THE EFFECTS OF SOCIALLY RELEVANT REPRESENTATIONS ON LEARNING, SOCIAL PRESENCE AND INTERACTION FOR STUDENTS IN SELF-DIRECTED ONLINE LEARNING SETTINGS

A Thesis in
Instructional Systems

by
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ABSTRACT

This study investigated the role of Socially Relevant Representations in learning. In particular I looked at the effects of Authorial Presence and Question & Feedback prompts on Learning, perceptions of Social Presence, and Interaction Level. Social Attunement was investigated as an exploratory individual difference variable for its possible moderating effects. Neither Authorial Presence nor Question & Feedback prompts significantly affected higher- or lower-order learning. Social Presence, however, did emerge as a predictor of Learning, and was significantly influenced by Authorial Presence. Study participants’ relative Social Attunement did not moderate the influence of Authorial Presence and Question & Feedback prompts on Learning.

In the context of a self-directed online learning setting with no available peers or instructor with whom to communicate, this data suggests that lesson materials imbued with Socially Relevant Representations such as Authorial Presence and Question & Feedback prompts, were not enough to improve student learning over lesson materials lacking such features. This study stopped short of addressing the ramifications of increased Authorial Presence in broader educational contexts, but it is an area that merits further research, especially in self-directed learning settings where author presence is traditionally limited.
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Chapter 1

Introduction

Self-paced instructional materials are a core component of much online instruction and multimedia training. This follows a history of widespread use in programmed and correspondence courses (Lockee, Moore & Burton, 2004). Online instructional materials—often in the form of online textbooks—are becoming increasingly prevalent (Carlson, 2005) and increasingly popular in face-to-face, hybrid or blended, and online distance education courses (National Center for Education Statistics [NCES], 2000). A recent report shows a nearly 40% increase in online enrollments in 2005 over 2004. The same report shows that over 80% of all higher education courses deliver a substantial proportion of their content online (Sloan Consortium, 2006). As online learning continues to grow in popularity, it places greater demands on instructors, designers and students. In order to keep pace with this growth, we must look more closely at learning materials, learning environments, and learner experiences in online settings.

This research sought to investigate the effects of several socially relevant cues or representations by which authors of online instruction can be perceived as valid social actors by students in self-directed learning settings. The setting I describe involves an individual learner engaged in online study of instructional materials with no readily available access (synchronous or asynchronous) to instructors, facilitators, or peer learners for interaction. In such socially-disconnected settings, I characterize the
emergent relationship between a lesson’s author and the learner as Social Presence, and further investigate its relationships with other study variables, how they are perceived, and their effects on learning.

At a time of increasing usage of the Internet for teaching and learning, a better understanding is needed of Socially Relevant Representations (Hoadley & Kirby, 2004) such as the Authorial Presence in online texts and how it may affect perceptions of Social Presence and learning. Research has already shown that instructional materials (Clark & Mayer, 2002) and software interfaces (Hoadley & Enyedy, 1999) influence the way students interpret the learning experience. I believe, however, that socially relevant information and questions in a given online text can either invite or discourage engagement in learners.

This research contributes significantly to our understanding of the way an author’s presence and questions in an online text affect learning in socially disconnected settings, which will help guide the design of more effective online learning experiences.

Problem

Consider the following instructions given to faculty developing online courseware at a large university:

Choose one person you know who could be a prospective student in the course. You may wish to jot down this student’s name at the top of the course outline so you can keep him or her in mind as you write. Whenever you work on the course, visualize this person. As you write, carry on a dialogue, a sort of tutorial, in your mind with this person. Using this technique will often help you create a course that has a warm and friendly tone (The Center for Instructional Design, 2002).
Why would such (socially salient) instructions be given to course authors? The above instructions might have been prompted more by marketing strategies aimed at lowering attrition rates of distance education students, than by learning considerations. Regardless of what motivated these instructions, what effects might a “warm and friendly tone” have on learners and their comprehension?

Academic culture generally calls for efficient communication with expository text being best suited to efficiently carry a message to readers with minimal “fluff” (i.e. extraneous details). For example, research has shown that “seductive details” such as extraneous images, tangential remarks, or flashy animations, have negative learning effects in instructional texts and multimedia (Garner, Alexander, Gillingham, Kulikowich & Brown, 1991; Harp & Mayer, 1998). On the other hand, research also exists (Hoadley, 1999) to support the idea that some apparent “fluff”—particularly socially relevant information and context—may support learning. Socially relevant representations (SRRs), for example, are representations or cues which contribute information that is not part of the traditional domain area content, but rather is used for (or derived from) social interaction (Hoadley & Kirby, 2004). To illustrate, information such as a famous chemist’s goals, personality, co-authors, or even political views may not be directly relevant to their theories, but such ancillary social context information may help learners build a deeper understanding of the chemist’s work.

According to the “seductive details” viewpoint, such non domain-related information (“fluff”), could potentially stunt efficient and effective learning (Garner et al., 1991). However, it is the type of non-domain related details used that seems to matter. For example, research also suggests that certain non domain-related strategies
such as message personalization (Moreno & Mayer, 2000) can help student learning when applied to learning materials. Likewise, in traditional face-to-face classroom settings, the benefits of teacher immediacy (Richmond, Lane & McCroskey, 2006; Gorham, 1988), teacher presence (Anderson, Rourke, Garrison & Archer, 2001), and caring (Teven & Hanson, 2004) have long been associated with improved learning but have little to do with the domain content. It is therefore not unreasonable to expect that similar relationships could be helpful in online learning settings, though the means to achieve them would necessarily be different, particularly in self-directed learning settings.

Despite growing evidence that SRRs in their many forms (people knowledge, voice and authorship, discursive structures, social agents) may help learning in meaningful ways, the research remains inconclusive and the enabling mechanisms or mediators are still largely uninvestigated (Hoadley & Kirby, 2004). Filling in the gaps will improve online learning by helping instructors and developers of online instructional materials more clearly understand the relationship between socially relevant information and learning.

Through this study, I investigated whether higher-order learning and perceptions of Social Presence could be improved through increased Authorial Presence in an online lesson. Furthermore, I investigated whether learner Social Attunement (awareness/sensitivity/orientation) to the embedded social cues acted to moderate the effects on learning.

The following outline represents an alternative and summarized view of the underlying theories, the arguments and predicted outcomes of this study:
1) Underlying theory a) From a socio-communicative perspective, learning occurs best when students interpret an educational experience as communicative rather than transmissive.

2) Underlying theory b) Learners’ differing sensitivity to, and employment of, socially relevant information (such as Authorial Presence) may lead to observable differences in learning outcomes.

3) Assumption: A precursor to any communicative engagement with an “other” involves the learner first perceiving that other’s presence. Only then can any communication commence.

4) Problem: During self-directed learning activities, the absence of apparent dialogue partners (instructors, facilitators, peer-learners) may lead students to interpret the educational experience as transmissive rather than communicative, thereby impeding learning.

5) Solution: Imbue an online text with specific social cues (Authorial Presence) and engagement prompts (Questions & Feedback) to cue perceptions of an available interlocutor (the author) with whom students can interact.

6) Rationale: By imbuing a text with Authorial Presence, I predicted that:

   a. Students would indeed perceive a supportive other—presumably the author.

   b. Students would consequently be more inclined to interpret the experience as communicative and be drawn into more dialogic interactions with the lesson author.

   c. Students would subsequently learn better.
d. Students varying sensitivity and orientation to Authorial Presence would affect outcomes.

Purpose Statement

Generally, the purpose of this dissertation study was to extend existing research on the role of Socially Relevant Representations in learning. This study was not designed to investigate which specific social cues embedded in online instructional texts best approximate face to face interaction, or to compare such with face-to-face learning settings. Rather, it was designed to inform researchers and designers of online learning experiences of the effectiveness of Authorial Presence (AP), Questions & Feedback prompts (Q/F), and Social Attunement (SA) in learning in self-directed contexts. This research will also inform designers of how best to support learning activities that lie somewhere between transmissive and communicative extremes (Hoadley & Enyedy, 1999) of online instruction. To this end and based on the literature to be reviewed, I posed the following four research questions:

Research Questions

For undergraduate students in a self-directed learning setting, my research questions are as follows:
RQ 1: What effect does Authorial Presence (Low and High) have on Learning, perceptions of Social Presence & Interaction Level?

RQ 2: What effect do Question and Feedback prompts (Prompts and No prompts) have on Learning & perceptions of Social Presence?

RQ 3: How might Social Attunement moderate the effects of Authorial Presence?

RQ 4: What relationships exist among the primary and secondary dependent variables?

**Definition of Terms**

In this introduction I have described the problem, stated the purpose of the research, and suggested some expected benefits from the study. I have also introduced the main arguments, research questions and assertions to be further addressed in the review of literature (chapter 2) and in the methodology (chapter 3) sections of this dissertation. I conclude this introductory chapter with a brief description of the variables and terminology to be used in this study, together with how I have defined them. These variables and terms are more fully explicated in the literature review.

**Socially Relevant Representations (SRRs)**

Socially Relevant Representations refers to social context information which contributes information that is “not part of the traditional domain area content, but rather
is used for (or derived from) social interaction” (Hoadley & Kirby, 2004, p. 264). For example, learning what an author looks like or getting a sense of their personality or of their friends and collaborators provides one with additional non-domain information which may or may not prove useful in contextualizing or integrating and retrieving information. In this study, the main independent variable, Authorial Presence, is considered a socially relevant means of representing the lesson content by providing context about the author that may seem irrelevant to the lesson topic.

**Authorial Presence (AP)**

Authorial Presence (AP) is an SRR (Hoadley & Kirby, 2004), and is the primary independent variable of this study. It describes a collection of features (rhetorical, visual, aural, interactive) designed to make the author of a given text very “visible” and “real” to the reader. Characteristics include, but are not limited to the following: author image, first person voice, use of personal and inclusive pronouns (I, you, we, our), conversational rather than didactic style, self-reference, disclosure of opinion and vulnerabilities, use of vocatives (name use), author audio or video. Author-initiated interaction prompts, such as questions directed at the reader, are also viewed as an important and special characteristic of Authorial Presence, and are defined separately below.

These humanizing (Tomlinson, 2001) cues are expected to elicit higher perceptions of social presence in learners. The construct is driven largely by rhetorical characteristics which alone are referred to as Author Voice.
Question & Feedback Prompts (Q/F)

Question prompts and associated author feedback responses—hereafter referred to as Question & Feedback prompts (Q/F)—trigger internal cognitive processes important to learning and are handled as a distinct independent variable in this study. Question & Feedback prompts refer to the combined questions, response fields, and pre-scripted author feedback screens embedded in the lesson environment. The Q/F prompts are presented both with and without Authorial Presence characteristics depending on the treatment condition in which they appear.

The presence of question prompts and feedback responses in a text, however, simultaneously carry inherent social and communicative properties. For example, the author may present a question in an online learning text, to which readers can reply and receive an automated (pre-determined) feedback response. Thus, the Question & Feedback prompts variable holds a unique position in this study in that it shares socially relevant characteristics with the independent variable of Authorial Presence.

Learning (Comprehension/Understanding)

Learning is the first of three dependent variables in this study. Higher-order comprehension is the specific learning objective that is targeted. While both lower-order learning (recall) and higher-order learning (comprehension) is assessed, the primary interest of this study is higher-order learning of complex knowledge. In this study, a “comprehension” test measures the learning of complex knowledge (rules and
procedures), which requires both lower-order cognitive abilities as well as mastery of pre-requisite, less-complex knowledge (facts, concepts).

**Perceptions of Social Presence (SP)**

Perceptions of Social Presence (SP) is the second of three dependent variables in this study. Definitions of Social Presence abound in the literature, but I subscribe to the definition that describes it as a psychological phenomenon—a sensory experience or perception indicating the presence of, and an interpersonal relationship with, another intelligent entity (Short, Williams & Christie, 1976). In the context of this study, Social Presence describes the learner’s perception that a text’s author is a real and knowable person, who seeks to communicate and support the learner in his/her learning.

**Interaction Level (IL)**

Interaction Level (IL) is the third of three dependent variables in this study. It refers to both the number (frequency) of typed responses, and the level of dialogue-like language used in student responses to the Question & Feedback prompts. This measure serves as a crude means of gauging observable student-author interactions. Nonsense (gibberish) responses were ignored and not counted as interaction.
Social Attunement (SA)

This variable refers to a measure of a learner’s relative orientation or sensitivity to embedded social cues and SRRs. This instrument is based on some of the proxies discovered for sensitivity such as that identified in Hoadley (1999). For example, given a short textual dialogue among three people, did learners take mental note of the authors’ gender or credentials? Did they recall who made which comments, or did they only remember what comments were made? Thus, Social Attunement describes a learner’s tendency towards explicit awareness of, attendance to, and recollection of specific social information. Data was factored in with the Authorial Presence and Question & Feedback prompts variables to help explore whether Social Attunement accounts for any observed differences in learning.
Chapter 2

Literature Review

In this chapter, I aim to review current research on the variables investigated, and provide the theoretical foundation for the study. I will also review related constructs that help define the parameters and context of the study. Specifically, after briefly addressing learning as a social process, I will present research on the two independent variables: Authorial Presence and Questions & Feedback prompts. I will then present relevant literature on the three dependent variables: Learning, Social Presence, and Interaction Level. Next, I discuss the potentially confounding variables of Q/F prompts and interaction. In general, sections will begin with an explication of the variable, followed by a presentation of existing research related to the study. Finally, I conclude the chapter with the specific hypotheses investigated in this study.

Learning, a socially constructed process

It is widely accepted that knowledge is socially constructed. This view emphasizes the role of collaborative learning, co-construction of knowledge through dialogue and negotiation with peers, teachers and society as a whole (Bandura, 2001; Lave & Wenger, 1991; Leontiev, 1975; Vygotsky, 1978). “Understanding happens between people; it can't be attributed to one individual or the other” writes Rogoff (1990, p. 67). Knowledge construction is a socially mediated process—a function of social
interactions between individuals in various environments (Bandura, 1986). Goldstein (1999) gets even more specific about the type of interactions needed for optimal learning by arguing that if learning indeed occurs “through socially mediated encounters…, then caring relationships, as a necessary and fundamental part of an inter-subjective encounter, actually enable and lead to cognitive development” (p. 669). From this vantage point, technologically-mediated instruction is presented with both challenges and opportunities in conveying the needed social information and context that facilitates learning. The mediating technology should at a minimum, have the capacity to facilitate social interaction, and perhaps even the “bandwidth” to convey affect and caring (Danchak, Walther & Swan, 2001; Goldstein, 1999). Naturally, whatever is conveyed to learners influences and interacts with learner interpretations and attempts to build meaning and understanding.

**Transmissive vs. Transactional interpretations**

Particularly relevant to the socio-communicative view of learning is research from the fields of communications and educational psychology. This research addresses the degree to which learner interactions with media are interpreted as either social activity or information delivery. Reeves & Nass (1998) demonstrated in a series of studies that the more computers employed social cues—particularly those paralleling human-to-human interactions—the more conventions of natural human conversational exchange were triggered. By extension, learners have been shown to interact socially with instructional content exhibiting social cues such as humans speech (Mayer, Sobko & Mautone, 2003),
direct address to the reader (Moreno & Mayer, 2000), use of first-person pronouns (Mayer, Fennell, Farmer & Campbell, 2004), and interface affordances for dialogue (Hoadley & Enyedy, 1999).

In their study on the effects of human voice, machine voice, and accents on learning from multimedia in college settings, Mayer, Sobko et al. (2003) describe their theory of Social Agency. They hypothesize that learners generally interpret multimedia learning episodes “as either a case of information delivery or a case of social communication” (p. 420), and that this interpretation “influences the type of schemas that are activated in the learner, the type of cognitive processing that occurs during learning, and ultimately the quality of the learning outcome” (p. 420).

Mayer, Sobko et al. (2003), also address issues beyond the simple appeal or satisfaction of what has been called a “personalization principle” (Mayer, 2005; Mayer et al., 2004; Moreno & Mayer, 2000). They suggest that social cues in a multimedia lesson give the materials an agential role, creating a learning scenario consistent with constructivist orientations where:

The learner engages in a sense-making process including selecting relevant information, organizing it into a coherent representation, integrating it with other knowledge, and encoding it in memory. The result of sense-making processing is the construction of a meaningful learning outcome, which supports good performance on transfer tests (p. 420).

These processes improve performance on transfer test. In contrast, consider their scenario for the information-delivery interpretation. Here, the weak social cues (such as text only, written in third-person), make the lesson agent-less, creating a scenario where:

human-to-human conversational rules are not activated, so the learner uses cognitive processing aimed solely at acquiring information rather than
trying to understand it…paying attention to key ideas and trying to store them in memory. This processing leads to rote learning outcomes that lead to poor performance on transfer tests. (p. 420)

Writings on this phenomenon are not new and are found in other literatures as well. Schraw & Bruning (1996) write, “readers bring a systematic collection of beliefs to the reading task” (p. 301) that affect how they interpret and interact with the text. Specifically, they describe transmissive and transactional reading models which map respectively onto Moreno and Mayer’s information delivery and social communication interpretations. They also demonstrated how the use of these different reader models influences participant learning, engagement and the level of critical evaluation employed as evidenced by essay responses. Salomon (1981) found that when instructional events (primarily educational television) were perceived by learners as communicational rather than informational, more mental effort was invested in them, and they invited more interaction.

Mikhail Bakhtin (1981) and Roland Barthes (1977) expound upon this concept. Bakhtin’s dialogism, and Barthe’s readerly and writerly texts both describe similar notions of the author-reader relationship and its impact on the co-construction of knowledge and meaning. Barthe’s writerly texts, for example, are literary works that encourage the reader to take an active role in interpreting the text thereby contributing as a partial author of the text. Readerly texts, by contrast, locate the reader as a mere consumer of a literary product with a fixed, pre-determined or author-sanctioned meaning (Barthes, 1977). Similarly, for Bakhtin (1981), meaning is dependent on the interpretations of others. The simple act of engaging in dialogue at all, assumes that one appropriates others’ meanings, re-interprets them, and thereby creates his/her own new
meaning. Engaging in dialogue—even by reading it—necessarily involves a co-construction of meaning. Barthes and Bakhtin together show that interaction and collaboration are innate to the author-reader relationship.

A common thread that runs through the literature reviewed is that readers’ interpretations of “texts” in the broadest sense (television, Internet, multimedia, print), influence how readers respond to and interact with the texts. Furthermore, the literature suggests that these interpretations can be cued or manipulated. Through various characteristics of the hypertext (Mayer, 2005; Michalak & Coney, 1993) and mediating technology (Clark & Mayer, 2002; Hoadley & Enyedy, 1999), active reader involvement is either encouraged or discouraged.

In this section, I have introduced learning as an inherently social activity. I have also briefly described a phenomenon that appears in different contexts, supporting the idea that strategic use of various social cues influences how learners interpret instructional events—as either transmission of information, or social communication. These different interpretations are further hypothesized to ultimately influence learning outcomes. Figures 2.1 and 2.2 represent two models of how this process occurs. Mayer’s (2005) Social Agency framework is summarized in Figure 2.1.

Figure 2.1  Mayer’s model for how personalized messages influence learner interpretations of educational event and lead to increased learning.
Figure 2.2 reflects my model to be tested in this study, adding the exploratory Social Attunement variable and the hypothesized interaction and interactivity pathways to learning.

In the following sections, I introduce the emerging concept of Socially Relevant Representations, Authorial Presence and Question & Feedback prompts as variables that may affect learning by influencing how learners interpret instructional events as either communicative or transmissive.

**Socially Relevant Representations (SRR)**

Socially Relevant Representations for learning are defined as representations or cues which contribute information that is not part of the traditional domain area content, but rather is used for (or derived from) social interaction (Hoadley & Kirby, 2004). The larger SRR construct is a helpful lens to apply to this research, and provides an umbrella...
under which I situate my independent variables of Authorial Presence and Questions and Feedback. For a more detailed overview of SRRs, see Hoadley & Kirby, 2004. It is the socially relevant properties and effects of Authorial Presence and Question & Feedback prompts that I investigated in this study.

Authorial Presence

As an example SRR, I have chosen the term “Authorial Presence” to represent the confluence of a number of related constructs that by themselves incompletely address the phenomenon investigated in this study. Although the term “Authorial Presence” can be found mentioned in various literatures (Coney & Chatfield, 1996; Paxton, 2002; Stapleton, 2002), it is usually only used as a synonym for related terms such as “author voice” and is seldom explicated as a unique variable. Thus to define Authorial Presence, I describe its characteristics in the following paragraphs.

Author Voice

Although Authorial Presence, or an author’s “visibility” in a text (Nolen, 1995; Paxton, 2002) includes some non-rhetorical properties, it is largely a function of the level of rhetorical “voice” injected into a text (Beck, McKeown & Worthy, 1995). Beck and her colleagues describe voice as having three primary characteristics, 1) activity, 2) orality, and 3) connectivity. Activity involves the use of active verbs that convey concrete actions and a “realness” of events and the reactions of human agents to them.
Orality describes the conversational tone of the text. Connectivity signifies the use of language and discursive devices to heighten connections between author and reader (Beck, et al., 1995). The characteristics of author voice (add some here) found in the literature (citation), comfortably fit under Beck et al.’s three primary characteristics of activity, orality, and connectivity, and help explain why voice is such an integral part of Authorial Presence.

**What it’s not**

Before going into further detail about what author voice is and its central role in Authorial Presence, I will first describe what “voice” is not. For clarity, it is worth noting that author voice in this context does not refer to the prosodic or phonetic characteristics of sound. It also does not refer to qualities of resonance or timbre associated with one’s spoken, audible voice. Audible characteristics of an author’s voice carried by speech are feasibly inserted into online multimedia texts, and can increase an author’s presence in the text (Lombard & Ditton, 1997), but human speech as a variable is beyond the scope of this study.

“Textbookese”, in short, is the antithesis of author voice. It is a term that describes the language of expository academic texts that are presented as collections of objective facts composed by distant, authoritative authors (Paxton, 2002). This voiceless style of narration, usually written in third-person, implies a detached, omniscient, all-knowing agent that oversees the information and concisely reports it to the reader.
Conciseness and efficiency in communication is highly valued in much academic writing—and for good reason, or at least for specific purposes (Coney, 1984; Hyland, 2001a). Indeed, presenting knowledge in such an impersonal, expository fashion is a cultural convention. Particularly in the physical sciences, it “remains a hallowed concept” where “academic research is purely empirical and objective, and therefore best presented as if human agency was not part of the process” (Hyland, 2001a, p. 208). Hyland discusses how such strategies work to heighten author credibility by stressing the “pervasive authority of impersonality” (p. 208). In quoting Albert Einstein: “when a man is talking about scientific subjects, the little word ‘I’ should play no part in his expositions” (p. 208), Hyland insinuates that self-reference and authorial voice changes expositions. As many do today, It appears that Einstein preferred voiceless, third person rhetorical conventions, as they are believed by many to allow “the research [rather than the researcher] to speak directly to the reader, in an unmediated way”(p. 208).

I argue, however, that instead of allowing the reader unmitigated access to the research, these voiceless texts serve to screen or becloud the author, which I hypothesize will cue in learners a more transmissive interpretation in an online, self-directed learning activities.

**What it is**

Having described what author voice is not, I’ll now describe what it is. Author voice describes rhetorical devices that promote the authors visibility and active role in a text. The use of self-referencing—or the first person “I” that Einstein spoke of—is
perhaps the most pronounced feature associated with author voice (Stapleton, 2002). Furthermore, using second person and inclusive pronouns like “you,” “we,” and “our” gives the author a voice that tells readers their presence is being acknowledged, and that the author is “talking” with them. The visible author will also often reference him or herself in the text using phrases such as “I think,” “in my opinion,” and “I believe” (Paxton, 2002). Through such phrases, authors suggest the potential fallibility of their views to the reader, and in a subtle way sanction opposing views and invite the reader to question the author (Gibb, 2002). In related work on textbook writing, Tomlinson (2001) lists a number of techniques to inject voice into a textbook.

    Tomlinson goal is to humanize the coursebook. To accomplish this humanization, he suggests that authors use active rather than passive voice, informal discourse features (conversational tone, phatics, contractions, and ellipsis), inclusive language (avoid signaling intellectual or cultural superiority over learners), and share personal experiences and opinions (exhibiting self-disclosure and vulnerability). He also suggests including casual redundancies rather than always being efficient and concise in one’s communication can help to humanize a text. As Tomlinson explains, these characteristics of author voice heighten the author’s presence in a text. I hypothesize that these methods will have much the same effects in online learning, providing online students with a more social and communicative interpretation of the instructional events.
From Author Voice to Authorial Presence

As previously mentioned, Authorial Presence relies primarily on the construct of author voice, but non-lexical and non-rhetorical factors such as images can also amplify an author’s presence in an online text. Likewise, interface features and affordances within the online learning environment help establish how learners interact with the others (Hoadley & Enyedy, 1999) and/or the lesson materials and therefore, how they interpret the experience.

Images

In online educational environments, authors can be represented in photos, avatars, or even animated pedagogical agents. Audio- and text-based communication applications—from audio-conferencing, to online forums, to instant messaging—have long featured the display of user likenesses or customizable avatars. In online forums, for example, communicant images commonly accompany each individual comment posted in the forum providing readers with a constant visual reminder of the message’s source or author. Such tight coupling of one’s image and utterances helps communicants form a clearer and richer “picture” of their communication partner.

Results from a number of studies prompt Mayer (2005) to agree that images act as a social cue but he concluded further that adding an the speaker’s image to the screen did not directly affect learning outcomes. It is noteworthy, but beyond the scope of this review, to mention the manifold ways in which people both self-represent and consciously mis-represent themselves visually in online settings. Images in the context
of this proposed study refer to real likenesses (i.e. photographs of authors), as opposed to representative images like cartoon characters or non-human objects.

Baylor and Ryu (2003) study on the effects of image and animation on a learning agent’s persona characteristics examines more closely different methods of representation. They found that providing readers with an agent image was a cost effective way of increasing agent credibility. In another study, Baylor (2005) found that an agent’s demeanor (e.g. “she looked caring”) was the most cited reason for selecting one learning agent over another. Mayer, Dow & Mayer (2003) found that the presence of their agent's (cartoon) image made no difference in learning outcomes, stressing the audio component of the agent as being more critical. These findings suggest that using the image of a “caring” learning partner can increase the credibility and attractiveness that participants attribute to an online lesson author, but may not directly impact learning.

**Direct Questions and Vocatives**

Questions directed at the reader can also amplify an author’s presence (Hyland, 2001b), and fall comfortably under the “connectivity” characteristic of Authorial Voice described by Beck et al. (1995). Gorham (1988) found in her work on teacher behaviors and learning that directing questions at the learner and addressing the learner by name contribute to the psychological closeness between teacher and learner. It stands to reason that such practices would have similar effects online. The author’s agential role in the text is much more salient and difficult to ignore or treat passively when one is presented
with a direct question—particularly in a first person manner (i.e. “What would you do in this situation?,” “Have you ever considered…?,” “Now you try,” etc.).

An author’s agency is further heightened when the author uses vocatives. Simply defined, vocatives are rhetorical devices designed to call out readers in a text. They indicate the person being addressed (i.e. “So Jim, what would you do in this situation?”). Eggins and Slade (1997) support the use of vocatives to cue social presence, noting “the use of redundant vocatives would tend to indicate an attempt by the addresser to establish a closer relationship with the addressee” (p. 145). The illusion of conversation and social interaction with online agents, however, can easily deteriorate when “bogus” or unnatural login names are supplied by users (i.e. “So jojo_the_man, what would you do in this situation?”). As illustrated by an inverted U-curve, when an interpersonal feature (i.e. the reader’s name) is used unnaturally, or an interactive element is used too frequently, the results can begin tipping to the undesirable (Bucy, 2004). This can be especially problematic in online learning environments that employ such connectivity or empathy-building strategies.

The Problem of Question Prompts

As a rhetorical device, questions directed at the reader imply an author or source. As such, question prompts are another important way means of raising an author’s presence in a text. In online learning contexts, however, it is problematic to treat questions (as well as instructor feedback) as merely an element of Authorial Presence.
Questions solicit interaction, which itself is held to be a significant contributor to learning (Clark & Mayer, 2002; Yacci, 2000).

Adding to the complexity of the online questioning situation is the fact that questions of all kinds are found in well-designed learning materials. They appear as tests, quizzes and other forms of thought or mastery questions. These are commonly employed to prompt learners to consider the materials more deeply, apply concepts to other contexts, and to evaluate a learner’s comprehension. Questions in online learning contexts can appear particularly interactive since timely feedback responses are commonly associated with the questions. Computers that respond to user input (i.e. retrieving data from a Google search or providing corrective feedback to a user response) can give the computer some level of agency or autonomy in the eyes of its users. Reeves and Nass (1998) have demonstrated how people respond socially to computers themselves to the degree that they are perceived—even subconsciously—as independent agents. To varying degrees, the mere presence of direct questions and feedback could be perceived as social interaction or dialogue by some learners. It is therefore challenging to separate the interactivity of questions and feedback from their dialogic and social counterparts tied to Authorial Presence. The effects of question-induced interactivity would need to be controlled to address the potential confound.

In this section, I have made the case for how the related elements of author voice, visual representations, questions, and feedback combine to make up the Authorial Presence construct—a prosocial collection of linguistic, visual, and interactive features which function to bring a text’s author to the fore, promoting him/her as a more salient,
sentient agent to the reader. In the following section, I review literature that relates Authorial Presence to Learning, perceptions of Social Presence, and Interaction Level.

**Authorial Presence and Learning**

In this study, learning is fundamentally viewed as a product of cognitive engagement facilitated by social interaction. The effects of Authorial Presence should chiefly be seen as social. What effects on readers and, more specifically, learners can be expected when texts incorporate Socially Relevant Representations such as Authorial Presence? Furthermore, what theoretical basis exists to suggest Authorial Presence would make a difference in self-directed learning settings? In this section, I attempt to present literature that addresses these questions in order to support my general hypothesis that a stronger perceived social presence of an author will better engage learners, which may in turn facilitate increased learning.

Recall that the rhetorical style of "textbookese" suggests an omniscient, non-visible author that gives little or no clue as to his or her personal point of view, and makes no overt attempt to connect with the reader. By some accounts, these materials take on a third person voice that discourages readers from questioning the text (Hyland, 2001b). Instead of being drawn into the text by gaining the opportunity to participate in the construction of knowledge with the author in a Barthes-esque fashion, the non-critical reader defaults to a more instructive mode, adopting the information-delivery interpretation previously discussed, thereby becoming a passive recipient of information (Olson, 1989; Paxton, 1997).
In contrast, Moreno and Mayer (2000), for example, found that across five experiments, college students consistently performed better when instruction included personalized messages and a conversational style. That is, when instruction was presented in first- and second-person rather than third-person language, and when students were directly addressed by the author, they performed better on problem-solving transfer measures across all five experiments. Interestingly, no significant differences were found with simple recall measures. Likewise, in a later set of studies, Mayer et al. (2004) found improved performance on transfer tests, but not on recall tests when they subtly made instruction more personal by changing the words “the lungs” to “your lungs” throughout a short text on the respiratory system. They stop short before identifying underlying mechanisms by which learning is improved, but they do cite more “active cognitive processing” (p.393) as a possible mechanism. Graesser, Bowers, Olde & Pomeroy (1999) reported that after a one week delayed test, undergraduate students (n=120) remembered story elements best when they came from narrators speaking in first person versus narrators speaking in third person, or from characters in the story.

In a similar study conducted on younger fourth grade students, Beck et al. (1995) found that coherent texts with strong features of voice resulted in improved recall, understanding and comprehension over coherent non-voiced texts. On a delayed test (one week later), results held with the exception of recall which declined. Importantly, Beck et al. felt that the primary role played by authorial voice was to increase participant engagement with the text. These studies suggest that employing stronger authorial voice in a text leads to increased learning (excluding recall). Though engagement was the suggested means, the mechanisms may not yet be fully understood.
Authorial Presence and Engagement

Authorial Presence seems to affect learners in other ways as well, which may help explain the observed learning effects discussed in the previous section. Paxton (2002), for example, cites “a small and as-yet-tentative body of research” which suggests that when a sense of authorship is heightened, “students tend to read more critically, more flexibly, and with a view to negotiating meaning for themselves” (p. 200). His report on history texts describes active reader/learners, engaged in a negotiated knowledge construction with authors.

In earlier work, Paxton (1997) found that by imbuing a history text with authorial voice—which he also termed “author visibility,” six high school students demonstrated high levels of mental interaction with both the content and the author during think-aloud activities and follow up interviews. Students referred frequently to the author’s views, as well as their own independent, views when prompted to recall the text concepts. In contrast, the anonymous text resulted in frequent verbatim repetition of the concepts to themselves during reading—as if “burnishing this information in memory” (p. 246). The think-alouds and interviews evoked similar verbatim responses from this group. Paxton poignantly concludes, “Most important is the fact that when confronted by a visible author, adolescent history students respond” (p. 246).

In a larger follow up study with 30 high school participants (Paxton, 2002), Paxton’s initial findings were strengthened with visible-author students generating more text and more dialogic responses in their essays and think-alouds. Paxton found across both studies that “students in the visible-author group were far more likely to mentally
converse with authors and to reflect on author perspectives. The visible introduction appeared to prime the pump of dialogical thought” (Paxton, 2002 p.235). Similarly, from an engagement and reading perspective, Guthrie, McGough, Bennett, and Rice (1996) found engaged readers to be more socially interactive and more likely to use knowledge actively to construct new understanding from text.

Nolen (1995) conducted a mixed methods study on the effects of visible authors in two statistical texts on 47 undergraduate female college students. She reported the comments of two participants that best represented the diversity of participants views. These comments showed that a heightened sense of Authorial Presence in the materials promoted the development of social behaviors and relationships between the reader and the author. Readers in the voiced condition increasingly referred to the author as they progressed through the lesson, which, to Nolen, “indicated a growing relationship” between the reader and author (p. 56). Interestingly, for one student who was put off by the voiced condition, even the dislike seemed to spurn the student on to potentially productive interaction with the content. Nolen cautioned readers, however, to not oversimplify the observed consequences of authorial presence.

An increased sense of Authorial Presence in and of itself does not automatically translate into desired learning outcomes or increased dialogue. Indeed, the author’s presence might be perceived as arrogant and controlling, leading to undesired outcomes and decreased engagement. As Nolen warns, “authors who emerge from the text may be welcomed, if students perceive them as helpful and supportive. However, because human relationships are inherently unpredictable, we cannot assume that this will be the case.” (1995 p. 58).
In the studies examined above, the mechanisms underlying the learning benefits observed with heightened Authorial Presence, remain somewhat elusive—though increased engagement is implicated. Whatever the specific mechanisms, the literature reviewed in this section lends credence to the hypothesis that social cues such as those found in Authorial Presence, activate a social response in learners which, in turn, increases active mental processing and higher quality learning outcomes.

Questions & Feedback Prompts

Questions & Feedback prompts and Dialogic Communication

Questions and feedback are central to any discussion of teaching and learning, and themselves imply a social, communicative, or dialogic act. I have already reviewed evidence that Authorial Presence can cue social schema, and now I look in more detail at how overt questions and feedback might—presumably through their dialogic nature—affect social presence and learning. The emphasis in this section will be specifically on the role of questioning as an elicitor of social, dialogic, and cognitive responses in learners, and less on the myriad of available question types or feedback options discussed at length in the education literature. More specifically, I refer to thought-question prompts that occur within the instruction (Dornisch & Sperling, 2006), and not to the graded, end-of-lesson quiz questions that are commonly used to assess learning outcomes.
For some communication researchers, true interactive communication involves two separate individuals and at least two complete loops of reciprocal and contingent utterances (Rafaeli, 1990). Figure 2.3 illustrates this scenario in an online instructional context. In loop 1, the instructor poses a question and the learner replies. In loop 2, the instructor provides the learner with feedback on his/her reply and the learner replies again, referencing the feedback and asking for further clarification.

Figure 2.3 Two-loop interactive communication

Literary researchers often allow a more liberal or philosophical view of communication than is allowed for in the above illustration. For example, according to Bakhtin, “dialogue may be external (between two different people) or internal (between an earlier and later self)” (Bakhtin, 1981, p. 427). Furthermore, in non-narrative or non-dramatic texts (as most instructional texts are), the author or narrator is the primary agent or social actor to whom the reader would respond, acknowledging that readers can also
engage in dialogue with themselves. As to where agency is attributed or where the questions originate—from the computer, from the lesson’s author, from oneself, or somewhere in between—is beyond the scope of this study. It suffices that learners have been shown to respond and behave socially when such social stimuli as questions appear in a text.

**Questioning the Author (QtA) & Self-Explanations**

The effects of questioning are widespread and fall under many constructs. Key characteristics of at least three related constructs, Elaborative Interrogation (EI) (Pressley, Symons, McDaniel, Snyder & Turner, 1988), Questioning the Author (QtA) (Beck, McKeown, Sandora, Kucan & Worthy, 1996), and Self-Explanations (Chi, Bassok, Lewis, Reimann & Glaser, 1989), are particularly relevant to the variable of Questions & Feedback prompts in this study. I will focus my review of QtA and Self-Explanations as they deal with the type of questions and answers most appropriate for the individual learner context of this study. That is to say, QtA and Self-Explanations describe interactions principally between the individual learner and a text, rather than those between learner and teacher or among peers.

In both these constructs, whether prompted or self-generated, dialogue emerges as an important factor in learning. In QtA, the presence of the author is explicitly acknowledged and readers are encouraged to engage in a dialogue with the author through the text in order to deepen understanding and learning (Beck & McKeown, 2001). As the name implies, Self-Explanation describes a learning strategy where
learners are prompted to read actively, question their assumptions, and explain to themselves the reasons why a phenomenon or procedure occurs the way it does (Chi et al., 1989). Learners are to generate inferences about the content rather than simply generate verbatim summaries or paraphrased materials. Responding to Self-Explanation prompts can cue a form of dialogue with self, and was shown to consistently promote greater learning (Hausmann & Chi, 2002). Common to both constructs is active, dialogic reading and some form of generative verbal and/or written output about one’s understanding (Grabowski, 2004).

QtA is as a “deceptively simple” means of empowering the learner to approach the text as the product of a human and fallible author (Beck et al, 1996). Kucan & Beck (1997) represent QtA as an attempt to capitalize on the facilitation effects of thinking aloud within a social context. It prompts the reader to collaborate in the construction of meaning by actualizing the presence of the author—someone who is trying to communicate a message—and to actively query the author and text with questions geared toward understanding and sense-making. Similar to Elaborative Interrogation (Dornisch and Sperling, 2006), QtA uses two main types of queries: Initiating Queries—Intended to elicit a general summary or an explanation of text ideas (e.g., What's the author's message here?), and Follow-Up Queries—used in response to student comments to elicit clarification or elaboration (e.g., Why do you think the author wants us to know about this?) (Kucan & Beck, 1997).

Beck et al. (1996) further state that “the intent of interrogating the ideas in a text through dialogue with the author is to ‘depose’ the authority of the text…in turn, students might be more likely to question text ideas and dig into their meaning” (p. 387).
Importantly, it does this within the context of the reading and without trying to undermine the author’s credibility. Unfortunately, since QtA appears to be largely a technique used in grades 3-9, the dialogue that is cued is often between the student and the classroom teacher about the author’s views, and not a dialogue directly between the author and reader. This needn’t be so, and certainly the point of QtA dialogue with the teacher is to model desired behavior for students so that they eventually engage in this type of activity on their own. The QtA principles appear easily transferred to individual computer-based learning contexts, and also to older participants where the cued dialogue would remain more internal to the reader and to the text author.

**Prompting**

The act of actually prompting students to reflect or consider aspects of the lesson is also important to learning, and stands in contrast to assuming or hoping they’ll do so on heir own (Hannafin & Hooper, 1993; Hausmann & Chi, 2002). In many online course settings, students are instructed to answer comprehension questions, or to discuss readings with peers only after they have read a given text, and not during the reading. “Thus, the ongoing process of constructing meaning that takes place ‘online,’ or during reading, is not addressed.” (Beck et al., 1996 p. 386) A similar issue is noted by Schön (1987) who distinguishes between reflection-in-action and reflection-on-action, the former being what Beck and McKeown (2001) advocate and find lacking in much online learning. Having Questions and Feedback appear throughout the lesson, rather than only at the end, should further lend the interaction a more dialogic feel.
Hausmann and Chi (2002) support this hypothesis as they found in computer based learning scenarios, that students who received periodic prompts to self-explain engaged the author or text far more often than students who were instructed to do so only at the beginning of the treatment and those not prompted to self-explain at all. Indeed, a main contribution of the Self-Explanation literature to the proposed research surrounds the importance given to prompting the learner. With very short learning scripts, Mayer, Dow et al. (2003) observed that students who were given just one single prompt before the learning activity, showed better transfer performance than students who were not prompted. It would make sense that more than one prompt would be helpful when longer reading texts are employed. Hausmann and Chi (2002) also found that prompting learners to explain their understanding—using even generic or content-free prompts—Increased their engagement and self-explanations. An example content-free prompt is: "Could you explain how that works?" (p. 10). When or where prompts were placed mattered less than how frequently prompts occurred, noting, perhaps obviously, that more frequent prompts led to increased frequency of responses.

Many interactive learning systems have been created by employing intelligent tutors and pedagogical agents that perform or scaffold a wide variety of activities like questioning to promote deeper comprehension. Graesser and colleagues’ Autotutor is such a system that prompts for self-explanation, soliciting dialog using natural language and contingent responses (Graesser, Moreno & Marineau, 2003). Such “intelligent” systems are beyond the scope of the present study, but they can provide some insight into what is desirable in a learning text with a “visible” author or learning partner.
In the research reviewed, prompts to query the author or to self-explain while reading usually came from the classroom teacher, researchers, or the computer learning environment as a third agent. None of the articles reviewed in this section addressed the idea that the text author might be the agent to directly engage the reader and prompt the learner to reflect more deeply on the material. Nevertheless, whether or not a student interacts at all is likely more important than with whom the interactions occur. A particularly relevant outcome of Hausmann’s and Chi’s (2002) computer-supported self-explanation experiments is that prompts from a human intuiting the need for prompts, and random prompts from a computer elicited equal responses from students and both led to deeper learning. The point is not that computers can prompt as well as an experienced teacher or researcher, but that in this limited case, random, pre-scripted, conversational messages appeared as effective in eliciting self-explanations as did a human who was trying to intuit when a learner might benefit from a self-explanation prompt. This supports the idea that cognitive engagement that leads to quality learning can be fostered by a fairly non-sophisticated, or non-intelligent strategy—inexpensively (Hausmann & Chi, 2002), and with a minimum of apparatus (Beck et al., 1996).

Types of Question & Feedback prompts

As previously noted, the nature and format of Questions and Feedback is also important. Good question prompts should steer clear of “the kind of narrow, retrieval-based, end-of-chapter questions that traditionally accompany school lessons, [which] serve more to limit than to activate meaning-getting” (Beck et al., 1996 p. 387). Instead,
questions should open a dialogue by “encouraging expressions of understanding, interpretations, [and] elaborations” (Burbules, 1993, pp. 87-88).

Less obvious, and perhaps equally important, are the type and functional characteristics of the Question & Feedback prompts. Interface affordances in a learning environment can serve to encourage or discourage certain kinds of responses. An open-ended question paired with a dialog box affords and solicits a different type of response from a learner than does a true-false question paired with a radial button response options. Likewise, the size of the dialog box can cue learners into how lengthy or elaborate a response is expected (or accepted), with a one-line dialog box soliciting less of a response than a multi-line dialog box.

These Question & Feedback prompts improve learning by asking students to elaborate on their ideas, particularly when students lack the self-regulation skills, propensity, or motivation to elaborate on their own (Chadwick, 2002). With the exception of perhaps the most self-regulated of learners, question prompts that lack explicit response affordances (often called “thought questions”), generally do not elicit much thought or reflection from readers. Such questions can be used to instruct learners to think about the question being asked, or may even prompt them to “pull out a piece of paper” and capture their reflections on the question. Where question prompts are directed at the learner with an invitation or expectation to respond, and simple provisions are made for learners to respond (i.e. A question is immediately followed by an open text field with blinking cursor), there is a greater chance that learners will actually enter a typed response. Indeed, as far back as Skinner (and certainly earlier), overt responses (vs.
covert responses) were considered to be critical to learning achievement (Lockee et al., 2004).

Non-graded, typed responses can, however, be challenging to elicit from study participants and learners. In online independent learning settings, thought questions often serve as non-graded, self-check or mastery questions. Where learners believe their typed responses to such questions will never be evaluated (either by computer or by human), there is a tendency for learners to either submit non-sense responses (gibberish) or to ignore such prompts. In earlier, unpublished work of my own, I observed that allowing students to save their typed responses for later review led to incremental response increases to thought questions in online courses over similar courses where student responses were not captured. Although not empirically tested, this provides some evidence that response rates to instructor questions in online self-directed settings could be improved if students data was recorded and available for later review.

Even if Interaction Level can be increased with this strategy, compared with verbally-expressed responses such as think-alouds, typed responses resulted in a lower overall number of interactions (Lebie, Rhoades & McGrath, 1995). What's more, typed responses were correlated with greater tendencies to simply paraphrase points (largely a recall function), rather than employ higher-order functions like explanation or analysis (Hausmann & Chi, 2002). Yet, in support of written or typed responses vs. verbal responses, the generative act of representing one’s thoughts through writing or typing creates a record—an external artifact which is more readily subjected to further analysis and modification by the learner. The written communication or “objectivization” of their thoughts and ideas allows the learner's reasoning to be examined, evaluated and discussed.
as an external object (Salomon & Perkins, 1998 p. 8). Furthermore, as these authors explain, “Through the process of articulating covert processes and strategies, learners are able to build new and modify existing knowledge structures” (Jonassen, Davidson, Collins, Campbell, & Banaan-Haag, 1995, p. 13).

Newell & Winograd (1989) caution, however, that the value of written language to record information is often over-generalized, and assumed to lead to better understanding. They found that extended writing tasks like essays led to better understanding of expository texts than did restrictive writing (short answer questions). While short study questions did allow for some text analysis, it “did not permit students to elaborate upon the meaning they had generated through analysis” (Newell & Winograd, 1989, p. 197). Along similar lines, simple paraphrasing was shown to be less effective than more analytical self-explanations in Hausmann & Chi’s experiments (2002), underscoring the idea that simply generating more response text is not necessarily better.

In summary of this section, I have reviewed literature that suggests that generic and automated question prompts and feedback cue readers to engage a text more deeply by entering into dialogic activities with the perceived author or with oneself which in turn supports meaning-making. The literature also demonstrate that typed responses are generally less frequent and elaborative than are verbal responses, but that typed responses create an editable and reviewable artifact. Finally, researchers caution that, while frequent question prompts lead to more frequent written responses overall, more writing does not automatically lead to better learning.
I further hypothesize in this study that a learner’s decision to engage with an author and respond dialogically to Question & Feedback prompts is influenced by the degree of Authorial Presence in the text. In the following section, I discuss the dependent variable of Social Presence which essentially seeks to describe how social a learner perceives an experience to be.

**Perceptions of Social Presence—Dependent Variable #1**

Unlike Authorial Presence, which I treat as a manipulable property of media and messages, Social Presence is an outcome—a perception or psychological phenomenon that is elicited when people encounter an environment or media rich with social cues (Lombard & Ditton, 1997). In this section, I examine the literature on social presence in online settings; how it is defined, how it is measured, and its relevance to learning and interaction.

The concept of Social Presence was initially put forward by Short, Williams and Christie in 1976. It can be minimally defined as the “illusion of nonmediation” (Lombard & Ditton, 1997), or the sense of being with an other or sensing an other through a medium (Biocca, Harms & Burgoon, 2003 p. 456). More descriptively, it is a sensory experience or perception indicating the presence of, and an interpersonal relationship with, another intelligent entity. (Biocca, 1997; Short et al., 1976; Walther, 1992; Walther & Burgoon, 1992;). The literature on social presence, however, is divergent and includes what Biocca describes as “a rather amorphous set of variables, many of which are being
equated or conflated with social presence” which muddies the field and makes it more
difficult to define the term (2003 p. 457).

Social presence was originally defined as an attribute of media or
communications technology, where a media’s relative capacity to carry visual, verbal,
and non-verbal social cues determine social presence. Specifically, Short et al. (1976)
wrote, “the capacity to transmit information about facial expression, direction of looking,
posture, dress, and non-verbal vocal cues, all contribute to the Social Presence of a
communication medium” (p. 65). Accordingly, this position would hold that face-to-face
communication conveys more social presence than audiovisual media (television), which
in turn conveys more social presence than aural media (telephone) or written text (email).

The “cues-filtered-out” (Culnan & Markus, 1987) and media richness (Trevino.
Lengel & Daft, 1987) views in the field of communications, would similarly cast
asynchronous textual communication as impoverished compared with voice or face-to-
face communication (Burgoon, Bonito, Ramirez, Dunbar, Kam & Fischer, 2002; Rovai
2002). Taking a different stance, Walther and Burgoon (1992) wrote to dispel aspects of
this notion by showing that in the workplace, what communicants did within various
media—the social processes—had more effect upon the perceptions of Social Presence
than did the media itself. Importantly, Walther and Burgoon also found that people
created ways of compensating for the lack of visual and aural social cues in media such
as email. They proposed that social relationships simply took longer to develop with
text-based media (Walther & Burgoon, 1992)—a theory readily observable more than 20
years later, where text-based instant messaging (IM) and other text-based media are
almost frenetically used to maintain and extend social relationships. This work remains
relevant to this study in that it suggests that text-based interactions which are employed in this study, can support or even help develop social relationships.

In more recent work, Nunez and Blake (2003) also stray from the media attributes view of presence, and emphasize the user's role in the phenomenon. They illustrated how perceptions of Social Presence could be psychologically primed or cued largely independent of environmental characteristics. They concluded that “presence does not simply occur as a consequence of sensory input only, but that it is a constructive process in which the virtual environment user creates an experience using both sensory and psychological inputs” (p. 101). This activation or construction of mental models to represent one’s interlocutor in asynchronous communication has also been called “psychological presence” (Kreijns, 2004). It is this psychological presence that comes closest to describing the kind of presence relevant to the this study because it emphasizes the perceptual view of Social Presence rather than the media attribute view. Unfortunately, however, psychological presence has been neither clearly differentiated from, nor measured differently than existing social presence conceptualizations. Thus, for the sake of compatibility with current terms, I have chosen to simply use the term “perceptions of Social Presence.”

Emphasizing the perceived aspects of Social Presence just discussed, Reeves and Nass (1998) have demonstrated in their Media Equation studies, how people respond socially to computers themselves when adequately cued. On one hand, computers are accorded some level of agency by humans, which further shows that the presence of “real” people is not a necessary prerequisite to perceiving Social Presence, and that social cues alone may be sufficient to elicit social responses from learners. On the other hand,
Schechtman and Horowitz (2003) demonstrate that the response to human-computer interaction is qualitatively different than human-human communication. Interaction between people resulted in more effort, lengthier responses, and more frequent persuasive language and relationship statements than did human-computer interaction conditions. The differences expressed here may prove significant in this study, where the degree to which Social Presence is felt may track with how strongly learners perceive the author (or another agent) in the lesson and how human the author is perceived to be.

Still, “in the world of perceptions, close counts” say Reeves and Nass (2000, p. 68). That is, it seems evident then that when people encounter an environment with human-like or social characteristics, it is likely to trigger perceptions of Social Presence due to either (or both) psychological and media attributes. Increasing the amount or range of Authorial Presence—turning up the volume, so to speak—may lead to higher responses and greater engagement. However, intensity should not be confused with quality. More Authorial Presence will increase the social data to be processed, which may ultimately get in the way of learning. In what is undoubtedly a wise conclusion, Reeves and Nass (2000) caution that it is more important to get the perceptual experience mix right, than it is to make the mix as rich as possible: “getting the mix wrong, could make things notably worse” (p. 70).

**Social Presence makeup**

Social presence is not a one-dimensional construct. In the following paragraphs, I will show some of the many facets of Social Presence as I present literature on some of
its constituent constructs: intimacy, immediacy, positivity, understanding and involvement. My purpose in reviewing this literature on Social Presence is not so much to evaluate theoretical merits of the concept, as it is to describe the concept and identify attributes that may be important to measure. Similarly, the purpose is also to identify socially-relevant cues that may contribute to the Authorial Presence manipulation.

Gunawardena (1995) provides a good account of how the highly related concepts of intimacy (Argyle, 1969) and immediacy (Wiener & Mehrabian, 1968) are integral to social presence. Intimacy and immediacy describe the extent to which certain communicative behaviors enhance both physical and psychological closeness in interpersonal communication (Mehrabian, 1967; Woods & Baker, 2004). More specifically, teacher immediacy describes the physical and psychological closeness between learner and teacher—usually in face-to-face classroom settings (Gorham, 1988; Richmond et al., 2006). The definitions of intimacy and immediacy overlap considerably in the literature reviewed here. Immediacy conveys perhaps an additional temporal dimension or synchronicity—a sense of an experience’s happening right now.

Feelings of intimacy and immediacy are the result of a perception that the author is interested in the learner; which can be created by both non-verbal and verbal prosocial behaviors. Non-verbal behaviors particularly salient to face-to-face settings include touch; eye-contact; proximity; responsiveness; and facial, vocal and, gestural expressiveness. In online settings, however, such physical, non-verbal behaviors are largely irrelevant. Immediacy is primarily cued by verbal behaviors such as addressing students by name, sharing personal experiences, using humor, frequency of communication, and disclosing one’s vulnerabilities or displaying fallibility (Gorham,
Due to the differences between teacher immediacy behaviors in the classroom and online, one researcher has accorded online immediacy’s characteristics a new name of “e-immediacy,” stressing frequent and consistent interaction to maintain social connectedness. (Slagter van Tryon & Bishop, 2006).

Though almost exclusively a face-to-face classroom variable, teacher immediacy remains a relevant construct to social presence in online learning contexts as well. Teacher immediacy captures and describes the unmediated essence of a desirable teacher-learner relationship which can be transposed onto what is, naturally, a highly-mediated experience in online contexts—wherein a reader interacts with an author through a static text. In such contexts, authors can employ the verbal characteristics of immediacy in order to reduce the psychological distance between themselves and learners, from whom they are separated physically and temporally.

Beyond immediacy and intimacy, Social Presence is also held to embody the relational conversation elements of positivity, understanding, and involvement (Burgoon & Hale, 1987; Kumar & Benbasat, 2002). Positivity describes affective and affinity characteristics of a relationship. Understanding describes the receptiveness, kinship, affiliation, and empathy characteristics of social presence. Involvement describes characteristics of engagement, participation, and interaction. Together, these components of Social Presence are believed to adequately capture the emergent relationship between the two participating social entities—the author and learner in this context (Kumar & Benbasat, 2002).

The characteristics mentioned above all sound particularly positive, but at its core, Social Presence should be seen as a largely value-free construct, potentially having both
positive and negative effects. For example, in online discussions, the teacher’s presence could either decidedly quell open discussion, or invite and encourage it. By extension, in sitting down to read an instructional text online, the perceived presence of an author could either raise or lower learner frustration or willingness to participate. Remember, however, that in at least one case previously reviewed (Nolen, 1995), even the learner irritated by the highly visible author, demonstrated above-average recall, presumably due to the increased attention she gave to that which irritated her. Thus, the positivity ascribed to the author of online learning materials becomes an important dimension in any measure of Social Presence and its effects on learning.

The literature I have presented thus far has defined the construct of Social Presence, its constituent parts, and described how social cues such as Authorial Presence along with a learner’s personal attributions combine to elicit it. I have also addressed how Social Presence should be viewed as a neutral variable—encompassing both positive and negative responses in learners. The following section will more specifically address the relationship between Social Presence and Learning

**Social Presence & Learning**

In this section I present findings on the relationship between Social Presence to Learning, and on their relevance to one another in this study. Rovai (2002) reports that online learning environments which feature mainly asynchronous text-based computer-mediated communication (CMC) have been criticized for their lack of support for social presence. Indeed, a challenge in online learning environments is facilitating the
necessary degree of interpersonal relations among instructors and peers that engender communicative activities. Many distance learning findings indicate that increased Social Presence will likely curb attrition rates and influence a student’s motivation and desire to enroll in future online courses (Phipps & Merisotis, 1999), but it will not necessarily directly affect student learning outcomes (Wise, Chang, Duffy & Del Valle, 2004). While curbing online drop outs is a worthy goal, there is still evidence that Social Presence is positively correlated with sustained attention and learning.

At some point, all students need to interact with a teacher, peer, or learning facilitator in order to demonstrate learning and receive guidance, feedback, and explanations (Cook, 2002). When individuals participating in online learning events are separated by time, physical location, and are working in isolated conditions (such as in this study), the ability to cultivate opportunities for dialogue and social learning encounters is diminished and requires purposeful attention. An environment rich in Social Presence promotes increased interaction (Tu & McIsaac, 2002) and has repeatedly been found to positively correlate with self-reports of learning, achievement, and sense of community (Richardson & Swan, 2003; Rovai, 2002; Shin, 2003). For social learning to occur at all, the other's presence must first be acknowledged. Tu (2000) writes, “behaviour, personal factors, and an ideal social learning environment can promote learning in CMC with an appropriate degree of Social Presence” (p. 31). Tu also reminds readers that if Social Presence is too low, the social interaction necessary for social learning won't occur.

In summary, Social Presence is often correlated with learning in the research. It appears that at least some threshold of Social Presence may be necessary for socially-
constructed kinds of learning to occur. I will expound on these kinds of learning, especially how I define and measure learning in the next section.

Learning—Dependent variable #2

I make an effort in this study to distinguish between different levels of learning because 1) it is unfortunately rarely reported in the research, and 2) the variables in this study are predicted to influence certain types of learning over others. Learning has been defined by hosts of theorists in a myriad of ways across multiple domains. My intent in this section is not to review this vast literature, but rather to focus on the type of learning and the cognitive processes relevant to this study, as well as ways in which such learning has commonly been measured.

The central dependent variable of this study is higher-order learning, specifically “comprehension.” While numerous taxonomies of learning have been created over the years, the learning measures employed in this study are based on the taxonomy of educational objectives devised by Benjamin Bloom and colleagues (1956). Bloom’s taxonomy identified six categories of cognitive outcomes: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. A more recent revision to Bloom's taxonomy (Anderson & Krathwohl, 2001) also identifies three main knowledge types: Facts, Concepts, and Procedures. These are hierarchical in that each relies successively on its predecessor, such that procedural knowledge requires knowledge of pertinent concepts, which in turn requires basic factual knowledge related to those concepts. Both the original and revised taxonomies represent comprehension (or “understanding,” as it is
termed in the revised taxonomy) as a higher-order intellectual skill or cognitive process superior to recall or recognition, but both still place it fairly “low” on the scale of higher-order cognitive processes. In order to achieve comprehension or understanding, learners must be able to build connections between new and prior knowledge and integrate concepts into existing schemas (Anderson & Krathwohl, 2001). The taxonomy authors suggest that interpreting, inferring, summarizing, comparing, and explaining are among some of the cognitive processes indicative of understanding.

Levels of learning objectives

Both lower-order (recall) and higher-order (comprehension) learning objectives are assessed in this study. As noted in previous sections, however, the type of learning hypothesized to be most affected by Authorial Presence is higher-order learning and therefore it remains the primary interest of this study (Mayer, 2005). It is perhaps not surprising that elaboration and dialogue would influence higher-order learning objectives like understanding and comprehension more than lower-order learning objectives such as identification and recall. Facts and concepts are respectively defined as being “arbitrarily associated pieces of information” and “groups of objects, events, or symbols that all share some common characteristics and that are identified by the same name” (Merrill, 1983, p. 287). The identification and recall of facts and concepts, for example, would be more directly influenced by repetition and rehearsal activities than by dialogic activity with the author of an online text. This study attempts to employ strategies that influence these different types of learning.
Anderson et al.’s revised taxonomy identifies four increasingly complex knowledge types that are important to briefly discuss. The learning materials employed in this study involve the first three knowledge types: facts, concept knowledge, and procedural knowledge. Metacognitive knowledge is the fourth knowledge type, but is not involved in this study. Procedural knowledge involves cause-and-effect relationships and criteria that are used to interpret events or circumstances (Merrill, 1983). This type of knowledge includes knowledge of subject-specific skills, algorithms, and techniques and methods, but is distinct from knowledge of their use. For example, a learner may recall the steps of a procedure without knowing how to apply it, or without really understanding it or being able to create a new procedure (Anderson & Krathwohl, 2001). When researching the effects of various variables on learning, it is therefore important to consider and report both the requisite intellectual skills (i.e. comprehension), as well as the knowledge type being addressed (i.e. facts, concepts and procedural knowledge).

Previously, I stated that social activity like dialogue is not likely to aid in the identification and recall of facts. What influence can social activity like dialogue have then on different types of learning? From a social constructivist view of learning, cognitive development occurs as people interact with others and their environment. Knowledge is constructed and internalized through communicative acts and dialogue (Vygotsky, 1978). The nature of dialogue often forces the learner to challenge and evaluate existing beliefs against newly encountered assertions, which facilitates increased integration of new knowledge into existing schemas. Likewise, dialogue with others can help learners contextualize new information and consider new ways to apply it. In this study I predict that comprehension, as defined in the afore-mentioned original and
revised taxonomies, could be aided by social factors insofar as they provide learners with communication partners with whom they can interpret, elaborate, infer, summarize, and explain the concepts being presented—as long as the online learning environment supports such interaction, and learners really engage in these processes.

Salomon & Perkins (1998) discuss at length the complex realm of individual and social learning and affirm that even at the social end of the spectrum, the learner still remains—and “should remain—an individual learner in significant ways” (p. 17). Put another way, even negotiated meaning must still be individually internalized, but technological and social resources can be used to support that process. Hoadley and Enyedy (1999) describe this phenomenon as the “middle space” between information and communication interfaces. They call for software interfaces that help learners transition from dialogue (exchange of ideas) to monologue (appropriation and integration of meaning) and then back again to dialogue (iteration and refinement of ideas). If dialogue or monologue are desired learning processes, then the materials and affordances of online learning environments need to encourage and support these processes—even in self-directed learning settings.

In this section, I have identified comprehension or understanding as the primary learning variable under investigation. I underscored the importance of reporting the nature of learning to be examined as all types of learning are not equally impacted by given instructional strategies. I closed the section by briefly revisiting how is dialogic-type interactions are generally hypothesized to influence higher-order learning such as comprehension—a hypothesis more fully addressed in previous sections of this review of literature.
Interaction Level—Dependent variable #3

In this section I first address the conflated terms of interaction and interactivity and define my view of interaction. I then describe the (quasi-contingent) view of interaction that I employ in this study. I then discuss how interaction is often measured, and why I choose to measure Interaction Level.

Interaction Level is the third dependent variable of this study, but is less central than the first two dependent variables. I employed it partially as a manipulation-check, or a means of gauging engagement. The term “interaction” is commonly interchanged with the term “interactivity” but, like others, I attempt to treat the two distinctly for clarity. Both terms are broad constructs with many levels and can be particularly difficult to concisely define and understand (Jensen, 1998; McMillan, 2002; Moore, 1989; Stromer-Galley, 2004; Sundar, 2004;). I hold that it is important to make these distinctions for conceptual clarity and because in this study, interaction and interactivity are predicted to influence learning in different ways that I discuss later in this section.

Generally speaking, however, interactivity has been conceptualized in terms of three component dimensions: features, processes and perceptions (Kiousis, 2002). Some insist that interactivity be defined as a feature or attribute of technology (Sundar, 2004). Sundar’s features view contends that the observable interactions (behaviors and user perceptions) are outcomes or effects of the interactive elements in technology, and that interactivity must remain an independent variable (feature) to be effectively researched. Others want to define interactivity as communicative processes, between agents, either face-to-face (Rafaeli, 1988) or mediated (Bucy, 2004; Stromer-Galley, 2004). Still others
view interactivity in terms of user perceptions (Sohn & Lee, 2005; Wu, 1999). Whether technology- or process-oriented, both views describe interaction and interactivity as “reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another” (Wagner, 1994 p. 8).

Process-oriented views emphasize this mutual, reciprocal or contingent nature of the communicative process (Rafaeli, 1988). Interaction occurs as agents reference one another’s previous messages. A less-than-fully contingent or reciprocal view is seen as reactive and has been described as quasi-interaction by Bretz (1983) and Henri (1992). Quasi-interaction involves only two actions: an initial utterance from person A, and a response from person B. While quasi-interaction may on the surface look like a convenient and appropriate description of the interaction that occurs between solitary learners and their online lesson materials, it minimizes the possible social and individual-level effects on the learner, as well as the perceived experience of interaction (Bucy 2004; Stromer-Galley, 2004). These effects are illustrated in Figure 2.4. In other words, while the interaction might technically be deemed non-reciprocal or non-contingent, one should not assume that the learner perceives it as such.
Sundar suggests, however, that it is possible to account for variables such as user perceptions through control manipulations and random assignment. In contrast, Sohn & Lee (2005) boldly state that “whether people actually perceive a medium/vehicle as interactive is the only valid criterion for judging its interactivity” (Introduction section, para. 2). Taking an only slightly broader view, Wu (2005) shows how perceived interactivity acts to mediate actual interactivity. In the context of this study, I rely heavily on this view of perceived mutuality and reciprocity.

Those with process and perception views of interactivity point out that technical or message attributes serve only to create interaction potential. According to Wu (2005) and Rafaeli, (1988), this potential must first be realized by the user to be considered interactive. In an online lesson, for example, learners encounter pop-up dialog boxes (technical view), displaying questions from the author on the materials just presented

Figure 2.4 Diagram illustrating actual vs. perceived interaction
(process view). As alluded to earlier, in this study it will likely require perceived interaction (perception view) before a learner will engage the author and answer questions in a thoughtful and meaningful way.

**Types and Measurement of Interaction**

In this section, I briefly review literature on types of interaction, and identify the variety relevant to this study, and how it is measured. This is important to discuss as all forms of interaction are not likely to influence learning in the same way.

Numerous researchers have attempted to categorize various interaction types. McMillan (2002) identified three types: user-to-user, user-to-system, and user-to-documents. In the distance education literature, Hillman, Willis, and Gunawardena (1994) extended Moore’s (1989) original three interaction types to include: learner-content, learner-instructor, learner-learner, and their addition, learner-interface interaction. Regarding learner-interface interaction they noted that, “when dealing with any tool, it is necessary for the user to interact with the device in a specific way before it will do his or her bidding” (p. 34). For the technologically-challenged learner, the interface itself becomes “an independent force with which the learner must contend” (p. 35). The point I wish to make here is that a level of interactivity (usually human-interface) is inherent in any learning interactions in an online environment. Thus, frequent interactivity itself may hold some properties that support learning such as helping maintain attention, focus or interest, but as previously discussed, the process and perception aspects of interaction are also critical to learning.
After considering this literature, for this study I define interactivity as those actions inherent in navigating and working within the online learning environment—manipulating the interface, the act of clicking on links, etc. that McMillan and Hillman et al. might respectively call user-to-system and learner-interface interaction. I define interaction in this context as the more social and dialogic processes and events which affect a learner’s schemata, their viewpoints, interpretations, and meaning-making (user-to-user, user-to-document; learner-instructor, learner-content interactions). Interaction may be merely internally perceived, and/or may include responding to, or posing questions in an online lesson, typing notes, reviewing (re-reading) sections of content to better understand the author’s intent, or replaying media clips for comprehension. Some of these forms of interaction are externally observable (i.e. by researchers), but much interaction may be internal and more covert, making interaction particularly challenging to measure.

Researchers holding each view of interactivity discussed—technology, process, and perception—have presented compelling cases for their respective approaches, but like Kiousis (2002) asserted, it is important to address more than one dimension when measuring interaction. Measuring interactivity can entail measuring frequency of actions, click counts, user control perceptions, hyperlinks, and responsiveness, but is not the focus of my measurements in this study. Measuring interaction entails a focus on communicative processes between agents: who is talking, what is being said, and how messages are interpreted and received (Stromer-Galley, 2004; Wagner, 1997). In learning settings, complex discourse analysis procedures are commonly used to look at
learner roles, comprehension and transformation of mental models (Aviv, 2000), but measures of interaction are also commonly made through participant surveys.

Many measures include some base assessment of interaction frequency. For example, a review of Hew & Cheung’s (2003) adapted framework for evaluating participation shows that both “quantity of participation” and “type of participation” are important characteristics in evaluating interactions among learners in online settings (p. 253). Importantly, their framework includes an “irrelevant” category that can be used to label off-topic comments for later removal during data analysis. Nonsense comments are commonly collected through online forms and surveys, especially when anonymity is guaranteed. Hew & Chung’s complete framework, designed for analyzing group asynchronous communications in online classes, helped guide the analysis methods used in this study.

As discussed in the introductory chapter, this study deals with a highly constrained view of social interaction where learners read an online text. Obviously, looking at the frequency of interactions alone lacks the sensitivity and explanation power of other measures and—as the literature suggests—is not indicative of quality learner engagement or quality discourse (Garrison & Cleveland-Innes, 2005; Grabowski, 1992). A more detailed, qualitative analysis of student responses would better reveal the degree to which the interactions were truly thoughtful and dialogic, and how communicative they interpreted the learning experience to be. Yet, at some level, after controlling for irrelevant (nonsense) responses, the number of dialogic interactions found in a setting where none is required, and where no “real, live” interlocutor is present, may suggest that
a social experience was successfully designed and that learners were engaged with the lesson author.

**Interactivity, Social Cues & Question & Feedback Prompts**

In this section I briefly revisit the confounding variable of Question & Feedback prompts in online settings. The presentation of any questions in online learning settings inherently entails features of interactivity—i.e places for the learner to click or select responses, type responses, submit answers, request feedback. Simultaneously, in a typical online learning setting, even being questioned by an ambiguous author of an expository text gives the system agent-like attributes that could cue social responses in learners. The lesson material or the lesson author becomes another social agent the moment s/he perceives being questioned by some “other.”

On the one hand, we might expect online learners to be inclined to respond dialogically and frequently when addressed by name and questioned in an online lesson exhibiting high Authorial Presence (author voice and author image). On the other hand, devoid of any overt social cues (author voice, author image), questions presented with interactive features assume agent-like characteristics and also invite interaction and beg a response of some fashion. The analog in face-to-face communication might be to interview someone with a microphone and recording device present. Communication norms simply dictate that a response necessarily follows a question: “It would take quite confident and empowered individuals to say little or nothing” (Spears & Lea, 1994 p. 432). Any distinction may well prove to be found in the nature or quality of the response.
In light of this discussion, it appears important to control for the effects “questions + interactivity” independent of “questions + overt social cues,” (i.e. Authorial Presence) to better discern the cause of any observed effects on either Learning, perceptions of Social Presence, or Interaction Level.

To summarize, in this section I reviewed more closely literature that considered the oft-debated concept of interactivity. I also made a distinction between interactivity and interaction. I suggested that both user perceptions and interactivity itself can potentially cue social responses in learners independent of other Authorial Presence features. In researching the effects of social cues on learning, it is therefore important to independently control for the effects of Authorial Presence and Questions & Feedback prompts.

**Social Attunement**

In this final section of the literature review, I introduce the exploratory variable of Social Attunement and touch on how this particular individual difference may interact with the Authorial Presence and Question & Feedback prompts variables to influence learning.

There is evidence that great variance exists in how students learn, particularly due to individual differences in multimedia learning (Jonassen & Grabowski, 1993). Readers are swayed by the presentation, affordances, and social cues in a text—whether consciously or subconsciously—and not all readers are equally autonomous, motivated, skilled, or purposeful in their approach to reading and learning in online settings. Social
Attunement describes an individual difference variable that may, in part, account for how learners differentially interpret an instructional experience, and why interaction may be differentially elicited. On the observable variance in user interaction, Sundar (2004) writes that:

Certain forms or elements of interactive interfaces may be more successful than others in issuing calls to action [i.e. to interact with an author]. And certain individual-difference variables, including skill level, may help explain how those calls are interpreted differentially and why some calls result in greater interaction than others. (p. 387)

Social Attunement describes the sensitivity or orientation of learners to social cues in learning. Learners are not equally attuned to social features, which may influence how they interpret learning environments with varying levels of embedded social cues (Davis, J., Lee, T., Vye, N., Bransford, J., & Schwartz, D., 2006). A better understanding of the ways in which people use social information in learning would help to explain why learners interpret and respond to instructional experiences differently.

In the design of experiences, Norman (1998) writes how perceived affordances, more than real ones, are what tell the user what actions are possible and largely how to accomplish those actions. Generally speaking, the more obvious the affordance, the more likely appropriate interactions will occur. But not always. Making perceptions and registration of social cues an important variable. Hoadley (1999) observed variance in how learners differentially keyed into socially relevant factors. Hoadley also observed that certain learners relied heavily upon socially relevant information (i.e. who said what?, whose ideas are clustered together?) in order to remember information. These learners included the socially-relevant information in subsequent questionnaires, quizzes, and in interviews with the researcher. In this case, although all students experienced the
same materials, only some both noticed the socially-relevant information, and used it as a mnemonic device (Hoadley & Kirby, 2004). Furthermore, Hoadley’s work suggested that high socially attuned students benefited from treatments with SRRs, but that low socially attuned students were unaffected by the presence of SRRs. Conversely, high socially attuned students were disadvantaged in treatments lacking SRRs.

Taking a different approach, Sutton (2001) identifies trait differences among learners and reveals four types of actors that describe learner interaction and communication (p. 232): 1) Direct interactors are students who directly interact with other students or the instructor. 2) Vicarious interactors are students who actively process the interactions of others. 3) Actors are students who provide unilateral input regardless of the reactions or comments of others. 4) Non-actors are students who do not participate in the communication process. Vicarious interactors would not be relevant in this study’s self-directed learning context because the learner is the only actor (i.e. there are no peer interactions in the class to vicariously experience). Sutton’s other three roles could certainly make a difference. Sutton argues here that in online settings, there are those who interact no matter what, those who—to use the vernacular—“avoid interaction like the plague and would rather die than post a message,” and those somewhere in between who interact when engaged by others. In online contexts particularly, evidence exists that social cues might also be perceived differently along gender lines (Baskin, Barker & Woods, 2004; Richardson & Swan, 2003). While the process of randomization can be used to control for such individual differences, it could also prove useful to better understand how such traits interact with varying levels of social cues in online, self-paced instructional materials.
As yet, no relevant Social Attunement instrument exists (or could be found) to assess the relative sensitivity and orientation of learners to social variables. Numerous related individual difference and learning style measures were reviewed for appropriateness, but seem to only address specific elements of social attunement. Field Dependence/Independence research (Witkin, Oltman, Raskin & Karp, 1971) looks at varying learner awareness issues. Introversion/Extroversion research (Henjum, 1982) deals with individuals’ propensities to attend to either outward and inward cues, and other behavioral traits involving social responses. The Socio-Communicative style scale (McKroskey & Richmond, 1996; Myers, Martin & Mottet, 2002b) measures assertive and responsive communication behaviors. None of these existing measures, however, adequately addresses relative learner awareness and use of social information. In Chapter three, I present in more detail how this exploratory variable was measured.

Summary

In an online, multimedia lesson, can a highly present author trigger a social and communicative experience? Will this manifest itself through more frequent interaction and increased comprehension? Paxton (2002) might respond affirmatively. He cites “a small and as-yet-tentative body of research” that suggests that when a sense of authorship in a text is heightened, “students tend to read more critically, more flexibly, and with a view to negotiating meaning for themselves (p. 200). If this is true, significant results should also be realized in the current study. More fundamentally, will the socially relevant representations of this study—Authorial Presence and Questions & Feedback
prompts—be strong enough cues to elicit social communicative behavior between, what on the surface appears to be, a learner and a computer-based multimedia lesson?

**Purpose Statement**

Generally, the purpose of this dissertation study is to extend existing research on the role of Socially Relevant Representations (SRRs) in learning. More specifically, however, it is to inform researchers and designers of online learning experiences and the role of Authorial Presence (AP), Questions & Feedback (Q/F) and Social Attunement (SA) in learning in self-directed contexts. This study also aims to inform designers how best to support learning activities that lie somewhere between the transmissive and communicative extremes of online instruction (Hoadley & Enyedy, 1999). To this end and based on the literature reviewed, I pose the following four research questions and associated null hypotheses:

**Research Questions & Hypotheses**

For undergraduate students in a self-directed learning setting:

**RQ 1:** What effect does Authorial Presence (Low and High) have on Learning, perceptions of Social Presence, & Interaction Level?

**RQ 2:** What effect do Questions and Feedback (Prompts and No prompts) have on Learning and perceptions of Social Presence?

**RQ 3:** How might Social Attunement moderate the effects of Authorial Presence?
RQ 4: What relationships exist among the primary and secondary dependent variables?

The associated Null Hypotheses are as follows:

H01 There will be no significant main effect for Authorial Presence on measures of Learning, perceptions of Social Presence and Interaction Level.

H02 There will be no significant main effect for Questions and Feedback on measures of Learning and perceptions of Social Presence.

H03 There will be no significant interaction effects between SA, AP & Q/F prompts.

H04 There will be no significant relationships among Learning, SP, IL, and secondary study variables.
Chapter 3
Methodology

In the following chapter, I describe the research design, instructional materials, and learning measurements that were employed. I will then describe the study variables and treatment conditions. This research study investigated the effects of Authorial Presence (AP) in the text, and the addition of Question & Feedback (Q/F) prompts on three dependent measures (Learning, perceptions of Social Presence (SP), and Interaction Level (IL). An additional variable, Social Attunement (SA), was also explored for its potential moderating effects. I further investigated the relationships among the study variables.

Design & Methods Overview

This research employed 2x2 cross-factored, posttest-only control group design study with random assignment (Campbell & Stanley, 1966). This design rendered four separate conditions or treatment groups that were analyzed independently and together in various combinations. As can be seen in Figure 3.1, treatment conditions 3 and 4 are manipulated with the Authorial Presence variable, and conditions 2 and 4 are manipulated with the Question & Feedback prompts. Condition 4 is manipulated with both independent variables, and treatment condition 1 acts as the primary control group receiving neither manipulation.
Study participants accessed study materials while seated at a computer terminal in a campus computer lab. Following a brief Social Attunement pretest, participants moved on to the main lesson: a three-part physiology lesson online about the functioning of the human heart. After each of the three lesson parts, all participants took one 20-item multiple choice test to measure different learning objectives. Following the third learning test, a final questionnaire was administered to measure perceptions of Social Presence and gather participant satisfaction and demographic data. The online lesson and associated measurement instruments commonly took participants between 50 and 60 minutes to complete. This stands in contrast to numerous related but significantly shorter research protocols completed by Mayer and Colleagues (Mayer, 2005).

**Participants Overview**

Participants were drawn from a convenience sample consisting of existing undergraduate courses at a large, public land grant university spanning a variety of subject areas including Astronomy, English, Information Science and Technology, Business, Biology, and Recreation Management. Student participants received extra
credit in their respective classes for participation in this study as well as a chance to win an iPod music player and coupons for free ice-cream. Alternative extra credit opportunities were made available to students not opting to participate in the study to avoid coercion to participate.

Based on a priori effect size estimate (Cohen, 1988) of .40 for the new independent variables, it was calculated that an ideal total population size of 360 participants would be required for a two-tailed test (Power=.95, Alpha=.05). A total of 416 study participants were recruited (n=416) and were randomly assigned to one of the four treatment conditions resulting in 104 participants per condition. When participants were screened for prior knowledge, 76 participants were eliminated who reported having high or very high prior knowledge of the lesson subject matter. The eliminated participants almost exclusively came from a large biology class. The number of participants whose data was ultimately included in the study analysis was 340 (n=340) resulting in two conditions with 86 participants, and two with 84 participants.

**Instructional Materials Overview**

The Dwyer Heart Content (Dwyer & Lamberski, 1977) is a 2000 word instructional script on the parts of the human heart, the circulation of blood through the heart, and the cycle of blood pressure. Its associated assessments measure a variety of simple to more complex educational objectives (ie. terminology recall, concept formation, rule application, and comprehension). Through what is known as the Program of Systematic Evaluation, the materials and assessments have been thoroughly validated.
and used in literally hundreds of empirical studies since 1965 with over 200,000 participants both in print and in online multimedia formats (Dwyer, 2006).

In the electronic format which I used, all instructional content was presented in 20, non-scrolling computer screens (frames). A few additional screens were used to explain study procedures, provide progress feedback, and quiz instructions. Each of the 20 instructional screens was split into three columns with a table of contents and instructor image (where applicable) in the left and narrowest column. The middle and widest column contained the instructional text, and the right column contained the static color graphic of the heart relevant to the text. Navigational controls were placed at the bottom of body text. All materials were coded in HTML and were presented in a Web browser (Firefox and Internet Explorer) within the Microsoft Windows operating system (see Figure 3.2 and Figure 3.3).

**Manipulating Authorial Presence**

Authorial Presence was operationalized using tactics described in the literature review, but included elements of author voice, instructor Image, vocatives. This section addresses how each of these was actualized in the treatment materials.
Figure 3.2  Sample instructional screen with authorial presence elements.

Figure 3.3  Sample instructional screen without authorial presence elements.
Author Voice

The literature showed that one of the strongest ways to heighten an author’s voice in a text was to use personal pronouns. In many instances, giving the base text a voice meant phrases like “the heart is…” were changed to “our hearts are…” or “your heart is…”. Likewise, on study procedure screens, phrases like “Part 1 is now complete” and “when ready, click ‘NEXT’ to begin the quiz,” were changed to “Ok, we’ve now completed Part 1” and “when you feel you’re ready to continue, click ‘NEXT’ to start the quiz.” Changes were largely word (pronoun) substitutions, but also included more significant rhetorical style changes that made the text more conversational.

A conversational tone, however, involves more verbage. Conditions 3 and 4 with Authorial Presence had between 13-38 more words per individual screen than their non-Authorial Presence counterparts. Care was also taken to add elements of Authorial Presence and conversational tone without “improving” the instruction. It was important to avoid adding references to previously covered concepts (reminding with anaphoric references), or hinting of concepts to come in future screens (foreshadowing with cataphoric references), as these could have acted as rehearsal or cueing strategies for learners in the AP conditions. Such linguistic devices and teaching techniques are arguably part of natural, conversational instruction, making it particularly challenging to create a natural conversational tone without unduly advantaging the AP conditions. Figure 3.4 provides side-by-side examples from both the control text and Authorial Presence text. Changes from the original control text appear in bold on the right.
Care was also taken not to disproportionately affect the prepositional density (and therefore readability) of the treatment. Making treatments sound more conversational inevitably increased the word count, but too much conversational language could have made the treatment text both significantly longer and more readable/understandable than the control, thereby confounding any observed effects. Paradoxically, a less precise “layman’s language” may also introduce confusion or lessen text coherence (Beck, McKeown & Worthy, 1995).

During a review of existing instruments and instrument piloting, I felt however, that author voice changes achieved simply by substituting inclusive pronouns like “your,” “my,” or “our” for the word “the” (i.e. “your heart” vs. “the heart”), might not sufficiently cue a social response from the learner. For this reason, an instructor image and vocatives were added to heighten the author’s presence in the text which I predicted might also cue a greater social response from the learner.

<table>
<thead>
<tr>
<th>No Authorial Presence (67 words)</th>
<th>Yes Authorial Presence (71 words)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conditions 1 &amp; 2</strong></td>
<td><strong>Conditions 3 &amp; 4</strong></td>
</tr>
<tr>
<td>The heart lies toward the front of the body and is in a slanting position between the lungs, immediately below the breastbone. The wide end points toward the right shoulder. The small end of the heart points downward to the front of the chest and toward the left. The lower portion of the heart is called the Apex and is the part that can be felt beating.</td>
<td>The heart lies toward the front of <strong>our</strong> human body, in a slanting position between <strong>our</strong> lungs, and immediately below <strong>our</strong> breastbone. The wide end points toward <strong>our</strong> right shoulder. The small end of the heart points downward to the front of the chest and toward <strong>our</strong> left. The lower portion of <strong>our</strong> heart is called the Apex. It’s the part that <strong>we can feel</strong> beating.</td>
</tr>
<tr>
<td><strong>Can you feel yours now?</strong></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.4 A side-by-side comparison of instructional texts with and without authorial presence. (changed text appears in **bold**)

---

<table>
<thead>
<tr>
<th>No Authorial Presence (67 words)</th>
<th>Yes Authorial Presence (71 words)</th>
</tr>
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</tr>
<tr>
<td><strong>Can you feel yours now?</strong></td>
<td></td>
</tr>
</tbody>
</table>

---

Can you feel yours now?
Instructor/Author Images

In a study looking at the impact of pedagogical agent images on affective outcomes, the agent’s perceived demeanor (e.g., “she looked caring”) was the most cited reason overall for why participants selected one agent over another. The next three runners-up were “agent gender, instructor-related characteristics, and agent ethnicity.” (Baylor, 2005 p. 2).

To identify images of “caring and approachable” author/instructors to place in the Authorial Presence conditions (3, 4), an image search was conducted in Google Images using the terms “professor” and “university faculty.” I selected a diverse (ethnic, age, and gender) sampling of 42 images and brought them before a small group of graduate students. Each was given a paper and asked to rank their top five selections based on the criteria seen in Table 3.1. After tabulating the rankings, the top ranked “professor” image was selected as the author/instructor image in the lesson.

Table 3.1
Criteria Used to Select Instructor/Author Images

- Pleasant, approachable, friendly looking
- Professional and credible looking (but not unapproachable)
- Someone you’d likely/enjoy engaging in conversation with
- Someone who’d likely talk informally or conversationally with you.
- Not too "slick" an image (i.e. portrait studio)—prefer a less formal IM image look.
- No overt credibility cues ("Dr." or “MD” cues such as stethoscope, diploma, lab coat)
Vocatives

Vocatives, or the use of the learner’s name, were employed sparingly in the Authorial Presence conditions appearing more often in the AP+Q/F prompts condition. Upon beginning the study, participants randomly assigned to Authorial Presence conditions (3, 4), were prompted to (optionally) enter their first name. In condition three without Q/F prompts, their entered name appeared on transition screens (i.e. “congratulations Joel, I hope you did well on test 1, click “next” to continue and we’ll begin our discussion on…”). Condition four participants, with Q/F prompts, received the same materials, but the name they entered also appeared in all three open-ended Q/F prompt screens (see Figure 3.5).

Eggin’s and Slade (1997) support the use of vocatives to facilitate Social Presence, noting “the use of redundant vocatives would tend to indicate an attempt by the addresser to establish a closer relationship with the addressee” (p. 145). For example, note the use of instructor image, textual dialogue cues, and vocatives in the high Authorial Presence condition (Figure 3.5 ), and compare it to the example without instructor image, textual dialogue cues, or vocatives in the low Authorial Presence example (Figure 3.6). The example with high Authorial Presence hints at a communication-friendly, instant messaging experience to a higher degree than does the low Authorial Presence example. Based on previous studies, these three elements were expected to strengthen the author’s presence and to heighten learners engagement with the instructional materials.
Manipulating Question & Feedback prompts

In instructional settings, question prompts generally solicit interaction. In an online textual communication setting, when presented with a question and an affordance to enter text (a blinking “I-bar” cursor), people will be much more likely to respond in writing than if no response affordance was evident. For this reason, Question & Feedback prompts were added to the study to help facilitate author-learner interaction and engagement. In both Q/F conditions (2, 4), self-check style multiple choice questions appeared periodically throughout the instructional materials. Three additional open-ended questions were added to the last part of the lesson (part three) where more complex knowledge appeared and where higher-order comprehension was measured. The more dialogic, open-ended questions, including a text response field were concentrated in part three of the lesson because of past research linking dialogue to higher-order learning: comprehension and understanding (See Figure 3.5).

Immediate feedback was provided to student responses, but was not item-specific. Feedback on responses to open-ended question was only semi-contingent. That is, the instructor feedback was not a fully-contingent response to the student’s comments. Instead, a “canned” or pre-scripted response was presented alongside the students’ own comments. The student was then invited to compare and contrast their own reasoning with that of the author. If the learners availed themselves to the engagement affordance, some semblance of reciprocal dialogue might have been perceived. More importantly, students might have engaged in the kinds of interactions that lead to higher-order learning.
Figure 3.5 shows a sample question prompt with high AP from condition four, while Figure 3.6 shows a sample question prompt with low AP from condition two.
In summary, Q/F prompts alone were not expected to render any higher-order comprehension benefits. Rather, the acts of thinking about and generating a response to prompts were anticipated to enhance learning (Garrison & Cleveland-Innes, 2005). Furthermore, upon receiving and comparing the author’s pre-scripted feedback with his/her own initial answer, students might have modified or amended their knowledge structures.

**Lesson Summaries**

A shortcoming with the Dwyer Heart lesson materials was observed in previous work with the materials. Scores on part one and two learning measures were quite low,
averaging around only 50 percent. To compensate for this, parts one and two of the heart lesson materials were enhanced with short lesson review/summary screens before students proceeded to take the respective learning measures. These changes were designed to help eliminate any undetected floor effect caused by poor performance on the first two parts of the lesson. The summaries would help students have a fighting chance of performing well on the final (and most important) comprehension test by helping ensure pre-requisite knowledge was in place on which higher-order learning could build. In theory this would have also allowed the main study variables of Authorial Presence and Question & Feedback prompts to have a greater potential effect.

Measurement Instruments Overview

Originally based on Bloom et al.'s Taxonomy of Educational Objectives (1956), and consistent with Anderson and Krathwohl’s revised taxonomy (2001), the Dwyer Heart Content assessments were designed to measure both varying types of knowledge (factual, conceptual, and procedural) as well as varying intellectual skills or cognitive processes (recall, recognition, comprehension/understanding). By taking steps to include both kinds of knowledge in its measurements, this study expected to fulfill a need left by existing literature as most studies failed to measure and/or report what type of learning or cognitive processes were affected by different social cues.

The three tests used to measure learning outcomes (Identification, Terminology, Comprehension), were comprised of 60 total multiple-response question items (20 each). They are described in the following section and can be viewed in their entirety in
Appendix F. Dwyer’s fourth test, a 20-item drawing test, is not used the study. Dwyer’s remaining three learning measures had reliability coefficients (Cronbach’s \(\alpha\)) of .80 or above which are considered more than adequate.

While these tests retained the same wording as their print originals, they were converted to an online HTML format for this study, where a server captured participant responses and stored them in a database. A sample multiple choice practice question is illustrated below.

**Identification Test**

The identification test (\(\alpha = .83\)) was designed to evaluate the participant’s ability to identify parts or positions of an object. The participants were required to identify parts of the heart numbered in a drawing by answering 20 multiple-choice questions. The objective of this test was to measure the student’s ability to recall facts from the text which generally involved lower-level cognitive processing. A sample question is illustrated below.
Terminology Test

The terminology test ($\alpha = .84$) was designed to measure knowledge of specific facts, terms, and definitions pertinent to the heart’s parts and functioning. This 20-item multiple choice test was used to evaluate the participant’s ability to learn concepts. A sample question is illustrated in the following figure.

21. Arrow number one (1) points to the
- Septum
- Aorta
- Pulmonary Artery
- Pulmonary Vein
- None of These

*Figure 3.7* Identification test sample question.
56. The ______ is the common opening between the right auricle and the right ventricle.
- Mitral Valve
- Tricuspid Valve
- Septic Valve
- Pulmonary Valve
- Aortic Valve

*Figure 3.8* Terminology test sample question.

**Comprehension Test**

This test consists of 20 multiple-choice items ($\alpha = .81$). It was designed to evaluate the participant’s knowledge of the functions of the heart as they occur during operational phases. The test was designed to measure a participant’s understanding of relationships between concepts and facts and to assesses a participant’s grasp of related rules and principles, which generally involves higher-level processing. For example, given the location of certain parts of the heart at a particular moment of its functioning, the learner was asked to determine the positions of other specified parts of the heart at the same time.
Perceptions of Social Presence Measure

A host of questions from a variety of Social Presence questionnaires was identified in van Baren and Ijsselsteijn’s (2005) online “Compendium of Presence Measures”, as well as Kreijn’s (2004) Social Presence instrument. It was, however, a “para-social presence” instrument developed by Kumar and Benbassat (2002) that most closely approached the nature and setting of Social Presence forwarded in this study. Their questionnaire was designed to assess the level of Social Presence felt by an Internet patron to a commercial website—a solitary, self-directed shopper. The numerous other
Social Presence questionnaires detailed in the compendium generally assumed two or more interlocutors, either human or virtual, whose communicative behavior was either asynchronously or synchronously contingent or responsive to the actions of the learner. Simply put, they measured the Social Presence felt by participants conversing with another human or agent—usually in an online community or class, through email, chat, forums, discussion boards, instant messaging, listservs or various conferencing technologies. Some questionnaires also dealt with presence in terms of sharing a virtual space with others in an online game or a videoconference.

All these scenarios and their associated presence measures were ill-suited for the solitary learning context of this study without significant modification. Therefore a largely original 25-item instrument was devised to measure perceptions of Social Presence. Data were collected using a 7-point Likert scale with the following response options: 1) Strongly Disagree, 2) Disagree, 3) Somewhat Disagree, 4) Neither Agree nor Disagree (neutral), 5) Somewhat Agree, 6) Agree, and 7) Strongly Agree.

In designing any instruments to measure social presence, one must be cautious in how one frames relational or social statements—especially when the communication partner is not deemed human. By extension, and according to Social Response Theory, by overtly equating the quasi-social interactions in a self-paced, multimedia lesson with traditional interactions between human beings, it is possible for (mindful) users to reject such “absurd” attributions (Kumar & Benbasat, 2002; Reeves & Nass, 1998). For example, asking a participant to rate their agreement with the following statement: “The computer really seemed to care about my learning,” could easily return “noisy” data. Many participants might emphatically reject the notion that computers “think!” The
perceptions of Social Presence questionnaire created for this research took this into account, featuring one Likert scale item that directly acknowledges the study’s unconventional context for relational questions: “Even though this lesson was really only one-way communication, it felt as though I was communicating with the author.”

The targeted nature of the above question and others in the questionnaire necessitated modifications to extant Social Presence questionnaire items. The resultant perceptions of Social Presence instrument remains similar to, but qualitatively distinct from other measures. In order to create this instrument, I began by culling items from numerous presence questionnaires. This step generated approximately 50 candidate items that, given varying amounts of editing, could be appropriate for the study’s context. Four subscales (Immediacy, Understanding, Positivity, and Involvement), representing major sub-dimensions of Social Presence, were also adopted and slightly modified to help guide the selection and creation of questionnaire items (Burgoon & Hale, 1987; Kumar & Benbasat, 2002). After being analyzed for recurring themes and redundancy, the edited items were pared down to 35 questions and were then reviewed by a small group of researchers familiar with the Social Presence construct. The edited items were compared back to the original Social Presence measures from which the items were derived to ensure they adequately reflected the construct. Following item deletions and final revisions, the instrument was once more reviewed to validate individual items and their relevance to their respective subscale constructs. The final 25-item Social Presence measure proved remarkably reliable ($\alpha = .90$). Additional non-social presence items (demographics, prior knowledge, student satisfaction, topic interest, etc.) were appended
to the final instrument for exploratory purposes. A complete list of the questions used in the proposed study can be found in Appendix G.

**Social Attunement**

Social Attunement (SA) is an individual difference construct that describes a learner’s relative sensitivity to social cues and factors and their use of such information in remembering and constructing knowledge. No validated instrument existed to measure Social Attunement as I have defined it, but a short protocol used previously in a related study (Hoadley, 1999), served as the basis for the measure I employed here (See Appendix H to review the complete instrument). The instrument had two main parts. First, an imaginary dialogue among 4 characters was presented on the nature of light and color—two historical figures, Isaac Newton and Johannes Kepler, and two present-day characters, “Chris” and a narrator. An image of the characters appeared by each of their respective utterances. Then, a series of two kinds of questions were posed which aimed at assessing both the readers’ memory of what was said, as well as their memory of who said what. Q1 was designed to determine a participant’s tendency to first use social resources instead of other resources when seeking knowledge. Q2a-2h addressed WHAT was said in order to obtain a baseline of what was remembered about the discussion topic. Q3a-3h addressed WHO said what in order to assess whether participants also “encoded” such social information as which social agent or character made the statement. Finally, Q4 was designed to discern whether participants encoded
gender, another socially relevant detail that was not germane to the domain or topic of the text.

Combined, questions one, three, and four were used to generate a participant’s Social Attunement score (See Appendix H). This SA score was held to reflect (albeit bluntly) a participant’s relative sensitivity to, and use of socially relevant information in their learning. The measure had a relatively low internal reliability coefficient ($\alpha=.53$).

<table>
<thead>
<tr>
<th>Sample Questions</th>
<th>Available Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) When you need to find something out, which would you prefer to do?</td>
<td>• First talk to your friend about it</td>
</tr>
<tr>
<td></td>
<td>• First look it up (online or books)</td>
</tr>
<tr>
<td>2) For each of the following statements, indicate which (if any) actually appeared in the scenario your just read.</td>
<td>• Yes</td>
</tr>
<tr>
<td>a. &quot;Only the daylight let you see the true color of the paint because it wasn't carrying any colors at all&quot;</td>
<td>• No</td>
</tr>
<tr>
<td>b. &quot;The distance light must travel also affects the colors that are reflected to our eyes&quot;</td>
<td></td>
</tr>
<tr>
<td>c. …</td>
<td></td>
</tr>
<tr>
<td>3) Match the following statements with their owner.</td>
<td>• Isaac Newton</td>
</tr>
<tr>
<td>a. &quot;Only the daylight lets you see the true color of the paint because it wasn't carrying any colors at all&quot;</td>
<td>• Chris</td>
</tr>
<tr>
<td>b. &quot;always look at the paint under the same kind of lighting as where it will be used&quot;</td>
<td>• Johannes Kepler</td>
</tr>
<tr>
<td>c. …</td>
<td>• Narrator</td>
</tr>
<tr>
<td></td>
<td>• Nobody</td>
</tr>
<tr>
<td>4) Was &quot;Chris&quot; in the scenario male or female?</td>
<td>• Male</td>
</tr>
<tr>
<td></td>
<td>• Female</td>
</tr>
</tbody>
</table>

*Figure 3.10* Sample questions and available responses for the Social Attunement Instrument.

**Interaction Level (IL)**

Interaction Level (IL) is a straightforward measure that tallied the frequency with which students typed in responses to question prompts. Invalid or nonsensical, “gibberish,” responses were deleted from the dataset. A strategy found to be moderately effective in eliciting student responses in independent learning situations involves
capturing student responses to self-check or mastery questions and, allowing students to save and/or print a record of their typed responses at the end of a lesson—often together with the author or instructor responses to the questions as well.

While it has proven challenging in the past to motivate thoughtful written (typed) responses to such non-graded, self-check questions, I have experienced a distance education setting in which this strategy has increased students responses. Oddly enough, early results from this study did not show a low response problem. In fact, the opposite was true which created a entirely new problem which I address in the following paragraphs.

Of the 168 participants in the Question & Feedback prompt conditions, 142 participants (84%) entered typed responses to all three of the open-form questions. The interactivity affordance of the blinking I-bar cursor combined with the prompt to type a response in the text field proved to be a powerful determinant of a participant’s response frequency irrespective of treatment group. I therefore decided to go through the additional effort needed to perform a simple dialogue analysis of the responses and use the new richer data to represent the Interaction Level variable. I devised a simple rubric to score participant responses on a scale of zero to four representing the level of dialogue in their responses (see Figure 3.11). The inclusion of this simplistic form of discourse analysis is consistent with my definition of interaction vs. interactivity described in Chapter 2. Hence, the IL data described in all the following analyses represents the sum of interaction, or “dialogue,” scores for each response submitted, as opposed to focusing solely on response frequency. The internal reliability coefficient for the IL measure was
fairly high and includes the dialogue analysis ($\alpha=.76$). The scoring criteria were deemed to be sufficiently objective to not require multiple raters.

As previously noted, frequency of responses alone does not provide very rich insight into a participant’s cognitive or social engagement with the author or materials. A thorough discourse analysis of student responses would be the most enlightening in this regard, but was beyond the scope of this study. The revised IL measure, that includes response frequency and the dialogue rating, therefore acts as a measure somewhere in between, and is used to help make observable participant interactions or responses to an author’s solicitations to consider and discuss the lesson materials.

<table>
<thead>
<tr>
<th>Score</th>
<th>Rubric Description</th>
<th>Example Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No typed response</td>
<td>“asdasd”</td>
</tr>
<tr>
<td></td>
<td>Gibberish responses</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Response, but not dialogic. Response in bullet-form or included only one or two words.</td>
<td>“-In right ventrical. -To right auricale. -Out pulminery valve. -To lungs -In valve. -Out aorta.”</td>
</tr>
<tr>
<td>2</td>
<td>Dialogic response. Short, non-elaborative, little effort.</td>
<td>“I am really not all that sure” “I have nooooooo idea, I'm just an HRIM major. None of this stuff makes sense”</td>
</tr>
<tr>
<td>3</td>
<td>Dialogic, elaborative response</td>
<td>“Hmm, blood goes up through the arm into the superior vena cava then into the right auricle through the tricuspid valve into the right ventricle then out the pulmonary artery to the lungs. From there it then goes into the heart through the pulmonary vein through the left auricle…”</td>
</tr>
<tr>
<td>4</td>
<td>Dialogic, elaborative response including pronoun use. Showed evidence of communicative language with author, referring to self and/or author (I, You, Our)</td>
<td>“If I were a submarine in my blood stream running out of oxygen, I’d start my propellors through my veins, up my arm and into the right Atrium though the superior vena cava. I would then pass through the tricuspid valve into the right ventricle, from which I would rush through the pulmonary artery into my lungs, from which I’ll return with oxygen through the…” “Well, I suppose first of all you would travel through the veins back to the heart, entering the right auricle through the superior vena cava, and then you would pass through the tricuspid valve to the…”</td>
</tr>
</tbody>
</table>

Figure 3.11 Participant response dialogue level rubric.
Demographics and Control Items

Though not all were used in the analyses, ten additional demographic and control items were administered to gather participant self-report data on interest, performance, and lesson difficulty (see Table 3.2). Items were gathered to help control for participants who may have already learned the lesson content (high prior knowledge), or who exerted little or no effort to perform well. Data for items 4-10 was gathered with the same seven-point Likert scale employed in the Social Presence instrument.

Table 3.2
Demographic and Control Items

1. Gender (Male/ Female)
2. Year in school (Fresh/ Soph/ Jun/ Sen/ Grad)
3. Major
4. This lesson was difficult.
5. I learned a lot from this lesson.
6. The lesson material was interesting to me.
7. I wish more authors wrote in this style.
8. I think I did well on the tests
9. I already knew the information presented in this lesson.
10. I tried hard to do well on this lesson

Analysis Procedures

Participant data was collected over the internet and stored in a secured database. The data was prepared for analysis in Microsoft Excel, and then imported into SPSS for statistical analysis with multivariate analysis of variance (MANOVA). Researchers recommend the use of the general linear model procedure to perform MANOVA to look
for significant variance among group means (Hinkle, Wiersma & Jurs, 1988; Tabachnick & Fidell, 2007). Where variance is found, subsequent ANOVAs are performed to explore where the differences occur. Before conducting the statistical analyses, some tests were conducted to first verify the overall integrity and trends of the data and to ensure that certain statistical assumptions were met (Tabachnick & Fidell, 2007). Pearson correlations, Cronbach alpha reliability coefficients, tests of normality and skewness tests were generated. The results of these tests indicated strong internal reliability coefficients for all dependent measures (Learning, SA, IL). Assumptions of normality were also met except for the IL variable which indicated skewed values. After running an explore program, I found a negative skewness value of -.90, but which George and Mallery (2006) still consider “excellent for most psychometric purposes” (p. 99).

The Social Attunement variable could be analyzed as a continuous covariate or as a third, categorical, independent variable. According to Munro (2005), if the correlation of a covariate and the dependent variables is less than +.30 in absolute value, the reduction in variance due to the covariate is “considered inconsequential” (p. 201). Correlation values between SA and the dependent variables were below .30 except for Learning \( (r=.33) \). Being borderline on only one of the measures, I decided to treat SA as an additional three-level (high, Med. Low) moderating variable rather than a covariate, which simultaneously helps clarify any observed effects for SA. It is worth reporting as well that the SA variable had a relatively low internal reliability coefficient \( (\alpha=.53) \), which George and Mallery consider to be poor.

Following an analysis of the correlations among the dependent variables, an additional post hoc analysis was conducted to explore a causal network in the
correlations (Baron & Kenny, 1986)—specifically whether or not Social Presence acted as a mediator or indirect pathway between Authorial Presence and Learning, and to see if Interaction Level similarly mediated the effects between Social Presence and Learning.

Overall, the tests indicated that statistical assumptions relevant to the use of MANOVA were met such as: 1) normal distribution and similar groups size, 2) multiple interval/ratio dependent variables, 3) multiple nominal independent variables, 4) equal variance in dependent variables across independent variables, and 5) independent observations.

In this chapter, I described in some detail the research design, the study procedures, instructional materials, learning measures, and finally the analyses employed in the study. In the following chapter, I present the results of the data analysis.
Chapter 4

Results

There were two main manipulated variables of interest this study--Authorial Presence and Question & Feedback prompts--and their influence on Learning (comprehension), perceptions of Social Presence, and Interaction Level. A third non-manipulated effect, Social Attunement, was also of interest. Specifically, the purpose of the study was to test the following four hypotheses for undergraduate students in a self-directed learning setting:

H₀₁ There will be no significant main effect for Authorial Presence (AP) on measures of Learning, perceptions of Social Presence, and Interaction Level.

H₀₂ There will be no significant main effect for Questions & Feedback (Q/F) on measures of Learning and perceptions of Social Presence.

H₀₃ There will be no significant interaction effects between SA, AP, and Q/F prompts.

H₀₄ There will be no significant relationships among Learning, SP, IL, and the secondary study variables.
In this chapter, I present the results of the data analyses used to test each of the hypotheses. Where appropriate, I present additional analyses used to provide more insight into the data and facilitate additional discussion in Chapter 5.

**Descriptive Statistics**

Study participants were recruited from a variety of existing classes across campus. Primarily freshman and sophomore students were sought for the study, but as the data in Figure 4.1 shows, recruitment strategies inadvertently drew in a large proportion (68 percent) of juniors and seniors. Figure 4.2 shows that female participants (58 percent) outnumbered male participants (42 percent) by a small margin.

*Figure 4.1 Year in school*
Table 4.1 presents the sample size, means, standard deviations and ranges for scores on all three dependent measures by treatment condition. The number of participants in each condition was comparable at around 86 participants. Comprehension was the chief learning measure of interest in the study, but for comparison purposes, I also included the overall learning data which included all three learning subtests: Identification, Terminology and Comprehension. The total possible range of scores for the tests were: Learning (comprehension), 0-20; Social Presence test, 0-147; and Interaction Level, 0-12. Descriptively, Table 4.1 shows that students in condition two (Text+Q/F) had the highest mean learning score among the four conditions (10.29), and that students in condition 1 (text only), had the lowest mean learning scores (9.47). The mean Learning score was 10 out of a possible score of 20. The mean overall learning scores across all four conditions fall within only two points of each other, and lie very close to only 50% of the maximum possible score of 60.
Table 4.1

Summary of Descriptive Statistics for Dependent Measures by Treatment Condition

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Condition</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>Comprehension</td>
<td>1—Text* only</td>
<td>87</td>
<td>9.47</td>
<td>4.89</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2— Text+Q/F*</td>
<td>83</td>
<td>10.29</td>
<td>4.41</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3— Text+AP*</td>
<td>84</td>
<td>10.11</td>
<td>4.40</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4—Text+AP+Q/F</td>
<td>86</td>
<td>10.14</td>
<td>4.62</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
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<td>4.58</td>
<td>2</td>
</tr>
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<td>87</td>
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<td>17.09</td>
<td>40</td>
</tr>
<tr>
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<td>2— Text+Q/F*</td>
<td>83</td>
<td>83.55</td>
<td>17.64</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>3— Text+AP*</td>
<td>84</td>
<td>94.77</td>
<td>18.36</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>4—Text+AP+Q/F</td>
<td>86</td>
<td>92.85</td>
<td>16.72</td>
<td>53</td>
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<tr>
<td></td>
<td>Total</td>
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<td>18.30</td>
<td>40</td>
</tr>
<tr>
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<td>2— Text+Q/F*</td>
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<tr>
<td></td>
<td>3— Text+AP*</td>
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<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td></td>
<td>4—Text+AP+Q/F</td>
<td>86</td>
<td>8.24</td>
<td>3.17</td>
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<td>Total</td>
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<td>2.95</td>
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<tr>
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<td>31.16</td>
<td>13.11</td>
<td>8</td>
</tr>
<tr>
<td>(combined learning</td>
<td>2— Text+Q/F*</td>
<td>83</td>
<td>32.37</td>
<td>12.66</td>
<td>13</td>
</tr>
<tr>
<td>tests)</td>
<td>3— Text+AP*</td>
<td>84</td>
<td>32.31</td>
<td>12.41</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>4—Text+AP+Q/F</td>
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<td>13.90</td>
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<tr>
<td></td>
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<td>340</td>
<td>32.24</td>
<td>12.79</td>
<td>8</td>
</tr>
</tbody>
</table>

*Text - base instructional text only; Q/F - Questions & Feedback prompts; AP - Authorial Presence.

**These conditions had NO questions prompts and therefore have no IL scores.

Table 4.1 also reveals that the highest mean scores for perceptions of Social Presence was found in condition 3 (Text+AP) at 94.85, and the lowest in condition 1 (text only) at 81.54. In fact, in the two conditions with Authorial Presence (conditions 3 & 4), mean scores of perceptions of Social Presence were around 10 points higher than in the two conditions without Authorial Presence (conditions 1 & 2). Additionally, the highest mean scores of the two conditions with Question & Feedback prompts (conditions 2 & 4) were found in condition 4 (Text+AP+Q/F). Descriptively speaking, participants in condition 4 on average, responded more frequently and more dialogically to question and feedback stimuli than did participants in condition 2.
Table 4.2 shows a summary of descriptive statistics for the original Social Attunement data, which followed a fairly normal curve with participants spread across the complete range of possible scores on this measure. The measure, however, exhibited a relatively low internal reliability coefficient (α=.53). This made SA suspect for use as a covariate, which according to Garson (2006), should have a reliability coefficient of .80 or greater. Since I was more interested in the extremes of the SA variable, the original continuous SA data was subsequently dummy-coded into a three-level categorical variable: low (0-4), medium (5-6) and high (7-10). Consequently, the inclusion of SA as an independent variable caused the individual cell sizes (n) to get smaller, but still fall within acceptable levels. I include a bar graph showing the frequency distribution of the current SA variable as well (see Figure 4.3).

Table 4.2
Summary of Descriptive Statistics for Social Attunement

<table>
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<tr>
<th></th>
<th>Original Continuous Social Attunement Variable</th>
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</thead>
<tbody>
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<td>M</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>340</td>
<td>5.37</td>
</tr>
</tbody>
</table>
I also include here tables showing more detailed descriptive summaries of the data including the three levels of SA used in the MANOVA. Descriptively, Figure 4.3 shows that for learning, participants with high SA in Q/F prompts conditions without AP scored highest with a mean learning score of 13.71. Low socially attuned participants in conditions lacking both AP and Q/F prompts performed on average most poorly, with a mean learning score of 7.47.

Figure 4.3  Social Attunement frequency distribution
Table 4.3  
Summary of Descriptive Statistics for Learning (Comprehension) by Treatment Condition and Level of SA

<table>
<thead>
<tr>
<th>Questions &amp; Feedback</th>
<th>Authorial Presence</th>
<th>Social Attunement</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
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</thead>
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<td>No AP (1,2)</td>
<td>Low</td>
<td>7.47</td>
<td>4.20</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Med</td>
<td>10.09</td>
<td>4.52</td>
<td>34</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>Total</td>
<td>9.47</td>
<td>4.89</td>
<td>87</td>
</tr>
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<tr>
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<td>Med</td>
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<td>4.05</td>
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</tr>
<tr>
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<td>Total</td>
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<td>4.40</td>
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<td></td>
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<td></td>
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<td>4.27</td>
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<td>4.19</td>
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</tr>
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<tr>
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<td></td>
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<td>4.04</td>
<td>53</td>
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<tr>
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<td>4.50</td>
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<td>4.10</td>
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Table 4.4

Summary of Descriptive Statistics for Social Presence by Treatment Condition and Level of SA

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<th>SD</th>
<th>N</th>
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</thead>
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<td>17.60</td>
<td>94</td>
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<td></td>
<td>Total</td>
<td>88.16</td>
<td>18.30</td>
<td>340</td>
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</table>
With regard to perceptions of SP, Table 4.4 shows that participants with high SA in AP conditions without Q/F prompts scored highest with a mean SP score of 102.96. Low socially attuned participants in conditions with Q/F prompts, but lacking AP, performed most poorly, with a mean SP score of 79.23.

In Table 4.5, I present a summary of descriptive statistics for Interaction Level, showing the influences of Authorial Presence and Social Attunement. Again, descriptively we see high SA participants in the AP condition with the highest average Interaction Level scores (9.41) and Low SA participants in non AP conditions with the lowest average IL scores (6.58).

Table 4.5

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<th>Social Attunement</th>
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<th>SD</th>
<th>N</th>
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</thead>
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<td>35</td>
</tr>
<tr>
<td></td>
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<td>9.00</td>
<td>.89</td>
<td>21</td>
</tr>
<tr>
<td></td>
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<td>2.64</td>
<td>82</td>
</tr>
<tr>
<td>Yes AP (3,4)</td>
<td>Low</td>
<td>8.04</td>
<td>2.72</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Med</td>
<td>7.45</td>
<td>3.86</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>9.41</td>
<td>2.28</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>8.24</td>
<td>3.17</td>
<td>86</td>
</tr>
<tr>
<td>Total</td>
<td>Low</td>
<td>7.31</td>
<td>2.97</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Med</td>
<td>7.21</td>
<td>3.26</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>9.23</td>
<td>1.80</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>7.82</td>
<td>2.95</td>
<td>168</td>
</tr>
</tbody>
</table>

Performing the MANOVA would allow us to see if any of the observed differences in these group means were statistically significant. Unlike doing a series of independent t-tests, MANOVA is designed to simultaneously look at both main effects
and interaction effects on multiple dependent variables. The MANOVA results are presented in the following section.

**Group Comparisons**

A three-way MANOVA was conducted to discover any statistically significant differences in Learning, perceptions of Social Presence and Interaction Level brought about by the three independent variables: Authorial Presence, Questions & Feedback prompts, and Social Attunement. Equality of co-variance is a prerequisite assumption that was checked before performing a MANOVA. Box’s test of equality of covariance was used and indicated the assumption was met (Box’s M=63.218, sig.= .672).

Table 4.6

*MANOVA Showing Significance of Main Effects and Interaction Effects Between the SA, AP and Q/F Variables. (N=340, all items)*

<table>
<thead>
<tr>
<th>Source</th>
<th>Pillai’s Trace</th>
<th>F</th>
<th>df/Error</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q/F</td>
<td>.003</td>
<td>.293</td>
<td>3/326</td>
<td>.830</td>
<td>.003</td>
</tr>
<tr>
<td>AP</td>
<td>.102</td>
<td>12.313</td>
<td>3/326</td>
<td>.000</td>
<td>.102</td>
</tr>
<tr>
<td>SA</td>
<td>.148</td>
<td>8.714</td>
<td>6/654</td>
<td>.000</td>
<td>.074</td>
</tr>
<tr>
<td>Q/F*AP</td>
<td>.016</td>
<td>1.810</td>
<td>3/326</td>
<td>.145</td>
<td>.016</td>
</tr>
<tr>
<td>Q/F*SA</td>
<td>.009</td>
<td>.520</td>
<td>6/654</td>
<td>.793</td>
<td>.005</td>
</tr>
<tr>
<td>AP*SA</td>
<td>.018</td>
<td>.973</td>
<td>6/654</td>
<td>.443</td>
<td>.009</td>
</tr>
<tr>
<td>Q/F<em>AP</em>SA</td>
<td>.031</td>
<td>1.728</td>
<td>6/654</td>
<td>.112</td>
<td>.016</td>
</tr>
</tbody>
</table>

*Computed using alpha = .05*

The MANOVA results (Table 4.6) indicates that Question & Feedback prompts produced no significant main effect on the dependent variable means. Authorial Presence ($F=12.31, p=.000$) and Social Attunement ($F=8.71, p=.000$), however, did show a main effects on the dependent variable means. No interaction effects are observed among any
of the independent variables. According to Tabachnick and Fidell (2007), after testing for all possible main and interaction effects, it is then appropriate to perform ANOVAs on those variables showing main effects. This process will help identify which dependent variables are significantly affected by the predictor variables, and under what conditions. It is also the means to directly test the hypotheses put forth in the study.

In addition to performing the three-way ANOVA for the Learning and SP variables, I also performed a two-way ANOVA for the Interaction Level variable which could not appear in the full MANOVA model, and present results in a combined table (see Table 4.6). In order to perform ANOVA, once again, assumptions must first be met. Levene’s test of equality of error variances examines the variance among the dependent variables. Equal variance tests were not significant for Learning and Social Presence allowing us to continue looking at the between-subject effects.

Table 4.7

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning</td>
<td>1.308</td>
<td>11</td>
<td>328</td>
<td>.218</td>
</tr>
<tr>
<td>Social Presence</td>
<td>1.068</td>
<td>11</td>
<td>328</td>
<td>.387</td>
</tr>
<tr>
<td>Interaction Level</td>
<td>9.774</td>
<td>5</td>
<td>162</td>
<td>.000</td>
</tr>
</tbody>
</table>

For the Interaction Level variable, however, the equal variance test was significant. Failure to meet homogeneity of variances assumption is not considered fatal to ANOVA since this procedure is generally robust for small to moderate departures from the equal variances assumption (Box, 1954; Moore, 1995). This is especially true when the number of cases in the cells is fairly equal—a condition that this data set meets.
Results of the between-subjects tests indicate that AP has a statistically significant effect on Social Presence ($F=33.47$, $p=0.000$), and approaches significance on the Interaction Level variable ($F=3.17$, $p=0.077$). When using the less powerful t-test, the AP variable approach significance on IL more closely at ($t=-1.946$, $p=0.053$).

Social Attunement shows significant effects for all three dependent variables: Learning ($F=21.477$, $p=0.000$), Social Presence ($F=6.770$, $p=0.001$) and Interaction Level ($F=8.151$, $p=0.000$). There was no significant interaction effect for Social Attunement and Authorial Presence (SA*AP) on Interaction Level ($F=0.579$, $p=0.562$). Following the recommendation of Toothaker (1993) when the assumption of homogeneity of variances was not met with the IL variable, I used the Games-Howell post hoc test to help clarify where SA main effects were found. Results indicate that the significant effects on Interaction Level were found between participants with high and low Social Attunement, and between participants with high and medium Social Attunement.

Table 4.8

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig. (2-tailed)</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorial Presence (AP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning</td>
<td>.510</td>
<td>1</td>
<td>.510</td>
<td>.027</td>
<td>.869</td>
<td>.000</td>
</tr>
<tr>
<td>Social Presence (SP)</td>
<td>9893.012</td>
<td>1</td>
<td>9893.012</td>
<td>33.471</td>
<td>.000</td>
<td>.093</td>
</tr>
<tr>
<td>Interaction Level (IL)</td>
<td>25.095</td>
<td>1</td>
<td>25.095</td>
<td>3.169</td>
<td>.077</td>
<td>.019</td>
</tr>
<tr>
<td>Social Attunement (SA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning</td>
<td>801.914</td>
<td>2</td>
<td>400.957</td>
<td>21.477</td>
<td>.000</td>
<td>.116</td>
</tr>
<tr>
<td>Interaction Level (IL)</td>
<td>129.111</td>
<td>2</td>
<td>64.555</td>
<td>8.151</td>
<td>.000</td>
<td>.091</td>
</tr>
</tbody>
</table>

$p <.05$
Analysis of Hypotheses

Test of Null Hypothesis One

H₀1 There will be no significant main effect for Authorial Presence (AP) on measures of Learning, perceptions of Social Presence, and Interaction Level.

MANOVA results indicate that Authorial Presence did account for significant variance in the means of the dependent variables ($F=12.313, p=.000$). Upon further analysis using ANOVA, Table 4.8 shows no main effect for Authorial Presence on Learning ($F=.027, p=.869$). Participants with AP (M=10.07) performed no better on the learning comprehension measure than students in conditions with no AP (M=10.15). The analysis did reveal a significant main effect for AP on perceptions of Social Presence ($F=33.471, p=.000$). Here, participants with AP (M=93.91), had significantly higher SP scores than participants without the AP manipulation (M=82.96). There was also no main effect observed for AP on Interaction Level at the .05 significance level, but results approached significance ($F=3.169, p=.077$). Huck (2004) for one, called on educational researchers to report and discuss effects that approach statistical significance.

Thus, null hypothesis one is retained for both the Learning and Interaction Level variables, but is rejected for the perceptions of Social Presence variable.

Test of Null Hypothesis Two

H₀2 There will be no significant main effect for Questions and Feedback (Q/F) on measures of Learning and perceptions of Social Presence.
The results of the MANOVA indicated no main effects for Questions & Feedback prompts (Q/F) on Learning ($F=0.813$, $p=0.368$) or perceptions of Social Presence ($F=0.006$, $p=0.938$). For example, participants in conditions with Q/F prompts (M=10.33) performed no better, statistically speaking, on the learning comprehension measure than participants in conditions with no Q/F prompts (M=9.90).

In order to test for the differential effects of Questions & Feedback prompts on lower-order vs. higher order learning predicted in the literature, I present results (see Tables 4.9 and 4.10 from a series of t-tests on all three learning measures, including the combined measure.

Table 4.9

<table>
<thead>
<tr>
<th>Learning Test</th>
<th>Q/F condition</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
<td>groups w/no QF (1,3)</td>
<td>171</td>
<td>11.52</td>
<td>4.440</td>
</tr>
<tr>
<td></td>
<td>groups w/QF (2,4)</td>
<td>169</td>
<td>11.25</td>
<td>4.872</td>
</tr>
<tr>
<td>Terminology</td>
<td>groups w/no QF (1,3)</td>
<td>171</td>
<td>10.42</td>
<td>4.786</td>
</tr>
<tr>
<td></td>
<td>groups w/QF (2,4)</td>
<td>169</td>
<td>11.29</td>
<td>4.785</td>
</tr>
<tr>
<td>Comprehension</td>
<td>groups w/no QF (1,3)</td>
<td>171</td>
<td>9.78</td>
<td>4.652</td>
</tr>
<tr>
<td></td>
<td>groups w/QF (2,4)</td>
<td>169</td>
<td>10.21</td>
<td>4.504</td>
</tr>
<tr>
<td>Overall Learning</td>
<td>groups w/no QF (1,3)</td>
<td>171</td>
<td>31.73</td>
<td>12.748</td>
</tr>
<tr>
<td></td>
<td>groups w/QF (2,4)</td>
<td>169</td>
<td>32.76</td>
<td>12.845</td>
</tr>
</tbody>
</table>

In an unexpected outcome, Table 4.10 reveals that Question & Feedback prompts did not significantly affect the different learning measure means. In other words, the added interactivity and rehearsal provided through Q/F prompts did not appear to affect any of the study learning outcomes. Thus, for all measures of learning and SP, null hypothesis two is retained at the .05 level.
Recall that Questions & Feedback prompts did not appear in treatment conditions one and three, and therefore no Interaction Level (IL) data was collected nor available for those groups.

**Test of Null Hypothesis Three**

\[ H_{03} \quad \text{There will be no significant interaction effects between SA, AP & Q/F prompts.} \]

In this study, I was interested in how the Social Attunement variable might interact principally with Authorial Presence to create interactive effects on Learning. The three-way MANOVA tested for all the possible main and interactive effects, by factoring in the effects of Social Attunement along with the AP and Q/F variables. The MANOVA Table 4.11 reveals that no significant interaction effects —whether involving SA or not— were observed for Learning or for perceptions of Social Presence. A significant main effect, however, is seen for Social Attunement itself on the dependent variable means.

<table>
<thead>
<tr>
<th>Learning Test</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
<td>.526</td>
<td>338</td>
<td>.599</td>
<td>.266</td>
<td>.505</td>
</tr>
<tr>
<td>Terminology</td>
<td>-1.674</td>
<td>338</td>
<td>.095</td>
<td>-.869</td>
<td>.519</td>
</tr>
<tr>
<td>Comprehension</td>
<td>-.865</td>
<td>338</td>
<td>.388</td>
<td>-.429</td>
<td>.497</td>
</tr>
<tr>
<td>Overall Learning</td>
<td>-.744</td>
<td>338</td>
<td>.458</td>
<td>-1.032</td>
<td>1.388</td>
</tr>
</tbody>
</table>

\[ p < .05 \]
Further analysis using ANOVA indicates the effect was on both the Learning \((F=21.477, p=.000)\) and the Social Presence variables \((F=6.770, p=.001)\).

Interaction Level was not included in this model due to a lack of data for conditions one and three which had no Q/F prompts. To test for the final possible interaction effect a separate two-way ANOVA testing the between-subject effects of Authorial Presence and Social Attunement on Interaction Level was performed. This analysis shows no main effect for AP*SA on Interaction Level \((F=.973, p=.443)\), but does show—as with Learning and Social Presence—a main effect for SA itself on Interaction Level.

Table 4.11

<table>
<thead>
<tr>
<th>Source</th>
<th>Pillai's Trace</th>
<th>F</th>
<th>df/Error</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q/F</td>
<td>.003</td>
<td>.293</td>
<td>3/326</td>
<td>.830</td>
<td>.003</td>
</tr>
<tr>
<td>AP</td>
<td>.102</td>
<td>12.313</td>
<td>3/326</td>
<td>.000</td>
<td>.102</td>
</tr>
<tr>
<td>SA</td>
<td>.148</td>
<td>8.714</td>
<td>6/654</td>
<td>.000</td>
<td>.074</td>
</tr>
<tr>
<td>Q/F*AP</td>
<td>.016</td>
<td>1.810</td>
<td>3/326</td>
<td>.145</td>
<td>.016</td>
</tr>
<tr>
<td>Q/F*SA</td>
<td>.009</td>
<td>.520</td>
<td>6/654</td>
<td>.793</td>
<td>.005</td>
</tr>
<tr>
<td>AP*SA</td>
<td>.018</td>
<td>.973</td>
<td>6/654</td>
<td>.443</td>
<td>.009</td>
</tr>
<tr>
<td>Q/F<em>AP</em>SA</td>
<td>.031</td>
<td>1.728</td>
<td>6/654</td>
<td>.112</td>
<td>.016</td>
</tr>
</tbody>
</table>

This analysis demonstrates that by factoring in the Social Attunement variable, the effects of AP on learning comprehension and Social Presence, and Interaction Level remain unchanged. Likewise, SA’s inclusion in the model did not influence the effects of Q/F prompts on Learning and Social Presence. Finally, the combined variables \((AP*Q/F*SA)\) created no significant three-way interaction effect.
Thus, with regard to interaction effects, we retain null hypothesis three, that no
significant interaction effects were observed among Social Attunement, Authorial
Presence, and Question & Feedback prompts on the dependent variables.

**Test of Null Hypothesis Four**

$H_04$ There will be no significant relationships among Learning, SP, IL, and secondary
study variables.

Another aim of the study was to explore the relationships among the primary and
some secondary study variables. It is worth reiterating that correlation analysis does not
establish a cause-effect relationship between related variables. I describe correlation
coefficients between -.20 and +.20 as weak, between .20 and .50 (positive or negative) as
moderate and above .50 (positive or negative) as strong (Urdan, 2001).

Two-tailed Pearson biserial correlations were calculated between the three
primary dependent variables: Learning (comprehension), perceptions of Social Presence,
and Interaction Level. Correlations were also calculated for exploratory purposes
between these measures and four additional questionnaire item addressing, participant
self-reports of 1) interest in lesson material, 2) lesson difficulty, 3) desire for similar style
instruction in the future, and 4) effort exerted to do well in the lesson.

In Table 4.12, we see the results of the correlation analysis which show moderate
and significant positive relationships between the Learning and Social Presence ($r=.297,$
$p<.01$), and Learning and Interaction Level ($r=.398,$ $p<.01$). Social Presence and
Interaction Level show a low, but also statistically significant positive correlation
(r=.182, p<.05). Consistent with earlier analyses, the Social Attunement correlates with the dependent variables here as well, but most strongly with Learning (r=.366, p<.01).

Table 4.12

*Pearson Correlations (N=340)*

<table>
<thead>
<tr>
<th></th>
<th>Difficult</th>
<th>Interesting</th>
<th>Want More</th>
<th>Tried Hard</th>
<th>SA</th>
<th>Learning</th>
<th>SP</th>
<th>IL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficult</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interesting</td>
<td>-.312(**)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Want More</td>
<td>-.248(**)</td>
<td>.568(**)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tried Hard</td>
<td>-.040</td>
<td>.373(**)</td>
<td>.267(**)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Attunement</td>
<td>-.194(**)</td>
<td>.169(**)</td>
<td>.134(*)</td>
<td>.221(**)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning</td>
<td>-.357(**)</td>
<td>.455(**)</td>
<td>.293(**)</td>
<td>.440(**)</td>
<td>.366(**)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Presence</td>
<td>-.154(**)</td>
<td>.503(**)</td>
<td>.628(**)</td>
<td>.296(**)</td>
<td>.216(**)</td>
<td>.297(**)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Interaction Level</td>
<td>-.164(*)</td>
<td>.150</td>
<td>.108</td>
<td>.288(**)</td>
<td>.280(**)</td>
<td>.398(**)</td>
<td>.182(*)</td>
<td>1</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

The additional data included in the correlation tables (see Table 4.12) include some observations which may aid in interpreting the results. There are a few observations here worthy of note. The item with the strongest positive relationship to Learning across all conditions was “interest” (r=.455, p<.01). This is followed by “tried hard” (r=.440, p<.01)—meaning participants who reported trying hard, also did well on the learning measure. Participants who found the lesson to be difficult show a moderate but negative correlation with Learning (r=-.357, p<.01) and found the lesson less interesting (r=-.312, p<.01). As presented above, the variable most highly correlated with Interaction Level, was Learning (r=.398, p<.01)—showing a moderate positive relationship. Interest in the lesson material was strongly related to perceptions of Social Presence (r=.503, p<.01), but the variable most strongly related to Social Presence, was
the participant’s desire for more (want more) lessons written in the style they received 
\( r = .628, p < .01 \). This was also the strongest relationship observed among the data 
variables.

Thus, null hypothesis four is predictably rejected as numerous statistically 
significant and interesting correlations were found amongst the primary and secondary 
study variables.

Upon viewing the results of the correlation analysis, I felt an additional analysis 
was warranted. Observing the moderate correlation between Learning and “Tried Hard”, 
and the negligible main effects of Authorial Presence and Questions & Feedback prompts 
on Learning—even when factoring in the influence of Social Attunement—I suspected 
that participant effort (tried hard) might be an important variable to control for. Even 
prior to conducting the study, I was concerned about how much real effort students might 
put into a challenging, hour-long lesson on a topic that was unrelated to their course 
work…and for which there was little incentive or compensation offered. Anticipating 
this potential problem, I included a question about the relative effort participants’ put into 
doing well on the lesson.

In response to the statement “I tried hard to do well in this lesson”, participants 
rated their agreement from “strongly disagree” (0), through “neither agree nor disagree” 
(4), to “strongly agree” (7). After eliminating from the analysis all participant cases with 
an “effort” score below four (0-3), I performed the same 3-way MANOVA, and observed 
no significant changes in the results. Likewise, for the Interaction Level variable, after 
eliminating the low effort participant cases, no significant changes were observed. These
analyses suggest that self-reported high effort (Tried Hard) did not play a significant role in the observed outcomes.

**Tests for Indirect Effects**

Results showed an indirect causal path (and correlation) from Authorial Presence to Social Presence, and a significant moderate correlation between Social Presence and Learning. Yet, we observed no direct path between Authorial Presence and Learning. In other words, A caused B, and B was significantly correlated with C, but there was no direct link between A and C. Following the hypothesized model of this study, an additional post hoc analysis looked at Social Presence and Interaction Level as a possible mediators between SRRs (Authorial Presence) and Learning.

Methodologically, since Baron and Kenney’s (1986) test for mediation assumes an initial total effect between A and C (Authorial Presence and Learning) which did not exist, I used the Sobel test which specifically tests for indirect effects, rather than simple mediation (Sobel, 1982). To test for indirect effects (vs. mediation), the presence of a total effect is not required (Preacher & Hayes, 2004).

The analysis results for indirect effects showed that the model was significant. \( F (3, 160) = 17.93, p=.000 \), indicating that in the presence of Authorial Presence, SP and IL were significant predictors of Learning. Figure 4.4 shows the path values for each stage of the model. First, we should note that no significant direct effect is observed from Authorial Presence to Learning (\( \beta=-.141, t=-2.122, p=.841 \)). Significant path values are
observed from AP to SP (β=9.385, t=3.530, p<.000), and from SP to Learning (β=.076, t=4.243, p<.000).

With regard to Interaction Level, the path from AP to IL was all but significant at the .05 level (β=.878, t=1.946, p=.053), and was significant from IL to Learning (β=.560, t=5.276, p<.000).

**Summary**

There were two manipulated variables investigated in this study: AP and Q/F. Analyses were conducted to see if the presence, absence or interaction of these variables lead to different learning comprehension scores. A third moderator variable, Social Attunement, was also included in the analysis model as it was predicted to influence the effects of Authorial Presence for some learners. The SA variable was not part of the main experimental manipulations, but was rather an existing learner trait or
predisposition. Based on the methods employed, the data gathered, and the analyses performed, the results for the four null hypotheses are presented below:

For undergraduate students in a self-directed learning setting:

H₀₁ There will be no significant main effect for Authorial Presence (AP) on measures of Learning, perceptions of Social Presence, and Interaction Level.

Result: H₀₁ is retained for both the Learning and Interaction Level (IL) variables, but is rejected for the perceptions of Social Presence (SP) variable.

H₀₂ There will be no significant main effect for Questions & Feedback prompts (Q/F) on measures of Learning and perceptions of Social Presence.

Result: H₀₂ is retained for both dependent variables (Learning and perceptions of Social Presence).

H₀₃ There will be no significant interaction effects among SA, AP & Q/F prompts.

Result: H₀₃ is retained for all dependent variables.

H₀₄ There will be no significant relationships among Learning, SP, IL, and secondary study variables.

Results: H₀₄ is rejected. Numerous significant and interesting correlations exist among the primary and secondary variables.

Testing for Mediation and Indirect Effects.
Results: Authorial Presence was a statistically significant but indirect predictor of Learning through Social Presence and Interaction Level.

These results will be discussed in more detail in the following chapter.
Chapter 5

Discussions and Conclusions

In this chapter I provide a brief review of the purpose of the study as well as a discussion that relates this study’s finding to the literature reviewed. Following my conclusions, I explore the limitations of this study and present recommendations for future research.

Review of Purpose for Study

Generally speaking, the purpose of this dissertation study was to extend existing research on the role of Socially Relevant Representations in online learning. Authorial Presence, the SRR of particular interest, was operationalized in this study by embedding a collection of socially relevant cues or properties into an online text. These cues served to draw attention to the author and to directly address the reader in a conversational and personable tone. A fictional pictographic representation of the author was also included in conditions with AP. Question & Feedback prompts were added in an effort to strengthen the effects of AP and to create an objective means of observing interaction. Furthermore, I investigated whether learners’ Social Attunement to the embedded social cues acted to moderate any observed AP effects.

Another purpose of this study was to inform researchers and designers of online learning experiences of the role of Authorial Presence, Questions & Feedback prompts,
and Social Attunement in self-directed learning contexts. To this end, in the Spring of 2007, 340 undergraduate university students were drawn from a variety of classes and disciplines on campus to participate in the study. Participants were randomly assigned to one of four lessons exhibiting different levels of Authorial Presence and Question & Feedback prompts. After collecting the data, a number of statistical tests were performed including multivariate analysis of variance, analysis of variance, and t-tests in order to help answer the following four research questions:

For undergraduate students in a self-directed online learning setting:

RQ 1: What effect does Authorial Presence (Low and High) have on Learning, perceptions of Social Presence, and Interaction Level?

RQ 2: What effect do Question and Feedback prompts (Prompts and No Prompts) have on Learning and perceptions of Social Presence?

RQ 3: How might Social Attunement moderate the effects of Authorial Presence?

RQ 4: What relationships exist among the primary and secondary dependent variables?

The following outline represents an alternative and summarized view of the research questions and the associated arguments in this study:

1. Underlying theory a) From a socio-communicative perspective, learning occurs best when students interpret an educational experience as communicative rather than transmissive.

2. Underlying theory b) Learners’ differing sensitivity to and employment of socially relevant information (such as Authorial Presence) may lead to observable differences in learning outcomes.
3. Assumption: In order for a learner to engage communicatively with an “other,” the learner must first perceive that other’s presence.

4. Problem: During self-directed learning activities, the absence of apparent dialogue partners (instructors, facilitators, peer-learners) may lead students to interpret the educational experience as transmissive rather than communicative, thereby impeding learning.

5. Solution: By imbuing an online text with specific social cues (Authorial Presence) and engagement prompts (Questions & Feedback) this study aimed to cue perceptions of an available interlocutor (the author) with whom students could engage.

6. Rationale: By cueing Authorial Presence, I hypothesized that:
   a. Students would indeed perceive a supportive other—presumably the author (tested by SP measure).
   b. Students would consequently be more inclined to interpret the experience as communicative and be drawn into more dialogic interactions with the lesson author (tested by IL measure).
   c. Students would subsequently comprehend the material better (tested by Learning measure).
   d. Students’ varying sensitivity and orientation to Authorial Presence would affect outcomes such that high SA students would benefit from AP, and low SA students would be unaffected (tested by interactions with Social Attunement measure).
Discussion of the Findings

In this study, I predicted that SRRs might influence learning by cueing greater interaction. Overall, the key predictions presented in the study were not supported by the data analysis results. Specifically, no significant effects on Learning were observed across all four treatment conditions. Though no gains in learning were achieved, the treatments did also not impede learning. I list the major findings of the study below and then address each in further detail in the context of the research questions.

1. AP increased perceptions of SP.
2. AP had no direct effect on Learning
3. AP approached significance effects on IL
4. Q/F prompts had no effect on Learning or on SP
5. SA had main effects on Learning, on SP, and on IL.
6. No interaction effects were seen among the variables
7. Learning was positively and moderately correlated with lesson interest and SP.
8. SP was positively correlated with lesson interest and desire for similarly styled instruction.
9. AP had an indirect effect on Learning through SP and IL.

Effects of Authorial Presence

As presented in the literature, Authorial Presence, as a Socially Relevant Representation, was predicted to cue perceptions of Social Presence in learners. Results
of the data analysis support this prediction. Participants in conditions with Authorial Presence scored significantly higher on measures of Social Presence than did those in conditions without the Authorial Presence manipulation. This finding shows that the Authorial Presence manipulations were perceived by participants and that these manipulations had the desired effect of making the author a more visible, socially present, and supportive agent in the text.

The next major finding related to AP, however, did not turn out entirely as predicted. AP was shown to have no statistically significant direct effects on Learning, but approached having a significant effect on Interaction Level. Consistent with some of the personalization findings and social agency theory of Mayer and his colleagues (Mayer, 2005; Mayer et al., 2004), Authorial Presence did not affect lower-order learning (retention and factual recall). Contrary to their findings and those of Beck et al. (1995), however, Authorial Presence also had no direct effect on the higher-order learning (comprehension) for which I tested. This study was specifically designed to contribute to the literature by reporting the effects of AP on different learning outcomes and types of knowledge identified in Anderson and Krathwohl's revised taxonomy (2001). The results, unfortunately shed little new light on how certain socially relevant representations affect comprehension differently than simple recall, but do suggest that influencing higher-order learning with Authorial Presence strategies is also not as straightforward as some research suggests. The test for indirect effects seemed to indicate that any effects of AP on Learning would be realized through increased perceptions of Social Presence and Interaction Level. This notion is supported by the research in the field. Tu and McIsaac (2002), Paxton (2002) and Nolen (1995), for example, observed how students
tended to become more involved with texts with Authorial Presence, and increased their
dialogic thought and interactions.

Since response frequency alone was unexpectedly high across all conditions, I
chose to perform the additional text analysis in order to increase the discerning power of
the IL measure. The updated measure combined the dialogic-ness of the response with
the response frequency and indicated that when opportunities were provided for learners
to interact with the author (participants in Q/F conditions), the effect of Authorial
Presence came close to making a difference in the dialogic nature of participant
interactions. This finding vis-à-vis the near effect of AP on IL should be further
investigated, because the Interaction Level measure was simply an observable proxy for
other forms of presumably more covert interaction that may be taking place. If the
mechanism by which AP affects learning is dialogic engagement as I hypothesized it
might be, it is possible that the reason we see no effect on learning in this study is
because participants didn’t achieve and the study design failed to measure whatever
critical level or type of interaction is needed to affect learning.

Thus, while Authorial Presence succeeded in making the author a more visible
and salient agent to study participants (perceptions of SP), this phenomenon did not
translate clearly into increased interaction with the author (IL). Since these two variables
themselves were not strong predictors of Learning, it is likely that still other variables are
involved that were not a part of this study. These findings should cause researchers to
more carefully evaluate the assertion of some (Mayer, Sobko et al., 2003), that the
communicative rather than transmissive interpretation of a learning event triggered by AP
does not itself lead to increased learning. More likely, Social Presence acts as a
moderating variable, strengthening the learning effects of communicative processes when they are adequately cued.

**Effects of Question and Feedback Prompts**

Question and Feedback prompts were included in this study for two main reasons. First, by asking questions and providing a means for learners to respond, I was able to externally observe otherwise internal processes. Through analyzing learners’ responses, I was better positioned to see if interaction was the underlying mechanism for any observed effects on learning. Second, by separating Q/F prompts as a unique variable from AP, I was able to a) strengthen the AP variable (text+Q/F) and b) better account for any added effect of interactivity or learner-content interaction that was independent of the AP variable (text+Q/F vs. text+AP+Q/F). In other words, the literature suggests that the presence of questions and feedback—even “canned” feedback—in an online text might alone project enough Authorial Presence to cue a perceived “other” in the text, but the same question prompts are a confound in that they also solicit interaction (Beck et al., 1995; Eggins & Slade, 1997).

Analysis of the Social Presence and Learning measures, however, revealed insignificant differences in group means between groups with Q/F prompts and those without. This indicates that though I had predicted that Q/F prompts might affect Learning by increasing interaction, they did not. Likewise, I had predicted that Q/F prompts alone might influence Social Presence, but again they did not. I had predicted that Q/F prompts situated in an environment with high Authorial Presence (AP*Q/F)
might cue a perception of a salient and supportive author and elicit increased interaction and greater learning from participants. It did not. In fact, even the multiple-choice type questions on factual and concept types of knowledge tested by the Identification and Terminology subtests failed to improve lower-order learning scores (see Table 4.10).

Based on the literature, there was ample evidence to suggest that prompting learners through questions to think and write about the topic more deeply should positively influence comprehension (Beck & McKeown, 2001; Grabowski, 2004; Hausmann & Chi, 2002), and Social Presence (Gorham, 1988). So, given the data analysis outcomes, what went wrong? Again, the literature may provide some answers.

The bulk of questions employed in the lesson were true/false and multiple choice questions. Only three open-ended questions solicited any sort of dialogic response from study participants. This stands in contrast to the recommendations of Newell and Winograd (1989) who found responding to essay-type questions to be more effective for learning than questions requiring only short or restricted answers. Similarly, Beck and McKeown (1996) advise that good questions avoid narrow, recall type of responses. Hausmann and Chi (2002) further recommend that learners be prompted frequently to explain their understanding. In this study, learners may simply have had too few prompts and opportunities to engage with the author or materials at a higher-order level.

Thus, contrary to predictions, Question & Feedback prompts—in the form of numerous multiple choice, and three open-ended questions—did not add significantly to the Social Presence felt by students, nor to their higher- or lower-order Learning in this self-directed learning context.
Role of Social Attunement

Social Attunement was included in this study as an individual difference variable for exploratory purposes. Some research reviewed (Hoadley, 1999; Davis et al., 2006) suggested that individuals are varyingly sensitive to socially relevant information in learning situations. I predicted that SA might act to moderate the effects of AP on the dependent variables such that students more socially attuned might benefit from high Authorial Presence, and students less socially attuned would remain unaffected. Conversely, I predicted that students more socially attuned might be disadvantaged by low Authorial Presence conditions, and that students less socially attuned would again remain unaffected.

For the purposes of this study, individuals who: 1) reported that they would more likely seek a social resource (ask a friend) about a question before looking it up (in a book or on the web), 2) attributed utterances to their proper source, and 3) correctly registered the gender of a given story character, were considered socially attuned. Statistically speaking, the analyses showed that SA had a highly significant main effect on all three dependent variables. That is to say that a participant’s Social Attunement score was a statistically significant predictor of their Learning score, their Social Presence score, and their Interaction Level score.

When analyzed, however, with Authorial Presence and Interaction Level in multiple ways, no interaction or moderator effects were observed on Learning, on perceptions of Social Presence, or on Interaction Level. This lack of Social Attunement moderating effects was generally not as predicted.
It should also be kept in mind that the Social Attunement instrument had a low internal reliability coefficient, and was not a fully validated instrument. This may offer a partial explanation of the unexpected outcomes. As a construct, and measurement instrument, SA needs greater definition. For example, my biggest concern with the SA instrument, was that it may in fact be as much a measure of recall (memory) as it is a measure of orientation to socially relevant details. It proved challenging to control for overall memory effects—i.e. Participants who simply had great memory for the content and socially relevant details. While the SA instrument may lack content validity, it is also plausible that it indeed has content and construct validity, but that the study results simply point to other—unmeasured, but more important—main or moderating factors that influence learning in self-directed settings. Either way, the effects of SA discussed should be interpreted with caution.

Figures 5.1 and 5.2 summarize the predicted and actual outcomes observed in the study.

*Figure 5.1* Model describing the predicted causal pathways for AP effects on Learning
Actual outcomes did not support the hypothesized pathways to learning predicted at the outset of the study. Authorial Presence strongly affected perceptions of Social Presence, and suggested a possible influence on dialogic interaction (see Figure 5.2).

**Figure 5.2** Study outcomes supporting an indirect AP effect on Learning through SP and IL.

**Relationships Among the Variables**

The analyses also revealed some interesting relationships among the primary and secondary variables in the study. With regard to Learning, those who performed well on the combine learning measures tests generally:

- Found the lesson materials more interesting
- Tried harder to do well on the lesson
- Interacted more dialogically
- Felt the author’s presence more strongly
- Wished “more authors wrote in this style.”
• Were more socially attuned

Those who found the materials interesting showed the highest levels of Learning which parallels findings by Alexander, Jetton & Kulikowich (1995) who observed that students performed better on courses in their field of study or interest. We might surmise from this that learners who opt to take online courses or enjoy the subject matter, could be better candidates for the influences of Authorial Presence—since we would be fighting less indifference than may have been observed in this study.

None of these relationships with learning, however, were directly influenced by the Authorial Presence manipulation. As in much of the literature, here too we see a relationship between social presence and learning (Richardson & Swan, 2003; Shin, 2003; Tu & McIsaac, 2002). However, while Authorial Presence was such a strong predictor of perceptions of Social Presence, there was still no direct causal link between Authorial Presence and Learning—a finding corroborated by Wise et al. (2004). Much of the literature available on social presence reflects online learning contexts with available peers and instructors. These contexts are markedly different than the context I investigated in this study. Nevertheless, despite the many correlational findings related to SP and Learning seen here and in the literature, I provided some evidence of other intermediary factors such as perceptions of SP that may be involved in the causal chain between Authorial Presence and Learning.

The correlation analyses point to another interesting finding with regard to perceptions of Social Presence. Participants who felt the author’s presence more strongly:

1. Performed better on learning tests
2. Found the lesson more interesting
3. Tried harder to do well.
4. Wished “more authors wrote in this style.”

The last point was the strongest relationship observed across all variables. Though participant responses referred to the particular treatment condition they were in, the data showed that high AP had the strongest effect on perceptions of SP. Thus, the observed strong positive relationship between SP and “want more” indicates that participants in high AP conditions wished that more authors wrote with Authorial Presence than did participants in non-AP treatment conditions. There is still ample ambiguity in the question item and the finding should certainly not send designers or instructors scurrying ;-) to rewrite all their materials to include Authorial Presence features, but it is significant that, participants did seem to prefer the Authorial Presence versions and found them more interesting. While these findings will require further exploration, they should not be too quickly discounted. For students engaged in programs of self-directed online learning, including distance learning programs and individual software-based training, satisfaction with one’s selected course of study can be important (Phipps & Merisotis, 1999). Ultimately, learning is impeded if students drop out of a course of study due to disinterest or dissatisfaction with the material’s presentation format or communication style.

With regard to variables related to Interaction Level, Learning held the strongest relationship. Yet in an interesting and unexpected outcome, the very question prompts and instructor feedback messages that enabled participant interactions (Q/F), were not causally linked to increased learning. In other words, the dialogic interactions captured
by the IL variable and related to learning were not necessarily caused or triggered by the question and feedback prompts. This could suggest that interaction level is still important to higher-order learning, but that the right type(s) was not elicited by the questions and “canned” feedback messages employed in the study.

Conclusions

The results of this study involving a one hour online lesson, indicate that Authorial Presence did not directly affect Learning but did lead to greater perceptions of Social Presence and suggested a possible effect on Interaction Level. However, a test for simple indirect effects suggested Authorial Presence indirectly influenced Learning through perceptions of Social Presence and Interaction Level but that these constructs—especially Social Presence—may be more significant predictors of Learning than Authorial Presence.

These results seem to support the Social Agency Theory model and the Personalization Principle reviewed in the literature (Mayer, 2005; Mayer, Sobko et al., 2003) insofar as those theories imply an indirect path to improved learning. That is to say that Authorial Presence may indeed help trigger perceptions of Social Presence and a communicative interpretation of a given learning episode, but that alone, such perceptions and interpretations to do not automatically lead to improved learning. They may in fact act as significant moderators of other more important factors that predict learning that were not addressed in this study. It should be noted, however, that while Mayer’s “transfer” and this study’s “comprehension” learning measures are both
indicative of higher-order learning and deeper cognitive processing, it might be argued that they are sufficiently different to render direct comparison inappropriate—with transfer perhaps reflecting slightly higher cognitive skills than comprehension. Nevertheless, comprehension is a worthy and desirable learning outcome that may have also been influenced by a host of other factors in this experiment.

Such factors might include presentation format and content domain. The lack of significant differences observed between the Learning means may be indicative of the power of presentation approach. By this, I mean that an information-heavy online lesson in a well-established content domain (physiology) may override instructional strategies designed to engender dialog and social interaction. The many established facts and processes presented about the heart and its functions, along with the in-line multiple choice quizzes, may have oriented learners toward simply remembering the information rather than thinking more critically about it. In retrospect, very little of the educational research reviewed in this study reported taking into account the subject matter or content domain. This is, of course, a variable that should be further explored, but if content domain truly does have an effect, it is suggested that designers consider more carefully the types of learning activities and objectives appropriate for the type of content.

My own professional experience in online course development suggests that social and collaborative learning activities increasingly receive a great deal of attention in online learning settings—rightly so for many instructional objectives. However, their recommended use across the board may not be supported by the findings of this study. What these findings suggest is that in a lesson that devotes much attention to information presentation, learners may be cued to adopt an “information transfer” interpretation of the
event, despite efforts to cue a communicative interpretation. Attempts to engage the learners, or to have them reflect on the content, may be overridden by the nature of the content. Again, this may point to the importance of more closely evaluating one’s instructional design strategies when more than recall or simple remembering is desired for the learning outcome. If higher cognitive skills and learning outcomes are desired, we may need to be cautious in flooding learners with information, regardless of its nature.

If student satisfaction is a desired outcome, increased Authorial Presence may be a worthy pursuit. As a Socially Relevant Representation, Authorial Presence effectively increased student perceptions of Social Presence which was also highly correlated with issues of student satisfaction (i.e. students found the online lesson interesting, and wished more authors wrote in a warm and conversational way). For such outcomes, employing this Socially Relevant Representation could prove to be advantageous. As I argued elsewhere, non-learning outcomes such as increased Social Presence should not be too quickly brushed aside, as their indirect effects on learning were shown to be significant in this study, and could be the focus of future research.

**Limitations**

In this section, I address some additional limitations and issues beyond the scope of the study which may help account for the study findings. The poor overall performance observed on the Identification and Terminology test scores might explain why Authorial Presence had no significant effect on learner comprehension.
Since the learning materials presented knowledge in a hierarchical fashion, the low scores on the Identification and Terminology tests (around 50 percent) suggest that the students did not possess enough pre-requisite knowledge to achieve high Comprehension test scores. A strong grasp of the parts of the human heart and other related concepts in parts one and two of the lesson, is essential to performing well on the subsequent comprehension test. In other words, for AP to have a fair chance at influencing higher-order learning, students have to better master the requisite lower-order terms and concepts. A quick analysis after removing the lowest scoring students, still rendered no significant changes in the results.

Another limitation that could possibly explain low learning comprehension scores, is the topic or subject matter selected for the instructional materials in this study. As was discussed in Chapter two, different domains have both varying expectations and epistemic views of the world and knowledge (Hyland, 2001b). Without delving into the debate again in this final chapter, it suffices to say that the physical and natural sciences, generally speaking, leave less to interpretation and negotiation than do the social sciences and humanities. With respect to the instructional topic selected for this research, “the functioning of the human heart”, a healthy human heart functions in a known and predictable way. Such well-established, physiological processes, for example, are not very open for debate, opinion, or social negotiation—and they are certainly not at the Physiology 100 level of complexity addressed in this study. This type of lesson material does not necessarily invite one to weigh in and engage an author in a reflective dialog.

This stands in contrast to subjects in the social sciences, arts or humanities like History, Literature, and Education. Here, ideas are regularly bantered about, debated, and
shored up with argument and reason. “Hard evidence” in these domains is scarce and
tenuous at best, and Knowledge in the domain is socially-constructed through dialogue
and communication. Topics in the social sciences incite dialogue—at least for those
willing to join in the fray. Perhaps this study would have been able to evoke more
response from participants if the subject matter came from a more discourse-centric field.

I briefly elaborate here on one final limitation introduced in an earlier section with
regard to the number and type of question prompts employed in the study. A “Question
the Author” scenario was never really achieved. That is, neither the type nor number of
question prompts devised—nor the subject matter—helped depose the author as the all-
knowing expert thereby inviting dialogic interaction (Beck et al., 1996). The sheer
number of multiple choice questions may have been intimidating. The self-check
(practice and review) questions embedded in the lesson, together with the 20 multiple-
choice test questions following each lesson part, may have acted to psychologically
“burnish” in students' minds that this was all about remembering facts about the heart
(Paxton, 1997 p.246). It is perhaps no surprise that many students—particularly those
engaging in a lengthy research study for extra credit—were not motivated to engage
dialogically with a perceived author on a non-negotiable topic.

**Recommendations for Future Research**

A number of recommendations for future work have already been alluded to in
the discussion of the findings and the study limitations. To summarize, future research
related to the influence of SRRs on learning might:
1. Delve further into the types and nature of interactions cued by SRRs.

2. Compare the effects of SRRs on different content domains, specifically selecting a domain more reliant on reason, argument, and dialogue (i.e. History, Literature).

3. Devise a more discriminating Social Attunement instrument with greater content, criterion, and construct validity.

**Summary**

The purpose of this study was to investigate the effects of Authorial Presence and Question & Feedback prompts on Learning, perceptions of Social Presence, and Interaction Level. This study also aimed to assess for any moderating effects caused by Social Attunement. Neither Authorial Presence nor Question & Feedback prompts resulted in significant differences in higher- or lower-order learning means. Social Presence, however, did emerge as a predictor of Learning, and was significantly influenced by Authorial Presence. Study participants’ relative Social Attunement did not appear to moderate the influence of Authorial Presence and Question & Feedback prompts on Learning.

The data suggest that for students engaged in self-directed online learning with no available peers or instructor with whom to communicate, lesson materials imbued with Socially Relevant Representations such as Authorial Presence, along with Question & Feedback prompts, were not enough to directly improve learning over lesson materials.
lacking such features. Moreover, the individual difference factor of Social Attunement failed in large measure to moderate the observed outcomes.

In the introduction to this document, I described an author’s guide that instructed online course authors to create a “warm and friendly tone” in their online learning materials. I wondered about what effect(s) this would ultimately have on learners. Based on the results of this study, I would conclude that it would have very little to do with learning directly, but that the resultant increase in perceptions of Social Presence could prove beneficial to learning in a number of ways. This study stopped short of addressing the ramifications of increased Authorial Presence in broader educational endeavors, but it is an area that merits further research especially in settings where author presence is traditionally limited.
Bibliography


Appendix A

Informed Consent Form

INFORMED CONSENT FORM FOR SOCIAL SCIENCE RESEARCH

The Pennsylvania State University

ORP USE ONLY: # 19749  Doc.#1
The Pennsylvania State University
Office for Research Protections
Approval Date: 10/12/06 T. Kahler
Expiration Date: 10/11/07 T. Kahler
Social Science Institutional Review Board


Principal Investigators: Researcher: Joel Galbraith, 314 Keller Bldg. University Park, PA 16802 (xxx) xxx-xxxx; xxxxxxx@psu.edu

Faculty Advisor: Dr. Christopher Hoadley. 314 Keller Bldg. University Park, PA 16802 (xxx) xxx-xxxx; xxxxxxx@psu.edu

1. The purpose of this study is to examine how different types of instructional variables help students learn from instruction.

2. This study requires your participation in a computer lab. You will sign this consent form and then will interact with a web based instructional unit on the parts and function of the human heart. During this task, you will be asked to complete 3 quizzes and one questionnaire to assess your learning and attitudes about the activity.
3. There are no known psychological, personal, or academic risks associated with this study.

4. Benefits: A greater understanding of the human heart and how it functions.

5. Compensation: Participants who complete the study will receive extra credit of points as per your instructor. In addition, every participant will be entered in a drawing* for an iPod nano. If you do not wish to participate in this study, you may still earn the extra credit points by reading and summarizing 2 current articles on the topic related to the course content identified by your instructor. Total payments within one calendar year that exceed $600 will require the University to annually report these payments to the IRS. This may require you to claim the compensation that you receive for participation in this study as taxable income.

6. Duration/Time: About 1 hour (60 minutes).

7. Statement of Confidentiality: Your information and responses will be confidential and will therefore not be associated with your name or other identifiers. The following may review and copy records related to this research: The Office of Human Research Protections in the U.S. Dept. of Health and Human Services; The Penn State University Social Science Institutional Review Board (IRB); the Penn State University Office for Research Protections (ORP).

8. You have the right to ask questions and have those questions answered. All questions should be directed to the researcher, Joel Galbraith, (814) xxx-xxxx; xxxxxxx@psu.edu

9. Your participation is voluntary. You are free to stop the study at any time. You can choose not answer questions without penalty.
You must be 18 years of age or older to consent to participate in this research study. If you consent to participate in this research study and to the terms above, please sign your name and indicate the date below.

You can contact the Office for Research Protections, (814) 865-1775 or ORProtections@psu.edu, for answers to questions about your rights as a research participant. You will be given a copy of this consent form to keep for your records.

*Drawing winner (for iPod nano) will be notified December 5th by email.

______________________________________  _____________________
Participant Signature     Date

I, the undersigned, verify that the above informed consent procedure has been followed.

______________________________________  _____________________
Investigator Signature     Date
Appendix B

Heart Content Learning Measures

IDENTIFICATION TEST

Directions: Select the answer you feel best identifies the part of the heart indicated by the numbered arrows and mark the corresponding answer.

_______21. Arrow number one (1) points to the
A. Septum
B. Aorta
C. Pulmonary Artery
D. Pulmonary Vein
E. None of These

_______22. Arrow number two (2) points to the
A. Superior Vena Cava
B. Inferior Vena Cava
C. Pulmonary Artery
D. Tricuspid Valve
E. Aorta

_______23. Arrow number three (3) points to the
A. Right Ventricle
B. Right Auricle
C. Left Ventricle
D. Left Auricle
E. Heart Muscle

_______24. Arrow number four (4) points to the
A. Pulmonary Valve
B. Pulmonary Vein
C. Aortic Valve
D. Tricuspid Valve
E. Mitral Valve

_______25. Arrow number five (5) points to the
A. Aorta
B. Pulmonary Artery
C. Superior Vena Cava
D. Inferior Vena Cava
E. Pulmonary Vein

_______26. Arrow number six (6) points to the
A. Aortic Valve
B. Pulmonary Valve
C. Mitral Valve
D. Tricuspid Valve
E. Semi-Lunar Valve
27. Arrow number seven (7) points to the
A. Left Ventricle
B. Right Ventricle
C. Right Auricle
D. Left Auricle
E. Vascular Space

28. Arrow number eight (8) points to the
A. Myocardium
B. Ectoderm
C. Pericardium
D. Endocardium
E. Epicardium

29. Arrow number nine (9) points to the
A. Endocardium
B. Myocardium
C. Pericardium
D. Ectoderm
E. Septum

30. Arrow number ten (10) points to the
A. Endocardium
B. Pericardium
C. Septum
D. Myocardium
E. Aortic Base

31. Arrow number eleven (11) points to the
A. Epicardium
B. Pericardium
C. Endocardium
D. Myocardium
E. None of These

32. Arrow number twelve (12) points to the
A. Pericardium
B. Myocardium
C. Endocardium
D. Endoderm
E. Apex

33. Arrow number thirteen (13) points to the
A. Pericardium
B. Endocardium
C. Ectocardium
D. Endoderm
E. Myocardium

34. Arrow number fourteen (14) points to the
A. Right Ventricle
B. Left Ventricle
C. Left Auricle
D. Right Auricle
E. Apex

35. Arrow number fifteen (15) points to the
A. Pulmonary Veins
B. Tendons
C. Aortas
D. Pericardium
E. None of These

36. Arrow number sixteen (16) points to the
A. Venic Valve
B. Pulmonary Valve
C. Tricuspid Valve
D. Mitral Valve
E. Aortic Valve

37. Arrow number seventeen (17) points to the
A. Superior Vena Cava
B. Tricuspid Valve
C. Aortic Valve
D. Pulmonary Valve
E. Mitral Valve

38. Arrow number eighteen (18) points to the
A. Right Auricle
B. Right Ventricle
C. Left Auricle
D. Left Ventricle
E. Semi-lunar Chamber

39. Arrow number nineteen (19) points to the
A. Inferior Vena Cava
B. Superior Vena Cava
C. Aortas
D. Pulmonary Veins
E. Pulmonary Arteries

40. Arrow number twenty (20) points to

A. Inferior Vena Cava
B. Aorta
C. Pulmonary Artery
D. Septum
E. Superior Vena Cava

TERMINOLOGY TEST

Directions: Select the answer you feel best completes the sentence and mark the corresponding circle. When finished with this page, first click "Print this Page" and then "Next" to go on to the next part of the test.

41. _____ is(are) the thickest walled chamber(s) of the heart.
A. Auricles
B. Myocardium
C. Ventricles
D. Pericardium
E. Endocardium

42. The contraction of the heart occurs during the _____ phase.
A. Systolic
B. Sympathetic
C. Diastolic
D. Parasympathetic
E. Sympatric

43. Lowest blood pressure in the arteries occurs during the _____ phase.
A. Sympatric
B. Sympathetic
C. Diastolic
D. Systolic
E. Parasympathetic

44. Blood from the right ventricle goes to the lungs through the _____.
A. Tricuspid Valve
B. Aortic Artery
C. Pulmonary Artery
D. Pulmonary Veins
E. Superior Vena Cava

45. The _____ is(are) the strongest section(s) of the heart.
A. Left Ventricle
B. Aorta
C. Septum
D. Right Ventricle
E. Tendons

46. When blood returns to the heart from the lungs, it enters the _____.
A. Left Auricle
B. Pulmonary Valve
C. Left Ventricle
D. Right Ventricle
E. Pulmonary Artery

47. Vessels that allow the blood to flow from the heart are called the _____.
A. Veins
B. Arteries
C. Apex
D. Tendons
E. Valves

48. Blood passes from the left ventricle out the aortic valve to the _____.
A. Lungs
B. Body
C. Aorta
D. Pulmonary Artery
E. Left Auricle

49. The chamber of the heart which pumps oxygenated blood to all parts of the body is the _____.
A. Right Auricle
B. Left Auricle
C. Aorta
D. Left Ventricle
E. Right Ventricle
50. The _____ is another name for the part of the heart called the heart muscle.
A. Apex
B. Epicardium
C. Endocardium
D. Myocardium
E. Septum

51. _____ is(are) the part(s) of the heart which controls its contraction and relaxation.
A. Myocardium
B. Endocardium
C. Ventricles
D. Auricles
E. Septum

52. The _____ is the name given to the inside lining of the heart wall.
A. Epicardium
B. Endocardium
C. Pericardium
D. Myocardium
E. Septum

53. Blood from the body enters the heart through the _____.
A. Aortic Artery
B. Pulmonary Veins
C. Pulmonary Artery
D. Superior and Inferior Vena Cavas
E. Superior Vena Cava Only

54. The membrane which borders on the inside lining of the pericardium and is connected to the heart muscle is called the _____.
A. Extotixim
B. Epicardium
C. Endocardium
D. Myocardium
E. Ectocardium

55. The _____ allow(s) blood to travel in one direction only.
A. Septum
B. Valves
C. Arteries
D. Veins
E. Tendons

56. The _____ is the common opening between the right auricle and the right ventricle.
A. Mitral Valve
B. Tricuspid Valve
C. Septic Valve
D. Pulmonary Valve
E. Aortic Valve

57. The _____ is the triangular flapped valve between the left auricle and the left ventricle.
A. Aortic Valve
B. Pulmonary Valve
C. Septic Valve
D. Tricuspid Valve
E. Mitral Valve

58. The semi-lunar valves are located at the entrance to the _____.
A. Pulmonary Veins
B. Superior and Inferior Vena Cavas
C. Pulmonary and Aortic Arteries
D. Mitral and Tricuspid Valves
E. Ventricles

59. The outside covering of the heart is called the _____.
A. Endocardium
B. Epicardium
C. Pericardium
D. Myocardium
E. None of These

60. Immediately before entering the aorta, blood must pass through the _____.
A. Left Ventricle
B. Mitral Valve
C. Lungs
D. Superior Vena Cava
E. Aortic Valve

COMPREHENSION TEST

Directions: Select the answer you feel best answers the question and mark the corresponding circle. When finished with this page, click “Print this Page”. Hand all printed answer sheets to your instructor.
61. Which valve is most like the tricuspid in function?
A. Pulmonary
B. Aortic
C. Mitral
D. Superior Vena Cava

62. When blood is being forced out the right ventricle, in which position is the tricuspid valve?
A. Beginning to open
B. Beginning to close
C. Open
D. Closed

63. When the blood is being forced out the aorta, it is also being forced out of the.
A. Pulmonary Veins
B. Pulmonary Arteries
C. Superior Vena Cava
D. Cardiac Artery

64. The contraction impulse in the heart starts in
A. The Right Auricle
B. Both ventricles simultaneously
C. Both Auricles Simultaneously
D. The Arteries

65. In the diastolic phase the ventricles are
A. Contracting, full of blood
B. Contracting, partially full of blood
C. Relaxing, full of blood
D. Relaxing, partially full of blood

66. During the first contraction of the systolic phase, in what position will the mitral valve be?
A. Begging to open
B. Open
C. Beginning to close
D. Closed

67. During the second contraction of the systolic phase, blood is being forced away from the heart through the
A. Pulmonary and Aortic Arteries
B. Superior and Inferior Vena Cavas
C. Tricuspid and Mitral Valves
D. Pulmonary Veins

68. When blood is entering through the vena cavas, it is also entering through the
A. Mitral Valve
B. Pulmonary Veins
C. Pulmonary Artery
D. Aorta

69. When the heart contracts, the
A. Auricles & Ventricles contract simultaneously
B. Ventricles contract first, then the auricles
C. Right side contracts first, then the left side
D. Auricles contract first, then the ventricles

70. While blood from the body is entering the superior vena cava, blood from the body is also entering through the
A. Pulmonary Veins
B. Aorta
C. Inferior Vena Cava
D. Pulmonary Artery

71. When the blood leaves the heart through the pulmonary artery, it is also simultaneously leaving the heart through the
A. Tricuspid Valve
B. Pulmonary veins
C. Aorta
D. Pulmonary Valve

72. When the pressure in the right ventricle is superior to that in the pulmonary artery, in what position is the tricuspid valve?
A. Closed
B. Open
C. Beginning to Close
D. Confined by pressure from the right auricle

73. When the ventricles contract, blood is forced out the
A. Superior and Inferior Vena Cavas
B. Pulmonary veins
C. Tricuspid and Mitral Valves
D. Pulmonary and Aortic Valves

74. Blood leaving the heart through the aorta had left the heart previously through the
A. Vena cavas
B. Pulmonary veins
C. Pulmonary artery
D. Tricuspid and Mitral Valves
________75. When the blood in the aorta is exerting a superior pressure on the aortic valve, what is the position of the mitral valve?
A. Closed
B. Open
C. Beginning to open
D. Confined by pressure from the right ventricle

________76. When the tricuspid and mitral valves are forced shut, in what position is the pulmonary valve?
A. Closed
B. Beginning to open
C. Open
D. Beginning to close

________77. During the second contraction of the systolic phase, in what position is the aortic valve?
A. Fully open
B. Partially open
C. Partially closed
D. Fully closed

________78. Blood is being forced out the auricles simultaneously as blood is
A. Entering only the vena cava
B. Being forced out the pulmonary and aortic valves
C. Passing through the tricuspid & mitral valves
D. Being forced out through the pulmonary artery

________79. If the aortic valve is completely open, the
A. Second contraction of the systolic phase is occurring
B. Diastolic phase is occurring
C. Tricuspid & mitral valves are completely open
D. Blood is rushing into the right & left ventricles

________80. When the heart relaxes, the
A. Auricles relax first, then the ventricles
B. Right side relaxes first, then the left side
C. Left side relaxes first, then the right side
D. Ventricles relax first, then the auricle
## Appendix C

### Social Presence Measure & Demographic Items

<table>
<thead>
<tr>
<th>Note</th>
<th>Misc. Non-Social Presence Items assessing perceptions of lesson (interest, performance, difficulty):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Participant ID</td>
</tr>
<tr>
<td>2.</td>
<td>I think I did well on the tests.</td>
</tr>
<tr>
<td>*</td>
<td>3. This lesson was hard.</td>
</tr>
<tr>
<td>*</td>
<td>4. I learned a lot from this lesson.</td>
</tr>
<tr>
<td>5.</td>
<td>The lesson material was interesting to me.</td>
</tr>
<tr>
<td>6.</td>
<td>I wish more authors wrote in this style.</td>
</tr>
<tr>
<td>**</td>
<td>7. I already knew the information presented in this lesson.</td>
</tr>
<tr>
<td>**</td>
<td>8. I tried hard to do well on this lesson.</td>
</tr>
<tr>
<td>**</td>
<td>9. Rather than use the online notes tool, I wrote study notes on my own paper/computer.</td>
</tr>
<tr>
<td>**</td>
<td>10. Gender (Male/ Female)</td>
</tr>
<tr>
<td>**</td>
<td>11. Year in school (Fresh/ Soph/ Jun/ Sen/ Grad)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>** Items assessing Immediacy (intimacy):</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. This lesson’s author seemed like a real person to me.</td>
</tr>
<tr>
<td>13. I can imagine what the author might be like.</td>
</tr>
<tr>
<td>* 14. I didn’t feel a connection with the author.</td>
</tr>
<tr>
<td>15. I felt as if I had a personal tutor for this lesson.</td>
</tr>
<tr>
<td>16. Even though this was really only one-way communication, it felt as though I was having a conversation with the author.</td>
</tr>
<tr>
<td>* 17. I did not feel the lesson author was addressing me personally.</td>
</tr>
<tr>
<td>* 18. The author felt distant in this lesson.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>** Items assessing Sense of Empathy (understanding, mutuality, shared experience, common ground):</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. This material was written with someone like me in mind.</td>
</tr>
<tr>
<td>* 20. The author did not seem to care about my understanding the material.</td>
</tr>
<tr>
<td>21. The lesson materials were written in such a way as to maximize my understanding.</td>
</tr>
<tr>
<td>* 22. The author’s presentation style made it difficult to relate to the lesson content.</td>
</tr>
<tr>
<td>23. The author addressed questions I had.</td>
</tr>
<tr>
<td>Items assessing Positivity (affect, attitudes):</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>24. The author seemed friendly.</td>
</tr>
<tr>
<td>* 25. The lesson materials communicated coldness rather than warmth.</td>
</tr>
<tr>
<td>* 26. The author's style was unappealing to me.</td>
</tr>
<tr>
<td>27. [deleted]</td>
</tr>
<tr>
<td>28. I would take another lesson from this author/instructor.</td>
</tr>
<tr>
<td>29. The author's communication with me seemed natural.</td>
</tr>
<tr>
<td>30. The author was knowledgeable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items assessing Involvement (engagement):</th>
</tr>
</thead>
<tbody>
<tr>
<td>31. As I reflect on doing this lesson, I felt as though I was interacting with the author.</td>
</tr>
<tr>
<td>32. The author kept me absorbed in the lesson.</td>
</tr>
<tr>
<td>33. I was deeply involved in trying to understand the materials.</td>
</tr>
<tr>
<td>** 34. Rate the degree of interaction you perceived in this lesson, from less interaction (like a lecture), to more interaction (like a discussion):**</td>
</tr>
<tr>
<td>** 35. Rate the degree to which you felt that the author was trying to cover/present the lesson content, rather than trying to teach you as a person.**</td>
</tr>
<tr>
<td>** 36. I felt no desire to reply in typing to author questions in this lesson (not including the tests)**</td>
</tr>
<tr>
<td>** 37. The author's questions caused (prompted) me to really think about my understanding of the material, even if I didn’t submit a typed reply.**</td>
</tr>
<tr>
<td>** 38. I ignored “replying” to questions in the lesson (not including the tests), and just moved on.**</td>
</tr>
<tr>
<td>** 39. I replied thoughtfully to the author’s questions in the lesson?**</td>
</tr>
<tr>
<td>** 40. Knowing that following the lesson, I could save and/or print out lesson notes and an “interaction history”, motivated me to use the notes tool.**</td>
</tr>
</tbody>
</table>

*Item reverse coded

**Item new for study two (added or significantly modified from pilot)
Appendix D

Social Attunement Measure

Note: participants received a version of this instrument from an online testing engine that was formatted differently than appears here.

Instructions
Read the following scenario and the associated fictional discussion. Then click next to answer a few questions before beginning the main Heart Lesson.  
(Please try to not take more than 5 minutes on this short pre-test)

<table>
<thead>
<tr>
<th><strong>Narrator:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chris recently decided to paint her living room. She went to the hardware store and picked out three colors in the store, and took samples of those colors home. When she got home that night, she took a look at the paint samples again. One of them seemed a lot more greenish than she had remembered in the store. In the morning, she looked at them in daylight, and the colors looked slightly different again.</td>
</tr>
<tr>
<td>She found a website about picking paint colors that read “always look at the paint under the same kind of lighting as where it will be used”. This sounded like good advice, but Chris was left wondering why.</td>
</tr>
<tr>
<td>That night Chris imagined the following discussion between herself and two historical scientists.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Chris:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>So, how are light and color related? Why did the colors look different in the store's fluorescent lighting, at home under my regular light bulbs, and in the sunlight that comes through my large, sliding living room windows in the morning?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Johannes Kepler:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that light can carry color. So for instance, if light shines through colored glass, it picks up the color and carries it to the object you're seeing. What happened here is that the store lights were carrying some color from their covers that changed the color of the paint. At home, your lamp shades added color that changed the color of the paint. Only the daylight lets you see the true color of the paint because it wasn't carrying any colors at all.</td>
</tr>
<tr>
<td><strong>Isaac Newton:</strong></td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Chris:</strong></td>
</tr>
<tr>
<td><strong>Isaac Newton:</strong></td>
</tr>
<tr>
<td><strong>Johannes Kepler:</strong></td>
</tr>
<tr>
<td><strong>Isaac Newton:</strong></td>
</tr>
<tr>
<td><strong>Johannes Kepler:</strong></td>
</tr>
</tbody>
</table>
Questions
1) When you need to find something out, which would you prefer to do?
Available responses:
- First talk to your friend about it
- First look it up (online or books)

2) For each of the following statements, indicate which (if any) actually appeared in the scenario your just read. (sentences either appear in their entirety or not)
   a. "Only the daylight let you see the true color of the paint because it wasn't carrying any colors at all"
   b. "The distance light must travel also affects the colors that are reflected to our eyes"
   c. "Always look at the paint under the same kind of lighting as where it will be used"
   d. "If light shines through colored glass, it picks up the color and carries it to the object you're seeing"
   e. "This is why they make daylight balanced lights, to mimic sunlight"
   f. "Sunlight doesn't have colors in it; the only color of light is white"
   g. "This is why the white light of the sun can be split into the many colors of the rainbow"
   h. "If I have white paper and black paper, the white reflects all the colors and black absorbs them all"
Available responses:
- Yes
- No

3) Match the following statements with their owner.
   i. "Only the daylight lets you see the true color of the paint because it wasn't carrying any colors at all"
   j. "Always look at the paint under the same kind of lighting as where it will be used"
   k. "Artificial light does not contain as many colors as sunlight"
   l. "This is why the white light of the sun can be split into the many colors of the rainbow"
   m. "The white paper looks red. That's because it's reflecting all the colors of light that reach it, where the black absorbs them all"
   n. "The next day, the room appeared a whole different color again"
   o. "The fluorescent light in the store may have picked up some color like from the plastic case around the light"
   p. "If I shine the light on my red car or even my white house door, everything looks bluish"
Available responses:
- Isaac Newton
- Chris
- Johannes Kepler
- Narrator
- Nobody

4) Was "Chris" in the scenario male or female? (Please do NOT use the browser "Back" button to check your answer)
Available responses:
- Chris was Male
- Chris was Female
VITA

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Blog  http://edusign.blogspot.com

Education

**Doctor of Philosophy (PhD) Instructional Systems**
2007  The Pennsylvania State University, University Park, Pennsylvania (USA)

**Master of Science (MS), Technology Teacher Education**
2000  Brigham Young University, Provo, Utah (USA)

**Bachelor of Arts (BA), Theater & Media Arts**
1993  Brigham Young University, Provo, Utah (USA)

**Associate of Arts and Sciences (AAS), Photography**
1987  Ricks College, Rexburg, Idaho (USA)

Employment

2007 - present  **Instructional Designer (PSU World Campus)**  University Park, Pennsylvania (USA)

2002 - 2007  **Graduate Research Assistant & Online Instructor (PSU)**  University Park, Pennsylvania (USA) (Instructional Systems Program)

1999 - 2002  **Center for Instructional Design (BYU)**  Provo, Utah (USA)

1993 - 1999  **Instructional Technology Center, (BYU)**  Provo, Utah (USA)

Teaching

**Instructional Systems 544 - Designing Video for Instruction & Training**  (2003-2005)

**Educational Technology 449 (Online) - Video and Hypermedia in the Classroom. (For Penn State World Campus)**  (2004 - present)

Publications


Presentations

Galbraith, J. (2006, October). Who Writes This Stuff, and Why Should I Care?: The Effects of Authorial Voice and Human Speech on Student Learning and Perceptions of Social Presence in Computer-based Instruction. Presentation at the Association for Educational Communications and Technology (AECT), Dallas, TX.