errors) and what the outcomes and ramifications of writing code in different ways has on a finished web page or site (e.g. active experimentation). This same process occurred often in
the classroom when learners were struggling with a concept or application. However, unlike multimedia screencast assessment feedback, there is no permanent record of those types of in-class interactions for students to look back on in the future.

While making corrections and actively experimenting with assignment submissions, I intended to make my thoughts visible by thinking-aloud about my impressions and interpretations, while explaining any changes I made while making them. Collins, Brown, and Holum (1991) and Abbott (2008) refer to the act of making thoughts visible as cognitive apprenticeship. The added benefit of using FireBug in collaboration with Adobe Captivate © is that I could modify a student’s work and record both the process and outcome of those changes without ever saving the modifications. Thus, providing an opportunity for learners to go back and apply the changes and modifications to their own work, as they saw fit, in accordance with my suggestions and their own interpretations.

In accordance with effective feedback principle number five, the aim of the multimedia screencast assessment feedback was to be presented in a conversational style. My first step in the assessment process was to look over a student’s assignment, making mental or written notes regarding the strengths and weakness of the work in comparison to the associated learning outcomes of the assignment. While doing so, I established a grade by measuring it against predetermined criteria outlined in the assignment rubric. Next, I began recording and went back over the assignment focusing on the areas noted in the initial scan while making corrections and modifications, talking-aloud throughout. I used the pause button to build the feedback in chunks when appropriate and I did not erase or re-record mispronounced words (Rotheram, 2009). It is important to note that I did not reference grades in the formative feedback. This was done in accordance with feedback principle number seven - do not focus on the mark. Instead, grades
were provided in the attached rubric. As mentioned earlier in this thesis, separating grades and feedback is recommended as it provides greater administrative flexibility and it has the potential to focus learners on ways of improving rather than on their perceived worth (Gibbs, n.d.; Rotheram, 2008).

Although Adobe Captivate © provides robust editing options, most feedback was recorded on the fly, in one take. The only editing performed on assessment feedback was to include a splash screen that indicated the course and assignment name and to erase coughing, sneezing, or extra noise that may have occurred. I specifically avoided editing so that feedback would be natural and conversational in style and to ensure the process of providing feedback in multimedia format was manageable within the existing workload. The length of recorded multimedia feedback was between 5 and 10 minutes per student, per assignment. Administrative aspects, discussed next, required an additional 5 minutes per student to open templates, save, publish, upload, and hyperlink the media to the assignment dropbox folder. An online sample of multimedia assessment feedback can be view at

http://www.brianegould.com/research/mmsample/Nicole_A1.htm or by clicking on Figure 6.
Once completed, the multimedia feedback was uploaded to the learning management system and a hyperlink was provided for each learner within the assignment dropbox. I used a standardized html template to provide succinct summative text comments, and to inform learners that their feedback was in multimedia format. The template also included information regarding the computer system requirements needed to view and listen to the feedback (Figure 7). Since the rubric was already filled-in, I then uploaded the template to the dropbox and customized it to ensure it would link to the correct feedback file(s). This was done while the multimedia files were also uploading so that I could save time. Each assignment dropbox folder, within the learning management system, was set-up with a direct link to the Grades tool within the course.
site. Thus, when the rubric, grade, and feedback finished being input and uploaded to the dropbox folder this information was also linked, and therefore available, from within the online gradebook. This process was repeated for each and every student that submitted an assignment.

![Assignment 1 Feedback](image)

**Figure 7.** HTML Template for providing Multimedia Feedback via Dropbox folder.

*Text feedback.*

For better or worse it appears that “written, text-based based, feedback comments have become the norm in higher education” (Higgins et al., 2002, p. 54). This being the case it seemed fitting that learners would be provided the opportunity to make a direct comparison between receiving feedback in multimedia and text-based formats. Thus, text was chosen for providing learner assessment feedback on assignments four and five.

I employed the same process for assessing and formulating feedback on the first three assignments as I did for assessing and formulating feedback on the last two. The only difference in methods was that the comments were provided in text. I used the same standardized template
to provide the text comments, however, the comments were expanded to include those that were both formative and summative in nature. The volume of text feedback provided ranged between one to three pages per student, per assignment, and took between 10 and 30 minutes to create. Uploading text feedback to the dropbox folder was quick and required only a minute or two per student. The third and final modality used for providing feedback was a combination of recorded audio and text.

*Audio feedback.*

Audio format was chosen for providing learner assessment feedback on the written project proposal assignment. Rubric and text-based summative comments were provided for this assignment in the same way that they were provided for the previous six assignments. The biggest difference for this assignment was the nature of the assessment itself and the format in which it was submitted. In this assignment learners were expected to submit a written proposal outlining the topic, purpose, effect, technical requirements, copyright considerations, and design ideas, for their final web site project. Students were asked to submit the project proposal in Microsoft Word, Microsoft PowerPoint, or Adobe Portable Document Format (PDF).

The methodology of crafting feedback for the project proposal was the same as that used in the other six assessments that required instructor feedback. The difference was in the media chosen for providing feedback and the process of creating that media. Once received, any proposal submissions that were not already in PDF format were converted using Adobe Acrobat Pro 9.5 © software. As per Ice, Curtis, Phillips, and Wells (2007) I initially attempted to record and embed audio comments directly into the PDF documents using the *Record Audio Comment* tool within Adobe Acrobat Pro 9.5 ©. However, I found the resulting audio to be of very poor sound quality. Lacking the ability to adjust or modify the record quality settings I quickly
abandoned that approach and instead used Adobe Soundbooth CS5 ©. Adobe Soundbooth CS5 © software is intended for recording and mixing digital audio on a desktop computer. Similar freeware software called Audacity is available online that will produce files of equal quality to Soundbooth CS5 ©. I used Soundbooth CS5 © because I already owned this application and was familiar with its tool-set and functionality.

Once I reconciled on using Adobe Soundbooth CS5 © for recording audio I went through the same process of assessing students’ work as I did for the other assignments. The difference was that I recorded audio via Adobe Soundbooth CS5 © rather than audio and screencast via Adobe Captivate ©. The resulting audio was in a wav file format. Wav files were recorded at a quality of 1024 kilobytes per second (kbps), in stereo, which produced high quality sounding audio but also resulted in very large file sizes. Therefore, the wav files were compressed to 32 kbps, in mono, and converted to an mp3 file format using Adobe Soundbooth CS5 © in order to reduce the overall file sizes while retaining a minimum acceptable sound quality. The file compression resulted in files that were roughly 32 times smaller than the original and had an audio quality similar to what one might hear on AM radio. However, I soon learned that mp3 files cannot be embedded into PDF documents so the mp3 files needed to be re-converted back into wav files. The compressed files where then embedded into the title page of each PDF assignment using the Attach a File as a Comment tool in Adobe Acrobat Pro 9.5 © and the PDF files were uploaded to the assignment dropbox folder. I used the same standardized template for providing succinct, summative text comments, and to inform learners that their feedback was in audio format. Aside from altering the html template to ensure it would link to the appropriate feedback file(s), it was also updated to include information regarding computer system requirement needed to open the PDF files and list to the audio (Figure 8). Audio feedback ranged
in length between 5 and 10 minutes per student. Administrative aspects, such as saving, compressing, embedding, uploading, and hyperlinking the audio and PDF files required an additional 5 to 10 minutes per student to complete.

![Project Proposal Feedback](image)

*Figure 8. HTML Template for providing Audio Feedback via Dropbox folder.*

In summary, I employed a variety of modalities to provide formative assessment feedback for learners on assignments that were instructor assessed in the *Building a Web Site* course. The different modalities, included text only, audio with text, and multimedia with text. All of these modalities were utilized to provide students with different formative assessment experiences upon which to reflect. In all instances, I used a standardized approach in the formulation and construction of the feedback so that the collection and analysis of data could focus on student experiences and perceptions of the media format in which the formative feedback was delivered.
Data Collection

A mixed methods approach was taken with priority given to the qualitative data (Creswell, 2009). Data collection was triangulated through a combination of a pre-course survey, post-course survey, and post-course interviews. The pre- and post-course surveys were used as means of capturing perceptions quantitatively. However, being exploratory in nature the primary concern of this research was to capture the stories, experiences, and perceptions of students in a qualitative manner. Qualitative data was captured in individual interviews and the pre- and post-course surveys.

Pre- and post-course surveys.

The pre- and post-course surveys (Appendices D and E) used in this study are modifications of instruments used and validated by Ice et al. (2007) in their work studying the impact on teaching presence and students’ sense of community when receiving audio feedback in on-line courses. The modified instruments are divided into five main sections; demographics, experience, course expectations, multimedia feedback, and comments.

The demographics sections asked participants to identify their gender, male or female, and the age group in which they fit: 18-25, 26-35, 36-45, 46-55, or 56+. Questions in the experience section asked participants to identify past experiences with blended or online courses and whether or not they had participated in a course in which the instructor(s) provided assessment feedback in audio or multimedia format. The course expectation section consisted of primarily Likert style questions that solicited learner opinions and experiences related to their expected (pre-course survey) and current (post-course survey) satisfaction with the course design, the instructor, and how much they expected to and actually learned in the course.
Respondents were provided with a five point Likert scale from which they could choose an answer. Options included; Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

The multimedia feedback section of the survey included nine questions aimed at capturing learner attitudes and perceptions regarding text, audio, and multimedia feedback specific to instructor intent, clarity of message, retention, motivation, and sense of belonging.

Respondents were provided with a five point Likert scale from which they could answer. Answer options included; Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. Finally, a Comments section included three open-ended questions as a means of allowing participants to express their ideas, opinions, or experiences related to the instructor, the use of multimedia in providing learner feedback, or the course design in general.

**Interviews.**

Formal, semi-structured, individual interviews were conducted at the end of the academic semester for the purpose of “comparing responses and putting them in the context of common group beliefs and themes” (Fetterman, 2009, p. 554). For ethical, validity and reliability reasons, the interviews were conducted after final course grades were submitted to the University’s Registrar Office. A pre-determined set of guiding questions (Appendix F) were used throughout the interviews as a means of initiating discussion on broad topics. As suggested by Stewart et al. (2009) modifications were made during each interview “in response to the discussion and interaction among the respondents” (p. 600).

The coordination of individual interviews was executed by the research recruiter, Nadine Ogborn, for the purpose of maintaining anonymity for those who chose not to participant in an interview. The participant consent agreement highlighted the fact that participant anonymity would be lost to those who agreed to participant in a post course interview. Therefore, once
Nadine obtained consent from the participants I contacted each of them directly to co-ordinate the interview dates and times.

When considering participant preferences and time constraints of the study I decided to conduct the interviews using web conferencing technologies. Out of the nine study participants four interviews were scheduled almost immediately. Subsequently, a final email invitation was extended to the remaining five participants offering the option to participate in either an online interview via web conference or a text-based interview via email, where participant could respond asynchronously. As a result, one additional participant responded explaining; “email would be the best way for me to complete an interview. I have no vehicle or permanent residence for a conference call” (anonymous, personal communication, January 19, 2012). In the end, a total of five individual interviews were conducted, four via web conference and one via email.

As the principle investigator, I facilitated the interview discussions and asked the questions. However, the recruiter, Nadine Ogborn, was also present during all interviews to ensure the ethical treatment of all participants. At the beginning of each interview an icebreaker was used to re-iterate the purpose of the study, to thank the interviewee for his or her participation, and to remind participants that their responses would remain anonymous. During that time, I also emphasized the fact that their responses should be honest and candid and that their responses would, in no way, affect their course grade or relationship with me. The duration of each interview varied between 45 and 60 minutes depending on the amount of information and ideas the interviewee was willing to share. Interviews were digitally recorded so that they could be transcribed verbatim for analysis. A good volume of rich data was collected in each interview equal to 3 or 4 pages of typed transcribed text.
A narrative analysis approach, referred to as “conceptual ordering” (Owen, 1984), was used as a starting point to analyze the qualitative data in this study. Conceptual ordering includes three discrete categories for organizing data: recurrence, repetition, and forcefulness.

Recurrence was measured by the re-occurrence of themes, concepts, and ideas within responses. Salient meaning of themes expressed were of interest in this study; thus, recurrences may have included the same, similar, or entirely different words and phrases provided the underlying meaning of expressed ideas were the same. Utilizing a grounded approach the initial transcription and analysis involved a process of reading and colour coding words, sentences, and paragraphs that occurred naturally within individual interviews and that fit into recurring themes. Subsequently, interviews were re-analysed two more time to ensure that themes had been adequately identified and captured across all interviews. To improve validity and reliability, the analysis was subsequently sent to my thesis supervisor and two independent researchers for review and feedback before the analysis was finalized.

Repetition is a subset of recurrence and was used to organize and record the repetition of specific words, or phrases through responses. After all interviews were transcribed the responses were pasted together into one large text file. The text file was then loaded into a web site called Wordle.net. The Wordle.net web site creates word clouds “that give greater prominence to words that appear more frequently in the source text” (wordle.net, 2011). Thus, the resulting word cloud provided a graphical representation of the repetition aspect in this framework.

Forcefulness refers to the volume, dramatization, vocal inflection, forcefulness, and pause used to emphasize or de-emphasize participant ideas, stories, and perceptions when shared verbally. When participants shared stories in text, online or printed, forcefulness was intended to
be measured by the use of colour, size, style, underlining, bolding, and visual emphasis of text. However, the one individual who completed the interview via text email was not adequately advised that he/she should use colour, size, style, etc. in order to emphasize or de-emphasize ideas, stories, or perceptions. As a result, forcefulness could not be consistently measured across all responses so this aspect of the conceptual ordering framework was not utilized in the final analysis process.

Statistical t-tests were used as a means of identifying, quantitatively, whether learner experiences or opinions regarding multimedia feedback changed over the course of the Fall 2011 academic semester. The mean responses for each question in the pre- and post-course surveys were calculated and compared using a standard deviation of $p=0.05$ to establish whether or not changes were statistically significant. Due to the small sample size, the Mann Whitney U tests were also used to compare ranked mean responses for each of the questions in the pre- and post-course surveys. Results of the two tests where then compared as a means of improving the validity and reliability of the statistical findings.

**Limitations and Delimitations**

This research project was bound by a series of limitations and delimitations. The scope of the project was delimited by the problem itself. *How will students perceive assessment feedback provided in multimedia format, as opposed to audio or text alone?* The nature of this question directed me to focus on student perspectives, and stories, thus guiding me toward a naturalistic inquiry approach with an emphasis on qualitative data (Lincoln & Guba, 1985). A combination of having no funding and operating within a limited time-frame made the proposition of recruiting instructors, other than myself, too problematic. The recruitment of other instructors would have required the purchase of additional software licenses and the planning, development,
co-ordination, delivery, and support of instructor training on how to use a multimedia software tool used to record and distribute assessment feedback. In addition, privacy is a key concern when providing feedback to learners. That is, students generally do not want others knowing what sort of feedback they receive from instructors. Thus, the multimedia files provided to students must be stored in a secure, password protected environment, and delivered to students in a way that would limit access to the files to only the intended recipient(s). Although this could be accomplished in many ways, I chose to collect assignments and distribute feedback through a Dropbox folder in the Desire2Learn learning management system (LMS) due to its security, availability, and ease of use. The result of decisions outlined herein does constrain the generalizability of these research findings.

The Building a Web Site course had a limited enrolment of 18 students due to the size of the computer lab in which it took place. Therefore, the pool of potential research participants was limited at the outset of the project. All of the research participants were students in a web design and development program of study which means that most, if not all, of them had some sort of prior interest and experience with computers, programming, and different forms of media, such as graphics, print, audio, or video, which may have influenced their attitudes and perceptions of receiving feedback in multimedia format. Finally, all of the research participants were predominantly Caucasian, English speaking adults, with similar educational and socio-economic statuses. Thus, findings are not necessarily generalizable to learners who are non-English speaking, children, or those with varying cultural, educational, and/or socio-economic statuses.
Validity and Reliability

This section outlines a series of threats to the validity and reliability of this study and how each of them have been systematically addressed to ensure the credibility of study finding. First, being the course instructor and researcher simultaneously introduces a researcher bias to the study. In order to mitigate the influence of researcher bias a recruiter was used to solicit, recruit, and liaise with study participants throughout the academic semester. Thus, the study participants remained anonymous to me, the researcher, throughout the study. Post-course interviews were arranged and conducted after final grades were submitted to the University’s Registrar Office, and anonymity was lost to those who agree to participate. This strategy was employed to ensure reliability and so that participants could freely express their thoughts and opinions without coercion, or fear of backlash in the form of poor grades. Similarly, students were not offered bonus marks for participating in the study. All participants did so voluntarily. In addition, a triangulation of pre-course survey, post-course survey, and post-course interview data and was used to increase reliability and provide a detailed contextual description of findings.

Furthermore, transcriptions of post-course interviews were sent to interviewees for confirmation that data collected was accurate and consistent with the ideas, stories, and perceptions that they intended to share in the interview. If the interviewee was not happy with the data presented they had the opportunity to make revisions or additions prior to returning it to the researcher. The qualitative analysis process did not begin until after all interviewees had replied with a confirmation of agreement that the data collected was accurate. To ensure validity and reliability of qualitative content analysis I relied on my thesis supervisor and two independent peer researchers to act as sounding boards for providing feedback on the development and analysis of themes as they progressed.
Summary of Methodology

This chapter has demonstrated how a naturalistic inquiry approach was utilized to investigate the principal research question for this study: *Does providing learner feedback, in digital multimedia format, affect student perceptions of cognitive, affective, and psychomotor learning?*

A naturalistic inquiry approach was employed in this study through multiple methods of data collection and analysis. Likert style survey questions were used to capture quantitative data regarding participant demographics and detect changes in learner perceptions regarding the effect of multimedia feedback on their learning throughout the Fall 2011 academic semester. Qualitative techniques such as open-ended survey questions, and individual interviews were used to gain insight, from participants’ perspectives, about how formative assessment feedback provided in multimedia format affected changes in cognitive, affective, and psychomotor learning.

The next chapter presents the research findings obtained from the triangulation of these research methods.
Chapter Four: Findings

In this chapter, the research findings are revealed as they relate to the research question: Does providing learner feedback, in digital multimedia format, affect student perceptions of cognitive, affective, and psychomotor learning? Aspects of the findings are comprised of the following areas: who participated, quantitative results, and qualitative results.

Who Participated

Sixteen learners were enrolled in the Building a Web Site course at the beginning of the Fall 2011 academic semester. Due to personal or professional reasons, two students dropped the course within the first few weeks while one student did not to attend classes or engage in course activities. Therefore, from a pool of 13 potential participants, nine provided participatory consent in the study. Participant demographics are outlined in tables 3 through 6 in the Methodology section of this thesis.

Quantitative Results

Quantitative results were obtained through pre- and post-course surveys. In addition to obtaining participant details and demographics, the pre-course survey also identified perceptions and expectations of learning, retention, satisfaction, and sense of belonging associated with receiving assessment feedback in different formats.

Pre-course survey results.

The pre-course surveys produced interesting results. Despite having only one participant self-identify as having received assessment feedback in audio or multimedia format the pre-course survey results showed that participants speculated either favourably or neutrally regarding the effect of multimedia feedback. No one perceived that receiving assessment feedback in multimedia format would have a negative effect in any way. Instead, 89% of respondents either
agreed or strongly agreed that inflections in the instructor’s voice would add clarity to the intent of the instructor’s message, and 100% either agreed or strongly agreed that being able to see the instructor’s examples would make his intent clearer. All participants expected to learn a great deal from the course and to be satisfied with the course and the instructor. Results were similarly positive when responding to questions regarding student engagement, learning, and personalization. An area where respondents were notably neutral (67%) in the pre-course survey was their perception of the effect that multimedia feedback would have on motivation. Table 8 shows participant responses regarding perceived effect of multimedia feedback on instructor intent, personalization, motivation, learning retention, personalization, and instructor caring.

Table 8

*Summary of Pre-course Survey Results*

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristic</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I expect to be satisfied with this course.</td>
<td>Agree</td>
<td>5</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>I expect to learn a great deal from this course.</td>
<td>Agree</td>
<td>5</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>I expect to learn a great deal from this course.</td>
<td>Agree</td>
<td>5</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>When using multimedia (audio &amp; visual) comments, inflection in the instructors' voice will make his/her intent clear</td>
<td>Neutral</td>
<td>1</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>6</td>
<td>67%</td>
</tr>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>When using multimedia (audio &amp; visual) comments, being able to see the instructor's examples will make his/her intent clear.</td>
<td>Agree</td>
<td>3</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>6</td>
<td>67%</td>
</tr>
<tr>
<td>The instructor's intent will be clearer when using multimedia (audio &amp; visual) than text.</td>
<td>Neutral</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>6</td>
<td>67%</td>
</tr>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>1</td>
<td>11%</td>
</tr>
<tr>
<td>The instructor's intent will be clearer through the use of</td>
<td>Neutral</td>
<td>1</td>
<td>11%</td>
</tr>
</tbody>
</table>
multimedia (audio & visual) than audio alone.  

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>4</td>
<td>44%</td>
</tr>
</tbody>
</table>

Multimedia comments will make me feel more involved in the course than text based comments.  

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>1</td>
<td>11%</td>
</tr>
</tbody>
</table>

Multimedia comments will motivate me more than text based comments.  

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>6</td>
<td>67%</td>
</tr>
<tr>
<td>Agree</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>1</td>
<td>11%</td>
</tr>
</tbody>
</table>

I will retain multimedia (audio & visual) comments better than text based comments.  

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>3</td>
<td>33%</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>2</td>
<td>22%</td>
</tr>
</tbody>
</table>

Multimedia comments are more personal than text based comments.  

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>3</td>
<td>33%</td>
</tr>
</tbody>
</table>

Receiving multimedia comments will make me feel as if the instructor cares more about me and my work than when I receive text based comments.  

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree</td>
<td>1</td>
<td>11%</td>
</tr>
<tr>
<td>Neutral</td>
<td>3</td>
<td>33%</td>
</tr>
<tr>
<td>Agree</td>
<td>5</td>
<td>56%</td>
</tr>
</tbody>
</table>

The pre-course survey also provided the opportunity for participants to share their comments related to multimedia feedback, the course, or the instructor in general. Earlier, I identified the fact that the pre-course survey was completed in the third week of the semester. Thus, it did not end up being a true pre-course survey. This trade-off was made because I feared that many potential participants would become overwhelmed by the prospect of enrolling in a research project while acclimatizing to the academic setting. Learners where provided two weeks to settle into the rhythm of academia before being introduced to the research project. The repercussions of doing so were that students had a chance to engage and interact with me (the instructor), the academic setting, the learning resources, the virtual learning environment, and each other. Comments, provided anonymously in the pre-course survey, confirm that these
interactions did influence their attitudes and perceptions of multimedia feedback. General comments expressed sentiments of curiosity, interest, and excitement toward the idea.

- I am interested to see how this will look.
- It is hard to judge how I feel about multimedia content because I have not seen any examples of multimedia content or feedback.
- It seems as though it would provide an ideal way for the instructor to give helpful feedback to individual students which, given the time and space constraints of a course like this, would otherwise be very difficult or impossible
- I look forward to the use of multimedia feedback
- I think this enhances learning and supports text portion of learning.

Comments related to the course and instructor where also early indicators that the timing of the pre-course survey may have influenced learner perceptions of multimedia feedback.

- The course is very interesting. I find that it is moving at a good pace
- This class is exceptionally organized and the course materials are very well laid out. I feel that I can assume that the multimedia feedback will be of high quality because of the precedent set so far in the class design and materials.
- So far I'm very impressed with the course. The materials in A2L are invaluable, the textbook is great, and the overall logical organization of the course inspires confidence.
- So far, I think the instructor is a very effective teacher.
- The instructor is knowledgeable and approachable, runs the classes with a good mix of lecture, question and answer, and hands-on, and has structured the course well.
- The instructor is approachable which facilitates learning.

In summary, the pre-course survey results indicated that students had high expectations for the course, the instructor, and their learning. Moreover, despite not having experience receiving assessment feedback in formats other than text, the majority of participants were curiously optimistic regarding the value and impact of using multimedia as a means for providing assessment feedback.

**Post-course survey results.**

Learners responded favourably overall when speculating about the prospect of receiving assessment feedback in multimedia format in the pre-course survey. Learners then confirmed that they did indeed think favourably of the experience after having received it on their assignments. The mean response was calculated for each of the questions in the pre- and post-course surveys. Statistical t-tests were then used to measure the difference in mean response ratings between the beginning and the end of the academic semester. T-test calculations were made using a non-directional (two-tailed) t-test with a 95% confidence interval rating ($p =< 0.05$) and the results are presented in Table 9.

Table 9

<table>
<thead>
<tr>
<th>Statement</th>
<th>Pre-course mean</th>
<th>Post-course mean</th>
<th>Difference</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I was / expect to be satisfied with this course.</td>
<td>4.44</td>
<td>4.11</td>
<td>-0.33</td>
<td>0.3972</td>
</tr>
<tr>
<td>I learned / expected to learn a great deal from this course.</td>
<td>4.44</td>
<td>4.11</td>
<td>-0.33</td>
<td>0.3972</td>
</tr>
<tr>
<td>Overall, I was / expect to be satisfied with the instructor.</td>
<td>4.44</td>
<td>4.22</td>
<td>-0.22</td>
<td>0.6224</td>
</tr>
<tr>
<td>When using multimedia (audio &amp; visual) comments, inflection in the instructor's voice made / will make his/her intent clear.</td>
<td>4.11</td>
<td>4.56</td>
<td>0.44</td>
<td><strong>0.0353</strong>*</td>
</tr>
</tbody>
</table>
When using multimedia (audio & visual) comments, being able to see the instructor's examples made / will make his/her intent clear.  

<table>
<thead>
<tr>
<th>Comment</th>
<th>Mean 1</th>
<th>Mean 2</th>
<th>Mean Difference</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The instructor's intent was / will be clearer when using multimedia (audio &amp; visual) than text alone.</td>
<td>4.67</td>
<td>4.44</td>
<td>-0.22</td>
<td>0.5588</td>
</tr>
<tr>
<td>The instructor's intent was / will be clearer through the use of multimedia (audio &amp; visual) than audio alone.</td>
<td>3.89</td>
<td>4.67</td>
<td>0.78</td>
<td>0.0431*</td>
</tr>
<tr>
<td>Multimedia comments made / will make me feel more involved in the course than text based comments.</td>
<td>4.33</td>
<td>4.44</td>
<td>0.11</td>
<td>0.7287</td>
</tr>
<tr>
<td>Multimedia comments motivated / will motivate me more than text based comments.</td>
<td>3.67</td>
<td>3.67</td>
<td>0.00</td>
<td>1.0000</td>
</tr>
<tr>
<td>I retained / will retain multimedia (audio &amp; visual) comments better than text based comments.</td>
<td>3.44</td>
<td>3.89</td>
<td>0.44</td>
<td>0.3466</td>
</tr>
<tr>
<td>Multimedia comments are more personal than text based comments.</td>
<td>4.11</td>
<td>4.00</td>
<td>-0.11</td>
<td>0.8337</td>
</tr>
<tr>
<td>Receiving multimedia comments made / will make me feel as if the instructor cared more about me and my work than when I receive text based comments.</td>
<td>3.44</td>
<td>3.78</td>
<td>0.33</td>
<td>0.4714</td>
</tr>
</tbody>
</table>

*p < 0.05

Due to the small sample size, the Mann Whitney U test was also used to compare results of the pre- and post-course surveys. Mann Whitney U calculations measured the ranked mean responses in the pre- and post-course surveys. Table 10 shows that the Mann Whitney U results were consistent with the t-test when showing a statistical significance (p = < 0.05) in one area. Specifically, students responded positively when asked if inflections in the instructor’s voice made his intent clearer when using multimedia format (p=0.0136) indicating that students found greater value in the audible component of multimedia than they originally anticipated. This overall lack of statistical significance may be partially attributed to the small sample size (n=9).
Table 10

*Mann Whitney U Results for Pre- and Post-Course Survey Results*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Pre study mean rank</th>
<th>Post study mean rank</th>
<th>Difference</th>
<th>U score</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I was / expect to be satisfied with this course.</td>
<td>98.50</td>
<td>80.50</td>
<td>-18.00</td>
<td>27.5</td>
<td>0.1255</td>
</tr>
<tr>
<td>I learned / expected to learn a great deal from this course.</td>
<td>98.50</td>
<td>78.50</td>
<td>-20.00</td>
<td>27.5</td>
<td>0.1255</td>
</tr>
<tr>
<td>Overall, I was / expect to be satisfied with the instructor.</td>
<td>92.00</td>
<td>85.00</td>
<td>-7.00</td>
<td>34.0</td>
<td>0.2830</td>
</tr>
<tr>
<td>When using multimedia (audio &amp; visual) comments, inflection in the instructor's voice made / will make his/her intent clear.</td>
<td>71.50</td>
<td>101.50</td>
<td>30.00</td>
<td>24.5</td>
<td>0.0789</td>
</tr>
<tr>
<td>When using multimedia (audio &amp; visual) comments, being able to see the instructor's examples made / will make his/her intent clear.</td>
<td>101.50</td>
<td>79.50</td>
<td>-22.00</td>
<td>24.5</td>
<td>0.0789</td>
</tr>
<tr>
<td>The instructor's intent was / will be clearer when using multimedia (audio &amp; visual) than text alone.</td>
<td>68.50</td>
<td>110.50</td>
<td>42.00</td>
<td>15.5</td>
<td>0.0136*</td>
</tr>
<tr>
<td>The instructor's intent was / will be clearer through the use of multimedia (audio &amp; visual) than audio alone.</td>
<td>89.50</td>
<td>110.50</td>
<td>21.00</td>
<td>36.5</td>
<td>0.3620</td>
</tr>
<tr>
<td>Multimedia comments made / will make me feel more involved in the course than text based comments.</td>
<td>95.00</td>
<td>86.00</td>
<td>-9.00</td>
<td>31.0</td>
<td>0.2008</td>
</tr>
<tr>
<td>Multimedia comments motivated / will motivate me more than text based comments.</td>
<td>82.00</td>
<td>95.00</td>
<td>13.00</td>
<td>31.0</td>
<td>0.2008</td>
</tr>
<tr>
<td>I retained / will retain multimedia (audio &amp; visual) comments better than text based comments.</td>
<td>90.50</td>
<td>90.50</td>
<td>0.00</td>
<td>35.5</td>
<td>0.3294</td>
</tr>
<tr>
<td>Multimedia comments are more personal than text based comments.</td>
<td>94.50</td>
<td>84.50</td>
<td>-10.00</td>
<td>31.5</td>
<td>0.2134</td>
</tr>
<tr>
<td>Receiving multimedia comments made / will make me feel as if the instructor cared more about me and my work than when I receive text based comments.</td>
<td>86.50</td>
<td>94.50</td>
<td>8.00</td>
<td>31.5</td>
<td>0.2134</td>
</tr>
</tbody>
</table>

*p < 0.05
These results provide an overview of changes in student perceptions between the beginning and the end of the fall 2011 academic semester. However, they do not provide a rationale for these perceptions. Thus, we will look at the qualitative data captured in post-course interviews to develop an understanding.

**Qualitative Results**

Qualitative data was captured, transcribed, and coded in this study for purpose of understanding the lived experiences, perceptions, and attitudes of research participants. The results of that process are outlined herein.

**Post-course interviews.**

Individual post-course interviews were arranged at the end of the academic semester. I received a 56% response rate (5 out of 9) from soliciting participation in the post-course discussions. Initially only two of the nine (22%) participants responded to a call for focus group attendants. In reaction to such a low response rate the recruiter, Nadine Ogborn, followed-up with an alternative option of attending the focus group discussion online, via web conference, as opposed to face-to-face. This message prompted two additional responses, for a total of 44%. However, arranging a common time for all participants to meet was unattainable, so individual, online, interviews were arranged with the four volunteers. Subsequently, Nadine sent a final email to the remaining five research participants, who had not responded, offering the option to complete the interview online, asynchronously, via email. The last call resulted in one additional respondent who completed the interview via email. Thus, from the nine research participants, five agreed to engage in a post-course interview. Out of the five who participated in post-course interviews, four were female (80%).
The synchronous online interviews were facilitated through web conference software called Elluminate. The interviews were recorded and archived within the Elluminate platform and then converted to an mp3 file format using Elluminate Publish software. The mp3 files were then re-played, and transcribed verbatim, by the author of this study, using Microsoft Word software for coding purposes. Before the coding process began, interview transcriptions were sent to participants for verification that I had accurately captured the essence of their thoughts, experiences, and perceptions shared in the interviews. Participants were also encouraged to add any additional reflective comments that they thought of after the interview or did not have a chance to share during the interview.

**Coding.**

A framework referred to as “conceptual ordering” (Owen, 1984) guided the coding of qualitative data. The conceptual ordering framework combined with a grounded theory approach produced the following results.

A word cloud was created by copying and pasting transcriptions of student responses in post-course surveys and interview transcriptions into a web site called Wordle.net. Wordle.net is a web site that creates word clouds from text. “The clouds give greater prominence to words that appear more frequently in the source text” (wordle.net, 2011). Thus, the word cloud presented in Figure 9 is a visual representation of the repetition category within the conceptual ordering framework.
Through a grounded analysis of the qualitative data obtained in post-course interviews and surveys, I identified that comments could be associated with one or more of the following four themes: head, heart, hands, and accessibility. From an educational perspective, the head, heart, and hands themes align with the different domains of learning identified in Bloom’s Taxonomy of Educational Objectives (Bloom, 1956): Cognitive learning (head), Affective learning (heart), and Psychomotor learning (hands). The accessibility theme will be discussed separately.
Cognitive learning.

Learning occurs in different ways, shapes, and forms. When thinking in terms of desired outcomes of learning activities, educators associate learning with changes in knowledge, attitude, or ability (Bloom, 1956), which align with the cognitive, affective, and psychomotor domains of learning in Bloom’s taxonomy. In higher education, the domain of learning that receives the most attention is cognitive learning (knowledge).

There are six levels, or types, of cognitive learning, within the cognitive domain (Bloom, 1956), as outlined in Figure 1. These levels range from the ability to acquire and remember knowledge (lowest) to the ability to create new knowledge (highest). The analysis of comments indicates that students perceived that multimedia feedback positively affected their understanding of the topic(s) and aided them in their abilities to apply and analyze new information.

To understand is to comprehend or grasp the meaning of something (BCIT’s Learning Resource Unit, 2003). Results confirm that receiving feedback in multimedia format supported the cognitive mentorship aspect of the course by allowing me (the instructor) to make my thought processes visual.

- it’s possible to see what you were thinking when you were marking.
- I liked that I could see what you were talking about
- code was all new to me so having sight and sound feedback and pointing to different parts of the code through multimedia, made the language and explanations stick

Other comments didn’t refer to cognitive mentorship. Rather, they attribute the tonal and visual qualities of multimedia feedback to perceptions of increased understanding.
- I found that it was really key to learning the code. It gave me a visual, as well, hearing your tone of voice was really helpful and conveyed your changes and your suggestions well.
- I thought it was awesome, because on my first assignment I had done a couple of things that were a little bit complicately wrong and it was just so immediately clear to me what exactly I need to do to fix the problem.
- it definitely affected my learning. It’s almost like it sped up the process

Several learners also attributed multimedia feedback to their ability to apply changes to their work in order to improve it.

- Being graded this way allowed me to see exactly where I made my mistakes and fix them;
- The feedback helped me go back and fix the mistakes I made

Finally, learners also identified that multimedia feedback contributed to their ability to analyze their work and consider how it can be improved.

- I think it definitely got your point across and helped me understand what I did wrong in my assignments and helped me think about ways in which I could improve.

These results suggest the learners perceive multimedia feedback as having a positive effect on four of six levels within the cognitive domain of learning: Knowledge, Comprehension, Application, and Analysis. Next, we’ll look at learner perceptions of their affective learning.

**Affective learning.**

The affective domain of learning, outlined in Figure 2, refers to aspects of learning associated with emotions, values, feelings, and attitudes. This domain is often under-utilized in higher education because it is relatively difficult to measure compared to other types of learning (Buissink-Smith, Mann, & Shephard, 2011). However, frequent student-faculty contact can
positively influence learning by improving student motivation, involvement, and self-confidence (Chickering & Ehrmann, 1996; Kim & Sax, 2007). The social aspect of learning is a key element in my teaching philosophy, and the Building a Web Site course design. Thus, it is not surprising that multimedia feedback would positively affect learners’ values, motivation, and perception of the instructor. Participant comments aligned will all five levels within the affective domain: Receiving, Responding, Valuing, Organization, and Internalizing, and are as follows.

**Receiving.**

Receiving is the lowest level in the affective domain of learning, and it refers to one’s ability to “selectively attend to stimuli” (BCIT’s Learning Resource Unit, p. 7), or to notice, listen, or pay attention to stimuli.

- it absolutely affected my perceptions (in a positive way) of the teacher.
- it shows that as an instructor you are willing to take that extra time to provide that feedback
- It made it feel like the instructor actually took the time to review and analyze my work instead of just marking to get the job done.

**Responding.**

It is implied in the responding level that a learner “responds to stimuli” (BCIT’s Learning Resource Unit, p. 7) by caring for or participating willingly in a process. Although the following comments do not imply physical action, emotional response is a common theme among them.

- it felt like you were talking to me personally and so when I saw you in class it felt like OK you understand what my project is and I can really talk to you
- it was also really nice to get that personal feedback in your own voice. It was just like having a little one-on-one in your office, with you, so I loved it.
the fact that this option is being offered makes him seem more approachable in general because he’s putting that out there for us.

I also appreciated being able to replay the feedback - sometimes even if I needed a little motivational boost.

However, not everyone responded positively to the feedback modality. Specifically, one participant indicated that receiving rich feedback limited student-faculty interactions in the classroom because she felt like there was no longer a need to approach the instructor for clarification.

It kind of affected my learning but perhaps in a negative way because I didn’t have to approach the instructor because everything was clarified.

Valuing.

To value is to “attach worth to something” (BCIT’s Learning Resource Unit, p. 7). The following participant comments suggest that assessment feedback in multimedia format added value to the learning experience in the Building a Web Site course.

it’s almost like another way of getting to know you (the instructor) so that as the course progressed and I felt more comfortable approaching you with questions

I felt like you were as much into the class as I was.

Organization.

Organization is the stage of affective learning where students attach value rating to something while “resolving conflict between it and other values” (BCIT’s Learning Resource Unit, p. 7). In other words, they begin to classify and group the value of ideas and activities within their pre-existing schemas. The following comments demonstrate student preferences that emerged at the end of the course.
- I think about it when I take my next classes of how it could be applied and I would enjoy receiving more feedback in the future in this format.

- Great Course. Really learned a lot through Multimedia comments and visuals. Would prefer this format to text marking.

- especially that this was the first class and it was so positive - for me it would have been nice to have it for the rest of the classes.

Internalizing.

Internalizing is the highest rung in the affective domain of learning. At this high level, students integrate new values into existing value systems and these changes are demonstrated by justifying, defending, advocating, and/or influencing ideas, actions, or behaviours (BCIT’s Learning Resource Unit, p. 7). Comments below are indicative of the fact the students not only value receiving assessment feedback in multimedia format but they modified and justified their behaviours while advocating for its use in future courses.

- not to sound corny but to know that your instructor cares enough to do that - it encourages you to try more and you end up taking more out of the course when you know that your instructor is giving more into the course.

- it really helped me feel motivated that you really cared about my learning so the effort that I put in was more important because I wanted to show you that I was also willing to put in the effort to the course material.

- it has perhaps raised my expectations in the future in the hopes that perhaps some other instructors will do something like that

The comments outlined herein support the notion that learners are encouraged and motivated, by the use of multimedia feedback. These gains were achieved due to the added ability to project myself as what Knowles (1975) refers to as an “authentic human being” with
feelings, strengths, and challenges, in the process of providing assessment feedback through multimedia. These findings are supported by Chickering and Ehrmann (1996) when they discuss the advantages of using electronic communication technologies for instructor-student interactions. “Communication increases and, for some students, the result seems more intimate, protected, and convenient than the more intimidating demands of face-to-face communication with faculty” (p. 2). Next, we’ll examine whether or not learners perceived multimedia feedback affected their physical abilities.

**Psychomotor learning.**

Ultimately, the intention of providing formative assessment feedback is for learners to act upon the ideas, suggestions, or recommendations for the purpose of improving their knowledge, attitudes, and abilities. Interview responses indicate that assessment feedback helped learners in two areas related with the psychomotor domain of learning (Figure 3): Guided Response and Mechanism.

A **guided response** is to “manipulate with guidance” (BCIT’s Learning Resource Unit, p. 6) or to imitate and practise skills that have been previously demonstrated. Whereas, **mechanism** refers to one’s ability to “perform with increased efficiency, confidence, and proficiency” (BCIT’s Learning Resource Unit, p. 6). Since, the *Building a Web Site* course is introductory in nature it is not expected that learners will progress past the mechanism level without extensive prior knowledge of the subject. Learner comments were as follows:

- *I just needed to hear you say where I could improve once and then myself going through the assignment on my own I was able to apply the feedback.*
- *Being graded this way allowed me to see exactly where I made my mistakes and fix them;*
- *The feedback helped me go back and fix the mistakes I made*
These results indicate that audio and visual aspects of multimedia feedback helped make learning more accessible by guiding students in their learning with an aim of transitioning to the mechanism level of the psychomotor domain.

**Accessibility**

The fourth and final category to emerge from interview responses was accessibility. Accessibility is an important consideration when providing assessment feedback in different media formats. Although richer in nature, audio and multimedia are inherently less accessible because they produce larger file sizes, take longer to download, are not scanned as easily, and require more or different senses to be received fully. Although not asked specifically about accessibility in the surveys or interviews, four out of five interviewees made comments regarding the accessibility of multimedia feedback.

- *It was really easy to download and play, and understand, and there were no problems.*

- *Everything was quite easy and you just click on it. I even want back on it today to review some of the feedback for this interview and I didn’t have any issues what-so-ever.*

- *I liked the fact that I could watch it a few times in a row to fully absorb everything that you had to say.*

- *I could watch the feedback a couple of times so that if I missed something it was like I was able to say “what?” and ask you again even though you weren’t actually present.*

- *unlike a conversation you can re-play your feedback over and over again should you need that.*
One learner did experience some technical issues, but he did not report them during the semester because he attributed the problems to his computer.

- Sometimes the audio didn’t line up with the video but that kind of stuff could have been on my end.

Another learner pointed out that although she did not have any problems accessing or viewing the feedback, she could not download them to her computer.

- I didn’t notice though if we can download them, and use them, to reference back to them if you do delete the access to your program online.... I was looking to see if there was any way to download and it doesn’t look like I can download

Consistent across several responses was the ability to watch the feedback over and over again. Text and audio feedback also have this quality, in that one can read or listen to recorded, typed, or written feedback as many times as needed. However, I believe the importance of these comments lies in the fact that learners were not comparing multimedia feedback with other types of asynchronous feedback. Rather, they viewed the multimedia feedback experience as another opportunity to engage in discussion with the instructor. Although a recorded discussion is not as rich as a real discussion, due the inability to respond or ask questions synchronously, learners appreciated that they had an opportunity to engage in discussion about their progress, and they could re-play or re-live it repeatedly. On the other hand, it is possible that multimedia feedback is overwhelming to learners, thus, requiring multiple views to absorb the message completely. However, that does not appear to be the case based on results of this study.

**Summary of Findings**

This chapter revealed the findings from the analysis of collected data as they relate the research question: *Does providing learner feedback, in digital multimedia format, affect student perceptions of cognitive, affective, and psychomotor learning?*
First, statistical t-tests were performed on the median scores of pre- and post-course survey questions to establish whether any significant changes occurred in their perceptions of multimedia as a means of providing assessment feedback in a blended, university, undergraduate course. More specifically, several questions asked whether the audio and visual aspects of multimedia would affect the intent and clarity of the instructor’s message, while others solicited responses regarding the effect of multimedia on student motivation, involvement, retention, personalization, and instructor fervor. Overwhelmingly, at the beginning students were positive, curious, and enthusiastic about receiving assessment feedback in multimedia format of the semester and, for the most part, there was no significant difference in opinions when asked the same questions at the end of the semester. Two questions that did receive positive increases in perceptions pertain to whether inflection in the instructor’s voice improved clarity of his message ($p=0.0353$) and whether the visual aspect of multimedia will clarify the intent of the instructors’ intent, when compared to text alone ($p=0.0431$). This statistical data provides insight into student perceptions of multimedia feedback and whether or not it changed over the period of one academic semester.

Next, students were asked open-ended questions in post-course interviews in order to help understand why students felt the way they did. Interviews were recorded and transcribed verbatim for coding by the author of this study. A framework called “conceptual ordering” (Owen, 1984), was used to code responses in terms of repetition, recurrence, and forcefulness. Results of the coding process suggest that receiving assessment in multimedia feedback helped students learn and become efficient with the mechanics of technical procedures, it provided insight into the instructor’s thought processes and work ethics, they felt more comfortable
approaching the instructor, and they responded to, valued, and internalized the experience of receiving feedback in this way.

The next chapter presents a discussion of the research implications and limitations, strengths and challenges of using digital technologies in the assessment process, and future directions associated with the outcomes of this study.
Chapter Five: Discussion, Implications, and Recommendations

This chapter discusses the research findings, implications and recommendations for practice, as they are related to the primary research question of this study: Does providing assessment feedback, in digital multimedia format, affect student perceptions of cognitive, affective, and psychomotor learning? In the first section, I discuss how the types of student-faculty interactions developed through the use of multimedia assessment feedback followed by a look at the impact of these interactions on cognitive, affective, and psychomotor learning. I then reflect and discuss how digital technologies can be used to support the eight principles of effective assessment feedback, outlined in chapter two, and the strengths and challenges of using different digital technologies in the assessment process. Finally, I suggest potential future research directions and provide some concluding comments about this study.

Student-Faculty Interactions

The findings from this study have demonstrated that providing assessment feedback in multimedia format in the Building a Web Site course had a positive effect on cognitive, affective, and psychomotor learning. This was achieved primarily through what students perceived as frequent, positive, student-faculty interactions. Frequent student-faculty interaction is viewed as a key element to student motivation and quality learning experiences in higher education (Chickering & Ehrmann, 1996). Moreover, Anderson (2008) posits: “sufficient levels of deep and meaningful learning can be developed as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at very high levels” (p. 66).

“The National Survey of Student Engagement (NSSE, pronounced "Nessie") is a survey that measures students' levels of engagement with their institution” (University of Calgary,
Survey items on the NSSE include effective practices in undergraduate education that are “empirically confirmed” (University of Calgary, 2010). They are grouped into five sections:

1. Levels of Academic Challenge (LAC),
2. Active and Collaborative Learning (ACL),
3. Student-Faculty Interaction (SFI),
4. Enriching Educational Experiences (EEE), and
5. Supportive Campus Environment (SCE).

Student-faculty interactions (SFI) are the focus of discussion herein.

According to the NSSE (2011) “students learn firsthand how experts think about and solve practical problems by interacting with faculty members inside and outside the classroom. As a result, their teachers become role models, mentors, and guides for continuous, life-long learning” (p. 5). The process of providing assessment feedback in multimedia format, in the Building a Web Site course, resulted in a perceived increase in positive student-faculty interactions that are aligned with NSSE’s definition. Specifically, students felt that multimedia assessment feedback enabled them to get to know the instructor better, understand his thought processes, value his work ethic, and gain a better understanding of course material. However, it should not be understated that the sample size in this research project was very small (n=9), and participant ages, demographics, and socio-economic statuses’ were relatively homogeneous. It should also be noted that 80% of the qualitative data obtained was from female participants.

When comparing gains resulting from student-faculty interaction, Sax, Bryant, and Harper (2005) found that females achieved “a sense of physical, emotional, and academic well-being” (p. 2), whereas males reported “gains in political engagement, social activism, and liberalism” (p. 2). Further research by Kim and Sax (2007) suggests that the benefits of student-faculty
interactions can also vary between learners of different race, gender, and socio-economic status. Thus, further research is needed with a larger and more diverse sample size to determine if the findings in this study are repeatable, and if so, among which constituent groups.

Next, I will explore student-faculty interactions in the Building a Web Site course and their impact on cognitive, affective, and psychomotor learning.

**Cognitive Learning**

As outlined in chapter four, themes found across student responses in this study indicate a positive effect on the cognitive domain of learning (Bloom, 1956). For example, many students indicated that multimedia feedback enabled them to see what the instructor was thinking and to make visual and mental connections between errors and potential corrections. One respondent felt that this modality of assessment feedback sped up the learning process.

*it definitely affected my learning. It’s almost like it sped up the process*

The quantitative data in this study indicated a significant change in perception regarding the intent of the instructor’s message within assessment feedback as a result of multimedia. Specifically, they agreed that inflections in the instructor’s voice clarified the message ($p=0.0353$) and the visual aspect of feedback, in combination with audio, improved their perceived value of the message even more ($p=0.0431$), as outlined in Table 8. However, what does this mean and why did it happen? As an introductory course, within a technical discipline, the focus of assessment feedback was aimed at knowledge, comprehension, and application levels within the cognitive domain of Bloom’s Taxonomy of Learning (Bloom, 1956). The goal of the feedback was to help learners make connections between theory and practice by emphasizing the rules of standards compliant syntax while demonstrating examples of how to bridge the gap between lab activities (aimed at comprehension) and assignments (aimed at
application and analysis). Since the discipline of web design combines aspects of visual creativity and aesthetics with technical accuracy and validity it is appropriate that the assessment feedback mechanism would include aspects that support all of these elements. Thus, principles of effective feedback such as providing positive comments in addition to corrections, focusing feedback on assignment outcomes, identifying patterns of weakness or strength, ensuring the feedback is timely, personalized, and legible/audible, facilitated learners in seeing how to improve, while motivating and providing opportunities for the them to apply the feedback and/or corrections to their existing and future work. Furthermore, the personal touches and conversational style facilitated by multimedia feedback contributed to positive student-faculty interaction and are congruent with the socio-constructivism and social-learning underpinnings of the course design and the instructor’s philosophical outlook.

Implications and recommendations for cognitive learning.

Qualitative findings in this study revealed that students felt that the visual aspect of multimedia enabled them to see what the instructor was doing and thinking. Pratt and Associates (1998) posit that from an apprenticeship perspective, “learning is understood as a blend of product and process” (p. 86). Thus, the process is equally, if not more, important than the product. Traditional apprenticeship models require learners to become embedded in situations of application, and this process often requires a high degree of enculturation.

In the world of academia, situations of application often occur in the mind. Thus, in these instances intellectual or cognitive apprenticeship is appropriate (Pratt & Associates, 1998). Since cognitive activities occur in the brain they are not as observable as tasks that might be associated with traditional apprenticeships. Thus, instructors must take extra care in order to overtly articulate their thinking and thought processes. According to Pratt and Associates (1998),
instructors must also place tasks in contexts that make sense to learners and to recognize when specific skills are, or are not, applicable (p. 98).

The practice of cognitive mentorship is demonstrated through a practice referred to as *chalk talk*, often seen in math, engineering, sports, and military lectures. Oxford Dictionary defines *chalk talk* as “a talk or lecture in which the speaker uses a blackboard and chalk” (2012). Currently, a web site called Khan Academy (http://www.khanacademy.org/) has taken the practice of *chalk talk*, and used multimedia software to create and share screencasts of concepts, and examples on topics ranging from “arithmetic to physics, finance, and history” (khanacademy.org, n.d.) over the internet. Khan Academy claims to have delivered 128,132,747 lessons through their web site (as of March 2012). Thus, this site’s popularity is a clear indication that students, parents, and educators find value in the richness, personalization, and immediacy that multimedia can afford. Despite this popularity, we have not seen an uptake of this methodology in providing assessment feedback. To put it another way, educators are using multimedia for teaching but they are not using it for assessment.

Educational contexts that require aspects of cognitive apprenticeships could benefit from multimedia as a means of providing assessment feedback. Specifically, the visual and audio aspects of multimedia feedback, in addition to the potential to embed interactivity, have the potential to support learners in the first phases of apprenticeship by modeling problem solving approaches, articulating the essence of activities, sharing tips and tricks-of-the-trade, and scaffolding learners through coaching and support (Abbott, 2008; Pratt and Associates, 1998). This approach may prove to be especially beneficial for promoting student-faculty interaction in online and/or blended learning contexts where teachers and learners have limited or no physical contact with one another.
Affective Learning

“Frequent student-faculty contact in and out of classes is the most important factor in student motivation and involvement” (Chickering & Gamson, 1987, p. 3). Qualitative findings in this study revealed that multimedia feedback contributed to students’ affective learning and enabled me (the instructor) to project myself socially and emotionally with learners. Participant responses indicated that student-faculty interactions, in the form of multimedia assessment feedback, positively affected their perception of the instructor and his work ethic, while motivating them to work harder and advocate for its use in future classes. The following comments are indicative of the types of interview responses received regarding affective learning.

- *it shows that as an instructor you are willing to take that extra time to provide that feedback*

- *it felt like you were talking to me personally and so when I saw you in class it felt like OK you understand what my project is and I can really talk to you*

- *I felt like you were as much into the class as I was.*

- *I think about it when I take my next classes of how it could be applied and I would enjoy receiving more feedback in the future in this format.*

These types of responses are due, in-part, to the fact that feedback was personalized, timely, of good visual and audio quality, was positive, and focused on specific individual strengths and challenges as they related to assignment outcomes. However, as outlined in chapter four, not everyone felt that multimedia feedback contributed positively to student-faculty interactions. Specifically, one participant felt the process of receiving rich, multimedia feedback negatively impacted classroom interactions because all her questions had been answered in the feedback. Thus, there was no need to approach the instructor for clarification in class.
It kind of affected my learning but perhaps in a negative way because I didn’t have to approach the instructor because everything was clarified.

However, later in the interview, the same participant made the following comment about multimedia feedback:

- it encourages you to try more and you end up taking more out of the course when you know that your instructor is giving more into the course.

Together these comments could be interpreted to mean that multimedia feedback contributed to this person’s affective learning by motivating her to work harder and to her cognitive learning by clarifying the strengths, challenges, and potential next steps of her work. However, an unexpected result of receiving feedback in this way was that this person perceived that multimedia assessment feedback reduced the number of opportunities for in-class student-faculty interactions.

Implications and recommendations for affective learning.

Providing assessment feedback in multimedia format has the potential to contribute positively to student-faculty interactions. As undergraduate university classes become larger, with more and more aspects of teaching and learning occurring online and asynchronously, multimedia may be a valuable tool for instructors to maintain or increase student-faculty interaction through the assessment feedback process. Similarly, this study revealed that learners were able to take greater control of their learning, as a result of receiving multimedia feedback, thus increasing their autonomy in the learning process.

Rotheram (2009) posits that even though providing assessment feedback in multimedia format may take more time to develop, learners may benefit from it greatly, which could save you and your colleague’s time in the long run. The learner comments highlighted earlier support
this claim when highlighting the fact that she learned and was motivated by the feedback, thus limiting the need for additional questions or support. Therefore, it will be important to consider the long-term impact on time when providing assessment feedback in multimedia in future research studies.

Finally, being able to project myself through multimedia assessment feedback was accomplished individually with learners and did not necessarily facilitate reciprocal action from, between, or among students. However, research supports the notion that student-led instruction can result in higher levels of cognitive, social, and teaching presences within an online course when compared to teacher-led instruction alone (Rourke & Anderson, 2002). Thus, future research needs to investigate the effects of peer assessment and instruction using freely available multimedia tools such as Jing, or VoiceThread in online or blended courses.

**Psychomotor Learning**

The findings from this study indicate that multimedia feedback positively affected learner perceptions of two levels within the psychomotor domain of learning (Table 3). The levels affected were Guided Response and Mechanism. A *guided response* is to “manipulate with guidance” (BCIT’s Learning Resource Unit, p. 6), whereas *mechanism* refers to one’s ability to “perform with increased efficiency, confidence, and proficiency” (BCIT’s Learning Resource Unit, p. 6). In this regard, the animated visual aspect of multimedia facilitated the instructor’s ability to provide specific and individualized demonstrations based on the immediate needs of learners. Marrs and Novak (2004) refer to this approach as “Just-in-Time Teaching (JiTT)” (p. 49). As an introductory course, students enter *Building a Web Site* with a wide range of prior knowledge and experience with web site design. Thus, applying the eight principles of effective assessment feedback in multimedia format enabled learners to improve their technical
manipulative abilities, at the micro-level, through addition guidance and demonstrations. As a result, they perceived that they were able to perform these tasks with increasing efficiency, confidence, and proficiency.

**Implications and recommendations for psychomotor learning.**

Micro-level evaluation comments (outlined in Table 1) focus on technical aspects of writing such as “choice/phrasing; missing words and pieces; grammar/punctuation; spelling/typos; technical style, and reference/citations” (Stern & Solomon, 2006, pp. 29-30). As outlined in chapter two, researchers (Ice et. al, 2010; Oomen-Early et. al, 2008; Simonsson, et al., 2009), found that students prefer a combination of visual mark-up and audio when receiving feedback on micro-level aspects of their work. However, the focus of these studies is similar in that they investigated feedback on academic writing in higher education. Thus, future research is needed to investigate the effects of using multimedia feedback in other areas that require competencies at the micro-level, such as language acquisition (both linguistic and programming), drafting, graphic design, spelling, grammar, diction, and citation and publication styling (e.g. APA, Chicago, MLA).

Indeed, a contributing factor to the project success was also due to a successful integration and application of technologies. Next, I will discuss how the technology worked.
Digital Technologies and the Assessment Process

The value of digital technologies, in an educational context, is that they allow for the representation of knowledge in different ways (Bates & Poole, 2003). In this study, assessment feedback was provided to learners in three different digital formats; multimedia (audio and visual) with text, audio with text, and text alone. All forms of digital feedback were provided to learners online and asynchronously, through assignment dropbox folders within the learning management system. Next, I will discuss how digital technologies support the principles of effective feedback, outlined in chapter two, followed by the strengths and challenges of each approach and their integration into this study.

Principles of effective feedback.

In chapter two of this thesis, I outlined eight principles of effective feedback that are based upon findings in a review of selected literature. After reflecting on the process and outcome of this study, I have identified ways in which the use of digital technologies can support the implementation of those principles.

1. Provide positive comments in addition to corrections.

Participants in this study indicated that inflections in the instructor’s voice made the intent of his message clearer and the experience of receiving feedback in multimedia format motivated them by creating the perception of being in a conversation with the instructor. When compared to providing text feedback, I felt that providing feedback orally enabled me to project enthusiasm through my voice while quickly pointing out strengths and areas for improvement without additional time or energy. Other instructors hoping to achieve similar results should consider providing feedback at a time and place that enables them to speak clearly and in a
positive and enthusiastic manner. I do not recommend providing assessment feedback in this way when one is tired or irritated.

2. **Focus feedback on course, program, or discipline specific outcomes and competencies.**

Electronic rubrics that outline assignment learning outcomes and align with course, program and discipline specific competencies can focus student learning and assessment. Following assignment rubrics as a guide when formulating comments kept me focused when assessing student work and providing feedback in the *Building a Web Site* course. Utilizing this approach assumes that one is already using rubrics for assessment or is willing to development and implement rubrics as part of his/her assessment strategy.

3. **Identify patterns of weakness, errors, or strengths rather than focusing on every error.**

The visual qualities of multimedia allowed me to rapidly show patterns throughout students work so that the focus of my assessment could quickly shift towards encouragement and ways of improving. This approach requires a thorough inspection of student’s work prior to recording feedback so that the instructor is already familiar with patterns, and their location(s) within the work, in order to keep the feedback at a reasonable length.

4. **Provide feedback in a timely manner.**

Digital file formats facilitated my ability to share and distribute assessment feedback online and asynchronously. Thus, students did not need to wait until the next face-to-face session in order to receive feedback. Marrs and Novak’s (2004) Just-in-Time Teaching (JiTT) strategies support this approach to the distribution of assessment feedback because it maximizes out-of-class time to benefit learning. As Nicol and MacFarlane-Dick (2006) point out, if feedback is to
be effective, students must receive it at a time when it is possible to apply changes to their work, not just soon after it was submitted.

5. **Personalize the feedback.**

Mayer’s (2003) Personalization Principle posits that conversation style within text and narration promotes learner engagement and motivation. Digital multimedia facilitated my ability to speak directly to a learner while showing his or her work, as I saw it. Thus, I recommend that others think of their feedback comments as the beginning of a conversation with each student that he or she can respond to at a later time. Personalized digital feedback also supports a JiTT approach to instruction (Marrs & Novak, 2004).

6. **Ensure feedback is legible and/or audible.**

Typed text is more legible than handwritten text. Audio and visual aspects of multimedia feedback are easily understood if spoken slowly and clearly, and are compressed at a minimum acceptable quality. In addition, combining audio with visual mark-up leverages Mayer’s (2008) Temporal Contiguity Principle and his Modality Principle of multimedia design by utilizing two sensory channels (audio and visual) while aligning narration with text and images to reduce cognitive load. When leveraging multimedia for assessment feedback I recommend that instructors familiarized themselves with all of Mayer’s Principles of Multimedia Design (2008).

7. **Do not focus on the mark.**

Marks can be included or omitted when providing assessment feedback digitally, just as they can be included or omitted when providing feedback in traditional ways. I did not include marks in assessment feedback, in the *Building a Web Site* course. Educators should consider the benefits and challenges of providing grades in their feedback based on details of their particular

8. **Two-stage or multi-stage feedback works better than one-stage feedback.**

Providing assessment feedback, online and asynchronously, can speed-up the feedback loop between student and instructor. Speeding up this loop has the potential to facilitate an instructor’s ability to provide two-stage or multi-stage feedback while accommodating students with additional opportunities to apply feedback in a meaningful way. This was certainly the case in the *Building a Web Site* course. Instructors wishing to implement this approach should consider reviewing the design and flow of all the assessments in their course or program rather than reviewing one assessment at a time. An instructional designer or assessment expert can assist in this process.

I have outlined ways in which digital technologies can help facilitate an implementation of the eight principles of assessment feedback and those ways are summarized in Table 11. In the next section, I will discuss the strengths and challenges of the three approaches to providing digital assessment feedback and their integration into this research study.
Table 11

Supporting the Principles of Effective Feedback with Digital Technologies

<table>
<thead>
<tr>
<th>#</th>
<th>Principle</th>
<th>Technical Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provide positive comments in addition to corrections</td>
<td>- Supports the projection of instructor enthusiasm and fervor, in addition to nuances, and inflections of one’s voice</td>
</tr>
<tr>
<td>2</td>
<td>Focus feedback on course, program, or discipline specific outcomes and competencies</td>
<td>- Electronic rubrics outlining assignment outcomes that align with course, program, and discipline specific competencies</td>
</tr>
<tr>
<td>3</td>
<td>Identify patterns of weakness, errors, or strengths rather than focusing on every error</td>
<td>- Quickly identify patterns of strength and weakness in digital feedback by performing a thorough inspection of student’s work prior to recording</td>
</tr>
<tr>
<td>4</td>
<td>Provide feedback in a timely manner</td>
<td>- Digital feedback is easily distributed online and asynchronously, outside of class time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supported by Marrs and Novak’s (2004) JiTT pedagogical strategy</td>
</tr>
<tr>
<td>5</td>
<td>Personalize the feedback</td>
<td>- Supports the ability to address each student by name (verbally or in text) and to present the students work, as the instructor sees it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supports the ability to provide personalized JiTT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Leverages Mayer’s Personalization Principle</td>
</tr>
<tr>
<td>6</td>
<td>Ensure feedback is legible and/or audible.</td>
<td>- Typed text is more legible than handwritten text</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Audio is easily understood if spoken slowly and clearly, and compressed to ensure acceptable visual and sound quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Combining audio with visual mark-up leverages Mayer’s Temporal Contiguity Principle and Modality Principles</td>
</tr>
<tr>
<td>7</td>
<td>Do not focus on the mark</td>
<td>- Mark can be easily omitted or included</td>
</tr>
<tr>
<td>8</td>
<td>Two-stage or multi-stage feedback works better than one-stage feedback.</td>
<td>- Distribution efficiencies of electronic feedback facilitates an instructor’s ability to provide two-stage or multi-stage feedback</td>
</tr>
</tbody>
</table>
Multimedia feedback.

I used Adobe Captivate © software to create multimedia assessment feedback in this study. The strength of this software is its ease of use for recording, and editing multimedia screencasts and interactive e-learning content. The process of recording assessment feedback and providing a user friendly learning object that was aesthetically pleasing was aided by the use of a Captivate template. Creating a template in Adobe Captivate © prior to the study allowed me to include custom slides at the introduction and conclusion of each student’s feedback that acted as proverbial bookends. The introductory screen (shown in Figure 6) included the course name, instructor name, instructor email, and assignment name while the conclusion slide, illustrated in Figure 10, included a re-play feedback button that allowed users to replay the feedback with one mouse click. Both the introduction and conclusion slides were branded with a look and feel that was consistent with course lecture slides and materials within the LMS. The template also enabled me to publish feedback with the same audio and image compression settings, video playback frame rate, and visual aesthetics with one button. In short, the use of a Captivate © template file enabled me to record and publish feedback quickly that was consistent in look, layout, aesthetics, and quality. Thus, I highly recommend the use of templates for anyone wishing to duplicate this study or provide multimedia assessment feedback to learners.
One challenge associated with providing feedback in multimedia is that it is difficult for end-users to save. This difficulty is due to the fact that multimedia generally functions as a group of many related files that rely on relative relationships with one another in order to perform properly. Whereas, with audio or text feedback there is generally only one, stand-alone, file that is easily downloaded and saved. This challenge was pointed out by one student who commented:

- *I didn’t notice though if we can download them, and use them, to reference back to them if you do delete the access to your program online.*

- *I was looking to see if there was any way to download and it doesn’t look like I can download.*
This lack of functionality was an oversight in the original design and has subsequently been addressed by providing a hyperlink within the text comments that point to a compressed zip file. The zip file acts a vehicle for learners to download and save the package of related files together while maintaining the relative relationships required for playback on a user’s computer. The hyperlink to download and save the feedback is provided, in addition to the button for viewing the feedback.

Assessment feedback was also provided for learners in audio format. I attempted to duplicate the procedure described by Ice, et al. (2007) as a means of providing a comparison for students between multimedia, audio, and text alone. The process of recording and distributing audio feedback is discussed next.

**Audio feedback.**

The process of creating and distributing assessment feedback in different formats can present challenges. In this study, embedding audio into Adobe PDF files proved to be a challenge for two reasons. The Record Audio Comment tool within Adobe Acrobat Pro © provides an easy way to record and embed audio directly into a PDF document, without the use of additional software. However, the results of this process were of very poor sounds quality, and I could not find a way to adjust the recording quality settings within Adobe Acrobat Pro 9.5 ©. Therefore, in order to achieve an acceptable quality, audio comments had to be recorded in third party software, saved, compressed, and converted into wav file format. Once the file(s) had been saved and converted they were embedded into a PDF document using the Attach a File as a Comment tool in Adobe Acrobat Pro 9.5 ©. Secondly, this process was far more complex, laborious, and time consuming than providing multimedia feedback but as Rotheram (2009) suggests, I saved more time as my comfort with the process increased. The extra time required
for distributing audio feedback can be attributed to the fact that I was more familiar with using Adobe Captivate © to record multimedia than I was embedding audio into Adobe Acrobat © PDF files. Therefore, this challenge could be mitigated in future studies by becoming familiar with the software and establishing a process and recording template prior to the assessment process.

Text feedback.

Learners received a text component of feedback on all instructor assessed assignments in the Building a Web Site course. When provided with multimedia, or audio feedback, the text component comprised of short, standardized, summative comments related to the overall quality of work submitted accompanied by instructions on how to access the media component of the feedback. When the feedback was provided in text only, comments were customized for each student, were longer, more specific, and formative in nature. Despite being a relatively proficient typist, I found it more time consuming to provide high quality, detailed feedback in text format, when compared to audio or multimedia. This increase in time was due to the fact that when providing text feedback I needed to explain what section of the assignment I was looking at prior to commenting on other aspects such as quality, accuracy, creativity, errors, areas for improvement, or suggestions for next steps. Whereas, with audio feedback I could explain what I was looking at verbally more quickly in a casual conversational style than I could typing it out. I found providing multimedia feedback to be the fastest because I could simply show the aspect or section as a visual rather than explaining it and therefore, focus on assessment for learning. Second, written English requires a more formal style than spoken English. This is especially true in an academic setting where it is expected and assumed that professors are highly educated and therefore, skilled and proficient at writing. I found it more time consuming to formulate and
create a formal written statement than I did to verbally explain something in a conversational style. However, for others, these variables will depend on class size, how much feedback one provides for learners, and how quickly one speaks and types (Rotheram, 2009).

All text components of feedback were provided via the Comments section of an assignment dropbox folder within the learning management system. The learning management system is web-based thus, the Comments sections of the dropbox folder facilitates the input of hypertext markup language (html) and cascading style sheets (css) for formatting, via an html editor. As a web designer teaching a web design course, the process of creating and manipulating html and css was easy and straightforward. However, instructors who do not have these skills may want to work with a web designer, or media developer in their teaching support centre, or Information Technology (I.T.) division to develop a template. If these supports are not available in their institution, one could consider hiring a student or research assistant who possesses these skills.

As mentioned previously, much of the summative comments that accompanied the audio and multimedia feedback were very short, general, and standardized. However, a feature with the html editor, called insert replace string, allowed me to insert a syntax variable that automatically inserts the first name of the student recipient. This functionality facilitated a more personal approach to feedback while removing all fears of mistakenly typing the wrong student name. Samples of the html template are illustrated in figures 8 and 9 and the insert replace string variable is represented by the {FirstName} syntax.

Multimedia, audio, and text are different medium that present their own strengths and challenges when used for providing assessment feedback for learners. When provided digitally they offer expanded options for communication and collaboration with, between, and among
teacher and learners synchronously, asynchronously, online, and in the classroom. A summary of the tools and features used in this study along with the accessibility and ease of use of each are provided in Table 12. As the proliferation of information, communication, and multimedia technologies grow in the future, so too will educators abilities to connect with learners in new and innovative ways.

Table 12

*Tools for Creating Multimedia Feedback*

<table>
<thead>
<tr>
<th>Format</th>
<th>Tool(s)</th>
<th>Features Used</th>
<th>Accessibility</th>
<th>Ease of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia</td>
<td>Adobe Captivate © software</td>
<td>For recording, editing, and publishing multimedia screencasts</td>
<td>- Enables unlimited playback</td>
<td>- Recording and publishing has a relatively small learning curve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Adjustable frame rates and audio/visual compression settings</td>
<td>- Facilitates a conversational presentation style</td>
<td>- Advanced editing requires a greater learning investment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Templates maximize re-usability</td>
<td>- Not easily searchable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Facilitates user interactivity when programmed correctly</td>
<td>- Large file sizes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Can take a long time to upload/download on slow internet connections</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio</td>
<td>Adobe Soundbooth CS5 © software</td>
<td>For recording, editing, and publishing digital audio</td>
<td>- Enables unlimited playback</td>
<td>- Recording has a relatively small learning curve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Adjustable audio compression settings</td>
<td>- Facilitates a conversational presentation style</td>
<td>- Publishing and advanced editing requires a greater learning investment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Multiple audio file output types to choose from</td>
<td>- Not easily searchable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Medium / Large file sizes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Can take a long time to upload/download on slow internet connections</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- File output options can be confusing</td>
<td></td>
</tr>
</tbody>
</table>
## Future Directions

In chapter one, I indicated time restriction as being one of the limitations of this study. Given more time, this study could act as a pilot for future studies. If this were the case, I have outlined a list of lessons learned and how I would do it differently next time.

First, multimedia feedback was the focus of this study. Upon reflection, since this was not a comparative study, providing assessment feedback in only one format (multimedia) would have been a more prudent and less confusing approach to take. In the second iteration, I would provide assessment feedback in only multimedia format with an aim of focusing results purely on those experiences. Although the majority of qualitative student responses in this study seemed to focus on multimedia, I cannot definitively make those associations due to the fact that they

| Audio | Adobe Acrobat Pro 9.5 © | For saving and distributing files in a format that is independent of the software in which it was created - converting assignment submissions to PDF format - embedding audio comments |-| Is viewable independent of proprietary software - PDF viewer is freely available - Text is searchable |-| Easy to use and manage - *Attach a File as a Comment* tool not compatible with mp3 audio files |

| Text | TextPad © software | For text writing, html, and css programming and editing |-| Very small file size - Searchable - Uploads/downloads quickly - Enables hyperlink connectivity on the web |-| Requires knowledge of (x)html and css programming - Html editor software can be used as an alternative for those who are not familiar with html and/or css |

| Rubric | LMS Rubric tool | For disseminating assignment expectations and assessment criteria |-| Very low file size - Searchable |-| Functions within all browsers supported the LMS |
also received feedback in text and audio. Later iterations could measure and compare empirical learning gains between learners who receive assessment feedback in different formats.

Second, as indicated in chapter three, I conducted the pre-course survey in the third week of the semester. This decision was made to allow potential participants a period during which they could acclimatize to the academic setting. As a result, student activities that occurred over the first three weeks, such as interacting with me (the instructor) and their classmates and engaging with the course environment and learning resources, online and in the classroom, may have influenced the attitudes and perceptions of participants. I made this decision as a tradeoff, fearing that potential participants may be overwhelmed, and therefore, not interested in the study, if the invitation to participate coincided with the course and academic orientations. The orientation period can be particularly overwhelming in the fall academic semester because it is the semester in which the majority of new students enroll in academic programs. This challenge may have been mitigated if the time-lines for the research project allowed for it to occur in a different academic semester or to be repeated over several semesters. Thus, being part of the requirements to complete a Master of Arts degree, the boundaries of the academic calendar imposed delimitations for which the study was conducted.

Third, at the outset of the research design, I recognized the relative homogeneity of research participants as a potential limitation. Although the age of students who enroll in the WDD program has ranged from 18 to 70+ years in the past, the majority of students who enrolled in the course over the fast five semesters have been within the range of 26 to 45 years. In addition, the number of potential research participants was limited by a course enrollment cap of 18 learners. McMaster University imposes this cap due to physical limitations of the classroom/computer lab in which the class takes place. Also, due the nature of the program of
study, which focuses on web site design and development, I expected that the pool of potential participants would all have some degree of prior knowledge, skills, and interest in computers, information technology, or different media types, such as photography, graphics, audio, video, or illustration, to name a few. Therefore, these types of interests and prior knowledge may have influenced learner perceptions of receiving feedback in multimedia format. To address this limitation, future research studies should include a larger and more diverse group of participants (students and teachers) who are studying and teaching in a variety of disciplines.

Fourth, I would argue that the relative context, topic, discipline of study, and the teaching philosophy of the instructor were all contributing factors to these outcomes. These results are also congruent with findings of Ice et al. (2010), Oomen-Early et al. (2008), and Simonsson, et al. (2009), who found that students preferred a combination of audio and visual mark-up in their assessment feedback on “micro-level evaluations” (Stern & Solomon, 2006). Therefore, I foresee further research in two additional areas. The first is determine whether a combination of audio and visual-mark, in the form of multimedia, would be perceived as helpful in disciplines that are not as visual, technical, or process oriented. Second, is to compare student perceptions and measured learning after receiving multimedia feedback between courses that involve micro-level learning and evaluations (first year and/or introductory courses) with courses the involve macro-level learning and evaluation (fourth year and/or advanced courses).

Summary and Conclusion

The purpose of this Scholarship of Teaching and Learning (SoTL) research project was to investigate learner perceptions of receiving assessment feedback in digital multimedia format. Chapter one established a lens through which the remainder of the document should be viewed by outlining the researcher’s teaching philosophy and the theoretical, political, and practical
underpinnings and rationale for the study. Limitations, delimitations, and definitions of terms were also outlined in the first chapter.

Next, a review of selected literature was synthesized into eight principles of effective assessment feedback and provided insight on the importance of integrating assessment processes into courses and program design in a methodical way. Benefits and challenges of providing assessment feedback in different formats, such as digital text, digital audio, and digital multimedia, were discussed followed by practical recommendations for improving the practice of providing assessment feedback in different media formats.

The third chapter established that the research project occurred in the *Building a Web Site* course which is part of the Web Design and Development Program at McMaster University, Centre for Continuing Education. Here, I also outlined the research methodology used to explore learners’ experiences and perceptions of receiving assessment feedback in different formats. A SoTL approach was used with a focus on obtaining data that will help improve learning experiences for students. An inductive approach utilized a triangulation of pre-course survey, post-course survey, and post-course interview data to establish whether student perceptions changed over the period of one academic semester and why.

Chapter four revealed that 44% of the 9 study participants were between the age of 26 and 35 years, and the ratio of males to females was 4:5. Despite the fact that 78% of participants had never taken an online or blended learning course previously, and 88% of participants had never received assessment feedback in audio or multimedia format, an overwhelming majority still speculated favorably that multimedia would contribute positively to their learning. Non-directional (two tailed) t-tests compared the median scores of pre- and post-course survey responses, with a 95% confident interval rating ($p=0.05$), which revealed significant changes in
only two areas. First, participants perceived that inflections in the instructor’s voice, through
audio and multimedia, improved clarity of his message \( (p=0.0353) \) and the visual aspect of
multimedia provided greater clarity to the intent of the instructors message, when compared to
text alone \( (p=0.0431) \). Qualitative data, obtained in post-course interviews was utilized to extract
meaning from the quantitative findings and revealed that learners perceived multimedia feedback
as having contributed to their cognitive, affective, and psychomotor learning through regular and
positive student-faculty interactions.

The fifth and final chapter outlined the importance and implications of frequent student-
faculty interactions on student learning, motivation, and satisfaction. Connections were made
between the process of providing assessment feedback in multimedia format and its future
research potentials in higher education.

This project was a first step in the investigation of using multimedia as a means of
providing assessment feedback for learners. As the acceptance and adoption of online, distance,
and blended learning continues to grow throughout western society, so too will the need for
innovative, efficient, and effective methods, and modes of providing high quality assessment
feedback for learners.

About the Centre for Continuing Education (CCE) (2008). McMaster University Centre for Continuing Education. Retrieved from http://www.mcmaster.ca/content/about/


doi:10.1080/08923640701341653


Queen Margaret University (n.d.). Audio feedback in learning and teaching: Learner [wiki]

Retrieved from
https://sites.google.com/a/qmu.ac.uk/audio_feedback/home/advantages/learner-perspective


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Appendix A: Royal Roads University Ethics Certificate

ROYAL ROADS UNIVERSITY

Office of Research

29 August, 2011

Brian Gould

Re: Ethical Review – Brian Gould

Dear Brian,

Please accept this letter as confirmation that the Royal Roads Research Ethics Board has given clearance for your research on the project "Using Multimedia Feedback to Enhance a Community of Inquiry".

This letter is to confirm that final clearance was granted on the 28 August, 2011, pending any additional clearances required by the sponsoring organization or any other organization.

Should you require any additional information, please feel free to contact us.

Sincerely,

Colleen Hoppirfs
Research Ethics Coordinator
Office of Research
Royal Roads University
Appendix B: McMaster University Ethics Certificate

McMaster University Research Ethics Board (MREB)
c/o Office of Research Services, MREB Secretariat, GH-305, e-mail: ethicaloffice@mcmaster.ca

CERTIFICATE OF ETHICS CLEARANCE TO INVOLVE HUMAN PARTICIPANTS IN RESEARCH

Application Status: New ☑ Addendum ☐ Project Number: 2011 160

TITLE OF RESEARCH PROJECT:
Using Multimedia Feedback to Enhance a Community of Inquiry

Faculty Investigator(s)/Supervisor(s) | Dept./Address | Phone | E-Mail
--- | --- | --- | ---
N. Vaughan | Administration | | |

Student Investigator(s) | Dept./Address | Phone | E-Mail
--- | --- | --- | ---
B. Goud | Multimedia | | |

The application in support of the above research project has been reviewed by the MREB to ensure compliance with the Tri-Council Policy Statement and the McMaster University Policies and Guidelines for Research involving Human Participants. The following ethics certification is provided by the MREB:

☑ The application protocol is approved as presented without questions or requests for modification.
☐ The application protocol is approved as revised without questions or requests for modification.
☐ The application protocol is approved subject to clarification and/or modification as appended or identified below.

COMMENTS AND CONDITIONS: Ongoing approval is contingent on completing the annual completed/status report. A "Change Request" or amendment must be made and approved before any alterations are made to the research.

Reporting Frequency: Annual: Other: 

Date: Chair, Dr. Br. Detlor:

http://iserv.mcmaster.ca/ethics/mreb/print_approval.cfm?id=2695

9/7/2011
Appendix C: Participant Consent Form

Name of Researcher, Faculty, Department, Telephone, & Email

Brian E. Gould, Student, Master of Arts in Learning and Technology, Education Studies, Royal Roads University.

This project is part of the requirements for a Master’s Degree in Learning and Technology at Royal Roads University. My credentials with Royal Roads can be established by calling Jennifer Walinga, Director of the Division of Education Studies.

Title of Project: Using Multimedia Feedback to Enhance a Community of Inquiry

This consent form, a copy of which has been given to you, is only part of the process of informed consent. If you want more details about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The Royal Roads University and McMaster University Research Ethics Boards have approved this research study.

Introduction

You are invited to participate in a research study that is investigating the effect of providing learner feedback in multimedia (audio & visual) format in a blended learning environment. You have been asked to participate in this study as a student in the 294-004: Building a Web Site course.

Purpose of the Study

The objective of this research project is to study the effects of providing assessment and evaluation feedback in multimedia (audio & visual) format in the 294-004: Building a Web Site course at McMaster University, Centre for Continuing Education. In addition to submitting my final report to Royal Roads University in partial fulfillment for a Master’s Degree in Learning and Technology, I will be sharing my research findings with McMaster University. My research findings will also be submitted for publication at research, education, and technology journals.

What Will I Be Asked to Do?

Everyone enrolled in the 294-004: Building a Web Site course will participate in the same learning activities, assessments, and evaluations and receive feedback in the same way whether you are involved in the study or not.
Involvement in this research project requires you to complete pre- and post-course surveys about your perceptions and attitudes regarding the course design and the use of multimedia to provide learner feedback. It is estimated that each survey will take you 10-12 minutes to complete. In addition, participants will be asked to participate in an optional interview and/or focus group discussion at the end of the semester. Loss of anonymity will occur for participants who agree to participate in interviews and/or focus group discussions.

The foreseen questions will ask for demographic information, your prior experience learning in blended or online delivery courses, your opinion on the course design, and your perceptions, opinions, and stories related to receiving feedback in multimedia format. Research participants must be 18 years of age or older to participate in the study.

Summary of Participation

Your participation in this study will consist of the following:

- Complete a pre-course online survey, outside of class time (10-12 minutes)
- Complete a post-course online survey, outside of class time (10-12 minutes)
- Participate in an optional post-course interview and/or focus group discussion, outside of class time (45-60 minutes)

What Type of Personal Information Will Be Collected?

Pre- and post-course surveys will be assigned token codes (e.g. zy7x9p3jfxnsfpi) in order to identify which participants have or have not completed a survey. Results of the pre- and post-course surveys will be used to identify changes in perceptions about the use of multimedia for providing learner feedback. Only the research team will have access to these surveys and no personal identifying information will be retained in this study or made public in any form. Interviews and focus group discussions will take place after course grades have been submitted to the McMaster University Registrar’s office and will be recorded to ensure transcription accuracy. No names or identifying information will be attributed to recorded discussions or the resulting transcriptions. Participants will be provided access to discussion transcriptions for the purpose of ensuring accuracy and granting approval of their use in the study.

Are there Risks or Benefits if I Participate?

There are no foreseeable risks involved in the participation of this study. In addition, you may withdraw from the study at any point by contacting Nadine Ogborn. Your survey data will immediately be removed from the study.
benefit of participating in this study is that you will be provided the opportunity to reflect on how receiving assessment and evaluation feedback in multimedia feedback could be used to support student learning and a sense of community in a blended learning context.

**What Happens to the Information I Provide?**

The survey data will be analyzed by Brian Gould. Your completed surveys will be assigned a token code (e.g. zy7x9p3jfxnsfpi) so that surveys responses cannot be attributed to specific individuals.

The digital survey data will be stored on a secure server located at Mohawk College of Applied Arts and Technology and, where appropriate, summarized in anonymous format in the body of the final report. At no time will any specific comments be attributed to any individual unless your specific agreement has been obtained beforehand. All documents will be kept strictly confidential.

Data collected in this study will be retained for a period of one year past the completion of the study (July 2013). At the end of the retention period all raw data will be deleted/destroyed. Information pertaining to individuals who withdraw prior to the completion of the study will be destroyed immediately upon withdrawal.

Participation in this study is completely voluntary and will have no bearing on your progress or marks in the 294-004: Building a Web Site course.

A copy of the final report will be published and archived in the RRU Library.

**Conflict of Interest**

Brian’s dual role as researcher/student and instructor in the 294-004: Building a Web Site course creates a conflict of interest. In order to mitigate this conflict a third-party recruiter (Nadine Ogborn) will recruit, enroll, and communicate with research participants throughout the academic semester. As a result only anonymous survey data will be assessed by the principle investigator; Brian Gould.

Participants will not receive extra marks or course credit for participating, nor will non-participants be penalized in any way.

You are not compelled to participate in this research project. If you do choose to participate, you are free to withdraw at any time without prejudice. Similarly, if you choose not to participate in this research project, this information will be maintained in confidence.
Signatures (written consent)

Your signature on this form indicates that you 1) understand to your satisfaction the information provided to you about your participation in this research project, and 2) agree to participate as a research subject.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. In the even that you suffer injury as a result of participating in this research, no compensation will be provided to you by Royal Roads University, McMaster University or the Researchers. However, you still have all of your legal rights and nothing said in this consent form alters your right to seek damages. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant’s Name:

Participant’s Signature: Date:

Researchers’ Name: Brian E. Gould

Researcher’s Signature: Date: September 28, 2011

Questions/ Concerns

Please feel free to contact Nadine Ogborn at any time should you have any additional questions regarding this project and its outcomes. You will be invited to attend a debrief session upon completion of this study.

Name: Nadine Ogborn

Email:

Telephone:

If you have any questions or concerns regarding the ethics of this study, please feel free to contact the Coordinator of RRU’s Research Ethics Board, Colleen Hoppins.

A copy of this consent form has been given to you to keep for your records and reference. The recruiter, Nadine Ogborn, has kept a copy of the consent form.
Appendix D: Pre-Course Survey

Using Multimedia Feedback to Enhance a Community of Inquiry:
Pre-Course Survey

Thank-you for participating in this research study that is investigating the effect of providing learner feedback in multimedia (audio & visual) format in a blended learning environment. You have been asked to participate in this study as a student in the 294-004: Building a Web Site course.

The objective of this research project is to study the effects of providing assessment and evaluation feedback in multimedia (audio and visual) format in the 294-004: Building a Web Site course at McMaster University, Centre for Continuing Education. In addition to submitting my final report to Royal Roads University in partial fulfillment for a Master’s of Arts Degree in Learning and Technology, I will also be sharing my research findings with McMaster University. You will be invited to a presentation where my research findings will be shared with you and my findings will also be submitted for publication at research, education, and technology journals.

There are 20 questions in this survey.

A note on privacy
This survey is anonymous. The record kept of your survey responses does not contain any identifying information about you unless a specific question in the survey has asked for this. If you have responded to a survey that used an identifying token to allow you to access the survey, you can rest assured that the identifying token is not kept with your responses. It is managed in a separate database, and will only be updated to indicate that you have (or haven't) completed this survey. There is no way of matching identification tokens with survey responses in this survey.

Demographics

Gender
- Female
- Male

Age
Choose one of the following answers
- 18-25
- 26-35
- 36-45
- 46-55
- 56+

Past Experience

How many blended or online courses have you previously taken?
Choose one of the following answers
- 0
- 1
- 2
- 3 or more

How many courses have you previously taken in which the instructor provided feedback in audio or multimedia format?
Choose one of the following answers
- 0
- 1
- 2
- 3 or more
Expectations of the 294-004 Building a Web Site course

Overall, I expect to be satisfied with this course.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

I expect to learn a great deal from this course.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Overall, I expect to be satisfied with the instructor.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

What grade do you expect to receive in the course?
Choose one of the following answers
- A (80-100%)
- B (70-79%)
- C (60-69%)
- D (50-59%)
- F (Fail)
- I (Incomplete)
- W (Withdraw)

Multimedia Feedback

When using multimedia (audio & visual) comments, inflection in the instructor’s voice will make his/her intent clear.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

When using multimedia (audio & visual) comments, being able to see the instructor's examples will make his/her intent clear.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree
The instructor's intent will be clearer when using multimedia (audio & visual) than text.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

The instructor's intent will be clearer through the use of multimedia (audio & visual) than audio alone.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Multimedia comments will make me feel more involved in the course than text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Multimedia comments will motivate me more than text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

I will retain multimedia (audio & visual) comments better than text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Multimedia comments are more personal than text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Receiving multimedia comments will make me feel as if the instructor cares more about me and my work than when I receive text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree
Comments

Do you have any other comments related to the use of multimedia feedback in general?
______________________________________________________________
______________________________________________________________
______________________________________________________________

Do you have any other comments related to the course?
______________________________________________________________
______________________________________________________________
______________________________________________________________

Do you have any other comments related to the instructor? (Please do not identify the instructor by name.)
______________________________________________________________
______________________________________________________________
______________________________________________________________
Appendix E: Post-Course Survey

Using Multimedia Feedback to Enhance a Community of Inquiry: Post-Course Survey

Thank you for participating in this research study that is investigating the effect of providing learner feedback in multimedia (audio & visual) format in a blended learning environment. You have been asked to participate in this study as a student in the 294-004: Building a Web Site course.

The objective of this research project is to study the effects of providing assessment and evaluation feedback in multimedia (audio and visual) format in the 294-004: Building a Web Site course at McMaster University, Centre for Continuing Education. In addition to submitting my final report to Royal Roads University in partial fulfillment for a Master of Arts Degree in Learning and Technology, I will also be sharing my research findings with McMaster University. You will be invited to a presentation where my research findings will be shared with you and my findings will also be submitted for publication at research, education, and technology journals.

There are 20 questions in this survey.

A note on privacy
This survey is anonymous. The record kept of your survey responses does not contain any identifying information about you unless a specific question in the survey has asked for this. If you have responded to a survey that used an identifying token to allow you to access the survey, you can rest assured that the identifying token is not kept with your responses. It is managed in a separate database, and will only be updated to indicate that you have (or haven’t) completed this survey. There is no way of matching identification tokens with survey responses in this survey.

Demographics

Gender
- Female
- Male

Age
Choose one of the following answers
- 18-25
- 26-35
- 36-45
- 46-55
- 56+

Past Experience

How many blended or online courses have you previously taken?
Choose one of the following answers
- 0
- 1
- 2
- 3 or more

How many courses have you previously taken in which the instructor provided feedback in audio or multimedia format?
Choose one of the following answers
- 0
- 1
- 2
- 3 or more
Experience in the 294-004 Building a Web Site course

Overall, I was satisfied with this course.
Choose one of the following answers
  o  Strongly Disagree
  o  Disagree
  o  Neutral
  o  Agree
  o  Strongly Agree

I learned a great deal from this course.
Choose one of the following answers
  o  Strongly Disagree
  o  Disagree
  o  Neutral
  o  Agree
  o  Strongly Agree

Overall, I was satisfied with the instructor.
Choose one of the following answers
  o  Strongly Disagree
  o  Disagree
  o  Neutral
  o  Agree
  o  Strongly Agree

What grade do you expect to receive in the course?
Choose one of the following answers
  o  A (80-100%)
  o  B (70-79%)
  o  C (60-69%)
  o  D (50-59%)
  o  F (Fail)
  o  I (Incomplete)
  o  W (Withdraw)

Multimedia Feedback

When using multimedia (audio & visual) comments, inflection in the instructor's voice made his/her intent clear.
Choose one of the following answers
  o  Strongly Disagree
  o  Disagree
  o  Neutral
  o  Agree
  o  Strongly Agree

When using multimedia (audio & visual) comments, being able to see the instructor's examples made his/her intent clear.
Choose one of the following answers
  o  Strongly Disagree
  o  Disagree
  o  Neutral
  o  Agree
  o  Strongly Agree

The instructor's intent was clearer when using multimedia (audio & visual) than text.
Choose one of the following answers
  o  Strongly Disagree
  o  Disagree
  o  Neutral
  o  Agree
The instructor's intent was clearer through the use of multimedia (audio & visual) than audio alone.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Multimedia comments made me feel more involved in the course than text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Multimedia comments motivated me more than text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

I retained multimedia (audio & visual) comments better than text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Multimedia comments are more personal than text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Receiving multimedia comments made me feel as if the instructor cared more about me and my work than when I receive text based comments.
Choose one of the following answers
- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Comments

Do you have any other comments related to the use of multimedia feedback in general?
Do you have any other comments related to the course?


Do you have any other comments related to the instructor? (Please do not identify the instructor by name.)


Appendix F: Guiding Post-Course Interview Questions

Please describe your experience of receiving feedback from your instructor in multimedia format for the first time?

Has the experience of receiving feedback in multimedia format affected your learning? If so, please explain.

Has the experience of receiving feedback in multimedia format affected your relationship with the instructor? If so, please explain.

Has the experience of receiving feedback in multimedia format affected your relationship with your classmates? If so, please explain.

Has the experience of receiving feedback in multimedia format affected you or your learning in any other way(s)? If so, please explain.

Do you have any other comments related to the use of multimedia feedback?

Do you have any other comments related to the course?