2007

INSTRUCTIONAL COMMUNICATION MATTERS: A TEST OF KNOWLEDGE ACQUSITION THEORY (KAT) FROM A MESSAGE-ORIENTED RECEIVER PERSPECTIVE

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ABSTRACT OF DISSERTATION

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A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Communication and Information Studies
at the University of Kentucky

By
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Lexington, Kentucky

Director: Dr. Derek Lane, Associate Professor of Communication

Lexington, Kentucky

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This dissertation encourages adoption of a message-oriented receiver perspective when developing new instructional communication theories and proposes a causal-process model derived from Knowledge Acquisition Theory to demonstrate how this perspective can be used to predict student cognitive learning outcomes. Three hypotheses are generated to test the propositions of the derived model. The first hypothesis seeks to determine which dimensions of instructional message clarity and course content relevance best predict student interactions with instructional content. The second hypothesis predicts that student self-reported knowledge gains are a function of student interactions with content. The third hypothesis predicts that a significant proportion of the variance in knowledge gains can be explained by the combination of message characteristics with student content interactions both in and outside the classroom. A cross-sectional survey research design was used to collect responses from undergraduate students at a large southern public research university (n=333). The hypotheses were tested using linear and hierarchical regression and results demonstrated statistical support for all three hypotheses. The first hypothesis revealed the dimensions of *instructional message clarity* and *course content relevance* that significantly predicted student interactions with content inside and outside of class. Support for the second hypothesis illustrated that both in class and out of class content interactions significantly predicted student self-reports of knowledge gains. Finally, hypothesis 3 tested the comprehensive causal-process model derived from Knowledge Acquisition Theory. The derived model received strong support and ultimately accounted for 65% of the variance in student perceptions of knowledge gains. Student perceptions of knowledge gains increased when students perceived textbook messages as clear, course goals and expectations as clear, content as relevant to their own lives, and when students enacted knowledge acquisition behaviors outside of class. Surprisingly, in class content interaction, presentation clarity, and procedural clarity dropped out of the model. Implications and limitations of the present study are discussed, directions for future research are suggested, and a persuasive argument is presented for why instructional communication researchers should continue to develop a message effects research agenda supporting the development of strong instructional communication theories that produce practical results to inform educational practices.

KEYWORDS: Instructional Communication, Cognitive Learning, Message Effects, Message Reception, Message Design

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Chapter 1: Introduction

The study of human communication is complex especially since human communication occurs across many unique contexts such as in organizations, families, churches, political processes, educational institutions, and even on something as mundane as park benches. Standard definitions of communication science (i.e.; Frey, Botan, Friedman, & Kreps, 1991; NCA Website, 1995) place emphasis on messages and meaning as the essential constructs uniting the study of communication across contexts. Indeed, messages are essential to communication since without a message, communication cannot occur. Thus, messages are the glue that binds message senders and message receivers together regardless of the context. Since messages are essential to communication, messages are also essential to communication research.

Instructional communication research as one branch of communication science focuses on the role that communication plays within the educational context regardless of the subject of instruction (Staton, 1989). Instructional communication research examines the role of communication within communication courses, psychology courses, education courses, corporate training courses, elementary schools, community colleges, or any location in which learning and instruction take place. It seems logical that instructional communication research as a branch of communication science would also place emphasis upon the study of messages as the most essential communication construct. Oddly enough, this is not so. Instructional communication research focuses almost exclusively on instructors and their behaviors. This sender focus among most instructional communication researchers results in a unidimensional view of the role communication plays in the educational context. This unidimensional view of the role communication plays within the educational context is appropriately labeled the "knowledge transference model" in this dissertation.

The knowledge transference model originally advanced by Hurt, Scott, and McCroskey (1978) claims that communication in the classroom is important because the difference between knowing and teaching is communication. In other words, instructors somehow transfer content knowledge to students via communication in the classroom. Indeed, from the knowledge transference perspective with its objectivist view of knowledge as an external entity with an absolute value that can be transferred into the empty vessel of student minds (Bostock, 1998), it is solely the instructor's responsibility that a student acquires knowledge. In fact, students as active participants in educational processes are largely missing from instructional communication research driven by the knowledge transference model except to the degree that students comply with instructor demands (Kearney, Plax, Richmond, & McCroskey, 1984; McCroskey & Richmond, 1983), mimic instructor misbehaviors (Kearney, Plax, & McPherson, 2006), or somehow feel affinity for their instructors (Bell & Daly, 1984; Frymier & Wanzer, 2006; McCroskey & Wheeless, 1976).

Even more surprising is the fact that knowledge itself is largely missing from the knowledge transference model. Knowledge is missing from the knowledge transference model because the outcome most commonly adopted in knowledge transfer driven instructional communication research is affect for instructors. The basic rationale provided for this emphasis on student affect for instructors is that liking of instructors transfers to liking of course content, and that as liking of course content increases, student motivation to learn increases (Christophel, 1990a, 1990b; Richmond, 1990). Not only is there minimal support for this rationale, but the relationship between affect and knowledge is at best indirect and at worst nonexistent.

The variable most often associated with increases in student affect for instructors within instructional communication research is called "teacher immediacy". Originally introduced by Mehrabian (1967, 1968, 1969), immediacy is the degree of physical or psychological closeness between instructors and students. While teacher immediacy is a robust predictor of student affect toward an instructor, there are no clear links between teacher immediacy and positive increases in student cognitive learning (Richmond, Lane, & McCroskey, 2006). Meta-analysis of the teacher immediacy experimental research literature also suggests that it is largely unclear whether affect for instructors and for course content translates into increases in student cognitive learning (Witt, Wheeless, & Allen, 2006). If increased positive affect does not lead to increased positive cognitive learning as long assumed in the knowledge transference model, then it is necessary to consider how student cognitive learning outcomes such as the acquisition of knowledge actually can be increased. This consideration requires an alternative view of the role that communication plays in the educational context.

This dissertation necessarily adopts an alternative view of the role that communication plays within the educational context since the current view contains many flaws. From this alternative view, communication is important within the educational context because of the effect that message characteristics have on communication based knowledge acquisition behaviors employed to gain knowledge. Characteristics of messages such as textbook clarity or distal relevance aid or impede the acquisition of knowledge. Clear messages are easier to deeply cognitively process, and thus facilitate the enactment of knowledge acquisition behaviors. Relevant messages are in align with student goals and/or needs and thus provide the impetus to overcome the natural tendency toward least effort. Thus, the alternative view of communication within the educational context adopted within this dissertation takes a message-oriented receiver perspective, and purposefully does so in order to compensate for the four flaws in the knowledge transference model discussed in greater detail below.

The major question asked from this alternative view of instructional communication is how student cognitive learning can be positively increased through enrollment in and completion of higher education courses. Of primary importance is the role that communication plays in significantly predicting positive increases in knowledge gained as a cognitive learning outcome. Knowledge in this dissertation is defined simply as usable information. In essence, knowledge is data that has been decoded and transformed into information and which also has a perceived and demonstrable potential application to human life either now or in a hypothetical future. Information, on the other hand, is data that has been organized (integrated and revised) and decoded, but which has not yet demonstrated use. Data is merely decoded or ignored.

Adopting knowledge as a cognitive learning outcome fills the first gap in the knowledge transference model's research agenda. Clark (2002) points out the lack of instructional communication research focusing on cognitive learning outcomes as the bottom line of educational practices. Clark also suggests that a message focus is more appropriate to research on student cognitive learning outcomes than an instructor focus. However, this message focus has largely not been adopted among instructional communication researchers. If knowledge is indeed transferred from instructors to students, then what is this knowledge and how well is it being transferred? The knowledge transference model has largely failed to address these questions even though it is obvious that knowledge transference is the transference of a tangible something. If knowledge remains largely undefined from a knowledge transfer model perspective, then instructor talk in the classroom is just that, talk, and there are no guarantees that what is being transferred is indeed knowledge. The underlying assumption of the knowledge transference model seems to be that instructors are knowledgeable pedagogues and that this is good enough, though even this assumption remains untested.

Friedrich (2002) following Schulman (1986, 1987) argues that definitions of teaching currently held by researchers and policy makers are largely trivial and incomplete resulting in a "missing paradigm." Whereas in the past an instructor was bestowed the title of teacher based on the acquisition of a domain's knowledge base, the recent focus is on instructor capacity to teach and on possession of basic skills such as reading, writing, spelling, and the solving of simple math problems. If instructors are supposed to transfer domain knowledge to students and yet lack that knowledge, then there is a large hole in the knowledge transference model. The way to test whether or not domain knowledge has been transferred is to test the quality of the knowledge that students have gained from the completion of a course. This requires that some standards or criteria are in place both for designating what content domain knowledge is and for assessing the student gains in that knowledge. Such standards or criteria within the higher education context have failed to emerge from traditional instructional communication research driven by the knowledge transference model. Thus, the knowledge transference model fails to justify the quality of knowledge transferred.

The second gap that this dissertation fills in the traditional instructional communication research agenda driven by the knowledge transference model is using theory to answer the question of how student knowledge as a cognitive learning outcome in higher education courses can be positively increased. Theory is, of course, integral to scientific inquiry. Stokes (1997) claims that the quest to solve problems or the quest to advance theoretical understanding drive scientific inquiry. Stokes further holds that scientific inquiry that both advances understanding (theory) and solves practical problems (application), what Stokes calls use-inspired basic research or Pasteur's quadrant, is the pinnacle of research efforts. Instructional communication research has long been criticized for the variable-analytic nature of the majority of its research studies though some attempt is being made to rectify this situation (Mottet, Frymier, & Beebe, 2006). This dissertation proposes Knowledge Acquisition Theory as a new instructional communication theory that explains how students can gain knowledge from completion of a higher education course. The basic proposition of Knowledge Acquisition Theory (KAT) is that message characteristics predict student knowledge acquisition behaviors, which in turn predict the quality of knowledge that students gain from completion of higher education courses.

The third gap in instructional communication research that this dissertation addresses is the refinement of two true message variables, namely instructional message clarity and course content relevance, through a proposal for an instructional message effects research agenda. Consistent with its source orientation, the knowledge transference model posits clarity and relevance as sets of teacher behaviors. Clarity is restricted to "teacher clarity" defined as "a cluster of teacher behaviors that result in learners gaining knowledge or understanding of a topic, if they possess adequate interest, aptitude, opportunity, and time" (Cruickshank & Kennedy, 1986, p. 43). Relevance is restricted to instructor attempts to make course content relevant (Frymier & Shulman, 1995) regardless of whether or not course content is intrinsically relevant to student goals and needs. Based on these definitions, clarity and relevance are sender (source) variables rather than true message variables.

Instructional communication researchers from the knowledge transference model further restrict clarity and relevance to teacher talk, and less so to student talk. Teacher clarity is then the teacher verbal behaviors that potentially result in learner knowledge acquisition. Content relevance is the teacher talk that persuades students that the information that the teacher is presenting to them is important. However, this dissertation refines the clarity and relevance constructs through a message driven view of higher education courses. First, instructional messages are not just oral, but are embodied in print materials, visuals, and multimedia as well as the more traditional lectures and discussions. Clear and unclear instructional messages can be exchanged in textbooks, lectures, discussions, procedures and assessments, and through the goals and objectives of courses usually in the form of the course syllabus. Thus, in this dissertation, instructional message clarity is divided into four functions based on the contexts in which clear and unclear instructional messages occur. These four functions are: 1) textbook clarity, 2) presentation clarity, 3) procedural clarity, and 4) course clarity.

In similar vein, course content relevance is relevance to a range of learner needs and goals. Students attend institutes of higher learning for a variety of reasons. One reason is to acquire domain knowledge. Another reason is to acquire the skills and knowledge sets prerequisite for starting a career. Yet another reason is to acquire understanding of themselves and the world around them. It seems likely that course content is relevant to students to the degree that course content matches students' needs and goals both at the present time and in a hypothetical future. Thus, the relevance of course content is largely pragmatic and utilitarian. Since course content could already have proven relevant (useful) to a student's goals and/or needs, there is also a third dimension to course content relevance. The first dimension of course content relevance used in this dissertation is labeled primal relevance. Primal relevance is the degree to which course content is relevant to a student's present goals and/or needs. The second dimension is distal relevance. Distal relevance is the degree to which course content is relevant to a student's hypothetical or projected future goals and/or needs. Finally, generic relevance is the degree to which course content has already proven useful to a student's goals and/or needs. By extension, generic relevance is also the degree to which course content is relevant to any human being since course content that has already proven useful to one individual is likely to be viewed as being relevant and thus useful to others.

The fourth and final gap that this dissertation addresses is the role that student behavior plays in the acquisition of knowledge. As mentioned earlier, the knowledge transference model in its obsession with teacher behaviors has largely ignored student behaviors except to the degree that student behaviors complement teacher goals and/or needs. If knowledge is a tangible something that can be transferred from one person to another as is a basic assumption of the knowledge transference model, then receiver behaviors are also likely to influence the transferal process. As mentioned earlier in this chapter, the knowledge transference model has traditionally held that changes in affect result in cognitive change, and that changes in cognition result in behavioral change. However, this claim of the knowledge transference model has been largely unsupported within the instructional communication research literature. In this dissertation, the claim is advanced that the enactment of certain behaviors results in cognitive change. More specifically, students that perform a set of knowledge acquisition behaviors are more likely to gain knowledge rather than merely acquire data or information.

Some student knowledge acquisition behaviors have already been identified by instructional communication researchers. Listening and notetaking have been found to increase student data decoding abilities in the higher education classroom (Aiken, Thomas, & Shennum, 1975; Kiewra, 1985; Kiewra & Benton, 1988; Titsworth, 2001). Critical thinking, while posited in instructional communication research as an outcome variable (Berkowitz, 2006), is also a student knowledge acquisition behavior likely to relate to perceptions of having gained knowledge in higher education courses. However, there are many student knowledge acquisition behaviors enacted inside or outside of the classroom that have received little if any attention from instructional communication researchers. Examples of these include: a) outlining assigned readings, b) highlighting key information in readings, c) writing summaries of lectures, discussions, or course readings, d) finding specific information in textbooks, e) seeking clarification of information through use of other information sources, f) giving presentations, g) leading class discussions, and h) conducting a research project. These behaviors, if performed systematically, may positively increase the quality and amount of knowledge gained from taking an undergraduate course. Perhaps more importantly, these behaviors if performed strategically help to move students from passive data consumers to active knowledge producers.

Pinker (2002) once claimed that scientific research is largely a process of reverse engineering. Using reverse engineering, one starts with the problem, and then moves backward to see how something works in order to find a solution. Phenomena are dissected into parts for careful analysis, and then reassembled back into wholes with additional suggestions for how overall performance can be improved based on the analyses of the parts. This dissertation operates in much the same way. Thus, this chapter provides the overall introduction to the challenge of student knowledge gain from higher education courses, and then moving backward dissects this challenge into its most salient parts. Section 1.1 of this chapter discusses the overarching problem of knowledge gains in higher education, and presents the conceptual theory used for analysis. Next in Section 1.2, consideration is given to knowledge acquisition behaviors and the role knowledge acquisition behaviors play in the challenge of increasing student knowledge. Section 1.2 is followed by Section 1.3 in which consideration is given to the effects message characteristics have on knowledge acquisition behaviors. Based on Section 1.1-1.3, a research study is proposed in Section 1.4. The purpose of this research study is two-fold. One, the research study is designed to provide preliminary support for the basic proposition of Knowledge Acquisition Theory. Two, the research study is designed to dispel the myth that focus on teacher talk is the only way that instructional communication research can enlighten the study of communication within higher education courses.

Where is the Life we have lost in living?
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?
T.S. Eliot's "The Rock" (1934).

Section 1.1: Knowledge

Section 1.1 of this introductory chapter reverse engineers the concept of knowledge within the higher education context. Working definitions of knowledge, data, and information are provided. Next the challenge of acquiring data and transforming data into information and information into knowledge is discussed from both a teacher-centered and a student-centered orientation. Communication behaviors that enable these transformations are discussed. Characteristics of messages that enable these communicative behaviors are presented. And finally, knowledge, knowledge acquisition behaviors, and message characteristics are reassembled into Knowledge Acquisition Theory.

If information was the buzzword of the twentieth century, then knowledge is the buzzword of the twenty-first. Knowledge is of particular interest to business and industry, and is associated with business related concepts such as "knowledge worker", "knowledge economy", "knowledge management", and "knowledge society" (De Weert, 1999). Since one of the goals of educational institutions is to supply workers equipped with skills and sufficient information to contribute productively to knowledge driven business and industry, knowledge is also of great concern among higher education administrators.

The Commission on the Future of Higher Education in their 2006 report states, "With too few exceptions, higher education has yet to address the fundamental issues of how academic programs and institutions must be transformed to serve the changing needs of a knowledge economy" (p. 25). The 2007 Education Criteria for Performance Excellence put forth by the Baldridge National Quality Program of the National Institute of Standards and Technology proposes that higher education institutes can meet the demands of a knowledge driven society by adopting a learner-centered approach focusing on active learning and the development of problem-solving skills. This dissertation supports these efforts, and thus adopts a message-oriented receiver perspective for analyzing the challenge of knowledge as a cognitive learning outcome within higher education courses.

An important question in a dissertation positing knowledge as a cognitive learning outcome is the question of what knowledge is. Knowledge is a somewhat fuzzy term, and is often used in a rather glib fashion. However, it is necessary to give some consideration to the question of what knowledge is in order to better understand the challenge of student knowledge gaining in higher education. To answer the question of what knowledge is, one must first consider the differences between data, information, and knowledge. The differences between data, information, knowledge, and wisdom (the DIKW chain) have long been of interest to scholars in information science and knowledge management (Ackoff, 1989; Brown & Duguid, 2000; Nonaka & Takeuchi, 1995; Zeleny, 1987). Debate on the intricate nuances of data, information, and knowledge are perhaps best left to philosophers (Polanyi, 1962, 1967). This dissertation simply provides working definitions of data, information, and knowledge derived from definitions provided in the DIKW chain to aid in the analysis of the role communication plays within the higher educational context framed within Knowledge Acquisition Theory.

Students learn in school at a young age that Christopher Columbus discovered America in 1492. Regardless of the truth claims of this statement, should one consider this statement evidence of knowledge? Many philosophers would label this factual statement declarative knowledge (Hofer & Pintrich, 1997) since it provides an example of a "known" fact. However, in this dissertation, this isolated factual statement is considered data. Knowing or not knowing this isolated fact generally results in very little difference in people's lives. The fact has little meaning outside of the context of history. The fact may be used in trivia games or taught to people at a young age as part of their cultural heritage (or mythos). But, knowing or not knowing that Columbus discovered America in 1492 (regardless of whether Columbus discovered America or someone else did, regardless of whether this event occurred in 1492, regardless of whether America was "discovered" in 1492, and regardless of whether a place can be discovered) is unlikely to impact many people's lives, behaviors, beliefs, or attitudes until this fact is compared to other facts. When facts are compared, evaluated for their truth claims, and organized into sets, then facts (data) become information. Information thus has more power to positively or negatively affect people's lives, behaviors, beliefs, and/or attitudes. Is information then knowledge?

In this dissertation, information is not inherently knowledge, though knowledge is one subset of information. While it may be important to learn sets of facts and to compare competing theories and arguments about sets of facts, one is still dealing with information and data. There still is no demonstrable use for the information except to have these comparisons and arguments. Until information can be demonstrably used for human purposes such as the solving of human problems, information is just information. When information can be used to generate new information, can be used to provide novel solutions to problems, and/or can be used to provide answers to pressing questions, then information becomes knowledge. Thus, knowledge is usable information.

More simply stated, people can memorize isolated facts and thus acquire data. People can discern patterns in data (largely though inference) and thus acquire information. Information that is integrated with prior information, revised through this comparison, and then proposed and hopefully tested as a solution to a known or perceived problem becomes knowledge. Knowledge is thus usable information.

The knowledge transference model has two flaws in relation to knowledge. The first flaw is that the knowledge transference model fails to make a distinction between data, information, and knowledge. This being the case, it is unclear exactly what is being transferred from instructors to students within higher education courses. The second interrelated flaw is that the knowledge transference model fails to make a distinction between data, information, and knowledge from a message receiver perspective. This being the case, it is unclear how students can take the data they have been exposed to while listening to a course lecture or reading a course textbook, transform that data into information, and ultimately transform that data into knowledge. The two flaws are subsequently elaborated upon in turn.

The first flaw is most important in relation to teacher selection of course content. If the goal of a course is to expose students to a specific fragment of a content domain's database (the topic of a course) in order for this data to be somehow transferred to students, then it is first necessary that such a database exists. Second, it is necessary for an instructor to be familiar with this database. Finally, it is necessary for instructors to produce messages that externally represent this database so that students can acquire data. Instructors often perform the final step by selecting textbooks or other instructional materials for students to acquire data (Boyd, 2004; Rubin & Hess, 1999; Schneider, 1992) since printed materials are less ephemeral than talk and/or may reinforce teacher talk.

Surprisingly little is known about the message production process from a communication perspective (Meyer, 2000). How exactly do instructors produce messages, tailor messages to students, tailor messages to situations or environmental constraints such as the availability of resources inside and outside of classrooms, and select textbooks as embodiments of a content domain? One would imagine that such questions would be of interest to instructional communication researchers. However, since this research has largely remained unexplored by instructional communication scholars, the answer to these questions is still largely unknown.

In contrast to K-12 where content is often government mandated, higher education course content is dependent on the instructor. Instructors select the messages to which students are exposed. Thus, student learning is restricted to an individual instructor's selection, which may differ from other instructors' selections, which in turn may or may not be grounded in a domain's theoretical and/or research literature (Allen & Preiss, 1990; Allen, Preiss, & Burrell, 2006; Webb & Thompson-Hayes, 2002). There are many different types of instructors of higher education courses (Boyer Report, 1998). Some instructors are temporary. Some have no formal educational training perhaps lacking even a Bachelor's degree in a content domain. Some are students. Some are from other countries. Is it likely that people of such different backgrounds transfer the same content to students about a given content domain? Obviously, there is a lack of standardization of course content across institutes of higher learning, and perhaps even within individual departments.

Lack of standardization of course content means that learners in different sections of a course may be exposed to different data, and hence acquire different data sets. Different data sets may lack accuracy or may fail to reflect the breadth and depth of accumulated information on a topic dependent upon the selection abilities and database of the instructor. Indeed, research shows that textbooks often vary in the types of data included and fail to reflect the current state of understanding about a given topic or subtopic. Yet, little is known about how instructors select textbooks and little is known about the content "transferred" in higher education courses. For some reason or another, instructional communication researchers still adopt a knowledge transference model.

Rubin and Hess (1999) state that the main complaint students have in basic communication courses is the poor quality of textbooks and invite researchers to determine the design features of a good textbook. These studies have been slow in coming. Several studies indicate that textbooks significantly vary in adherence to current advances in research and theory and even vary as to the type of content included. Allen and Preiss' (1990) meta-analysis of public speaking and persuasion textbooks shows that textbooks are inconsistent in content covered and fail to accurately review findings in the most recent research literature. A more recent meta-analysis of communication textbooks (Allen, Preiss, & Burrell, 2006) indicates that the biggest problem with communication textbooks is the sin of omission. In spite of the fact that a topic has been widely researched, textbooks fail to include any mention of that topic. Schneider (1992) suggests that readability is a major factor in student interactions with content, and suggests that public speaking textbooks, and to lesser extent interpersonal communication textbooks, vary greatly in readability. In relation to the presentation of theory in interpersonal communication textbooks, Webb and Thompson-Hayes' (2002) content analysis reveals that presentations of theories are oversimplified and under attributed. Finally, Allen, Preiss, and Burrell (2006) argue a case for meta-analysis as a tool for evaluating textbooks since meta-analysis can reveal the most significant findings about a topic and can determine how well these findings are represented in texts. It is unknown whether or not the results of meta-analyses are used in the selection of course content to represent a content domain in a higher education course.

While it is largely unknown how or why instructors select messages to present a content domain to students, research in persuasion on the selection of evidence may illuminate the selection process. McCroskey (1969) defines evidence as information presented to message recipients that comes from a source external to the message sender within a larger pool of information forming a message. Toba (1975) distinguishes between evidence and evidentiary matter. Evidentiary matter is the "stuff out of which facts or assertions are constructed or perceived" (p. 9). Evidentiary matter becomes evidence when it is used by a source to support a claim (Reinard, 1988). This distinction between evidence and evidentiary matter is necessary because it illustrates the fact that message senders consciously select evidence in support of claims even though other evidentiary matter may exist that message receivers are or are not aware. In other words, messages are framed based on the a priori biases of the message senders. Textbooks and instructor selection of course content provide good examples of this. Textbook writers select content based on the writer's biases (Allen, Preiss, & Burrell, 2006). It seems likely that instructors also produce messages and select content based on their own biases.

While the examples of the problems identified with textbook content all come from the study of one content domain (communication), it is apparent that the data contained in textbooks (at least in this domain) are often inaccurate and fail to reflect what is known about the domain. Instructors select these textbooks to represent a content domain either out of ignorance of the content domain or in support of their own biases. This being the case, what exactly is transferred from instructors to students in higher education courses? More poignantly, why are instructional communication researchers not investigating this? If communication science is the study of messages and meaning, then it seems natural that the meaning of the data being "transferred" in higher education courses would be a topic of interest to instructional communication researchers especially those driven by the knowledge transference model.

It seems clear that the tangible "knowledge" that instructors transfer to students from a knowledge transfer model perspective is somewhat less than tangible since this "knowledge" is at the whim and mercy of individual instructors and individual instructor proclivity and familiarity with a content domain. Knowledge is not clearly defined. Knowledge is not clearly externally represented in textbooks. Knowledge is not clearly transferred from instructors to students. What then is the use of the knowledge transference model if it does not provide guidance in these matters? In this dissertation, since the tangible "knowledge" of a domain is largely undetermined, students decide if they have acquired knowledge from a course or not. While this might not be the optimal method for determining if students have indeed acquired knowledge from a higher education course, it will have to suffice until "course content knowledge" becomes more tangible and universally agreed upon.

In the second flaw of the knowledge transference model in relation to "knowledge", researchers driven by the knowledge transference model fail to consider that data presented to students in higher education courses is simply data from the students' perspective. While an instructor may view the data of a content domain as information or even knowledge, to most students it is simply data, random facts decoded and stored in short-term memory or even completely ignored. In order for the data that students are exposed to in higher education courses to be transformed into information and more hopefully knowledge, it is necessary for students to interact with the data. The reason for this is that exposure to data does not mean that data will be decoded or transformed into information into knowledge. For data to be decoded, it must be attended and stored in memory. For data to become information, data must be organized, compared to other data, set into a context, and must become integrated into some kind of pattern or schema. This requires further interaction. Interaction with data is the enactment of certain behaviors that support underlying psychological processes, namely attention, memory, and information processing.

First, data must be attended. Gibson (1947) points out that in order for a stimulus to be responded to, the stimulus must first be perceived. Scholars from the field of communication echo Gibson's sentiment. Donohew, Palmgreen, and Duncan (1980) and later Donohew, Palmgreen, and Lorch (1994) in their Activation Model of Information Exposure (also Donohew et al., 1991, 1998) advance and offer considerable support for the claim that persuasion begins with attention. What is persuasion other than changes in affect, cognition, and/or behavior and hence learning? In this dissertation and its Knowledge Acquisition Theory (KAT), data must first be attended in order for decoding to ensue. At the minimum, in order for data to be attended within a higher education course, a lecture must be listened to or a textbook must be read. While these behaviors do not guarantee that data will be attended, performance of these behaviors increases the probability that data (and hence information and knowledge) will be acquired.

Second, data must be remembered. If data are not remembered, they cannot be processed. In other words, data must be stored long enough in memory for data to be able to be analyzed, evaluated, compared, contrasted, and integrated with other data. Behaviors related to positive increases in recall and retention include highlighting key data, notetaking, outlining, summarizing, and discussion (Doctorow, Marks, & Wittrock, 1978; Hooper, Sales, & Rysavy, 1994; Taylor & Berkowitz, 1980; Wittrock & Alesandrini, 1980). Again, performance of these behaviors increases the probability that data (and hence information) will be recalled, but does not guarantee data (or information or knowledge) acquisition.

The first and second steps when combined equal decoding. In other words, decoding combines attending data with the lowest level of Bloom's (1956) taxonomy of cognitive learning objectives, remembering data (Anderson & Krathwohl, 2001). Decoding is simply data acquisition, and there is a final step necessary for data to be transformed into information.

The final step for data to be transformed into information is information processing. Information processing is roughly equivalent to the revised higher order cognitive learning objectives of Bloom's taxonomy (Anderson & Krathwohl, 2001) namely analyzing, evaluating, synthesizing, and integrating. While these cognitive learning objectives are loosely based on Bloom's taxonomy, they in no way follow Bloom's prescribed order since these actions can occur simultaneously as well as in tandem. Behaviors associated with this final step include: a) critical thinking, b) summarizing, and c) thinking deeply about the relationships between data. Yet again, performance of these behaviors increases the probability that data will be transformed into information, but does not guarantee data (or information) acquisition.

For information to be transformed into knowledge, data must first be acquired through decoding and data must be processed into information. Thus, knowledge acquisition is dependent on data and information acquisition. However, in order for information to be transformed into knowledge, information must be usable to students. There is a difference between knowing and doing. Data and information are known (decoded and analyzed). However, until data as information becomes usable and thus the basis for action, data as information is not knowledge. Usable information (knowledge) can be applied to problem solving or future learning. Behaviors likely to support this final transformation based partially on recommendations for higher education reform of research universities in the Boyer Report (1998) include: 1) doing applied research, 2) creating finished products, 3) giving presentations, 4) leading discussions, and 5) providing systematic accounts of how information could be used to solve hypothetical problems. Of course, performing these activities in no way guarantees that information will be transformed into knowledge. However, performing these activities increases the probability that information will be transformed into knowledge (usable information).

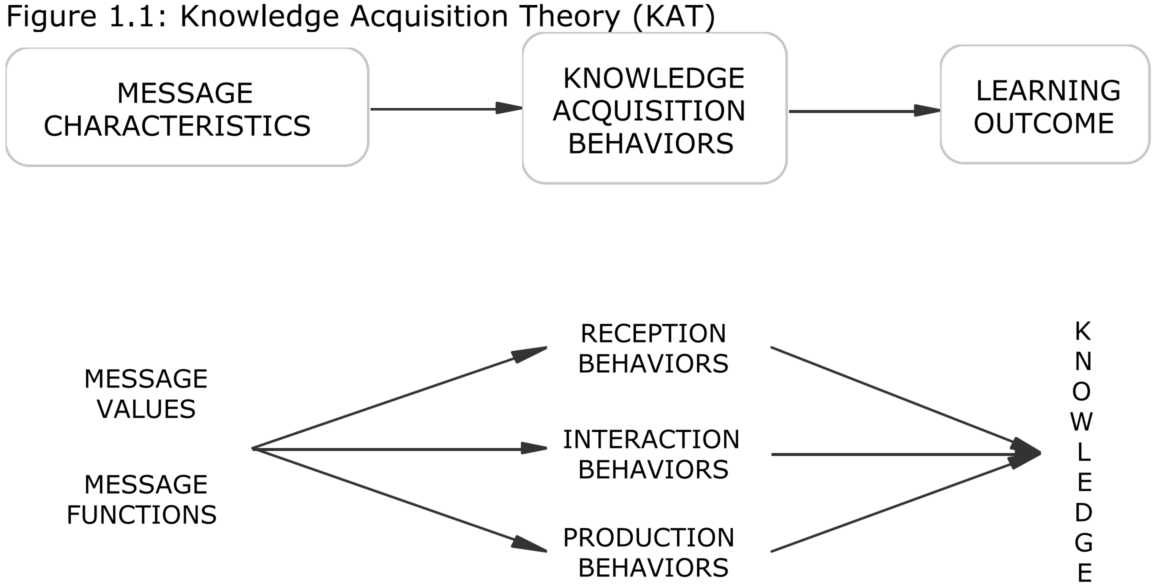
In reverse engineering the challenge of student acquisition of knowledge in the higher education context, it becomes apparent that the knowledge acquisition behaviors described above are all commonly associated with communication. For data acquisition, the communication is predominantly receptive. Students listen to or read other people's generated messages. For information acquisition, the communication is predominantly interactive. Messages are exchanged between instructors and students and/or between students and other students. For knowledge acquisition, the behavior is predominantly productive. Students become the producers of messages. Thus, for students to acquire knowledge, they have to move from message receivers to message producers. Messages are, of course, the central communication science construct. This being the case and since messages are central to data, information, and knowledge acquisition, the next step in the development of a theory of knowledge acquisition is to consider how the characteristics of messages relate to student knowledge acquisition behaviors in the higher education context.

There are many message characteristics that could potentially relate to student knowledge acquisition in the higher education context. Messages can have perceived values such as being simple or complex, long or short, clear or ambiguous, accurate or misleading, relevant or irrelevant, funny, or just plain stupid. And, messages can have different functions such as to present domain content, to provide rules, to externally represent content, to organize content, and to meet present or distal goals and/or needs. Instructional communication researchers have isolated two message values as important to student learning in the higher education context. These two message values are message clarity and message relevance. Clear messages positively affect student cognitive learning outcomes such as recall (Chesebro & Wanzer, 2006; Roshenshine & Furst, 1971). Relevant messages have a moderately strong correlation with student motivation (Frymier & Shulman, 1995; Frymier, Shulman, & Houser, 1996). Thus, it seems likely that clear messages support the enactment of knowledge decoding behaviors and relevant messages provide the impetus to act.

In reverse engineering the challenge of student knowledge from higher education courses, it becomes apparent that communication is essential to the acquisition of knowledge since messages and communication behaviors are essential to transforming data into information into knowledge. Students in higher education courses are first presented with instructor selected messages in the form of data. To acquire knowledge, students move from being passive message receivers (data decoders) to active message producers (knowledge wielders). Characteristics of the instructor selected messages such as their clarity value and relevance value as well as their functions influence whether or not students act to transform these data into information and subsequently into knowledge. This last statement is the central proposition of Knowledge Acquisition Theory.

Knowledge Acquisition Theory (KAT) is deceptively simple. Students are exposed to messages. These messages have a range of characteristics. Some messages are clear, and some are not. Some messages are relevant to a student's goals and needs, and some are not. These messages have a variety of functions. Some are used to expose students to data (textbooks, lectures). Some messages are used to help transform data into information (discussions). Some messages are used to organize other messages (syllabi, graphical representations, outlines, summaries, indexes, glossaries). Finally, some messages are used to encourage student interaction with data, to encourage students to transform data into information, and to encourage students to transform information into knowledge (procedures and assessments). The functional relevance of these messages as a whole and the clarity of these four functions of messages are likely to influence student knowledge acquisition behaviors. Students need to decode data. Students need to process data into information. Students need to find ways to use information to transform it into knowledge. Message characteristics and functions affect knowledge acquisition behaviors. Enactment of knowledge acquisition behaviors results in students who are able to succeed in the knowledge-driven world of the twenty-first century. The conceptual model of Knowledge Acquisition Theory is graphically represented in Figure 1.1 below.

Figure 1.1: Knowledge Acquisition Theory (KAT)



Knowledge Acquisition Theory is a mid-range instructional communication theory of knowledge among higher education students. As a mid-range theory, some specificity is lost. Knowledge Acquisition Theory does not account for every message characteristic, every message value, every message function nor their possible effects on every reception, interaction, or production behavior. Knowledge Acquisition Theory does not account for every possible knowledge acquisition behavior's effect on the knowledge gained from higher education courses. What Knowledge Acquisition Theory does do is to provide a communication based account of how higher education courses can be optimized to increase student gains in knowledge from higher education courses. The theory is flexible enough to accommodate changes in educational practices as research support for these practices emerges. And, the theory is flexible enough to accommodate an expansion of research on message effects. The theory is specific enough to guide future instructional communication research and to provide guidance in the development of educational practices that increase the knowledge obtained from higher education courses.

Section 1.1 presents the reasoning that leads to Knowledge Acquisition Theory. The primary question is how students can acquire knowledge from higher education courses. In order to provide an answer to this question, consideration is given to what knowledge is and how knowledge is dependent on data and information acquisition. Knowledge acquisition behaviors (actually communication behaviors) are suggested for increasing the probability that students will gain knowledge from taking a higher education course. Message characteristics and their values and functions are described that increase the likelihood that knowledge acquisition behaviors will be enacted. Finally, message characteristics, knowledge acquisition behaviors, and knowledge as a cognitive learning outcome are reassembled into Knowledge Acquisition Theory. Section 1.2 provides support for why knowledge acquisition behaviors are essential to student knowledge gains from higher education courses. Section 1.3 provides more details about message characteristics and the problems with message effects research. And, Section 1.4 presents the subset of Knowledge Acquisition Theory and the specific hypotheses derived from this subset tested in this dissertation.

Section 1.2: Knowledge Acquisition Behavior

Section 1.2 builds on Section 1.1 by providing more insight into the role that knowledge acquisition behaviors play in gaining knowledge from higher education courses. First, the full range of content interactions is discussed. Next, data acquisition behaviors are elaborated upon followed by a discussion of information and knowledge acquisition behaviors. Since the acquisition of knowledge is largely a process of self-generated effortful change, attention is directed to self-generated content interaction behaviors to support data acquisition and to thinking behaviors to support information and knowledge acquisition. Finally, Section 1.2 argues that data acquisition behaviors require the least effort and that information and knowledge acquisition behaviors require considerable effort to enact. Since people have a propensity toward least effort (Zipf, 1949) in their information acquisition behaviors, it is necessary to design messages that alleviate perceptions of effort.

Instructional communication research in focusing on teacher talk in the classroom has largely ignored the full range of communicative interactions that occur within higher education courses. This oversight is particularly glaring in relation to student interaction with content. While the content (data) of a higher education course that students are exposed to is generally selected by the instructor, the messages produced due to interaction with content can be predominantly teacher generated, student generated, or a mixture of both. As proposed in Knowledge Acquisition Theory, in order for students to transform data into information into knowledge, it is necessary for students to move from message receivers to message producers.

At a minimum, instructor interactions with content include the selection and organization of content and the subsequent presentation of course content to students in the form of lectures. However, instructor generated messages based on instructor interactions with content may also be provided to students in the form of instructor lecture notes, instructor interpretations of primary content domain sources, instructor summaries of texts, instructor visual representations of course content, instructor lead discussions of content, and instructor examples of course content. Student interactions with content include at a minimum listening to teacher talk or reading instructor provided content. Student generated messages based on student interactions with content include notetaking, outlining texts, summarizing texts, creating analogies, writing essays and papers, student lead discussions of course content, finding and selecting content placed into bibliographies, and creating visual representations of course content. Hybrids also exist in which instructors provide partial outlines, notes, study guides, and/or visual representations that students then complete while listening to teacher talk or while reading texts.

Some student interactions with content may occur in class and some may occur outside of class. In class interactions with content may include listening to lectures, notetaking, participating in discussions, giving presentations, leading discussions, and summarizing discussions. Out of class interactions with content may include reading texts, taking notes on texts, outlining texts, summarizing texts, writing essays and papers, and finding and selecting content. The purpose of mentioning these interactions here is not to provide an exhaustive list of all possible types of student or instructor interactions with content. One purpose is to simply illustrate the fact that much instructional communication research remains undone. However, the main purpose is to take the research findings that do exist and apply these findings to the challenge of student knowledge in the higher education context while keeping in mind that possible benefits and detriments of the varying types of interactions with content remain largely unexplored.

Indeed, there are surprisingly few instructional communication studies that even examine the link between something as basic to communication as listening and its possible relation to cognitive learning outcomes. However, Di Vesta and Gray (1973) find that recall increases when students take notes while listening. Aiken, Thomas, and Shennum (1975) clarify the relationship between listening and notetaking in a study suggesting that alternating between listening and notetaking increases recall beyond merely taking notes or merely listening. The other studies that have been conducted in this area generally contrast listening with notetaking in which instructors provide students with partial outlines. Improvements in notetaking through completion of partial outlines are associated with greater recall of lecture materials (Aiken, Thomas, & Shennum, 1975; Kiewra, 1985; Kiewra & Benton, 1988; Titsworth, 2001). Obviously, as the amount of student active interaction with content increases, recall increases.

In fact, for over thirty years, research in educational psychology and marketing has shown that knowledge that is self-generated is easier to recall (Slamecka & Graf, 1978; Wittrock, 1974). In other words, retention increases when students produce their own messages about content rather than merely reading or listening to someone else's produced messages about content. Robust self-generation effects have been found within a wide variety of contexts such as to increase reading comprehension and retention (Doctorow, Marks, & Wittrock, 1978; Hooper, Sales, & Rysavy, 1994; Taylor & Berkowitz, 1980; Wittrock & Alesandrini, 1980); the solving of mathematical problems (Lawson & Chinnappan, 1994; McNamara & Healy, 1995a, 1995b, 2000); the retention of nonwords (Begg, Snider, Foley, & Goddard, 1989; Brooks, Dansereau, Holley, & Spurlin, 1983; Foos, Mora, & Tkacz, 1994; Frase & Schwartz, 1975; Jacoby, 1978; Johns & Swanson, 1988; Nairne & Widner, 1987; Watkins & Sechler, 1988); the recall of advertising product information (Reardon & Moore, 1996; Sengupta & Gorn, 2002); and even the recall of answers to trivia questions (deWinstanley, 1995; Pesta, Sanders, & Murphy, 1999; Peynircioglu & Mungan, 1993). Active interaction with data is likely to increase decoding, the first step in the knowledge acquisition process, since a person may not always understand what someone else tells them, but will always understand, having gone through the generation process, what they tell themselves (Grabowski, 2004; Wittrock, 1974, 1989, 1982).

The challenge still remains of transforming data into information. This step requires that data is processed—compared to other data, analyzed for truth claims, organized into patterns, and evaluated based on the evidence provided. Kuhn and associates (Kuhn, 1986, 1989a, 1989b, 1990a, 1990b, 1992, 1993a, 1993b; Kuhn, Amsel, & O'Loughlin, 1988; Kuhn, Garcia-Mila, Zohar, & Andersen, 1995; Kuhn, Weinstock, & Flaton, 1994a; Kuhn, Weinstock, & Flaton, 1994b) argue that people have naïve causal theories derived from prior experiences and inference that produce expectations for how causal processes work, a position also adopted in Kruglanski's lay epistemic theory (1989, 1990). These naïve causal-process theories are revised through experiences in the real world. Based on Kuhn and colleagues' research, knowledge acquisition is largely a matter of changing expectations derived from prior data/information exposure (framed as informal causal-process theories) to accommodate new evidence (data) culminating in the creation of new information (and possibly knowledge) and revised theories. The major challenge is as Kuhn states to coordinate theories (processed information) and new evidence (data). Undergraduates are not blank slates (Pinker, 2002) but have been exposed to a wide variety of data and/or information that result in certain expectations for the content of individual courses, and the coordination of theories (expectations based on prior exposure to data/information) and evidence (new data) among undergraduates is largely dependent on the use of thinking behaviors.

Thinking is generally considered a skill among educational researchers (Smith, 2002). The great debate about thinking skills centers on whether thinking skills are content domain specific or universal (Ennis, 1989, 1991; McPeck, 1981, 1990a, 1990b). Smith (2002) rightly concludes that some thinking "skills" are universal and some are domain specific. This seems to support a view of thinking as a behavior rather than a skill. It seems rather odd that thinking is treated as a skill among most educational researchers. In this dissertation, thinking is treated as a goal-directed behavior—a reaction, largely under the control of the thinking organism, to the data to which one is exposed. This reaction is controlled since one can chose to ignore the data, can have minimal interaction with the data such as decoding, or can have considerable interaction with the data such as information processing. Thinking as a behavior can, of course, influence the degree of enactment of other behaviors. Thus, thinking is required for the transformation of data into information into knowledge. This conclusion receives considerable support from research conducted in persuasion.

Simply stated, data that is more deeply processed is more persuasive resulting in change that is more resistant to erosion, or at least, this is the well supported claim of major persuasion theories such as Petty and Cacioppo's Elaboration Likelihood Model (Cacioppo & Petty, 1984; Petty & Wegner, 1999) and Kruglanski's Unimodel (Kruglanski, 1989, 1990; Kruglanski & Orehek, 2007; Kruglanski & Thompson, 1999). One conclusion from this line of research is that people vary in their thinking behaviors. Some people are inclined to think deeply and some are not. This difference in thinking behavior is labeled need for cognition (Harrington et al, 2006; Haugtvedt & Petty, 1992; Howard, 1997). If people vary in their thinking behavior and yet it is necessary for people to think deeply about data in order to transform data into information into knowledge, then the question remains about whether or not people can be trained to think deeply even if they have a natural proclivity not to think deeply or "critically". Critical thinking is associated with training people to think deeply about data. Thus, research on critical thinking may provide at least a partial answer to this question.

Critical thinking is still somewhat of a floating construct. However, Facione (2007) defines critical thinking based on the consensus statement of a national panel of "critical thinking experts" after a two-year research project sponsored by the American Philosophical Association as consisting of six core critical thinking skills (behaviors) and seven critical thinking dispositions (habitual application of those skills). The seven critical thinking skills are: 1) analysis (finding inferential relationships), 2) inference (data selection), 3) interpretation (finding meaning or significance), 4) evaluation (determining source credibility), 5) explanation (presentation of results), and 6) self-regulation (controlling for bias). The seven critical thinking dispositions mean being: 1) inquisitive, 2) judicious, 3) systematic, 4) analytical, 5) truth-seeking, 6) open-minded, and 7) confident in reasoning. Even if these six skills are acquired and seven dispositions become habitual, there is still no guarantee that the quality of thought generated from critical thinking is any better than that of any other thinking behavior.

Elder and Paul (2007) of the National Council for Excellence in Critical Thinking claim that there are seven universal intellectual standards that can be used to ascertain the quality of thinking. These seven standards are: 1) clarity to establish accuracy and relevancy, 2) accuracy to establish truth, 3) precision to establish specificity, 4) relevance to establish connectedness to the issue(s) at hand, 5) depth to establish whether or not all considerations of an issue have been dealt with, 6) breadth to guard against one-sidedness, and 7) logic to establish if combinations of ideas make sense. It seems that critical thinking as defined by Facione and Elder and Paul relate to student knowledge acquisition behaviors in the sense that the skills and dispositions associated with critical thinking mirror the processing of data into information. However, the question remains as to whether or not critical thinking can be learned. Research in instructional communication provides an answer to this question.

In instructional communication research, critical thinking is treated as a learning outcome. Berkowitz' (2006) meta-analysis of twenty-three research studies examining the effects of communication skill courses on the development of critical thinking skills indicates that participation in communication skills courses such as basic public speaking, debating, argumentation, and forensics result in significant gains in critical thinking skills. Competitive forensics courses engender the greatest gains, and public speaking courses the least. Perhaps, the more formal and explicit the training in critical thinking, the higher are the gains. In this dissertation, thinking is treated as a behavior (or a set of behaviors based on the list of critical thinking "skills"). It is a behavior the performance of which can be improved. And, it is a behavior required for the transformation of data into information into knowledge.

If the goal of higher education is indeed for students to transform data into information into knowledge, then the solution posited in Knowledge Acquisition Theory is to move students from relatively passive message recipients to critical message processors to active message producers. However, in moving students from relatively passive message recipients to active message producers, a major challenge is encountered. Processing and producing messages require more effort than simply receiving messages. One universal law of human behavior appears to be a tendency toward least effort (Zipf, 1949). Zipf's principle of least effort is a grand theory of information seeking behavior (Case, 2005) predicting that people will attempt to minimize the expenditure of effort needed to acquire information even if it means that lower quality information becomes the basis for subsequent decision making and action. Poole's (1985) review of 51 information seeking studies shows that 40 of the 51 studies sampled support the Principle of Least Effort (Case, 2005). If the propensity toward least effort is a universal human trait, then it becomes necessary to consider how the probability that students will make the effort to transform data into information into knowledge can be increased. The answer to this proposed in Knowledge Acquisition Theory is to reduce perceptions of effort through the strategic design of messages based on a message effects perspective as is discussed in Section 1.3.

Section 1.1 set up the conditions under which students gain knowledge in higher education courses. Section 1.2 details the role that data, information, and knowledge acquisition behaviors play in gaining this knowledge. Active participation in data, information, and knowledge acquisition through the self-generation of messages increases decoding and information processing. Thinking is a necessary interaction with data in order to transform data into information into knowledge. However, active participation increases the amount of effort necessary to acquire data, information, and knowledge. Data acquisition behaviors require the least effort and information and knowledge acquisition behaviors require considerable effort to enact. Since people have a propensity toward least effort (Zipf, 1949), it is necessary to design messages that alleviate perceptions of effort. How this can be accomplished is discussed in the next section of Chapter 1.

Section 1.3: Message Characteristics

A higher education course consists of many sets and types of messages. Instructional communication researchers driven by the knowledge transference model limit these sets and types of messages to teacher talk with emphasis placed on "communication in the classroom" defined as instructor presentation of content to students through lectures. The alternative view of communication within higher education courses adopted in this dissertation does not limit messages to teacher talk, but does acknowledge that research on teacher talk illuminates part of the puzzle of student learning in a higher education course. No claims are made that this dissertation fills in all of the missing pieces of the puzzle, but at least this dissertation attempts to add more of the pieces.

Section 1.3 provides an overview of "message effects" research, and provides an answer to the question of how messages can be designed to reduce perceptions of effort in the enactment of data, information, and knowledge acquisition behaviors. Message design is strongly influenced by strategic communication, and thus some consideration is given to strategic message design. Finally, this dissertation refines the clarity and relevance constructs as part of the larger goal of developing an instructional message effects research agenda.

In message effects research, messages are generally treated as stimuli that evoke changes in psychological states culminating in behavioral changes (Capella, 2006; O'Keefe, 2003). This research is criticized both for its lack of generalizability (Brashers & Jackson, 1999; Jackson & Jacobs, 1983; Jackson, O'Keefe, & Jacobs, 1988) and for its lack of specificity (O'Keefe, 2003). Much of the research on message effects uses messages as stimuli to, for example, tailor messages to specific types of individuals in order to change their health behaviors (Kreuter, Farrell, Olevitch, & Brennan, 1999). If messages are tailored to specific individuals in specific situations, then can findings from such research be replicated among subjects in other situations? In other words, does this research inform understanding of abstracted characteristics of messages or is the finding merely indicative of the effects of a specific instance of a message on a specific group of people?

O'Keefe (2003) argues that the pragmatic application of message effects research in persuasion is largely unclear. It may be known, for example, that message designers should create messages that induce fear in targeted audience members in order to reduce risky behaviors, but it is still largely undetermined what constitutes a fearful message. The focus of message effects research is often more on the psychological states that may produce behavioral change than on the design of messages. The science of communication accepts "message" as its central construct. Thus, the focus of message effects research should be on the design of messages when viewed from a communication perspective. Design is inherently a strategic endeavor involving planning, organization, and the testing of the effects of design on a targeted audience.

One of the basic tenets of communication science is that communication is most effective when strategic (Berger, 1995, 1997, 2002; Berger, Knowlton, & Abrahams, 1996) though Berger (2002) suggests that nonstrategic communication can also be informative and exciting. Nonstrategic communication leaves goal and objective attainment up to chance, whereas strategic communication tries to increase the probability that a goal will be met or a need fulfilled by reducing the potential for human error. Strategic communication is primarily concerned with the attainment of communication goals and objectives through the selection, organization, and structuring of messages that are appropriate to the context, subject matter, and audience. Strategic message design is thus defined in this dissertation as the process of reducing error by redirecting effort in the maximization of the attainment of a well-defined goal. Messages within higher education courses are not usually random events. Messages are designed to fulfill specific goals in relation to the context, subject matter, and audience. In Knowledge Acquisition Theory, message characteristics influence knowledge acquisition behaviors. In other words, gains in knowledge occur when messages are strategically designed with certain characteristics to illicit and support knowledge acquisition behaviors. This begs the question of what a characteristic of messages really means.

In this dissertation, a message characteristic is a combination of the value derived from a message and the communicative function of the message. A value is what the message is supposed to do (the value added) and a function is the context to which the value applies. For example, clarity and relevance are values as clarity adds value to a message by reducing ambiguity and relevance adds value to a message by demonstrating need. Textbook clarity is a message characteristic in that the message value (clarity) functions to make the context (textbook) clear and less ambiguous.

Message effects research is largely unexplored in instructional communication. While clarity and relevance are labeled "message" variables in the *Handbook of Instructional Communication* (2006), clarity and relevance as defined in instructional communication research have little to do with messages per se since the focus is on the instructor (sender) rather than on the message. Relevance, for example, is framed in terms of instructor attempts to make course content relevant to students regardless of whether or not content is actually relevant (Frymier & Shulman, 1995; Frymier & Houser, 1998; Frymier, Schulman, & Houser, 1996). What then is a relevant instructional message? In this dissertation, relevant instructional messages have three functions: 1) primal relevance or relevance to a student's current goals and needs as defined by the student, 2) distal relevance or relevance to a student's possible future needs as defined by the student, and 3) generic relevance or content that a student has already determined as relevant to their goals and/or needs which then is likely to be relevant to other people's goals and/or needs. Since students are likely to select the courses they take based on a perceived goal or need, relevance is largely a matter of how well a course meets that goal or need.

Clarity in traditional instructional communication research is restricted to teacher clarity defined as "a cluster of teacher behaviors that result in learners gaining knowledge or understanding of a topic, if they possess adequate interest, aptitude, opportunity, and time" (Cruickshank & Kennedy, 1986, p. 43). In Knowledge Acquisition Theory, it is not the behaviors of teachers that help students gain knowledge so much as it is the behaviors of students. However, teachers as message designers can produce clear messages, but the value of clarity is not to make instructors clear, but rather to make the messages instructors present to students clear so that students can redirect their energy to the enactment of knowledge acquisition behaviors rather than to deciphering instructor meaning and intent.

There are four functions of clear messages that instructors present to students. Three of these functions are generally instructor produced clear messages and one function is clear messages selected by an instructor but not necessarily produced by instructors. The three functions of clear messages produced by instructors are: 1) presentation of content in class through lectures, discussions, or other teacher generated interpretations of content, 2) presentation of procedures and assessments for students to follow, and 3) presentation of the goals and objectives of the course as embodied by the course syllabus. The fourth function of messages in higher education courses is the textbook (or other instructional materials such as research articles) selected by instructors but not necessarily produced by instructors to represent a content domain. It is also possible for students to select the content to which they are exposed. Clarity, in instructional communication research driven by the "knowledge" transference model, is largely restricted to the first function.

Interest in clear communication from a communication perspective stretches back at least into the 1950's. Nebergall (1958), for example, claims that his definition of rhetorical clarity, that clarity is the degree to which a speaker's intended meaning for a message agrees with an audience's obtained meaning from the message, is common among rhetorical theorists. This view of clarity as a sense making value is apparent in the work of more recent instructional communication scholars attempting to refine clarity through a largely underdeveloped relational view (Civikly, 1992; Eisenberg, 1984; Hativa, 1998; Kendrick & Darling, 1990; Simonds, 1997). The underlying and untested claim to this view of clarity is that clear messages increase understanding.

While the relational approach to clear instructional messages may be appropriate in regards to an individual message, a higher education course as a conglomerate of messages, intents, and meanings is too complex to measure all of the intended meanings and possible interpretations of those intended meanings, and then compare them. The relational view in focusing on the process of negotiating meaning between instructors and students is currently counterproductive for research on increasing gains in knowledge among students through the use of message design strategies. The goal of clarity research is not to establish what is a clear meaning or intent from a teacher or student perspective, but to demonstrate possible effects that clear messages ultimately have on student learning outcomes. While defining "clear" messages is part of this process, this definitional process is one small part of the overarching goal of determining possible effects of clear messages on student learning outcomes. The relational approach could add value to instructional message effects research if the underlying claim that clear messages result in increased understanding were tested. Other approaches to clarity research also suffer from lack of a message effects approach.

Roshenshine and Furst's article (1971) is generally cited as the seminal piece that brought the importance of teacher clarity to the attention of both educational researchers and practitioners. The rediscovery of the importance of clarity for effective teaching in the 1970's resulted in a proliferation of educational studies attempting to measure and define clarity (Kennedy, Cruickshank, Bush, & Myers, 1978; Hines, Cruickshank, & Kennedy, 1985; Land, 1979, 1980, 1981; Land & Smith, 1979a, 1979b; Metcalf, 1992; Metcalf & Cruickshank, 1991). Results from this proliferation of research using experimental designs indicate that "clear" lessons have a significant impact on cognitive learning lending support to the argument that there is a cause and effect relationship between clear and unclear teaching and student achievement (i.e. Land & Smith, 1979a). What then is a "clear" lesson?

Kennedy, Cruickshank, Bush, and Myers' highly cited study (1978) compares the responses of junior high school students from Ohio, Tennessee, and Australia on a survey designed to determine the characteristics (high and low inference) of clear and unclear instructors. Results of this study show that a clear instructor presents new material in the most simple terms, uses concrete examples when and wherever possible, provides students with an opportunity to think about what is being taught and to respond to what is taught, continually appraises the current level of student understanding, remains with the idea or topic until most students understand it, employs frequent repetition, and paces the lesson in a planned, methodical manner. This study specifies the teacher behaviors that result in clear lessons. Communication scientists have not adapted these findings to the development of a message effects research agenda on instructional message clarity in spite of the fact that a message focus is communication science's unique contribution to human knowledge.

Hines, Cruikshank, and Kennedy's (1985) study was the first to establish a correlation between teacher clarity and student learning outcomes. This study compared trained observer ratings, student ratings, and instructor self-ratings of teacher clarity on measures of student achievement and satisfaction. Moderate to moderately strong correlations between teacher clarity (regardless of rater type) and both student achievement and student satisfaction support the claim that teacher clarity consists of three low-inference dimensions (highlights key information, uses concrete examples to explain content, and assesses and corrects student gaps in understanding) divided into 12 low-inference behaviors. This study provides support for the development of a definition of a clear message. A clear message (or set of messages) highlights key information and uses concrete examples.

From the 1980's to the present, clarity has resurfaced as a topic of interest to communication scientists operating mainly within the Instructional Communication context. Teacher clarity has been studied in relation to immediacy (Chesebro, 2003; Chesebro & McCroskey, 1998a; Chesebro & McCroskey, 2001; Frymier & Weser, 2001; Guerrero & Miller, 1998; Myers & Knox, 2001; Nussbaum, 1992; Powell & Harville, 1990), communication apprehension and anxiety (Chesebro, 2003; Chesebro & McCroskey, 1998a;

Chesebro & McCroskey, 2001; Frymier & Weser, 2001), use of humor in the classroom (Frymier & Weser, 2001), student clarification tactics (Kendrick & Darling, 1990), cross-cultural comparisons (Kim, 1994; Kim & Wilson, 1994; Powell & Harville, 1990), student information seeking (Myers & Knox, 2001), affective learning (Chesebro, 2003; Chesebro & McCroskey, 2001; Guerrero & Miller, 1998; Powell & Harville, 1990), and "cognitive learning" (Chesebro, 2003; Chesebro & McCroskey, 2001; Nussbaum, 1992; Powell & Harville, 1990; Simonds, 1997). In spite of an over reliance on self reported data obtained through the use of surveys and a less than convincing measure of cognitive learning (the "learning loss measure" described in chapter 2), results have consistently supported the much stronger evidence coming from experimental educational research showing a causal relationship between teacher clarity behaviors and student cognitive learning.

The above research studies have done little to contribute to the development of an instructional message effects research agenda. While they have contributed to an understanding of how teacher behaviors influence student behaviors and learning outcomes, they have not directly contributed to an understanding of how instructional messages and their characteristics influence student behaviors in the acquisition of knowledge. Part of the problem is that focus in instructional communication research is on instructor presentation behaviors. This is true in spite of Simonds' (1997) distinction between content clarity (interpretive explanations) and process clarity (descriptive and reason-giving explanations). The emphasis of the majority of instructional communication research is still on teacher talk and teacher behavior rather than on instructional messages and student learning outcomes (Clark, 2002). Research outside of instructional communication that is recently receiving attention among instructional communication researchers does inform the development of an instructional message effects research agenda.

One promising area of inquiry is the use of what Ausubel (1960, 1968) calls "advanced organizers". Advanced organizers, defined as conceptual previews of instructional materials upon which subsequent lecture content is organized, is the subject of a recent meta-analysis by instructional communication researchers (Preiss & Gayle, 2006). After their meta-analysis of 11 experimental studies and review of the previous reviews of advanced organizer research, Preiss and Gayle conclude that 43 years of research shows that oral advanced organizer use associates with small, but meaningful increases in learning and retention. The use of oral advanced organizers may be one strategy for the clear presentation of instructional messages. While Preiss and Gayle's analysis focuses on oral advanced organizers, structural enhancements to learning (Trumpower & Goldman, 2004) include both written and oral advanced organizers, graphic organizers, concept maps, knowledge maps, and interactive overviews.

Since a content domain or an instructional material such as a textbook may not be linearly organized or structured in a hierarchical sense as is required with advanced organizers, other structural enhancements such as concept maps and knowledge maps may be better structural enhancements for content domains or instructional materials that are more web-like or nonlinearly structured. For over 20 years, researchers at Texas Christian University have studied the use of node-link mapping (knowledge maps) in relation to recall of scientific texts. Findings from this research program include: a) knowledge maps work best with learners having low prior "knowledge" and low verbal ability (Lambiotte & Dansereau, 1992; Lambiotte, Skaggs, & Dansereau, 1993; O'Donnell & Dansereau, 1992; Rewey et al., 1989; Patterson, Dansereau, & Wiegmann, 1993); b) node-link maps facilitate recall of main ideas but are no different than text for the recall of details (Hall, Dansereau, & Skaggs, 1992; Rewey, Dansereau, Skaggs, Hall, & Pitre, 1989; Rewey, Dansereau, & Peel, 1991); and c) knowledge maps enhanced using Gestalt principles of organization resulted in better recall (both immediate and delayed) of information than unenhanced maps or text (Wallace, West, Ware, & Dansereau, 1998; Wiegmann, Dansereau, McCagg, Rewey, & Pitre, 1992). Thus, the use of structural enhancement may provide one strategy for the design of clear textbook messages particularly for students unfamiliar with content. This is especially true since generally the use of visuals in instructional materials has proven efficacious for student cognitive learning outcomes such as retention in instructional systems design research (Anglin, Vaez, & Cunningham, 2004).

In summary, a clear instructional message or set of messages reduce ambiguity and thus help make meaning clear. Knowledge Acquisition Theory holds that meaning that is clear is easier to both recall and to process. Thus clear instructional messages support data and information and thus knowledge acquisition. The design of clear instructional messages is somewhat dependent on the meaning for which ambiguity is being reduced. In other words, the design of clear instructional messages depends on the function, the context to which the message or set of messages apply. The design of clear instructional messages is best achieved if guided by strategic communication from a message effects perspective. A message effects perspective involves demonstrating the effects of messages on underlying psychological processes that result in behavioral changes.

In higher education courses, instructional messages are designed within at least four contexts: 1) presentation of specific content in class, 2) presentation of procedures and assessments for a course or for an individual assignment, and 3) presentation of the goals and objectives of the course, and 4) presentation of a content domain through external representations of that contain domain such as textbooks. Thus there are four message characteristics subsumed under the general label of instructional message clarity: 1) presentation clarity to reduce the ambiguity of messages presented in class, 2) procedural clarity to reduce the ambiguity of messages presented in relation to course procedures and assessments, 3) course clarity to reduce the ambiguity of messages pertaining to course goals and objectives, and 4) textbook clarity to reduce the ambiguity of messages representing a content domain.

Presentation clarity may include the following message design strategies as revealed in the research literature: 1) use of examples, 2) highlighting key information, 3) use of visuals, and 4) use of oral advanced organizers such as previews and internal summaries. Suggested message design strategies for improving procedural clarity derived from Simonds' (1997) work include: 1) defining tasks, 2) providing feedback, and 3) specifying rules and standards. Message design strategies for improving course clarity based on strategic communication include: 1) defining goals, objectives, and expectations, 2) integrating content, 3) organizing content, and 4) producing a well-organized syllabus. Finally, message design strategies for improving textbook clarity derived from the research literature include: 1) use of examples, 2) highlighting key information, 3) use of visuals, and 4) use of structural enhancements.

It seems likely that presentation instructional message clarity, procedural instructional message clarity, course instructional message clarity, and textbook instructional message clarity support the enactment of underlying psychological processes and their associated self-generation behaviors. Knowledge Acquisition Theory as a mid-range theory does not specify these relationships. More micro level theory development is called for in specifying the relationships between presentation instructional message clarity, procedural instructional message clarity, course instructional message clarity, and textbook instructional message clarity and data, information, and knowledge acquisition behaviors. However, it is proposed in this dissertation that instructional message clarity predicts the enactment of data, information, and knowledge acquisition behaviors because clear messages are easier to decode and process thus reducing perceptions of effort.

If a stimulus is ambiguous, it requires considerable effort to reduce this ambiguity through attempts at determining the stimulus' meaning (Putnam & Sorenson, 1982). Since people have a natural inclination toward least effort (Zipf, 1949), it seems reasonable that messages that require more effort to process are less likely to be processed. Rather, the message may be avoided altogether or may take a back seat to the processing of other easier to process stimuli. In a higher education course, there is a vast array of stimuli, both salient and extraneous to the goal of gaining knowledge, competing for student attention and processing. Clear instructional messages in being perceived as requiring less effort are more likely to be attended and processed. The same can be said of relevant instructional messages, but for slightly different reasons as is discussed below.

In Knowledge Acquisition Theory, relevant instructional messages in meeting the needs and goals of students are more likely to be attended and processed. Gaining knowledge is not viewed as a simple or easy process. Rather, effort must be made if cognitive and behavioral changes are to be enacted. By minimizing the perceptions of effort required and by providing a reason why efforts should be made to endure the difficult process of change, then students are more likely to make the effort necessary to gain knowledge of a content domain including the acquisition of the behaviors necessary for how to gain knowledge. A clear and relevant instructional message is thus more likely to predict the enactment of data, information, and knowledge acquisition behaviors through the perceived reduction of the effort involved or by providing the impetus to act than either a clear instructional message or a relevant instructional message alone.

Section 1.3 first outlines the problems with message effects research, their lack of generalizability and lack of specificity. Next, a solution to these problems is posed based on strategic communication and the use of strategic message design. A proposal is made for the development of an instructional message design research agenda by first pointing out the lack of a message orientation among current instructional researchers on alleged "message" variables. A refinement of the clarity and relevance constructs is presented in which a message characteristic is defined as the combination of a message value (what the message is designed to improve) and a function (the context to which the value applies). This section ends with a claim that clear, relevant instructional messages are more supportive of data, information, and knowledge acquisition behaviors than clear or relevant messages alone. The next section of this chapter, Section 1.4, presents the reasons for the study conducted and the hypotheses tested.

Section 1.4: Hypotheses

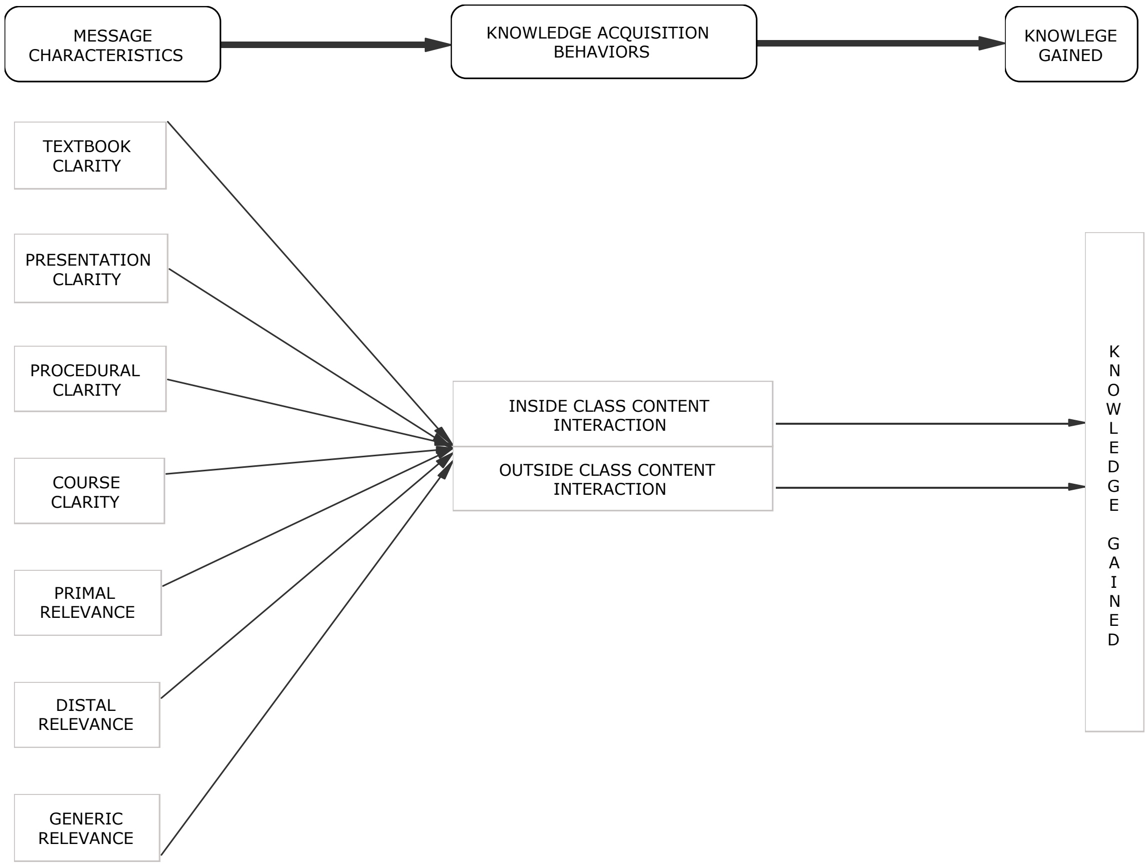
The purpose of the research study conducted in this dissertation is two-fold. First, the research study is designed to provide preliminary support for Knowledge Acquisition Theory through testing of its central proposition that message characteristics predict knowledge acquisition behaviors leading to gains in knowledge among traditional undergraduates after the completion of a higher education course. The rationale leading up to this proposition through reverse engineering the problem of knowledge gains among traditional undergraduates is presented in Sections 1.1-1.3 of this chapter, but a brief summary is as follows:

1. Knowledge is usable information and for information to be usable, data must first be decoded and then processed.
2. To gain knowledge, students must interact with data, transform data into information, and finally transform information into knowledge. This is best achieved through the enactment of effortful, self-generated interactions (behaviors) with content inside and outside of the classroom.
3. Message characteristics are likely to influence perceptions of effort, and thus influence the enactment of the effortful, self-generated interactions with content. Possible message characteristics likely to influence perceptions of effort based on a refinement of the clarity and relevance constructs from a strategic message effects reinterpretation of the instructional communication research literature are: textbook clarity, presentation clarity, procedural clarity, course clarity, primal relevance, distal relevance, and generic relevance.

This overarching proposition is stated in Hypothesis 3 below. However, Hypothesis 2 tests the proposition that knowledge acquisition behaviors predict perceptions of knowledge gains and Hypothesis 1 tests the proposition that message characteristics predict knowledge acquisition behaviors.

The second purpose of this research study is to dispel the myth that focus on teacher talk is the only way that instructional communication research can inform the study of communication within higher education courses. For this reason, data, information, and knowledge behaviors are divided into two types, in class content interactions and out of class content interactions. Specifically, Hypotheses 1 and 2 are designed to test this. The model tested in this study is graphically represented in Figure 1.2 below followed by the three Hypotheses.

Figure 1.2: Tested Model



$H_{1.1a}$: Perceptions of instructional message clarity significantly predict in class interactions with content.
$H_{1.1b}$: Perceptions of instructional message clarity significantly predict out of class interactions with content.
$H_{1.2a}$: Perceptions of course content relevance significantly predict in class interactions with content.
$H_{1.2b}$: Perceptions of course content relevance significantly predict out of class interactions with content.
$H_{1.3a}$: Perceptions of instructional message clarity and course content relevance significantly predict in class interactions with content.
$H_{1.3b}$: Perceptions of instructional message clarity and course content relevance significantly predict out of class interactions with content.
H_2: Knowledge acquisition behaviors significantly predict student gains in knowledge.
H_3: Perceptions of instructional message clarity, course content relevance, and knowledge acquisition behaviors significantly predict student perceptions of gains in knowledge in higher education courses among traditional undergraduates.

Chapter 2: Methods

This dissertation is primarily concerned with how perceived message characteristics potentially influence knowledge acquisition behaviors leading to perceptions of having gained knowledge among undergraduate learners in higher education courses. The study conducted is designed to expand instructional communication research beyond the teacher talk focus as well as to potentially provide support for the basic tenet of Knowledge Acquisition Theory that message characteristics predict student knowledge acquisition behaviors resulting in student gains in knowledge. This dissertation is unique within instructional communication research in taking a message-oriented receiver perspective to approach the investigation of knowledge gains from higher education courses. Traditionally, instructional communication research focuses on teacher behaviors and their possible effects on affective learning, though more recent research adopts a student perspective. This bias toward teacher talk and teacher behaviors among traditional instructional communication researchers creates a gap in what is known about the challenge of increasing knowledge gains among traditional undergraduate learners. This dissertation is by nature formative, and it has been necessary to develop several new measures to capture the constructs tested within the dissertation's theoretical framework.

This study uses cross-sectional survey research methods and linear and hierarchical linear regression to test the three research hypotheses listed at the end of Chapter 1. In instructional communication research, it is standard practice to ask students to reflect upon the previous class they had had immediately before the present class in which the research is being conducted. The rationale for this is that teachers often do not want to participate in research studies when they feel that they are the subject of investigation (McCroskey & McCroskey, 2006). This method has proven successful in previous instructional communication research studies for procuring subjects and instructor consent. This is the approach adopted within the present dissertation for obtaining subjects with a few modifications. Since this dissertation deals with perceived knowledge gains from the completion of an entire course rather than an individual lesson, undergraduate students are asked to reflect back on the previous semester and to contemplate the course that had had the highest course number.

One potential problem with use of this sampling procedure in this study and with having subjects reflect back upon a course taken in the previous semester is that insufficient time may have elapsed in order for students to have determined if a course has been relevant to their present and/or future goals and/or needs. With this limitation in mind, this dissertation has adopted this sampling approach based on current practices within instructional communication research.

Section 2.1: Sampling, Setting, and Procedures

The sample for this study is taken from undergraduate students enrolled in basic communication courses at a large research one institution in the south-central region of the United States. Students in these courses were offered either extra or course credit for their participation. The study originally included 367 undergraduate subjects taking a 100 or 200 level basic communication course. One of the items on the online survey asked about the honesty with which participants had filled out the survey measured on a 5-point Likert scale ranging from "Not Honest at All" to "Completely Honest". One case was dropped from the analysis based on the self-reported lack of honesty ("Not Very Honest").

This study restricts itself to students between the ages of 18-22 since non-traditional students may vary significantly from traditional undergraduates in their perceptions of classroom practices and outcomes as is apparent in the Houser study in which traditional and nontraditional students varied in their expectations for teacher immediacy (2005). This resulted in the exclusion of 9 further cases (age 23: 1 case, age 24: 2 cases, age 25: 2 cases, age 35: 1 case, and declined to respond: 3 cases). Z-scores were calculated for the remaining 357 subjects and 20 respondents were excluded based on Z-scores greater or less than 3. Finally, based on the Mahalanobis Distance scores (Mertler & Vannatta, 2005) taken on the regression model, four cases that were too extreme were subsequently excluded leaving a sample total of 333.

Demographics of the final sample (n = 333) are as follows. The mean for age was 19.26 with 155 (46.5%) 19 year old subjects, 77 (23.1%) 18 year olds, 55 (16.5%) 20 year olds, 28 (8.4%) 21 year olds, and 18 (5.4%) 22 year olds. The sample had slightly more females than males; 192 females (57.7%) compared to 140 (42%) males with 1 subject declining to answer (.3%). The majority of the sample were freshmen (209 subjects or 62.8%) compared to sophomores (69 subjects or 20.7%), juniors (31 subjects or 9.3%), seniors (22 or 6.6%), and 2 subjects declining to answer (.6%). Since the majority of the sample were freshmen reflecting back on a course most likely taken in their first semester of college, perceptions of knowledge gains may have been less indicative of all undergraduates at the university. Freshmen are often still transitioning from high school and may have less prior experience to draw upon for making distinctions between effective and ineffective message strategies or use of knowledge acquisition behaviors to gain knowledge.

Subjects came from 10 colleges within the university with the majority being from the College of Business and Economics (84 subjects or 25.2%). The College of Communications and Information Studies had 62 representatives (18.6%). The College of Arts and Sciences had 56 representatives (16.8%). The College of Engineering was next with 28 representatives (8.4%) followed by Education (15 representatives or 4.5%), Nursing (12 representatives or 3.6%), Design (11 representatives or 3.3%), Fine Arts (9 representatives or 2.7%), Agriculture (6 representatives or 1.8%), Social Work (1 or .3%), undecided (42 or 12.6%), and declining to answer (7 or 2.1%). Students in different majors may have different goals and needs, but there is enough diversity in the sample to represent the targeted population.

Student subjects were guaranteed complete anonymity, and those who agreed to participate in this study were directed to an online survey using MRInterview. The subjects were asked to select and reflect back on a course taken the previous semester that had the highest course number. The following statements appeared on the online survey consent form:

"Consent to Participate in a Research Study

Investigator's Name: Robert J. Trader
Investigator's Telephone Number: 859-523-3700

I. INTRODUCTION

You are invited to participate in a research study. Before you decide to be a part of this study, you need to understand the risks and benefits. This consent form provides information about the research study. I will be available to answer your questions and provide further explanations if need be. If you agree to take part in the research study, you will be asked to sign this consent form. Your decision to take part in the study is voluntary. You are free to choose whether or not you will take part in the study.

II. PURPOSE

I am conducting this study test a theory of instructional communication used in my dissertation research. This study tests whether message characteristics influence student knowledge acquisition behaviors leading to gains in knowledge from higher education classrooms.

III. PROCEDURES

The research will be completed in the form of an on-line survey. The total amount of time you will be asked to volunteer is approximately twenty minutes.

IV. POSSIBLE RISKS

To the best of my knowledge, by filling out the attached survey you will have no more risk of harm than you would experience in everyday life.

V. POSSIBLE BENEFITS

You will not get any personal benefit from taking part in this study. However, results from this research may aid teachers in the construction of subsequent courses.

VI. COSTS

There are no costs associated with taking part in this study

VII. COMPENSATION

You will receive course or extra credit points as determined by your instructor for participating in this study. You are permitted to skip questions and still receive full credit for your participation.

VIII. RIGHT TO WITHDRAW FROM THE STUDY

Your participation in this research study is voluntary. You may decide not to begin or to stop this study at any time. Your records will be used for research purposes only.

IX. CONFIDENTIALITY OF RESEARCH RECORDS

Your records will be private. Your personal records will be kept private unless you permit their release. Your records will be used for research purposes only. Someone from the University of Kentucky may review the data to ensure that the study is being done correctly. At the end of the study, the records will be destroyed. On-line participants should be reminded that a third party may intercept electronic data transmissions and the researchers cannot guarantee private responses.

X. QUESTIONS

If you have questions about the procedures of this research study, please contact me, Robert J. Trader, by telephoning anytime or sending an E-mail to rjtrad2@uky.edu. If you have questions about your rights as a volunteer in this research, contact the staff in the Office of Research Integrity at the University of Kentucky at (859) 257-9428 or toll-free at 1-866-400-9428.

XI. ON-LINE CONSENT

Please click "Next" if you are willing to agree to the terms of this consent form and participate in the study. If you do not agree with the terms or do not wish to complete the survey, simply close the browser window at this time."

After clicking on "Next", subjects were asked to read the statement (provided below) and to respond to the survey items.

"Reflecting back on the previous semester in your undergraduate education, select the course you took that had the highest course number (i.e. if you had taken ENG 101, SOC 304, SPA 102, and COM 181 in the previous semester, you would consider your learning experiences in SOC 304 when answering the following questions), and answer the following questions as honestly as possible."

In line with the large number of freshmen, the courses reflected upon during the survey tended to be within the 100's (232 courses, or 69.7%, had a course number within the 100 range). There were 62 (18.6%) courses with a course number in the 200's reflected on, 15 (4.5%) courses in the 300's, 11 (3.3%) courses in the 400's, 11 (3.3%) courses in the 500's, and 2 (.6%)

respondents declined to answer. Lack of upper level courses may have skewed the data away from discussion style courses since freshmen often are required to take large lecture-style courses usually with course numbers in the 100's. Thus, results may not be indicative of all classroom conditions or instructional methods.

Section 2.2: Measures

The measures used in this study are: 1) the Knowledge Gained Inventory (KGI) to measure student perceptions of having gained knowledge; 2) the Student Interaction with Content Outside of Class Measure (OCCI) and the Student Interaction with Content Inside of Class Measure (ICCI) to measure student knowledge acquisition behaviors; 3) the Primal Relevance Measure (PRM), the Distal Relevance Measure (DRM), and the Generic Relevance Measure (GRM) to measure student perceptions of course content relevance; and 4) the Textbook Clarity Measure (TCM), the Presentation Clarity Measure (PCM), the Procedural Clarity Measure (PROCM), and the Course Clarity Measure (CCM) to measure student perceptions of instructional message clarity. All of the above-mentioned measures use 5-point Likert scales ranging between strongly disagree, disagree, undecided, agree, and strongly agree. The Correlation Matrix for all measures used in this dissertation is provided in Table 2.1 below:

Table 2.1: Correlation Matrix for All Mean Composite Scales

	KGI	OCCI	ICCI	CCM	PROCM	PCM	TCM	GRM	PRM	DRM
KGI	1									
OCCI	.497**	1								
ICCI	.431**	.524**	1							
CCM	.711**	.426**	.484**	1						
PROCM	.651**	.414**	.537**	.842**	1					
PCM	.686**	.397**	.483**	.849**	.878**	1				
TCM	.538**	.393**	.318**	.597**	.514**	.556**	1			
GRM	.726**	.425**	.469**	.667**	.642**	.672**	.460**	1		
PRM	.545**	.413**	.478**	.491**	.481**	.466**	.267**	.620**	1	
DRM	.587**	.245**	.289**	.541**	.479**	.551**	.376**	.699**	.452**	1

* All correlations are significant at the 0.01 level (1-tailed).

KGI = Knowledge Gains Inventory
OCCI = Out of Class Content Interaction
ICCI = In Class Content Interaction
CCM = Course Clarity Measure
PROCM = Procedural Clarity Measure
PCM = Presentation Clarity Measure
TCM = Textbook Clarity Measure
GRM = Generic Relevance Measure
PRM = primal Relevance Measure
DRM = Distal Relevance Measure

The high correlations between Course Clarity, Procedural Clarity, and Presentation Clarity and between Generic Relevance, Primal Relevance, and

Distal Relevance may be indicative of problems of multicolinearity. However, tolerance levels over 1 were obtained for all variables in the regression analysis thus indicating that the measures were not measuring the same things. It is also evident in the results of Hypothesis 3 which tested the model as a whole, that the high correlations between Course Clarity, Procedural Clarity, Presentation Clarity, Generic Relevance, and student perceptions of Knowledge gains were not evidence of problems with multicolinearity. Procedural Clarity and Presentation Clarity drop out of the model all together, and Course Clarity and Generic Relevance do not predict 70% of the variance in student perceptions of Knowledge Gains.

Section 2.2a: The Measurement of Knowledge Gains

There are no established measures of knowledge gains though there is a self-reported measure of student cognitive learning common in instructional communication research. This measure, called the learning loss measure, consists of the following two questions on a 0-9 scale: 1) "How much did you learn in class" and 2) "How much do you think you could have learned in the class had you had an ideal instructor" (Richmond, McCroskey, Kearney & Plax, 1987). The first item is subtracted from the second in order to compute the perceived learning loss. Chesebro and McCroskey (2000) claim that the learning loss measure is valid, and its use has been supported in one comparative experimental research study. While this measure is convenient and can be applied to any classroom context, it oversimplifies perceptions of cognitive learning (Witt, Wheeless, & Allen, 2004) and posits student cognitive learning as the result of the efforts or existence of a perceived "ideal" instructor. While this approach is consistent with the traditional knowledge transfer model and its emphasis on pedagogy, it is an inadequate measure for this dissertation in which the burden for knowledge acquisition is largely placed on the student.

Henning in his unpublished dissertation (2006-2007) offers the following measure of perceived cognitive learning to replace the learning loss measure with all of its inadequacies. Henning's measure, the perceived Cognitive Learning Aptitude Measure (CLAM), is an 8-item 5-point Likert-type scale derived from Bloom's (1956) original conceptualization of cognitive learning. The measure has a 1-factor structure and a strong reliability of items ($\alpha = .928$), and in Henning's study explains 66.58% of the variance in perceived cognitive learning aptitude.

While Henning's Cognitive Learning Aptitude Measure is a strong measure of student perceptions of cognitive learning in a general sense, this dissertation has created and adopted the Knowledge Gained Inventory to more fully capture student perceptions of knowledge gained from undergraduate course. Henning's Cognitive Learning Aptitude Measure includes items about linking course content to other course content, but not to past or projected learning experiences and objectives. Knowledge gain is partly a question of knowing and partly a question of doing something with the information known such as using it in present or future learning endeavors. The Knowledge Gained Inventory (KGI) includes items to capture both knowing and doing. In this study, the reliability for KGI using Cronbach's alpha is .89 with a mean of 3.75, a Standard Deviation of .76, and an Eigenvalue of 4.29. KGI explains 62% of student perceptions of knowledge acquisition in this study. Factor loadings are as follows:

Table 2.2: Factor Loadings for Knowledge Gained Inventory

Item	Loading
I learned more in this course than I had expected.	.748
The information in the course made sense.	.775
This course helped me see previous experiences in a new light.	.799
This course made me consider new ideas.	.721
I thought the course was very meaningful.	.830
Based on knowledge and skills gained in this course, I can more easily solve problems.	.778
I can use the skills and knowledge I acquired in this course to continue learning new things.	.836

Extraction Method: Principal Component Analysis.
a 1 components extracted.

For a list of the specific items contained in the Knowledge Gained Inventory, see Appendix A.1.

Section 2.2b: Measurement of Student Knowledge Acquisition Behaviors

Knowledge acquisition occurs through student interactions with content inside of class and through student interactions with content outside of class. Interaction with content is essentially to knowledge acquisition. Decoding behaviors include reading a text or listening to a course lecture and taking notes on it. Interaction behaviors include outlining (selecting and organizing), summarizing (integrating), or thinking deeply about content meaning (critical thinking). Finally, production behaviors include applying the knowledge acquired to a current or potential future problem (research), giving presentations, and leading discussions.

Items on the Out of Class Content Interactions measure capture student self-reports of their interactions with content such as the textbook and other instructional materials. Specifically, items on the Out of Class Content Interactions measure ask for student self-reports of their interactions with content in regards to: 1) reading the materials (decoding), 2) notetaking, outlining, and/or summarizing materials (decoding), 3) thinking deeply about materials (information processing), 4) determining gaps in understanding of the instructional materials and trying to fill those gaps (information processing), and 5) finding other sources to aid in understanding the meaning of instructional materials (information processing). The Out of Class Content Interactions measure consists of 9 items (see Appendix A.2 for the specific items). The Cronbach's alpha reliability for the scale is .82. The Mean is 3.6 with a Standard Deviation of .68. The Eigenvalue is 3.781 with 42% of the variance explained. The factor loadings for the items are:

Table 2.3: Factor Loadings for Outside Class Content Interactions

Item	Loading
I read the textbook and other instructional materials.	.604
I took notes or wrote an outline/summary about what I had read.	.585
While reading the instructional materials, I noted the concepts I didn't understand well.	.684
I thought deeply about the meaning of the instructional materials.	.750
I used the index or glossary of the textbook to find specific information.	.579
I thought about how the course materials fit into the course as a whole.	.695
Before studying new course material thoroughly, I skimmed it to see how it was organized.	.648
When I didn't understand something in the instructional materials, I tried to find other sources to explain it to me.	.531
I thought carefully about how chapters in the textbook related to other chapters.	.724

Extraction Method: Principal Component Analysis.
a 1 components extracted.

Item 2 (*I took notes or wrote an outline/summary about what I had read*), Item 5 (*I used the index or glossary of the textbook to find specific information*), and Item 8 (*When I didn't understand something in the instructional materials, I tried to find other sources to explain it to me*) fall below the standard cutoff point of .60 for factor loadings, but are retained in the scale due to their conceptual relevancy to the construct.

In similar vein, the In Class Content Interactions measure consists of 10 items (see Appendix A.3 for the specific items). The scale includes items that capture both passive and active interactions with content inside of class. Passive items (items 1-4) relate to decoding behaviors such as listening and notetaking during lectures and discussions. Active items (items 5-10) involve information processing and message production behaviors. Examples of these include: 1) presenting content to others, 2) discussing content with others, 3) filling in gaps in understanding by consulting other learning materials, and 4) summarizing class discussions. Items 1-4 loaded as one factor and items 5-10 loaded as a separate factor resulting in the creation of two subscales: Passive In Class Interactions with Content and Active In Class Interactions with Content. The Cronbach's alpha reliability for the In Class Content Interactions measure is .81, .83 for the Passive In Class Interactions with Content subscale, and .84 for the Active In Class Interactions with Content subscale. The means are 3.45, 3.70, and 3.28 with Standard Deviations of .71, .70, and .85 respectively. The Eigenvalues for the In Class Content Interactions measure are 3.77 (37.72% of the variance explained) for factor 1, and 2.41 (24.23% of the variance explained) for factor 2 with a total of 62% of the variance explained. Factor loadings for the In Class Content Interactions measure are as follows:

Table 2.4: Factor Loadings for In Class Content Interactions

Item	Loadings	
	1	2
I listened carefully to lectures.	.047	.850
I took good notes of course lectures.	-.035	.857
I listened carefully to class discussions.	.114	.808
I took good notes about class discussions.	.177	.732
I gave a presentation in class about the course readings.	.771	-.067
I lead a class discussion.	.770	-.040
We discussed course content in small groups.	.767	-.045
We summarized discussions at the end of class.	.694	.190
I asked questions when I did not understand what the instructor was saying.	.696	.252
I asked questions in class about the things I did not understand when reading the course materials.	.755	.270

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with KGIser Normalization.
a. Rotation converged in 3 iterations.

The Eigenvalue for the Passive subscale is 2.71 with 68% of the variance explained. Factor loadings are as follows:

Table 2.5: Factor Loadings for Passive In Class Content Interactions

Item	Loading
I listened carefully to lectures.	.852
I took good notes of course lectures.	.854
I listened carefully to class discussions.	.817
I took good notes about class discussions.	.766

Extraction Method: Principal Component Analysis.
a 1 components extracted.

The Eigenvalue for the Active subscale is 3.34 with 56% of the variance explained, and the factor loadings are as follows:

Table 2.6: Factor Loadings for Active In Class Content Interactions

Item	Loading
I gave a presentation in class about the course readings.	.741
I lead a class discussion.	.753
We discussed course content in small groups.	.748
We summarized discussions at the end of class.	.710
I asked questions when I did not understand what the instructor was saying.	.739
I asked questions in class about the things I did not understand when reading the course materials.	.795

Extraction Method: Principal Component Analysis.
a 1 components extracted.

Section 2.2c: Measurement of Content Relevance

The Primal Content Relevance Measure, the Distal Content Relevance Measure, and the Generic Content Relevance Measure are derived from Frymier and Shulman's (1995) Content Relevance Scale (reliability = .88). The problem with Frymier and Shulman's measure is that it emphasizes teacher behaviors rather than potential relevance of content to student learners and fails to indicate clearly the way in which content can be relevant to students. In fact, Frymier and Shulman's scale with its emphasis on examples is more closely related to presentational clarity than relevance. Relevance in this dissertation is primarily the degree of utility of course content, and has a temporal dimension in that content can be relevant to a learner's past experiences (has already shown relevance), present life, and/or future experiences or expectations. Further, content can be relevant to a learner's life outside of a course and to a learner's perceived future goals as well as relevant to all people.

In order to tap into the above mentioned dimensions of content relevance, the following three measures were created. The Primal Relevance Measure consists of three items to capture student perceptions of the relevance and applicability course content had to their present lives. The mean for the Primal Relevance Measure is 3.26 with a Standard Deviation of .81. The Cronbach's alpha reliability for the scale is .90 with an Eigenvalue of 2.514 and 83.81% of the variance explained. The factor loadings for the Primal Relevance Measure items are as follows:

Table 2.7: Factor Loadings for Primal Relevance Measure

Item	Loading
The course topic was relevant to my life at that time.	.892
I could apply the course content to problems in my life at that time.	.909
The content applied to my own life at that time.	.944

Extraction Method: Principal Component Analysis.
a 1 components extracted.

For a list of the specific items contained in the Primal Relevance Measure, see Appendix A.4.

The Distal Relevance Measure consists of four items that capture student perceptions of potential relevance and applicability of course content to future life, career, and learning. The mean for the Distal Relevance Measure is 3.62 with a standard deviation of .92. The Cronbach's alpha reliability for the scale is .90 with an Eigenvalue of 3.119 and 77.99% of the variance explained. Factor loadings for the items are as follows:

Table 2.8: Factor Loadings for Distal Relevance Measure

Item	Loading
I believed the course content would help me find a job.	.847
I thought I might need the information/skills from this course someday.	.915
I believed the knowledge I gained in this course would help me with other courses.	.859
I believed the course content would help me in my future life.	.909

Extraction Method: Principal Component Analysis.
a 1 components extracted.

For a list of the specific items contained in the Distal Relevance Measure, see Appendix A.5.

The Generic Relevance Measure contains six items asking about student perceptions of the relevance of course content to understanding of the world in which they live. Several items ask if content has already proven useful for work, life, and learning. And, one item asks if everyone needs to know the content. The mean for the Generic Relevance Measure is 3.55 with a Standard Deviation of .79. The Cronbach's alpha for the Generic Relevance Measure is .89 with an Eigenvalue of 3.843 and 64.04% of the variance accounted for. Factor loadings for the items of the Generic Relevance Measure are as follows:

Table 2.9: Factor Loadings for Generic Relevance Measure

Item	Loading
I understand why the content of the course was important.	.783
The course content was similar to my own experiences.	.822
Since taking the course, I have a better understanding of the world I live in.	.747
I have used knowledge gained from this course in my other courses.	.782
I have used knowledge gained from this course outside of school in my work or internship.	.848
Everyone needs to know the content in this course.	.816

Extraction Method: Principal Component Analysis.
a 1 components extracted.

For a list of the specific items contained in the Generic Relevance Measure, see Appendix A.6.

Section 2.2d: Measurement of Clarity

Instructional message clarity in this dissertation is divided into four measures: textbook clarity, presentation clarity, procedural clarity, and course clarity. The Textbook Clarity Measure is based on Chesebro and McCroskey's (1998) Teacher Clarity Short Inventory (reliability = .92). “My textbook” was used in place of “my instructor”. Several items were moved to other scales. And, several items were added to more clearly specify the clarity of textbooks. The most important aspects of textbook clarity as revealed in the research on clarity are: 1) clearly presenting concepts, 2) content organization, 3) having clear objectives, 4) use of examples, 5) readability, and 6) inclusion of multiple entry points for finding information. Textbooks that include these things are more likely to be perceived as high in clarity, and those that do not as low in clarity.

The Textbook Clarity Measure used in this dissertation consists of seven items reflecting the important aspects of textbook clarity listed in the preceding paragraph. The mean for the Textbook Clarity Measure is 3.76 with a Standard Deviation of .68. The Cronbach’s alpha reliability for the Textbook Clarity Measure is .91 with an Eigenvalue of 4.680 with 67% of the variance accounted for. Factor loadings for the Textbook Clarity Measure items are as follows:

Table 2.10: Factor Loadings for Textbook Clarity Measure

Item	Loading
My textbook clearly defined major concepts.	.860
In general, I understood the textbook.	.875
The objectives for each chapter in the textbook were clear.	.886
My textbook was well organized.	.876
My textbook provided clear and relevant examples.	.881
My textbook used relevant graphics to explain key concepts.	.689
The textbook had a good index or glossary to find necessary information.	.609

Extraction Method: Principal Component Analysis.
a 1 components extracted.

For a list of the specific items contained in the Textbook Clarity Measure, see Appendix A.7.

The Presentation Clarity Measure and the Procedural Clarity Measure are based on Simonds' (1997) Teacher Clarity Scale (reliability = .93) with the two subscales (content clarity and procedural clarity) having reliabilities of .88 each. Important aspects of presentation clarity are: 1) use of examples, 2) use of visual aids to clarify explanations, 3) use of previews and summaries, 4) stressing and defining main points, 5) staying on topic, and 6) having clear objectives. Inclusion of these aspects is likely to lead to higher perceptions of presentation clarity. The Presentation Clarity Measure used in this dissertation consists of ten items. The mean for the Presentation Clarity Measure is 4.16 with a SD of .82. The Cronbach's alpha for the Presentation Clarity Measure is .95 with an Eigenvalue of 7.07 and 71% of the variance accounted for. Factor loadings for the measure are as follows:

Table 2.11: Factor Loadings for Presentation Clarity Measure

Item	Loading
My instructor was clear when presenting content.	.861
My instructor used examples when presenting content.	.879
My instructor related examples to the concept being discussed.	.894
My instructor used the board, transparencies, or other visual aids during class.	.768
My instructor gave previews of material to be covered.	.791
My instructor gave summaries when presenting content.	.810
My instructor stressed important points.	.857
My instructor stayed on topic.	.779
My instructor clearly explained the objectives for the content being presented.	.881
My instructor defined major/new concepts.	.877

Extraction Method: Principal Component Analysis.
a 1 components extracted.

For a list of the specific items contained in the Presentation Clarity Measure, see Appendix A.8.

The important aspects of procedural clarity are: 1) having clear goals and objectives, 2) having clear assessments and procedures for assessment, 3) checking student understanding, 4) providing feedback, and 5) having clear classroom policies and consequences for violation. The Procedural Clarity Measure used in the dissertation consists of ten items. The mean for the Procedural Clarity Measure is 4.01 with a SD of .85. The Cronbach's alpha reliability for the Procedural Clarity Measure is .95 with an Eigenvalue of 6.748 and 67.48% of the variance accounted for. Factor loadings for the Procedural Clarity Measure items are as follows:

Table 2.12: Factor Loadings for Procedural Clarity Measure

Item	Loading
My instructor communicated classroom processes and expectations clearly.	.826
My instructor described assignments and how they should be done.	.858
My instructor asked if we knew what to do and how to do it.	.833
My instructor prepared us for the tasks we would be doing next.	.875
My instructor pointed out practical applications for coursework.	.830
My instructor prepared students for exams.	.821
My instructor explained how we should prepare for an exam.	.816
My instructor provided students with feedback of how well they were doing.	.695
My instructor provided rules and standards for satisfactory performance.	.837
My instructor communicated classroom policies and consequences for violation.	.811

Extraction Method: Principal Component Analysis.
a 1 components extracted.

For a list of the specific items contained in the Procedural Clarity Measure, see Appendix A.9.

Finally, the Course Clarity Measure is a blend of the most relevant items from the Chesebro and McCrockey clarity scale and the two Simonds' scales mentioned above applied to the clarity of courses as a whole. Aspects of course clarity include: 1) clear organization, 2) clear goals and objectives, 3) integration of parts and whole, 4) a clear syllabus, 5) clear instructor expectations, and 6) clear relationship between assessment and content. The Course Clarity Measure used in the dissertation consists of ten items reflecting the six aspects listed in the preceding sentence. The mean for the Course Clarity Measure is 4.06 with a SD of .79. Cronbach's alpha reliability for the Course Clarity Measure is .95 with an Eigenvalue of 6.821 and 68.21% of the variance accounted for. Factor loadings for the Course Clarity Measure items are as follows:

Table 2.13: Factor Loadings for Course Clarity Measure

Item	Loading
The course was well organized.	.843
I understood the purpose or goal of the course.	.852
The different parts of the course contributed to my understanding of the course as a whole.	.854
The different parts of the course were good examples of the course's main goal or purpose.	.861
The syllabus was clear.	.825
The syllabus outlined the content of the course well.	.836
I knew what the instructor expected of me in this course.	.840
Testing reflected what I was supposed to have learned in the course.	.762
The course was what I expected it to be.	.727
The course was well integrated.	.849

Extraction Method: Principal Component Analysis.
a 1 components extracted.

For a list of the specific items contained in the Course Clarity Measure, see Appendix A.10.

The above measures were used to test the three hypotheses of this dissertation. Results of those tests are reported in the next chapter.

Chapter 3: Results

Hierarchical linear regression was used to test the overall model of how well perceptions of instructional message clarity, perceptions of content relevance, and self-reported interactions with content (knowledge acquisition behaviors) predict self-reports of knowledge gained (H3). Linear regression was used to test Hypotheses 1.1a through 2b. The following table provides descriptive statistics for all of the composite measures used in this dissertation.

Table 3.1: Descriptive Table for All Composite Measures

	N	Mean	Std. Deviation	Minimum	Maximum
KNOWLEDGE GAINED INVENTORY	333	3.7564	.75793	1.00	5.00
OUTSIDE CLASS CONTENT INTERACTIONS	333	3.6234	.67719	1.00	5.00
IN CLASS CONTENT INTERACTIONS	333	3.4490	.71623	1.00	5.00
COURSE CLARITY MEASURE	333	4.0592	.79155	1.00	5.00
TEXTBOOK CLARITY MEASURE	333	3.7607	.67877	1.78	5.00
PRESENTATION CLARITY MEASURE	333	4.1559	.82263	1.00	5.00
PROCEDURAL CLARITY MEASURE	333	4.0113	.84745	1.00	5.00
GENERIC RELEVANCE MEASURE	333	3.5541	.78596	1.00	5.00
PRIMAL RELEVANCE MEASURE	333	3.2583	.80983	1.00	5.00
DISTAL RELEVANCE MEASURE	333	3.6233	.91639	1.00	5.00

Section 3.1: Hypothesis 1— Instructional Message Characteristics and Knowledge Acquisition Behaviors

Hypothesis 1 tests the proposition in Knowledge Acquisition Theory that instructional message characteristics significantly predict knowledge acquisition behaviors. Hypothesis 1 is divided into 6 specific hypotheses to isolate the possible effects of varying message design strategies (instructional message clarity and course content relevance) on varying knowledge acquisition behaviors (interactions with content in and out of class). The results of the linear regressions used to test the 6 specific hypotheses are provided below.

Hypothesis 1.1a: Instructional Message Clarity and In Class Interactions with Content

Hypothesis *1.1a* expects that instructional message clarity significantly predicts student interactions with content inside of class. Linear regression was used to test this. Results (Adjusted R-Square = .284, $F(4, 328) = 33.883$, $p < .001$) support Hypothesis *1.1a*, but only Procedural Clarity (β

= .448, t = 4.257, p < .001) is significant. Textbook Clarity (β = .038, t = .650, p = .516), Presentational Clarity (β = -.011, t = -.102, p = .919), and Course Clarity (β = .094, t = .948, p = .344) are not significant. The following table sums up the results of the linear regression used to test Hypothesis *1.1a*.

Table 3.2: Hypothesis *1.1a* Results (Instructional Message Clarity on In Class Content Interactions)

Variable	β	SE	β
Textbook Clarity Measure	.040	.062	.038
Presentation Clarity Measure	-.010	.094	-.011
Procedural Clarity Measure	.378	.089	.448***
Course Clarity Measure	.085	.090	.094
Adj. R2	.284		
Change R2	.288		
Sig. F Change	.000***		

*** Sig. < .001

Hypothesis H1.1b: Instructional Message Clarity and Outside Class Content Interactions

Hypothesis H1.1b expects that instructional message clarity significantly predicts student interactions with content outside of class. Linear regression was used to test this. Results (Adjusted R-Square = .212, F (4, 328) = 23.287, p < .001) support Hypothesis H1.1b, however only Textbook Clarity (β = .214, t = 3.498, p = .001) is significant. Procedural Clarity (β = .194, t = 1.760, p = .079), Presentational Clarity (β = -.024, t = -.208, p = .836), and Course Clarity (β = .155, t = 1.488, p = .138) are not significant. The following table sums up the results of the linear regression used to test Hypothesis 1.1b.

Table 3.3: Hypothesis 1.1b Results (Instructional Message Clarity on Out of Class Content Interactions)

Variable	β	SE	β
Textbook Clarity Measure	.214	.061	.214***
Presentation Clarity Measure	-.019	.093	-.024
Procedural Clarity Measure	.155	.088	.194
Course Clarity Measure	.214	.061	.155
Adj. R2	.212		
Change R2	.221		
Sig. F Change	.000***		

*** Sig. ≤ .001

Hypothesis 1.2a: Course Content Relevance and In Class Content Interactions

Hypothesis 1.2a expects that course content relevance significantly predicts student in class content interactions. Linear regression was used to test this. Results (Adjusted R-Square = .274, F (3, 329) = 42.702, p < .001) support Hypothesis 1.2a, but only Primal Relevance (β = .306, t = 5.140, p < .001) and Generic Relevance (β = .339, t = 4.561, p < .001) are significant. Distal Relevance (β = -.087, t = -1.323, p = .187) is not significant. The following table sums up the results of the linear regression used to test Hypothesis 1.2a.

Table 3.4: Hypothesis 1.2a Results (Course Content Relevance on In Class Content Interactions)

Variable	β	SE	β
Primal Relevance Measure	.271	.053	.306***
Distal Relevance Measure	-.068	.051	-.087
Generic Relevance Measure	.309	.068	.339***
Adj. R2	.274		
Change R2	.280		
Sig. F Change	.000***		

*** Sig. < .001

Hypothesis 1.2*b: Course Content Relevance and Out of Class Content Interactions*

Hypothesis 1.2b expects that course content relevance significantly predict student out of class content interactions. Linear regression was used to test this. Results (Adjusted R-Square = .216, F (3, 329) = 31.552, p < .001) support Hypothesis 1.2b. However, only Primal Relevance (β = .247, t = 3.991, p < .001) and Generic Relevance (β = .350, t = 4.526, p < .001) are significant, and Distal Relevance (β = -.112, t = -1.640, p = .102) is non-significant. The following table sums up the results of the linear regression used to test Hypothesis 1.2b.

Table 3.5: Hypothesis 1.2b Results (Course Content Relevance on Out of Class Content Interactions)

Variable	β	SE	β
Primal Relevance Measure	.207	.164	.247***
Distal Relevance Measure	-.082	.050	-.112
Generic Relevance Measure	.301	.067	.350***
Adj. R2	.216		
Change R2	.223		
Sig. F Change	.000***		

*** Sig. < .001

Hypothesis 1.3: Message Characteristics and Knowledge Acquisition Behaviors

Hypothesis *1.3* expects that message characteristics (their clarity and relevance) will significantly predict knowledge acquisition behavior. This was tested using two linear regressions; one for message characteristics as predictors of in class content interactions and one for message characteristics as predictors of outside class content interactions.

Results (Adjusted R-square = .347, F (7, 325) = 26.191, p < .001) of Hypothesis 1.3a support this hypothesis, but only Procedural Clarity (β = .367, t = 3.602, p < .001) and Primal Relevance (β = .260, t = 4.527, p < .001) are significant. Textbook clarity (β = .047, t = .829, p = .408), Presentation Clarity (β = -.028, t = -.265, p = .791), Course Clarity (β = .010, t = .104, p = .917), Distal Relevance (β = -.108, t = -1.705, p = .089), and Generic Relevance (β = .138, t = 1.762, p = .079) are not significant.

Results (Adjusted R-square = .273, F (7, 325) = 18.835, p < .001) of the second regression support Hypothesis 1.3b, but only Textbook Clarity (β = .220, t = 3.717, p < .001), Primal Relevance (β = .234, t = 3.852, p < .001), Distal Relevance (β = -.146, t = -2.180, p = .030), and Generic Relevance (β = .186, t = 2.249, p = .025) are significant. Procedural Clarity (β = .108, t = 1.004, p < .316), Presentation Clarity (β = -.038, t = -.341, p = .733), and Course Clarity (β = .077, t = .749, p = .455) are not significant.

Results of the two regressions used to test Hypothesis 1.3 are summed up in the following tables:

Table 3.6: Hypothesis 1.3a Results (Message Characteristics on In Class Content Interactions)

Variable	β	SE	*β*
Textbook Clarity Measure	.049	.059	.047
Presentation Clarity Measure	-.024	.092	-.028
Procedural Clarity Measure	.310	.086	.367***
Course Clarity Measure	.009	.088	.010
Primal Relevance Measure	.230	.051	.260***
Distal Relevance Measure	-.085	.050	-.108
Generic Relevance Measure	.126	.071	.138
Adj. R2	.347		
Change R2	.361		
Sig. F Change	.000***		

* Sig. < .05
*** Sig. < .001

Table 3.7: Hypothesis 1.3b Results (Message Characteristics on Out of Class Content Interactions)

Variable	β	SE	*β*
Textbook Clarity Measure	.220	.059	.220***
Presentation Clarity Measure	-.031	.092	-.038
Procedural Clarity Measure	.086	.086	.108
Course Clarity Measure	.065	.087	.077
Primal Relevance Measure	.195	.051	.234***
Distal Relevance Measure	-.108	.049	-.146*
Generic Relevance Measure	.160	.071	.186*
Adj. R2	.273		
Change R2	.289		
Sig. F Change	.000***		

* Sig. < .05
*** Sig. < .001

Section 3.2: Hypothesis 2—Knowledge Acquisition Behaviors and Knowledge Gained

Hypothesis 2 tests one of the basic propositions of Knowledge Acquisition Theory (KAT): student knowledge acquisition behaviors significantly predict knowledge gained. Linear regression was used to test this. Results (Adjusted R-Square = .283, F (2, 330) = 66.499, p < .001) support Hypothesis 2 that both In Class Content Interaction (β = .236, t = 4.319, p < .001) and Outside Class Content Interactions (β = .374, t = 6.849, p < .001) significantly predict student self-reports of knowledge gained. Results of Hypothesis 2 are summed up in the following table:

Table 3.8: Hypothesis 2 Results (Acquisition Behaviors on Knowledge Gained)

Variable	β	SE	*β*
In Class Content Interaction	.249	.058	.236***
Out of Class Content Interaction	.418	.061	.374***
Adj. R2	.283		
Change R2	.287		
Sig. F Change	.000***		

*** Sig. < .001

Section 3.3: Hypothesis 3—Testing the Overall Model

Knowledge Acquisition Theory expects that message characteristics and knowledge acquisition behaviors will significantly predict knowledge gained from a higher education course among traditional undergraduate learners. To test this, hierarchical linear regression was used in two steps and variables were entered into the regression in accordance with the theoretical framework. The first step included: Textbook Clarity Measure (TCM), Presentation Clarity Measure (PCM), Procedural Message Clarity (PROCM), Course Clarity Measure (CCM), Primal Relevance Measure (PRM), Distal Relevance Measure (DRM), and Generic Relevance Measure (GRM). The second step included In Class Content Interactions (ICCI) and Outside Class Content Interactions (OCCI).

In Step 1 (adjusted R-Square = .639, F (7, 325) = 84.890, p < .001), Presentational Clarity (β = .110, t = 1.392, p = .165), Procedural Clarity (β = -.005, t = -.063, p = .950), and Distal Relevance (β = .086, t = 1.814, p = .071) are not significant predictors of student knowledge gained, but Textbook Clarity (β = .136, t = 3.266, p = .001), Primal Relevance (β = .118, t = 2.754, p = .006), Course Clarity (β = .234, t = 3.243, p = .001), and Generic Relevance (β = .304, t = 5.208, p < .001) are significant.

In Step 2 (Adjusted R-Square = .654, F (9, 323) = 70.665, p < .001), Presentational Clarity (β = .114, t = 1.481, p = .139), Procedural Clarity (β = -.002, t = -.030, p = .976), and In Class Content Interactions (β = -.054, t = -1.275, p = .203) are not significant predictors of knowledge gained, but Textbook Clarity (β = .103, t = 2.471, p = .014), Course Clarity (β = .222, t = 3.142, p = .002), Primal Relevance (β = .094, t = 2.159, p = .032), Distal Relevance (β = .103, t = 2.218, p = .027), Generic Relevance (β = .281, t = 4.876, p < .001), and Outside Class Content Interactions (β = .162, t = 4.007, p < .001) are significant. Results of the hierarchical linear regression are summed up as follows:

Table 3.9: Hypothesis 3 Results (Testing the Whole Model)

Variable	Step 1	Step 2
Textbook Clarity Measure	.136***	.103*
Presentation Clarity Measure	.110	.114
Procedural Clarity Measure	-.005	-.002
Course Clarity Measure	.234***	.222**
Primal Relevance Measure	.118**	.094*
Distal Relevance Measure	.086	.103*
Generic Relevance Measure	.304***	.281***
In Class Content Interaction	--	.162***
Out of Class Content Interaction	--	-.054
Adj. R2	.639	.654
Change R2	.646	.017
Sig. F Change	.000***	.000***

* Sig. < .05
** Sig. < .01
*** Sig. < .001

Results indicate moderately strong support for Hypothesis 3, and the overall model accounts for 65% of the variance in student self-reports of knowledge gained.

Chapter 4: Discussion

This dissertation tested a causal-process model predicting that student positive perceptions of instructional message clarity and course content relevance result in positive increases in student self-reports of in and out of class interactions with content and that student positive self-reports of in and out of class interactions with content result in positive increases in student perceptions of knowledge gained from the completion of individual higher education courses. The model tested received support that ultimately accounted for 65% of the variance in student perceptions of knowledge gains from completion of individual undergraduate courses—though not every dimension of instructional message clarity, course content relevance, or interactions with content was significant.

Instructional communication research has generally been unable to account for significant amounts of the variance in student cognitive learning outcomes. Witt, Wheeless, and Allen's (2004) meta-analysis of the correlations between student cognitive learning and teacher immediacy, for example, reveals that instructional communication research in this area accounts for less than 10% of student gains in cognitive learning outcomes from teacher use of immediacy strategies. One possible reason that instructional communication research has not yielded high results for student cognitive learning outcomes is the lack of a theory-driven approach to research (Clark, 2003). Lack of theory results in a lack of conceptual clarity and in a lack of research consistency and continuity over time; problems cited by Witt, Wheeless, and Allen in their meta-analysis. Research is thus fragmented, and it becomes difficult to draw conclusions about a phenomenon or set of phenomena. Theory building helps to organize and specify existing knowledge as well as to reveal gaps in existing knowledge requiring further research for clarification. This dissertation, in building on existing knowledge through the development of a new instructional communication theory, was thus able to account for a much larger percentage of the variance (65%) in student perceptions of a cognitive learning outcome than had previously been obtained in published instructional communication research because of its theory-driven approach.

The model tested in this dissertation is derived from Knowledge Acquisition Theory, a new mid-range instructional communication theory that predicts that message characteristics affect student knowledge acquisition behaviors which in turn affect student knowledge gains from undergraduate courses. As a mid-range instructional communication theory, Knowledge Acquisition Theory is somewhat limited in its specificity. The theory, for example, is unable to specify which exact characteristics of messages affect which precise knowledge acquisition behaviors, but rather predicts that message characteristics will significantly affect the enactment of knowledge acquisition behaviors. The theory also does not specify which knowledge acquisition behaviors engender the greatest gains in knowledge—though the theory does suggest that decoding behaviors and information processing behaviors are prerequisites to knowledge acquisition behaviors. The theory provides a conceptual framework to guide research that then can specify the match between message characteristics and knowledge acquisition behaviors as well as the match between knowledge acquisition behaviors and knowledge gains. The ability of Knowledge Acquisition Theory to guide more specific research is thus the first question needing to be addressed in this chapter, and is dealt with in Section 4.1.

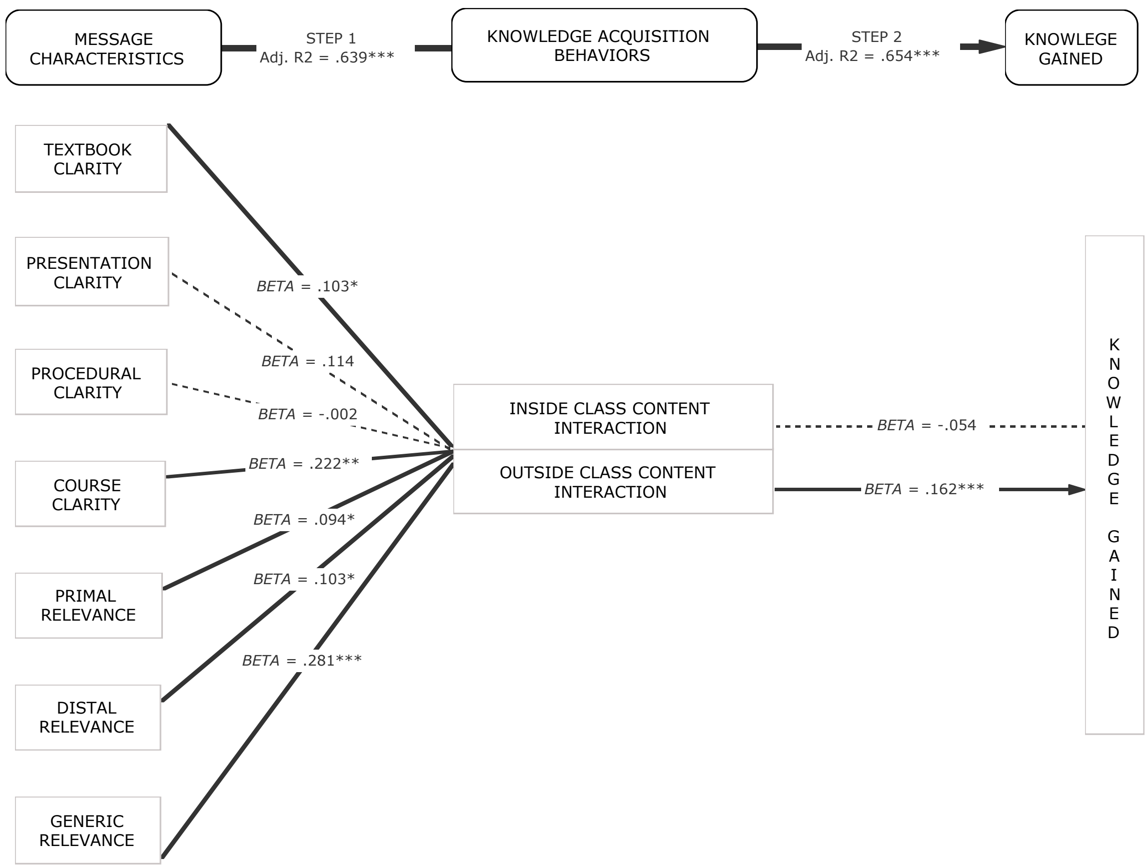
This dissertation also refines two instructional communication *message* variables, instructional message clarity and course content relevance, in order to gain a better understanding of the role(s) that these two message variables play in student cognitive learning. Instructional communication research is dominated by interpersonal communication scholars who emphasize the oral tradition. Yet, messages in an educational context are not restricted to teacher talk because they can also be externally represented in the form of print, visual, and/or digital artifacts. Instructional message clarity, traditionally treated as a unidimensional construct in instructional communication research focusing on instructor classroom oral presentation, was thus divided into textbook, presentation, procedural, and course instructional message clarity. Likewise, course content relevance, also traditionally treated as unidimensional construct in instructional communication research, was divided into primal, distal, and generic course content relevance. Support or lack thereof for this refinement of these two important message variables is the second question addressed in section 4.1 below.

Section 4.1 of this chapter interprets the results of this study in relation to Knowledge Acquisition Theory and the refinement of the instructional message clarity and course content relevance constructs discussed above. After the interpretation of the results, Section 4.2 highlights the limitations of the study. Section 4.3 suggests the many future directions for instructional communication research based on the results. Finally, Section 4.4 presents the conclusions of this dissertation.

Section 4.1: Interpretation of the Results

In this particular study, strong support for the causal-process model derived from Knowledge Acquisition Theory demonstrated that approximately 65% of the variance in student self-reported knowledge gains was accounted for by the model. The results of the hierarchical linear regression used to test the model as a whole in Hypothesis 3 are graphically represented in Figure 4.1 below to serve as a reference for the following discussion of the results and the relation between the results and Knowledge Acquisition Theory:

Figure 4.1: KAT Results Based on Hypothesis 3



Based on the results of Hypothesis 3 which tested the model as a whole, it is clear that both message characteristics and knowledge acquisition behaviors play a major role in predicting self-reported knowledge gains from individual undergraduate courses. Results indicate that students report positive gains in knowledge from the completion of an individual undergraduate course when students perceive that textbook messages are clear, when students perceive that course goals and expectations are clear, when students perceive that content is in some way relevant to their own lives, and when students enact knowledge acquisition behaviors outside of class.

Knowledge Acquisition Theory does not postulate a direct relationship between message characteristics and student knowledge gains. However, it is evident from the results of the current study that student positive perceptions of textbook clarity and course clarity and relevance directly predict student positive perceptions of having gained knowledge from a course. In Step 1 of the hierarchical linear regression used to test Hypothesis 3, student perceptions of message characteristics account for nearly 64% of the variance in student perceptions of knowledge gains. One possible explanation for this is that in order for students to have perceived a message as clear and/or relevant, the student must have interacted with the message on some level; either through decoding the message (attention and/or memory), cognitively processing the message (analysis, interpretation, and/or integration), or through applying the message meaning to some aspects of the student's life (application and/or creation). It is likely that message clarity and relevance share variance with knowledge acquisition behaviors, and this is supported in the results for Hypotheses 1 and 2 as elaborated upon below.

Indeed, the more specific proposition of Knowledge Acquisition Theory that message characteristics significantly predict knowledge acquisition behaviors is supported in the present study though not as strongly as the overall model. The results of Hypothesis 1.3a illustrate that message characteristics predict 35% of the variance in inside of class content interactions though not every message characteristic is significant. While 35% may seem meager compared to the 65% of the overall model, 35% is substantial when compared with the results of much social scientific research. Message characteristics also explained 27% of the variance in outside of class content interactions. Knowledge Acquisition Theory also proposes that knowledge acquisition behaviors significantly predict knowledge gained from undergraduate courses. This proposition receives support from the results of Hypothesis 2. Both in class and out of class interactions with content significantly predict self-reported knowledge gains though only accounting for 28% of the variance.

The results of Hypotheses 1 suggest that student perceptions of message characteristics do significantly predict student self-reports of in and out of class content interactions. And, the results of Hypothesis 2 suggest that student self-reports of in and out of class content interactions significantly predict student perceptions of having gained knowledge from individual undergraduate courses. The results of Hypothesis 3 need to be interpreted in light of these findings. It would appear that student self-reports of content interaction only add 1% to student perceptions of knowledge gains in this study. However, Hypothesis 2 shows that the amount of variance explained by student reports of content interactions is higher than this thus indicating that perceptions of message characteristics and self-reports of content interaction share variance as suggested by Knowledge Acquisition Theory.

Indeed, the relationships between message characteristics, content interactions, and knowledge gains are likely to be highly complex. Further research is needed to tease out these relationships. This study does not take into account individual differences among students nor teachers, differences in specific content domains and the types of demands this content places upon students and instructors, nor does this study take into account student prior knowledge of the content as is often emphasized as an important factor in educational psychology research (Wittrock, 1974). However, this study does indicate that the relationships between message characteristics, content interactions, and knowledge gains from undergraduate courses are important and fruitful avenues of inquiry. The study also indicates that Knowledge Acquisition Theory serves as a useful framework to guide this inquiry.

The second question addressed in this section of Chapter 4 is the value of refining the instructional message clarity and course content relevance constructs. The Correlation Matrix on page 35 of this dissertation indicates that the measures may not have been sensitive enough to fully capture the differences between course clarity, presentation clarity, and procedural clarity or between the three types of relevance. One would, of course, expect the correlations between these variables to be somewhat high. However, the question remains as to whether or not students could perceive differences between them. In answer to this question, one must consider the results.

In relation to in class content interaction, procedural clarity was the only significant predictor. This seems to indicate that students only interact with content in class if required to do so. The communication apprehension research literature shows that students who suffer from some high levels of communication apprehension are less likely to be active participants in the classroom (Bourhis, Allen, & Bauman, 2006). Since communication apprehension is common occurring in nearly 20% of the population (McCroskey & Richmond, 2006) and students may have other less than favorable orientations toward communication in the classroom such as reticence, shyness, and unwillingness to communicate (McCroskey & Richmond, 2006), it is not surprising that students only interact with content in class if it is part of the course requirements. More importantly, if there were no differences between course clarity, presentation clarity, and procedural clarity, then all of these variables should have been either significant or non-significant. Thus, the measures were sensitive enough to capture this difference between these constructs.

In relation to out of class content interaction, textbook clarity was the only significant predictor. Knowledge Acquisition Theory proposes that higher perceptions of effort result in more resistance to content interaction. This was not directly tested in this study. However, one possible reason that perceptions of textbook clarity is the only significant predictor of student self-reports of out of class interactions with content is that clear textbooks require less effort for interaction in the process of obtaining data, information, and/or knowledge than unclear textbooks. The refinement of the instructional message clarity construct was able to capture this. Also, in Hypotheses 1.a and 1.b, presentation clarity has a negative (yet non-significant) relationship with content interactions. The measures were sensitive enough to capture this difference since all of the other measures had positive relationships with content interactions.

Finally, in the results for Hypothesis 3, presentation clarity and procedural clarity dropped out of the model while course clarity and textbook clarity were significant predictors of student perceptions of having gained knowledge. Procedural clarity even had a negative though non-significant relationship with perceptions of knowledge gains. The measures were sensitive enough to capture these differences, and it is apparent that refinement of the instructional message clarity construct has been informative. Previous instructional message clarity research in focusing on classroom teacher talk (presentation clarity) did not illustrate the importance of having clear course goals and expectations or clear textbooks for the purpose of increasing student perceptions of having gained knowledge from an undergraduate course. The present study is somewhat limited in the conclusions that can be made, and it is not recommended that either presentation clarity or procedural clarity be dropped from subsequent instructional message clarity research studies in relation to cognitive learning outcomes. Rather, it is recommended that future research further refines the relationships between these four aspects of clarity, the range of content interactions, and data, information, and knowledge gains. In other words, there is a need for even more specific message effects research demonstrating the possible effects of these four clarity dimensions on underlying psychological processes such as attention, recall, information processing, and information application and creation.

Course content relevance has also traditionally been treated as a unidimensional construct in instructional communication research. In the present study, course content relevance is divided into three temporal dimensions; past, present, and future. Content may have already proven useful, may be relevant to a student's present goals and needs, or may be relevant to a student's future goals and/or needs. While the high correlations between these three dimensions of course content relevance may indicate a lack of sensitivity among the measures in that students may have found it difficult to distinguish between them, the three measures do contribute differently to the findings of this study. For example, in Hypothesis 1.2a 1.2.b, and 1.3a, distal relevance is non-significant and negative in relation to student self-reports of in and out of class interactions with content. In Hypothesis 1.3b, distal relevance is negative and significant in relation to student self-reports of out of class interactions with content. This implies one of two things. Either students are not concerned with the relevance of content to their futures since the majority of the sample are freshman and life beyond school is too distant of a goal to be relevant now or the content simply was not relevant to life beyond school and present student concerns.

In contrast, primal relevance and generic relevance are both positive and significant in Hypotheses 1.2a, 1.2b, and 1.3b. Generic relevance is positive yet non-significant in relation to in class content interaction. The measures are sensitive enough to capture these differences. In Hypothesis 1.3a, only student perceptions of procedural clarity and primal relevance are significant predictors of student self-reports of in class content interactions. This seems to indicate that students only interact with content in the classroom if that interaction is both required and fulfills an immediate goal such as passing the course. This also appears to indirectly support the postulate of Knowledge Acquisition Theory that messages can be designed to help students overcome the innate human tendency toward least effort. The refinement of the instructional message clarity and course content relevance variables does indeed provide heuristic value.

Textbook clarity, primal relevance, and generic relevance predict student self-reports of positive interactions with content outside of class. This again indirectly supports the postulate of Knowledge Acquisition Theory stating that messages can be designed to help students overcome the innate human tendency toward least effort. When textbooks are easy to understand, and when interactions with content outside of class aid in meeting immediate goals such as the completion of assignments or have already proven useful in the past, then students may be more willing to make the effort to perform these out of class content interactions.

Finally, generic relevance in the results of the hierarchical linear regression used to test Hypothesis 3 is the strongest predictor of student self-reports of knowledge gains in this study. This is not surprising since content that has already proven useful is by definition already knowledge. Further, the strength of the generic relevance construct as a predictor of self-reported knowledge gains seems to support the position adopted by educational psychologists that knowledge builds upon previous experiences. Things that worked successfully in the past are also likely to be successfully employed in the future or in relation to a current problem.

In this study, a student self-report of their knowledge gains from the completion of individual undergraduate courses was the phenomenon under investigation. Most research studies focus on one specific problem or knowledge gain in one minute area of a course. The design and reception of messages for the purpose of gaining knowledge about a specific topic or idea may be different than gaining knowledge from an entire course. It is thus not surprising that students perceive having gained knowledge from a course when course content has already proven useful or is perceivably useful for an immediate or potential future goal or need, when course goals and expectations are clearly stated, when textbook messages that often form the crux of a course are clear, and when students interact with content outside of class. If knowledge gaining is a process of obtaining knowledge piece by piece, then other variables such as presentation clarity, procedural clarity, and in class interaction with content may be important in gaining these individual pieces of knowledge. For this reason, it is recommended that these potential important variables not be omitted from future instructional communication research studies.

It is clear in this study that communication plays a major role in self-reports of knowledge gains from individual undergraduate courses. Every proposition tested in the causal-process model derived from Knowledge Acquisition Theory is supported. The model as a whole accounts for 65% of the variance in self-reports of knowledge gained from undergraduate courses. While both the theory and the study have their limitations, both are a necessary first step in the development of an expanded instructional communication research agenda based on a message-oriented receiver perspective. The limitations of this study are discussed in the next section of this chapter, and future directions for research are suggested in Section 4.3.

Section 4.2: Limitations of the Study

In spite of the optimism generated by the results of the current dissertation, the findings should be interpreted against the backdrop of several unavoidable limitations. The first limitation is the sample. The vast majority of the subjects were freshmen taking courses geared toward freshman which tend to be large, lecture-style courses. Thus, there are certain threats to external validity based on the characteristics of this sample, and results and conclusions may not be applicable to a generalized undergraduate experience in gaining knowledge from undergraduate courses. Freshman may not have adopted the most appropriate knowledge acquisition behaviors yet, and this was not controlled for in the present research study.

Another possible threat to the integrity of the study was the targeted unit of analysis. Students may not have accurately reflected back upon a course they attended in the previous semester. Nearly 40% of the respondents listed a course with a course number that may have been the course in which they were currently enrolled rather than a course from the previous semester with the highest course number. In other words, 40% of the respondents listed a course number that was the same as the number for the courses from which the data were collected. Unfortunately, there is no way to verify if students were reflecting back on a course from the previous semester or a course in which they were currently enrolled.

This study used cross-sectional survey research to obtain data. It is well-documented in the social sciences that cross-sectional survey research is subject to several threats to internal validity. One of the major threats to internal validity using survey methods is social desirability. Subjects may respond as they think the researcher wishes for them to respond. While this was somewhat controlled for using a "how honest were you in answering this survey" one-item Likert scale that resulted in the exclusion of one case proclaiming a lack of honesty, it is possible that subjects even lied about whether or not they were lying while filling out this survey. Cross-sectional survey research lacks the advantages of a true experiment. Since there is no random assignment to groups, external factors that may be influencing the results are not controlled for, and thus there is the possibility that other factors have generated the effects. Some caution is advised in analyzing the results. Since this study was not a true experiment, there was no true manipulation of the variables. In other words, one of the potential problems with the study that may have influenced the results is whether or not students had actually enacted some of the knowledge acquisition behaviors. Since this was not controlled for, it is possible that in and out of class interactions with content were not exhibiting their full predictive power.

In fact, a review of some of the individual items representing specific knowledge acquisition behaviors, makes it apparent that certain behaviors were not being enacted. This is especially true of two items on the In Class Content Interaction measure representing knowledge acquisition behaviors (rather than decoding or information processing behaviors). For the item asking about giving a presentation in class, 57% of the respondents had given a negative answer, 9% were undecided, and 34% had given a positive answer. For the item asking about leading a class discussion, 57.6% had given a negative response, 13% were undecided, and 29.4% had given a positive response. Around 50% of the responses to items 7-10 representing information processing behaviors on the ICCI measure were either undecided or negative. On the first 4 items of the ICCI measure representing mere decoding behaviors (listening and notetaking during lectures or discussions), over 70% of the responses were positive. Of course ICCI dropped out of the overall model since the behaviors most likely to lead to knowledge gains were not being enacted. This same trend is also apparent in student responses to the Out of Class Content Interaction measure though not to the extreme of the ICCI measure. Generally, students were reporting the enactment of decoding behaviors, but not processing or especially knowledge acquisition behaviors. The study's design and the sensitivity of the measures did not control for this.

Another limitation of this study is the need for better measures. The Knowledge Gained Inventory does not fully capture the differences between gains in data, information, or knowledge. The knowledge acquisition behavior measures (ICCI and OCCI) fail to fully reflect the theoretical distinctions between data acquisition behaviors (message reception), information acquisition behaviors (message interaction), and knowledge acquisition behaviors (message production). Obviously, further research and theory is needed to improve these measures and in order to determine if students were not enacting these information and knowledge acquisition behaviors because of the perceived effort to enact them, lack of opportunity (the course did not enable use of these behaviors), or for some other reason.

Finally, this study does not take into account possible individual differences in student learning abilities, prior knowledge, or orientations toward communication; possible differences in teaching abilities and use of instructional strategies; possible differences in the demands that content place upon instructors and students such as the complexity of the content; possible differences in course goals such as the difference between professional and academic degrees; and the possible differences between the availability of academic resources such as libraries, databases, access to information, and access to learning help centers. In light of all these limitations, the most surprising result of this study was that 65% of the variance in self-reported knowledge gains was explained. The limitations of the study as well as with Knowledge Acquisition Theory suggest several directions for future research, and these are discussed in the next section of this chapter.

Section 4.3: Future Research Directions

Any good research study and theory should raise more questions than it answers. This study and Knowledge Acquisition Theory at least fulfill this minimum requirement of "good" research and theory. This section of Chapter 4 first addresses more micro level questions requiring future research and then discusses more macro level questions. The micro level questions concern the possible reasons why variables played out in the results section the way that they did. The macro level questions address the adoption of a received-oriented message perspective within instructional communication research.

The first puzzling question is why only procedural clarity and primal relevance significantly predicted in class interactions with content. One possible explanation for this is that what students do in the classroom is traditional mandated by the instructor. Instructors present lectures, require participation in discussions, allot time for student presentations, ask students to lead discussions, provide students with opportunities to conduct research, and students act or react accordingly. Basically, instructors have a great deal of control over how student interactions with content in class are designed into a course. Students know that they will receive a grade based on instructor designated in class interactions with content. Thus, in class interactions with content are governed by the instructor-specified classroom procedures, and the primal relevance is passing the course in order to move on to bigger and better things. This is one possible explanation, but future research is required to confirm or deny it.

The second puzzling question is why presentation clarity is negative (though non-significant) in relation to both in class and out of class interactions with content in the results for Hypotheses 1.3a and 1.3b. One possible explanation is that the more an instructor talks, the less time students have to actively interact with content in class. Another possible explanation is that the clearer the instructor's presentation of course content, the less students feel the need to bother interacting with content on their own. If an instructor tells the students what they need to know (and the instructor assigns grades based on their own biases), then why should a student bother to interact with content on their own since the instructor has already done this for them? The Principle of Least Effort (Zipf, 1949) suggests that this may be so. Yet another possible answer is that too much clarity fails to stimulate the brain since the brain is not required to actively resolve the ambiguity as suggested by the "generation effects" research literature discussed in Chapter 1, Section 1.2. This suggests a curvilinear relationship between presentation clarity and student interactions with content. These are possible answers to the question, but future research is required to provide a more definitive answer.

The third puzzling question is why distal relevance is negatively (though non-significantly) related to in class interactions with content as well as negatively (and significantly) related to out of class interactions with content. The answer to this may be that freshmen (and the majority of the sample were freshmen) are not yet considering the future since they are at the beginning of their academic careers, and thus may not be framing course content in terms of possible future needs and/or goals. This is one possible answer, but future research is required to provide a more definitive answer.

It is apparent in this study that textbook clarity and course content relevance influence the enactment of student out of class content interactions. Knowledge Acquisition Theory suggests that this is so because the increased clarity of messages embodied in textbooks and the increased relevance of course content to student goals and/or needs reduces the perceptions of effort and provides the impetus act. This was not directly tested in this study, and thus future research should try to support or deny this claim. In fact, several of the propositions of Knowledge Acquisition Theory require testing. First, the propositions concerning data, information, and knowledge acquisition behaviors require further testing. Second, the propositions concerning message characteristics and their possible influence on perceived effort require testing. This is in line with the development of a message effects research agenda in which messages are treated as stimuli that evoke changes in psychological states culminating in behavioral changes.

It is evident in this study that message characteristics and student acquisition behaviors influence self-reports of knowledge gained from individual undergraduate courses. What is not clear is exactly how this process operates though Knowledge Acquisition Theory posits least effort as a mitigating factor. Research is needed to clarify the matching of message characteristics with decoding behaviors, information processing behaviors, and knowledge acquisition behaviors. These message characteristics need to be clearly spelled out. While this study tested two message characteristics divided into seven functions and the data was promising, there may be equally promising message characteristics (such as information complexity) relevant to the enactment of acquisition behaviors culminating in knowledge gains. Future research is required to both theorize these possible relationships and provide support for claims made.

To the degree that acquisition behaviors are communication behaviors as proposed in Knowledge Acquisition Theory, it is also incumbent on instructional communication researchers to tease out the possible relationships between message reception behaviors as decoding behaviors, message interaction behaviors as information processing behaviors, and message production behaviors as knowledge acquisition behaviors and their possible effects on knowledge gains. This could be accomplished through collaboration with educational psychologists and instructional systems designs. More research is called for to increase our knowledge of the roles these behaviors play in the achievement of cognitive learning outcomes.

Section 4.3 highlights the unanswered questions requiring further study. These questions relate to the role message characteristics play in influencing acquisition behaviors both within this study and in general. These questions also relate to the role that acquisition behaviors as communication behaviors play in gaining knowledge. Suggestions are made for the implementation of a message effects research agenda through collaborative efforts between instructional communication researchers, educational psychologists, and instructional systems designers to find answers to these important questions. The next section of this chapter presents the conclusions of this dissertation.

Section 4.4: Conclusions

Knowledge Acquisition Theory posits that the transformation of undergraduate learners from passive data consumers to active knowledge producers is best achieved through the enactment of self-generated, effortful change. The model derived from Knowledge Acquisition Theory tested in this dissertation received moderately strong support and explains 65% of the variance in student self-reported knowledge gains due to message characteristics and the enactment of data, information, and knowledge acquisition behaviors as interactions with content in and out of class. However, the truly shocking finding from this study is that students are not enacting the important self-generated content interaction behaviors most likely to lead to the transformation from passive data consumers to active knowledge producers necessary for life in the knowledge driven twenty-first century.

Government and industry are calling for higher education to step up to the challenge of training and developing students that can fill the demand for people able to transform data into information into knowledge. Since communication is essential to the transformation process, instructional communication research should be leading these efforts. However, much of instructional communication research is stuck in the dead end of the traditional knowledge (data) transference model. For this reason, this dissertation was designed to challenge the assumptions of the knowledge transference model and to provide a solution for guiding future research that can place instructional communication research into a leadership position rather than an archaic curio.

First, students need to have quality interactions with course content. Teacher talk is simply not enough for developing knowledge producers. Students need to learn research supported strategies for enhancing data acquisition through message reception behaviors. Students need to develop research supported information processing strategies though the enactment of communication interactions. Students need to become message producers in order to effectively apply research supported knowledge gaining strategies. Instructional communication researchers in partnership with educational psychologists and instructional systems designers need to supply the research that show what strategies are most effective for achieving these goals.

Second, deeper interactions with content are more demanding of a student than merely doing seat time in class. Communication science's unique contribution to human knowledge is a message focus. It is thus imperative that instructional communication researchers as communication scientists adopt a message focus to establish which messages make the effort to deeply interact with content easier and that provide the impetus for action. In the present study, clear textbooks and relevant course content were shown to increase out of class content interactions. Clear procedures and course content relevant to a student's current needs and goals were shown to increase interactions with content inside of class. Neither of these two findings would have been possible based on the present teacher talk focus of most instructional communication researchers.

Hurt, Scott, and McCroskey (1978) claimed that communication in the classroom is important because the difference between knowing and teaching is communication. This dissertation provides considerable evidence that the classroom is only one small part of the learning environment. This dissertation also provides considerable evidence that what is happening in the classroom is not enough to engender student knowledge gains. In class content interactions dropped out of the final model. Presentation clarity dropped out of the final model. Procedural clarity dropped out of the final model. It is disconcerting that student learning seems to get lost in all of the teacher talk. As Wittrock (1974) once suggested, people do not always learn from what other people tell them, but always learn from what they tell themselves. Communication is thus important in higher education courses to the degree that students tell themselves what is known about a content domain and how what is known can be applied to the solving of human problems. Instructors can aid or impede student talk.

In reverse engineering the challenge of increasing student gains in knowledge from higher education courses, it becomes apparent that teacher behaviors do influence student behaviors, though perhaps not in the ways specified by the knowledge transference model. Instructors need to create learning environments in which student transformations of data into information into knowledge can take place. These learning environments should not be dominated by teacher talk, but by student talk. Designing content interactions into a course and teaching students appropriate strategies for *interacting with content* such as alternating listening and notetaking (Aiken, Thomas, & Shennum, 1975) and writing outlines and summaries (Wittrock & Alesandrini, 1980) to enhance data acquisition, critical thinking to enhance information processing (Berkowitz, 2006; Elder & Paul, 2007; Facione, 2007), and research related activities to facilitate knowledge acquisition (Boyer Report, 1998) are not only possible, but absolutely *essential* for moving students from passive data consumers to active knowledge producers. Instructors must design clear and relevant messages that support the use and development of these behaviors and strategies. And, instructors can support the use and development of these behaviors and strategies by selecting clear and relevant learning materials such as textbooks that accurately and sufficiently represent a content domain and which are designed to support student active interactions with the content domain they embody.

The message is clear. In order to meet the demands of a knowledge driven society, researchers, instructors, and students need to embrace self-generated, effortful change—learning.

Appendix A: Measures

Appendix A.1: Knowledge Gained Inventory

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about your experiences with knowledge gains in that course as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. I learned more in this course than I had expected.	1	2	3	4	5
2. The information in the course made sense.	1	2	3	4	5
3. This course helped me see previous experiences in a new light.	1	2	3	4	5
4. This course made me consider new ideas.	1	2	3	4	5
5. I thought the course was very meaningful.	1	2	3	4	5
6. Based on knowledge and skills gained in this course, I can more easily solve problems.	1	2	3	4	5
7. I can use the skills and knowledge I acquired in this course to continue learning new things.	1	2	3	4	5

Appendix A.2: Interactions with Content Outside of Class Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about your experiences interacting with course content outside of class as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. I read the textbook and other instructional materials.	1	2	3	4	5
2. I took notes or wrote an outline/summary about what I had read.	1	2	3	4	5
3. While reading the instructional materials, I noted the concepts I didn't understand well.	1	2	3	4	5
4. I thought deeply about the meaning of the instructional materials.	1	2	3	4	5
5. I used the index or glossary of the textbook to find specific information.	1	2	3	4	5
6. I thought about how the course materials fit into the course as a whole.	1	2	3	4	5
7. Before studying new course material thoroughly, I skimmed it to see how it was organized.	1	2	3	4	5
8. When I didn't understand something in the instructional materials, I tried to find other sources to explain it to me.	1	2	3	4	5
9. I thought carefully about how chapters in the textbook related to other chapters.	1	2	3	4	5

Appendix A.3: Interactions with Content Inside of Class Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about your experiences interacting with content inside of class as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. I listened carefully to lectures.	1	2	3	4	5
2. I took good notes of course lectures.	1	2	3	4	5
3. I listened carefully to class discussions.	1	2	3	4	5
4. I took good notes about class discussions.	1	2	3	4	5
5. I gave a presentation in class about the course readings.	1	2	3	4	5
6. I lead a class discussion.	1	2	3	4	5
7. We discussed course content in small groups.	1	2	3	4	5
8. We summarized discussions at the end of class.	1	2	3	4	5
9. I asked questions when I did not understand what the instructor was saying.	1	2	3	4	5
10. I asked questions in class about the things I did not understand when reading the course materials.	1	2	3	4	5

Subscale Passive Interaction (items 1-4)

Subscale Active Interaction (items 5-10)

Appendix A.4: Primal Relevance Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about the relevance of the course content to your life at that time as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. The course topic was relevant to my life at that time.	1	2	3	4	5
2. I could apply the course content to problems in my life at that time.	1	2	3	4	5
3. The content applied to my own life at that time.	1	2	3	4	5

Appendix A.5: Distal Relevance Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about the possible relevance of the course content to your future as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. I believed the course content would help me find a job.	1	2	3	4	5
2. I thought I might need the information/skills from this course someday.	1	2	3	4	5
3. I believed the knowledge I gained in this course would help me with other courses.	1	2	3	4	5
4. I believed the course content would help me in my future life.	1	2	3	4	5

Appendix A.6: Generic Relevance Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about the general relevance of the course content as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. I understand why the content of the course was important.	1	2	3	4	5
2. The course content was similar to my own experiences.	1	2	3	4	5
3. Since taking the course, I have a better understanding of the world I live in.	1	2	3	4	5
4. I have used knowledge gained from this course in my other courses.	1	2	3	4	5
5. I have used knowledge gained from this course outside of school in my work or internship.	1	2	3	4	5
6. Everyone needs to know the content in this course.	1	2	3	4	5

Appendix A.7: Textbook Clarity Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about the clarity of the course materials as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. My textbook clearly defined major concepts.	1 2 3 4 5
2. In general, I understood the textbook.	1 2 3 4 5
3. The objectives for each chapter in the textbook were clear.	1 2 3 4 5
4. My textbook was well organized.	1 2 3 4 5
5. My textbook provided clear and relevant examples.	1 2 3 4 5
6. My textbook used relevant graphics to explain key concepts.	1 2 3 4 5
7. The textbook had a good index or glossary to find necessary information.	1 2 3 4 5

Appendix A.8: Presentation Clarity Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about the clarity of your instructor's presentation of course materials as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. My instructor was clear when presenting content.	1	2	3	4	5
2. My instructor used examples when presenting content.	1	2	3	4	5
3. My instructor related examples to the concept being discussed.	1	2	3	4	5
4. My instructor used the board, transparencies, or other visual aids during class.	1	2	3	4	5
5. My instructor gave previews of material to be covered.	1	2	3	4	5
6. My instructor gave summaries when presenting content.	1	2	3	4	5
7. My instructor stressed important points.	1	2	3	4	5
8. My instructor stayed on topic.	1	2	3	4	5
9. My instructor clearly explained the objectives for the content being presented.	1	2	3	4	5
10. My instructor defined major/new concepts.	1	2	3	4	5

Appendix A.9: Procedural Clarity Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about the clarity of classroom and course procedures as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. My instructor communicated classroom processes and expectations clearly.	1	2	3	4	5
2. My instructor described assignments and how they should be done.	1	2	3	4	5
3. My instructor asked if we knew what to do and how to do it.	1	2	3	4	5
4. My instructor prepared us for the tasks we would be doing next.	1	2	3	4	5
5. My instructor pointed out practical applications for coursework.	1	2	3	4	5
6. My instructor prepared students for exams.	1	2	3	4	5
7. My instructor explained how we should prepare for an exam.	1	2	3	4	5
8. My instructor provided students with feedback of how well they were doing.	1	2	3	4	5
9. My instructor provided rules and standards for satisfactory performance.	1	2	3	4	5
10. My instructor communicated classroom policies and consequences for violation.	1	2	3	4	5

Appendix A.10: Course Clarity Measure

Reflecting back on the course taken in the previous semester that had had the highest course number, answer the following questions about clarity of the course in general as honestly as possible using the following range of responses:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. The course was well organized.	1	2	3	4	5
2. I understood the purpose or goal of the course.	1	2	3	4	5
3. The different parts of the course contributed to my understanding of the course as a whole.	1	2	3	4	5
4. The different parts of the course were good examples of the course's main goal or purpose.	1	2	3	4	5
5. The syllabus was clear.	1	2	3	4	5
6. The syllabus outlined the content of the course well.	1	2	3	4	5
7. I knew what the instructor expected of me in this course.	1	2	3	4	5
8. Testing reflected what I was supposed to have learned in the course.	1	2	3	4	5
9. The course was what I expected it to be.	1	2	3	4	5
10. The course was well integrated.	1	2	3	4	5

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Vita

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Education:

Master of Science in Library and Information Science (2003, University of Kentucky).

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Academic Honors:

Awarded full tuition scholarship (2001 - 2007).

Awarded *Bruce H. Westley Memorial Scholarship* for Excellence in Mass Communication Theory and Research (Fall, 2006).

Awarded *Kentucky Opportunity Fellowship* (2003 ~ 2004): $15,000 non-service stipend.

Awarded *Michael J. Lach Fellowship* for Computer Technology (Fall, 2003): assisted Dr. Jennifer Brueckner (Anatomy) in the development of 3D representations of body cavity development in human embryos.

Inducted into *Beta Phi Mu* (LIS) honor society (May, 2003).

Undergraduate Fellowship in Sociology (1983-1984): assisted Dr. Brad Simcock with his industrial Sociology classes to gain an understanding of the professional life of a university professor.

Greer-Hepburn Award in Linguistics (May, 1984): $100 cash prize for best student paper in linguistics.

Fuller Prize in TESL (May, 1984): book award for most promising future ESL teacher.

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- Web designer, Graduate Programs in Communication (Summer, 2006).
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- Web designer, College of Communications and Information Studies (2003 – 2007).
- Student representative, reaccreditation process, School of Library and Information Science (2003).
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- Graduate Assistant, Center for Applied Information Technology (2002 – 2003).
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Publications and Presentations:

Scholarly Publications

- **Trader, R. J.** (In press). Publications and organizations in instructional technology and related fields. In Anglin, G. J. (ed.) *Instructional Technology: Past, Present, and Future* (3rd edition). Libraries Limited.
- Noar, S. M., & **Trader, R. J.** (2004). [Review of the book Reasoning with statistics: How to read quantitative research]. *Structural Equation Modeling: A Multidisciplinary Journal.*

Popular Press Publications

- **Trader, R. J.**, & Kojima, K. (In press). Phrases for parenting preschool kids. Tokyo, Japan: Goken.
- Kojima, K., & **Trader, R. J.** (2006). *Making progress with the TOEIC test*. Tokyo, Japan: Kinseido.

Scholarly presentations

- **Trader, R. J.** (2007). *The development of a message effects research agenda for instructional communication*. Paper presented at the 11th Annual Communication Symposium, University of Kentucky.
- Lane, D. R., & **Trader, R. J.** (2006). *Engineering feedback: a student-developed approach to the assessment of peer evaluation in civil engineering*. Paper presented at the annual meeting of the National Communication Association, San Antonio, TX.

- **Trader, R. J.** (2006). *Use of course maps to facilitate student knowledge retention in the basic public speaking course*. Poster presented at the annual meeting of the Kentucky Communication Association, Cumberland Falls, KY.
- Anglin, G. J., & ISD Group (2005). *Research trends in Instructional Systems Design as revealed in an analysis of 4 ISD journals*. Paper presented at the annual meeting of the Association for Educational Communication and Technology, Orlando, FL.
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- **Trader, R. J.** (2005, September). *Back by popular demand: Information seeking skills development for graduate students.* Colloquia for the Graduate Student Association.
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