THE EFFECTS OF PEDAGOGICAL AGENT-DELIVERED PERSUASIVE MESSAGES WITH FEAR APPEAL ON LEARNERS’ ATTITUDE CHANGE

By

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Although the work of the Ph.D. is mine, had it not been for the love, care and support from my family, it would not have been accomplished.

Therefore, this dedication is to them.

Most of all, I dedicate this work to my first family: To my mother, ChoonJa Lee, late father, DongPhil Son, sister, YangGyoung Son, and bother TaeHee Son.

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# TABLE OF CONTENTS

LIST OF TABLES ......................................................................................................................... xi

LIST OF FIGURES ...................................................................................................................... xii

CHAPTER I .................................................................................................................................... 1
INTRODUCTION .......................................................................................................................... 1

CHAPTER II ................................................................................................................................... 4
LITERATURE REVIEW ................................................................................................................... 4

Introduction .............................................................................................................................. 4

Animated Pedagogical Agents ................................................................................................. 6

Attitude as an Affective Learning Outcome ............................................................................ 11

Approaches to Attitude Change .............................................................................................. 15

Source Credibility and Fear Appeal and Relevance to Agent Research ................................ 19

Credibility as a message source factor ............................................................................. 20

Fear appeal as a message factor ....................................................................................... 23

Interactions between source credibility and fear appeal for attitude change .................. 28

PURPOSE OF STUDY ................................................................................................................. 29

The Effects of Agent Credibility and Fear Arousing Message on Attitude Change .......... 30

The Effects of Agent Credibility and Fear Arousing Message on Recall and Application
Tests ........................................................................................................................................ 32

The Relationship between Attitude Change and Recall & Application Tests .................. 34
CHAPTER III ............................................................................................................................... 36

METHOD ..................................................................................................................................... 36

Participants ............................................................................................................................. 36

Research Design ..................................................................................................................... 36

Independent Variables ............................................................................................................ 38

Portraying agent credibility ............................................................................................. 38

Designing fear arousing message .................................................................................... 44

Measures ................................................................................................................................. 45

Pre-measures .................................................................................................................... 45

Dependent measures ........................................................................................................ 46

Agent Development ................................................................................................................ 47

Instructional Materials ............................................................................................................ 48

Procedures .............................................................................................................................. 49

Data Analysis .......................................................................................................................... 49

Pilot Study .............................................................................................................................. 50

CHAPTER VI ............................................................................................................................... 55

RESULTS ...................................................................................................................................... 55

Preliminary Data Analyses ..................................................................................................... 56

Group equivalence test .................................................................................................... 56

Missing subjects/data analysis ......................................................................................... 57

Participants deletion ........................................................................................................ 57

Case analysis ....................................................................................................................... 58

Assumptions tests ................................................................................................................. 62
ANOVA assumptions tests........................................................................................................ 62
MANOVA Assumptions Test........................................................................................................ 64
Hypotheses Testing.................................................................................................................... 66
The effect of agent credibility and fear arousing message on attitude change................. 67
The effects of agent credibility and fear arousing message on recall and application tests ......................................................................................................................... 69
The relationship between affective learning (attitude change) and cognitive learning (recall and application tests).................................................................................................. 71
Summary of Hypotheses Testing............................................................................................ 72
Learners’ Perceived Agent Credibility ................................................................................... 73
Learners’ Perceived Fear of Message.................................................................................... 75

CHAPTER V ................................................................................................................................ 77
DISCUSSION ............................................................................................................................... 77
Introduction ............................................................................................................................ 77
The Effects of Agent Credibility and Fear Arousing Message on Attitude Change .......... 77
The effect of agent credibility on attitude change ............................................................... 77
The effects of fear arousing message on attitude change ............................................... 80
The interaction effects of agent credibility and fear arousing message on attitude change ............................................................................................................................................. 82
The Effects of Agent Credibility and Fear Arousing Message on Recall and Application Tests ................................................................................................................................. 83
The effects of agent credibility on recall and application tests ........................................ 83
The effects of fear arousing message on recall and application tests ............................ 84
The interaction effects of agent credibility and fear arousing message on recall and application tests ................................................................................................................................. 85

The Relationship between Affective Learning and Cognitive Learning ........................................ 85

Learners’ Perceived Agent Credibility .......................................................................................... 86

Learners’ Perceived Fear of Message ......................................................................................... 87

Limitations of the Study ............................................................................................................ 88

Implications .................................................................................................................................. 89

Suggested Future Research ........................................................................................................ 91

Conclusions .................................................................................................................................. 92

APPENDICES

APPENDIX A. FULL SCRIPTS OF THREE FEAR AROUSING MESSAGE CONDITIONS ....................................................................................................................... 95

APPENDIX B. SCREENSHOTS OF INSTRUCTIONAL MODULE ................................................. 106

APPENDIX C. USE OF HUMAN SUBJECTS IN RESEARCH - APPROVAL MEMORANDUM .................................................................................................................112

APPENDIX D. DEMOGRAPHIC INFORMATION & PRIOR KNOWLEDGE/EXPERIENCE ............................................................................................114

APPENDIX E. RECALL TEST ITEMS ......................................................................................... 116

APPENDIX F. APPLICATION TEST ITEMS .............................................................................. 119

APPENDIX G. ATTITUDE MEASURE ....................................................................................... 121

APPENDIX H. PERCEIVED AGENT CREDIBILITY MEASURE ................................................. 123

APPENDIX I. PERCEIVED FEAR OF MESSAGE MEASURE.................................................... 125

APPENDIX J. SHAPIRO-WILK NORMALITY TESTS FOR ATTITUDE CHANGE,
LIST OF TABLES

2.1 Example Statements of each of four fear arousing components ........................................... 26
2.2 The List of Acronyms of Treatment Groups ........................................................................... 35
3.1 Factorial Combinations of Two Independent Variables ....................................................... 37
3.2 Portraying Agent Credibility .................................................................................................... 44
3.3 Operationalization of Each Fear Appeal Condition ................................................................. 45
3.4 Agent Design for Pilot Study .................................................................................................... 51
3.5 Multivariate and Univariate Analysis of Variance F Ratios for Perceived Agent Credibility ......................................................................................................................... 53
3.6 Means and Standard Deviations for Perceived Agent Credibility ......................................... 53
3.7 Means and Standard Deviations for Learners’ Perceived Fear of Message ............................ 54
4.1 Descriptive Statistics from Group Equivalence Test ............................................................... 57
4.2 Univariate and Multivariate Outliers Identified for Each Dependent Variable .................. 61
4.3 Sample Sizes Retained After Each Data Trimming Process .................................................. 61
4.4 Correlation Coefficients among Three Measures of Agent Credibility ................................. 66
4.5 Descriptive Statistics for All Dependent Variables ............................................................... 67
4.6 Two-Way Analysis of Variance for Attitude Change Measure ............................................... 68
4.7 Means and Standard Deviations for Attitude Change Measure ............................................. 68
4.8 Two-Way Analysis of Variance for Recall and Application Tests ........................................ 70
4.9 Means and Standard Deviations for Recall & Application Tests .......................................... 71
4.10 Correlation Coefficients for Affective Learning and Cognitive Learning ............................ 71
4.11 Summary of Hypotheses Tests ............................................................................................... 73
4.12 Multivariate and Univariate Analysis of Variance F Ratios for Perceived Agent Credibility ................................................................................................................................. 74
4.13 Means and Standard Deviations for Perceived Agent Credibility ...................................... 75
4.14 Two-Way Analysis of Variance for Perceived Fear Measure ............................................... 76
4.15 Means and Standard Deviations for Perceived Fear Measure ............................................. 76
LIST OF FIGURES

2.1. The Yale Attitude Change Approach ...............................................................17
2.2. A Simplified Graphical Representation of Information-Processing Approach .......18
2.3. A Graphical Representation of Hypothesis 1.3 ..................................................31
This dissertation study examined how pedagogical agent’s credibility and fear arousing (threatening) message influence affective learning as well as cognitive learning. This study employed a 2 x 3 factorial design with the two independent variables: agent credibility with two levels (less and more) and threatening message with three levels (not threatening, moderately threatening, and strongly threatening). The design specifications for both agent credibility and threatening message were derived from the previous research and the design specifications were validated through a pilot study.

A total of 332 undergraduates participated in the study and each of them was randomly assigned into one of the six experimental conditions. After they studied the instruction given according to their assigned experimental condition, they completed the dependent measures. The dependent variable, affective learning, was assessed with the attitude change measure and the dependent variable, cognitive learning, was measured with both recall and application tests.

The results found the main and interaction effects for agent credibility and threatening message on cognitive learning. The more credible agents were more effective than the less credible agents in both recall and application test and the not-threatening messages more were effective than the strongly threatening messages in recall test. Regarding the interactions, the moderately threatening messages were more effective in recall test than the strongly threatening message given the less credible agent while there were no significant differences among the three message conditions given the more credible agent. However, no significant main or interaction effects were found in affective learning.
CHAPTER I
INTRODUCTION

Attitudes have been examined more thoroughly in communication research in relation to the communication-persuasion paradigm than in educational research. Persuasion is the study of attitudes and how to change them in the field of communication. Perloff (2002) defined persuasion as “a symbolic process in which communicators try to convince other people to change their attitudes or behavior regarding an issue through the transmission of a message, in an atmosphere of free choice.”

Media technology has played a significant role in facilitating the delivery of persuasive messages. Technology becomes an especially powerful tool when it allows the persuasive techniques to be interactive rather than one-way, that is, altering and adjusting the pattern of interaction based on the characteristics or actions of the persuaded people – the user’s input, needs, and context (IJsselsteijn, de Kort, Midden, Eggen, & van den Hoven, 2006). This realization has led to the investigation of persuasive technology (Fogg, 1999, 2003), which is defined as a class of technologies that are intentionally designed to change a person’s attitude or behavior. In the area of education, persuasive technology also has a significant part to play (IJsselsteijn, de Kort, Midden, Eggen, & van den Hoven, 2006).

Animated pedagogical agents have been drawing increasing attention as a social interface in computer-based instructional programs, with the belief that pedagogical agent can have social influences on learner behaviors by employing a variety of human-like behaviors in terms of verbal and non-verbal communications. Indeed, the pedagogical agent research indicates that a pedagogical agent can make a difference in the affective learning domain (e.g., motivation and self-regulation) more than in the cognitive learning domain that is usually measured based on message learning. Even though there have been a few early explorations of using animated agents for delivering persuasive messages (A. L. Baylor & Plant, 2005; Creed, 2006; Davis & Bobick, 1998;
Eyck et al., 2006; Nguyen, Masthoff, & Edwards, 2007), research on pedagogical agents has placed greater emphasis on cognitive learning. This study expands the focus of pedagogical agent research to affective domain of learning beyond cognitive domain of learning. That is, the present study investigates the effect of pedagogical agents on learners’ attitude toward a specific topic) as well as message learning within the communication-persuasion paradigm involving message source and message itself.

Communication research has indicated that message source and message itself can influence attitudes in isolation and they also interact with each other to have an impact on attitude change. The message source refers to the communicator who delivers the message. In an attempt to influence a person’s attitude toward a specific social issue it really matters who communicates the message intended to elicit attitude change. The message source’s characteristics include authority, social attractiveness, and credibility. The message itself is also an important factor that can influence attitudes. There are three major types of message factors (Perloff, 2002): message structure (e.g., message sidedness, conclusion drawing, and order of presentation), message content (e.g., evidence, fear appeal, and framing), and language (e.g., speed of speech, powerful vs. powerless speech, and language intensity).

Indeed, persuasion research suggests that personality characteristics of individuals who receive the persuasive messages (e.g., self-esteem, self-monitoring, and need for cognition) influence the process of attitude change. It is thought, however, that those personality variables do not have direct influence on attitude change. Rather, it appears that they determine how message source and persuasive message influence individuals’ attitudes. Thus, this study limits its focus to specific aspects of the first two factors: message source and message itself.

It appears that pedagogical agent research is well aligned with the communication research in that research on pedagogical agents has also placed its focus on those two factors, including pedagogical agents as a message source and instructional message as a message. In addition, it is believed that persuasive techniques are useful tools to deal with social issues when used for the purpose of education. This study, based on the communication-persuasion paradigm, investigates how persuasive techniques, in a pedagogical agent-based learning environment, influence attitude change as an affective
learning outcome as well as recall and application as a cognitive learning outcome. More specifically, this study examines the effects of agent credibility as a message source factor and fear arousing instructional message as a message factor.

Based on these issues and the overall question it addresses, this study has four overarching research questions: (1) How does agent credibility influence affective learning as well as cognitive learning?; (2) How does fear appeal influence affective learning as well as cognitive learning?; (3) How do agent credibility and fear appeals interact with each other to elicit attitude change?; and (4) Are cognitive learning and affective learning correlated?

The main focus of the present study is on agent credibility as a message source factor and fear arousing as a message factor. Thus, the first three research questions are intended to identify the main effects on affective as well as cognitive learning of agent credibility and fear arousing, respectively, and the interaction effects between these two persuasive communication factors on the two different learning outcomes.

Regarding the correlation between cognitive and affective learning, the message-learning approach to attitude change suggests that a persuasive communication must be “remembered” in order to be actually persuasive and learning the persuasive message precedes attitude change. In this approach, retention of the message arguments is important because it indicates that the message recipient has attended, comprehended, and learned the persuasive communication. Along this line, the fourth research question is of great interest.

The significance of this study is four fold. First, this study proposes a new role pedagogical agents can play as a persuasive message source for attitude change based on the well-established communication paradigm. In other words, pedagogical agent research is extended to a new area by being incorporated with the communication-persuasion paradigm. Secondly, attitudes are attended to as a specific learning outcome beyond simple perceptions and a new approach to measuring attitudes is proposed. Third, the results from this study helps formulate design guidelines for agent credibility and persuasive message for attitude change. Lastly, this study will help illuminate the relationship between cognitive and affective learning.
CHAPTER II
LITERATURE REVIEW

Introduction

Animated pedagogical agents have been drawing increasing attention as a social interface in computer-based instructional programs with the belief that pedagogical agent can have social influences on learner behaviors by employing a variety of human-like behaviors. Despite this belief, previous research on animated pedagogical agent has somewhat neglected the affective influences of pedagogical agents on learners.

Affective learning can be represented by attitude formation, attitude reinforcement, or attitude change. Attitudes as an affective learning outcome have been examined more thoroughly in communication research in relation to the communication-persuasion paradigm – persuasion is the study of attitudes and how to change them - than in educational research. Communication researchers have proposed many different definitions of attitudes. Perloff (2002) incorporated those proposed definitions and suggested his own definition. He defines attitudes as a learned, global evaluation of an object (person, place, or issue) that influences thought and action. This incorporated definition is very similar to Gagne’s (1985) definition of attitudes: acquired internal states that influence the choice of personal action toward some class of things, persons, or events. What they have in common is that both assume: (1) attitudes can be learned, (2) attitudes are emotional evaluations, (3) attitudes influence thought or actions, and (4) attitude is functional (Perloff, 2002). Along this line, it is believed that persuasion research provides useful implications for educational research, including pedagogical agent research.

Various theories of attitude change have been formulated to explain how attitudes are formed, reinforced, and changed and they can be categorized into seven major approaches (R. Petty & Cacioppo, 1981). They include: (1) conditioning and modeling approach, (2) message-learning approach, (3) perceptual-judgmental approach,
(4) motivational approach, (5) information-processing approach, (6) mathematical approach, and (7) self-persuasion approach. Each of the approaches focuses on a different basic process to explain how and why peoples’ attitudes change. Basically, all of the different approaches to attitude change involve three influencing factors: message source who delivers the persuasive message; message delivered by the message source; and the characteristics of audience who receive the message (Hovland, Janis, & Kelley, 1953; Perloff, 2002).

Regarding the persuasive message source such attributes of communicators as authority, social attractiveness, and credibility influence audiences through different processes. Especially, credible communicators influence people through internalization (Perloff, 2002). That is, people accept the message recommendations suggested by credible communicators because they are congruent with our values and attitudes. Human communication research has shown that a high credibility communicator is more effective in producing attitude change than a low credibility communicator (Burgoon, Pfau, & Birk, 1990; Plax & Rosenfeld, 1980; Pornpitakpan, 2004; Sternthal, Phillips, & Dholakia, 1978). A pedagogical agent as a message source can be perceived as more or less credible by learners by evoking different emotional responses from the learners. Indeed, portraying agent credibility has been an important issue in animated agent research (e.g., Burgoon et al., 2000; e.g., Cowell & Stanney, 2005; Fogg & Tseng, 1999).

The message itself is also an important factor that can influence audience. There are three major types of message factors (Perloff, 2002): message structure (e.g., message sidedness, conclusion drawing, and order of presentation), message content (e.g., evidence, fear appeal, and framing), and language (e.g., speed of speech, powerful vs. powerless speech, and language intensity). Among the message factors, a fear appeal is proposed as an effective persuasive strategy in the present study. A fear appeal is a persuasive communication that attempts to “scare” people into changing their attitudes by conjuring up “negative consequences” that will occur if they do not comply with the message recommendations (Perloff, 2002). Human communication research suggests that fear enhances attitude change and that high-fear appeals are more effective than low-fear appeals (e.g., Boster & Mongeau, 1984; Mongeau, 1998).

This chapter begins with presenting previous research on animated pedagogical
agents as an instructional message source, focusing on both verbal and nonverbal behaviors the pedagogical agents can express in order to make differences in learning, mainly in affective learning. The second section of this chapter presents how attitudes are defined and what the characteristics of attitudes are. The third section provides different theoretical approaches to attitude changes and presents an incorporated approach to attitude change to be employed as a theoretical foundation for the present study. Finally, this chapter ends with explaining about credibility as a message source characteristic and fear appeal as a persuasive message that are two independent variables for the present study, showing the evidence of how source credibility and fear appeal can influence attitudes both in isolation and in combination with each other, and providing their relevance to research on animated pedagogical agent and instructional message design.

**Animated Pedagogical Agents**

For the past years, increasing attention has been paid to pedagogical agent research. However, some researchers still raise a fundamental question, “Why not simply use a real person – images or video clips of a real person - instead of an animated human-like agent?” Pedagogical agent researchers do not try to defend themselves in response to this question. Indeed, the use of a real person has not been ignored in the pedagogical agent research. Pedagogical agents can enrich the repertoire of available presentation styles based on either cartoon drawings, recorded video images of real persons, or 3D body models. Embodiment of agents can range from simple to quite complex depending on the desired quality of animation. For example, a visual element of the agent could be a simple bitmap image of the agent in a particular pose, a graphical animation sequence of the agent moving from one pose to another, or even an image or video clip of a real person (e.g., Andre, Rist, van Mulken, Klesen, & Baldes, 2000; Brave, Nass, & Hutchinson, 2005). All three approaches have been used in designing existing pedagogical agents (Johnson, Rickel, & Lester, 2000).

Recognizing the instructional potential of animated pedagogical agents as a user interface, researchers have suggested and developed a variety of pedagogical agents, which differ in terms of voice (Atkinson, 2002; Atkinson, Mayer, & Merrill, 2005; Mayer,

Voice can carry a great amount of information beyond the nominal instructional message in the words of a narration and it is accompanied by information regarding the speaker’s suitability as a conversational partner (Mayer, Sobko, & Mautone, 2003). According to the research on the effects of voice in computer-based learning environments involving animated pedagogical agents (Atkinson, 2002; Moreno, Mayer, Spires, & Lester, 2001), voice can provide a powerful indicator of meaning. Atkinson (2002), even while he did not use a human image for the on-screen agent, placed a focus on examining the modality effect of voice vs. text in the presence of the agent. He programmed the agent to deliver monologue-style instructional explanations in a nonpersonalized fashion while using nonverbal cues such as gesture and gaze to direct attention. He found out that “aurally” delivering instructional explanations is more effective than “textually” delivering in learning. Moreno et al. (2001) also attempted to determine the role of an agent voice in one of a series of five experiments. They compared students’ learning in a computer-based environment, Herman the bug, in which the agent communicated via speech with an identical environment in which the same explanations were communicated via on-screen text. Their experiments confirmed the finding Atkinson (2002) made.

Beyond the presence or absence of agent voice many researchers have examined the effect of the nature of the agent voice (e.g., machine-generated vs. human voice) (Atkinson, 2002; Atkinson, Mayer, & Merrill, 2005; A. L. Baylor, Ryu, & Shen, 2003; Kim, Baylor, & Reed, 2003; Mayer, Sobko, & Mautone, 2003). Atkinson et al. (2005) compared a human voice with a computer-synthesized voice in a computer-based mathematics lesson that provided four worked-out examples along with step-by-step descriptions of how to solve them. The results indicated that learners who worked with the animated agent with the human voice outperformed those who worked with the animated agent with the computer-synthesized voice on transfer tests, and that learners in the human-voice condition rated the agent more positively in terms of three dimensions including superiority, attractiveness, and dynamism. Similarly, Mayer et al. (2003) had
the students who were native-English speakers receive a narrated animation that explained how lighting forms, and compared the narration spoken by a male native-English speaker with the same spoken by an animated agent with a machine-generated male voice in terms of learning and attitude. Furthermore, they focused on the varying social appeal of the agent’s voice and compared multimedia lessons, in which the narration was spoken by a male native-English speaker with a standard accent, so-called, “socially appealing voice” (p. 420) or by a male speaker with a Russian accent, “nonsocially appealing voice” (p. 420) for the same groups of students. In their studies there were voice effects where learners outperformed on the transfer test and rated the agent more positively when the agent voice was human rather than machine generated and when the agent voice had a standard accent (socially appealing) rather than a foreign accent (nonsocially appealing). In the same vein, to answer the question of what types of voice will be more effective and appealing, Kim et al. (2003) compared strong human voice, calm human voice, and computer-generated voice. While the strong voice was authoritative, assertive, and enthusiastic the calm voice was soft, nice, and kind. As indicated above, agent voice can influence how the learners perceive the pedagogical agents they are communicating with. Furthermore, it has been shown that different agent voices can make a significant difference in learning and attitudes. Along this line, the present study treats agent voice as an important design element for influencing learners’ attitudes toward a specific issue.

Like in human-human conversation, an animated pedagogical agent as a social interface can deliver information through non-verbal behavior as well as verbal behavior. Non-verbal behavior refers to the modes used to communicate non-verbally (Tortoriello, Blatt, & DeWine, 1978) and every behavior for communications, except for verbal behavior (e.g., voice), can be considered as non-verbal behavior. It includes a variety of body movements such as deictic gestures, head nodding, gaze (eye contact), facial expressions, etc. Such non-verbal communication modes work well together with the agent’s verbal behavior (voice) to promote human-computer interaction. Although verbal communications via voice may be superior to visual features of agents for communication, it appears that learners also rely on the visual features in order to more clearly interpret the meaning of the communication or emotion (Lester, Towns, Callaway,
Voerman, & FitzGerald, 2000). In this vein, researchers have paid equal or more attention to such non-verbal behavior as a strong factor that can influence learner motivation and performance.

It can be thought that attitude as an affective learning outcome is more emotional response than cognitive response to the communicated message. Thus, in the present study that places more focus on affective learning than on cognitive learning, such nonverbal behaviors should be an important consideration when designing pedagogical agents to be used for the study.

An animated pedagogical agent can function as different role-players for teaching and learning. The roles of pedagogical agents may be broadly divided into two categories: authoritative roles such as instructors, mentors, or expert; and non-authoritative roles such as motivators or learning companions (c.f. Chou, Chan, & Lin, 2000). Those different agent roles can be realized by manipulating its attributes including agent physical appearance, and verbal and nonverbal behaviors. In an exploratory experimental study, Baylor et al. (2003) attempted to validate the effectiveness of pedagogical agent roles for promoting learner motivation and learning outcomes. They designed pedagogical agents with such different roles as motivator, expert, and mentor and examined whether learners perceived agent roles as intended. In their agent role design framework, the motivator and mentor agents had the most expressive animations in terms of facial expressions and gestures while the expert agent had the most subdued animations. Regarding message, the motivator agent provided encouragement and support while the expert agent provided information. The mentor agent provided both types of message. In the same vein, Kim & Baylor (2003) compared the effects of expert-like and mentor-like agents on learning and learning-related outcomes. They specified the expert-like agent as wearing a suit and looking stern, the mentor-like agent as wearing casual clothing and looking comfortable. However, the roles mentioned thus far – instructors, mentors, expert, motivators, learning companions, etc – are prototypical pedagogical roles. But there are also roles that are less pronouncedly pedagogical but yet impact learning (Gulz & Haake, 2006), especially attitude toward a specific social issue as an affective learning outcome.

Assigning different roles to pedagogical agents has its foundation in both the
theory of social modeling (Bandura, 1997) and the notion of social interface. Bandura suggested that much of learning derives from vicarious experience and social modeling of behaviors enables us to learn new behaviors, strengthens or weakening previously learned behaviors, and reminds us to perform behaviors about which we had forgotten. Research on human-computer interaction has found that people tend to apply human social rules to computer technologies (Prendinger & Mitsuru, 2004; Reeves & Nass, 1996). That is, people tend to treat computers as social actors interacting with them in a highly social manner. Recent research has also shown that pedagogical agents can potentially serve as simulated social models having social interactions with learners by employing a variety of human-human communication attributes such as physical appearance, and verbal and non-verbal behaviors.

The concept of social modeling or social interface provides important implications for the present study that investigates the social influence of pedagogical agents on learners’ attitudes, in that social models can also influence learners’ attitudes (Goethals & Nelson, 1973). Observing a social model perform a behavior provides us with information relevant to self-efficacy through a process of social comparison (Bandura & Schunk, 1981). In the same vein, Bickmore, Gruber, and Picard (2004) suggest that computer characters can influence a proactive change in everyday behavior. Thus, it is believed that animated pedagogical agents can serve as a persuasive message source in computer-based learning environments for enhancing attitude change.

Indeed, there have been a few attempts to examine the effects of pedagogical (embodied conversational) agents on attitudes toward a specific issue or even (e.g., A. L. Baylor & Plant, 2005; Nguyen & Masthoff, 2007; e.g., Nguyen, Masthoff, & Edwards, 2007). Baylor and Plant (2005) examined the influence of pedagogical agents as social models to shape, reinforce, or change female undergraduate students’ attitudes toward engineering. The students in their study chose a pedagogical agent they most preferred to learning among sixteen agents that differ by appearance in four aspects including age, gender, attractiveness, and coolness. After they selected their most preferred agent, they interacted with it, receiving a persuasive message about engineering. Regarding influence on attitudes toward engineering, the results indicated that the older agent had more positive effect on their attitudes toward engineering than the younger counterpart.
Nguyen, Masthoff, and Edwards (2007) took into consideration not only animated agents as a message source but also message sidedness as a message factor. More specifically, they attempted to answer the questions: (1) Does the use of a team of agents to present the message make it more persuasive than that of a single agent?, and (2) Is a two-sided message (a message that discusses the pros and cons of a topic) more persuasive than a one-sided message (a message that discusses only the pros of the topic)? In the agent team condition, each of the agents delivers a part of the message. In the single agent condition, one agent delivers the whole message. In their first experiment, they implemented their virtual characters as static images of real people with no animation or sound, which have been verified to have high credibility (Fogg et al., 2003). With respect to the use of a team of agents to present information, Andre et al. (2000) suggest that a team of animated agents could be used to reinforce the users’ attitudes by allowing us to repeat the same information by employing each agent to convey it in a different way. The results showed that two-sided messages are more persuasive than one-sided ones and the use of a team of agents to present information considerably damaged the impact of the persuasive message, which is quite a surprise result in light of Andre and his colleagues’ suggestion. Despite these explorations, there is still the need for research on the persuasive effects of agent credibility on learners’ attitudes, in conjunction with the persuasive message itself. The present study is to address this research need.

**Attitude as an Affective Learning Outcome**

It has been widely accepted that there are three major domains in learning outcomes: cognitive, affective, and psychomotor (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Gagne (1972) also proposed an integrated taxonomy of learning outcomes incorporating the three major domains and further dividing the cognitive domain into three distinct categories including verbal information, intellectual skills, and cognitive strategies. Thus, Gagne’ taxonomy of learning outcomes includes five major categories: verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills.
Like research on other areas in the field of instructional technology, however, previous research on animated pedagogical agent has somewhat neglected the affective learning domain represented by attitudes. There have been just a few efforts to investigate agent effects for affective learning domain (e.g., A. L. Baylor & Plant, 2005). Baylor and Plant attempted to change women’s negative attitudes regarding engineering and science-related fields with the notion that it may be possible to use pedagogical agents as mechanism for persuasion. The results indicated that interacting with an agent had a positive influence on their math-related beliefs. The women who interacted with an agent reported more positive attitudes toward engineering compared to their attitudes at the beginning of the semester and compared to a group of women who did not interact with an agent. However, it appears that the persuasive message itself had an impact on their attitude toward engineering rather than the agent that delivered the persuasive message in that the group of women who did not interact with an agent only completed the post-survey without viewing any persuasive message. In addition, their attitude measure seems to be somewhat arbitrary and more like learners’ perception rather than attitudes. Attitudes should be attended to as a learning outcome and attitude measures should be generated based on a concrete theoretical foundation. In order to address this issue this study employs an attitude measure generated on the basis of expectancy-value theory as such a theoretical foundation.

Attitudes have been examined more thoroughly in communication research in relation to the communication-persuasion paradigm than in educational research. Persuasion is the study of attitudes and how to change them in the field of communication. Perloff (2002) defined persuasion as “a symbolic process in which communicators try to convince other people to change their attitudes or behavior regarding an issue through the transmission of a message, in an atmosphere of free choice.”

Communication researchers have proposed many different definitions of attitudes. Perloff (2002) incorporated those proposed definitions and suggested his own definition. He defines attitudes as a learned, global evaluation of an object (person, place, or issue) that influences thought and action. This incorporated definition is very similar to Gagne’s (1985) definition of attitudes. Gagne defined attitudes as acquired
internal states that influence the choice of personal action toward some class of things, persons, or events. What they have in common is that both assume: (1) attitudes can be learned, (2) attitudes are emotional evaluations, (3) attitudes influence thought and actions, and (4) attitude is functional (Perloff, 2002).

We are not born with attitudes toward a specific object. That is, attitudes are learned. Indeed there is considerable evidence that learning is a component of persuasion – the more people learn and comprehend message arguments, the more likely they are to accept the advocated positions (Chaiken, wood, & Eagly, 1996). This evidence also indicates that message learning is closely related to attitudinal learning. Along this line, this study is interested in identifying the relationship between cognitive and affective learning, which may be represented by message learning and attitudinal learning, respectively.

Secondly, having an attitude toward a specific attitude object means that we make a certain judgment of its value or worth and we are no longer neutral about the topic (Perloff, 2002). That is, attitudes are emotional evaluations. In that attitudes are emotional attitudes involve affect and emotions, which play an important part in how attitudes are formed or changed. This characteristic of attitudes implies that affective or emotional features should be taken into account when designing pedagogical agents intended to influence learners’ attitudes toward a specific issue.

Thirdly, attitudes are never directly observed. They just can be inferred from thought or action because attitudes influence thought and action. That is why we usually translate attitudes into behavior, which can be directly observed. This characteristic of attitudes raises an issue about measuring attitudes. It would be almost impossible to observe how people behave in their everyday life to measure their attitudes toward a specific issue. Except the direct observation of their behaviors the only alternative way to measure their attitudes would be to measure their perception of the issue or topic. Thus, this study will infer learners’ attitudes from their perceptions of the issue based on a concrete theoretical foundation: Expectancy-Value Approach involving cognition and affect as two major components of attitude (Fishbein & Ajzen, 1975). It will be discussed in more detail later.

Lastly, attitudes are functional and attitude objects influence attitude functions
(Shavitt, 1990). Attitude objects refer to a specific person, issue, or event. Researchers have categorized the main functions of attitudes or the primary benefits that attitudes provide (Katz, 1960; Maio & Olson, 2000). Attitudes can serve a *knowledge* function, helping people organize and structure one’s environment and providing an overarching framework that assists individuals in cognitively coming to terms with the array of ambiguous and sometimes scary stimuli they face in everyday life (Katz, 1960). On a more material level, attitudes can serve to maximize rewards and minimize punishments obtained from attitude objects in one’s environment (Katz, 1960). For example, students in a statistics course may believe that it is functional to develop a positive attitude toward the statistics course because they figure that if they show enthusiasm the professor will like them more. The role of attitudes in maintaining rewards is referred to as the *utilitarian* function. We all like to be accepted by others. Attitudes help us “adjust to” reference groups. In other words, people sometimes adopt attitudes not because they truly agree with the advocated position, but because they believe they will be more accepted by others if they take this side. This role of attitudes refers to a *social adjustive* function. People also hold attitudes to communicate who they are and what they aspire to be (Shavitt & Nelson, 2000). This is one reason people buy certain products; they hope that by displaying the product in their home (or on their bodies), they will communicate something special about themselves – for example, expensive cars, T-shirts with the names of brand name stores, etc. The role of attitudes in communicating who they are refers to a *social identity* function. An important reason people hold attitudes is to express core values and cherished beliefs. For example, some individuals claim that they favor capital punishment because they value law and order. The role of attitudes in expressing values and beliefs refers to a *value-expressive* function. Lastly, attitudes can serve as a “defense” against unpleasant emotions people do not want to acknowledge. People adopt attitudes to shield them from psychologically uncomfortable truths. This role of attitudes refers to an *ego-defensive* function.

These characteristics of attitudes have implications for understanding and designing persuasive messages. A persuasive message is most likely to change an individual’s attitude when the message is directed at the underlying function the attitude serves (Snyder, Clary, & Stukas, 2000). Messages that match the function served by an
attitude should be more compelling than those that are not relevant to the function addressed by the attitude. Thus, it is an important issue to select an appropriate attitude object and match the persuasive messages with the function the attitude object serves.

This study places a focus on the utilitarian attitude function. Attitudes objects are expected to engage a utilitarian attitude function to the extent that they are intrinsically associated with rewards and punishments. The issue of “intellectual property” could be considered utilitarian because there are rewards (e.g., comfort) and punishments (e.g., fines and imprisonment) intrinsically associated with the issue of intellectual property. Thus, intellectual property as an attitude object has been selected as a topic of the instruction module for this study and much attention will be paid to matching the persuasive message embedded in the instructional module with the function the attitude object serves: utilitarian.

**Approaches to Attitude Change**

Various theories of attitude change have been developed and they can be categorized into seven major approaches (R. Petty & Cacioppo, 1981). They include: (1) conditioning and modeling approach, (2) message-learning approach, (3) perceptual-judgmental approach, (4) motivational approach, (5) information-processing approach, (6) mathematical approach, and (7) self-persuasion approach. Each of the approaches focuses on a different basic process to explain how and why peoples’ attitudes change.

The conditioning and modeling approach focuses on the direct administration of rewards and punishments to the target of influence or on the effects of the target observing others being rewarded or punished for expressing certain attitudes. The message-learning approach examines how different variables affect a person’s attention to, comprehension of, yielding to, and retention of the arguments in a persuasive message. The perceptual-judgmental approach focuses on how a person perceives the message and how attitude judgments are made in the context of a person’s past experiences. The motivational approach discusses how different human motives (e.g., the desire to maintain consistency between beliefs and between attitudes and behaviors) affect attitudes. The information processing approach places its focus on process (Perloff,
2002) by which messages influence attitudes. The proponents of the information-processing approach to persuasion believe that if they can understand how people cognitively process messages, they can better explicate the impact that communication have on attitudes.

Among the seven different approaches to persuasion, the message-learning and the information-processing approaches have been considered significant. First, the message-learning approach has provided a concrete historical foundation from which many contemporary models of persuasion evolved. It contributed helpful insights and also laid the groundwork for current theorizing (Perloff, 2002). Secondly, the information-processing approach currently dominates the field of persuasion research and it addresses an important issue surrounding the message-learning approach to persuasion, which is the claim that the message-learning approach failed to shed much light on the ways that messages influence attitude.

The message-learning approach to persuasion championed by Carl Hovland and his colleagues’ Yale Attitude Change Model (Hovland, Janis, & Kelley, 1953) assumes that “people are spongelike creatures who passively take in information they receive (Perloff, 2002, p. 122).” However, it is apparent that people are very actively process information while they are listening to the persuasive communication (Perloff, 2002).

The Yale Attitude Change Model suggests that a persuasive communication must gain a person’s attention and must be remembered in order to be actually persuasive (see Figure 1). In other words, it emphasizes that attitude change entails learning messages arguments and notes that attitude change occurs in a series of steps from attention, comprehension, yielding, and retention.
In this approach, retention of the message arguments is important because it indicates that the message recipient has attended, comprehended, and learned the persuasive communication. But the Yale Attitude Change Model also emphasizes that attitude change occurs only if a certain incentive or reward for the new attitudinal position, which are promised or expected, outweighs those associated with the initial attitude. Thus, retention is necessary but not sufficient preconditions for attitude change (R. Petty & Cacioppo, 1981). The Yale Attitude Change Model involves communicator’s credibility, message appeals, and audience members’ personality traits as critical factors influencing the attitude change process (Perloff, 2002). Among these factors, message arguments are presumed to motivate attitude change by the incentives they provide or because they serve as rewards within the message (R. Petty & Cacioppo, 1981). This presumption may indicate that the Yale Attitude Change Model is geared to the utilitarian attitude function, which is associated with rewards or punishments the persuasive message involves, more than to other attitude functions.

The information-processing approach (c.f. Andre, Rist, & Muller, 1999; Chaiken, 1980; R. E. Petty & Wegener, 1998) sheds much light on the ways that messages influence attitudes and explains how we can utilize it to devise messages to change attitudes. The cornerstone of the information processing approach is a focus on process. The information processing approach emphasizes that we cannot understand communication effects without appreciating the underlying processes by which messages
influence attitudes and claims that there are two different mechanisms by which communications affect attitudes. That is, according to the information processing approach, information is processed either peripherally or centrally by the message recipient.

The central processing is characterized by considerable cognitive elaboration. It occurs when individuals focus in depth on the central features of the issue, person, or message. When people process information centrally, they carefully evaluate message arguments, ponder implications of the communicator’s ideas, and relate information to their own knowledge and values. This is the thinking person’s route to persuasion. On the other hand, the peripheral processing is entirely different. Rather than examining issue-relevant arguments, people examine the message quickly or focus on simple cues to help them decide whether to accept the position advocated in the message. Factors that are peripheral to message arguments carry the day. These can include a communicator’s physical appeal, glib speaking style, or pleasant association between message and music playing in the background. When processing peripherally, people invariably rely on simple decision-making rules or heuristics. For example, an individual may invoke the heuristic that “Experts are to be believed,” and for this reason accept the speaker’s recommendation.

![Figure 2.2. A Simplified Graphical Representation of Information-Processing Approach to Persuasion](image)

The information-processing approach to persuasive communication also involves message source, message, and message recipient. The message recipients determine which information processing route they will take. The influencing factors on this
selection of information processing routes include a variety of individual personalities characteristics such as self-esteem, need for cognition, self-monitoring, etc. However, the present study does not put its main interest in the “process” of how message source and message influence attitudes. Rather, this study attempts to examine the effects of different levels of agent credibility as a message source factor and different levels of fear arousing as a message factor on attitude and message learning.

As described above, all the different approaches to attitude change involve three influencing factors in common: message source who delivers the persuasive message; message delivered by the message source; and the characteristics of audience who receive the message (Hovland, Janis, & Kelley, 1953; Perloff, 2002). Even though what determines which information process route to take is those individual personality variables individuals’ attitudes are under the direct influence of message source and message itself. When individuals take the central information processing route they tend to be more influenced by message arguments than message sources, while when they take the peripheral information processing route message sources tend to prevail in eliciting attitude changes compared to message arguments (Perloff, 2002; R. E. Petty, Cacioppo, & Schumann, 1983). This is another reason why the present study excludes such individual personality variables as self-esteem, need for cognition, and self-monitoring.

Source Credibility and Fear Appeal and Relevance to Agent Research

As indicated above, there are three factors that influence the process of attitude change: message source who delivers the persuasive message; message delivered by the message source; and the characteristics of audience who receive the message (Hovland, Janis, & Kelley, 1953; Perloff, 2002). The focus of this study is on the effects of message source and message itself on students’ affective learning, attitudes toward a specific attitude object. Of course, it may be more meaningful to examine how all of three persuasion factors work for attitude change, including message source, message, and individual characteristic in one research study. However, there are many individual personality variables to consider at the same time. Moreover, it appears that what
actually influences attitudes are message source and message itself rather than individual personalities like self-esteem, need for cognition, and self-monitoring. Thus, this study constraints its focus to the first two factors: message source and message itself. It is discussed below how message source and message factors influence attitudes and how they are related to pedagogical agent research.

**Credibility as a message source factor**

Regarding the persuasive message source such attributes of communicators as authority, social attractiveness, and credibility influence audiences through different processes. Authorities frequently influence people through compliance (Kelman, 1958). They adopt a particular behavior not because they agree with the persuasive message, but because they expect to gain specific rewards or approval and avoid specific punishments or disapproval by conforming. Attractive communicators – likeable and physically appealing ones – seem to influence through more affective processes, such as identification (Perloff, 2002). People go along with attractive speakers because they identify with them or want to establish a positive relationship with the communicators. Credible communicators, in contrast to authorities, influence people through internalization (Perloff, 2002). People accept the message recommendations suggested by credible communicators because they are congruent with our values and attitudes. Human communication research has shown that a high credibility communicator is more effective in producing attitude change than a low credibility communicator (Burgoon, Pfau, & Birk, 1990; Plax & Rosenfeld, 1980; Pornpitakpan, 2004; Sternthal, Phillips, & Dholakia, 1978).

Communicators’ credibility is of particular interest in this study for two main reasons. First of all, credibility may be “the single biggest variable under the speaker’s control during the presentation” (Whalen, 1996, p. 97). Conger (1998) also states that “credibility is the cornerstone of effective persuading; without it, a persuader won’t be given the time of day” (p. 90). In the same vein, pedagogical agent researchers maintain that if on-screen characters are part of a computing product, they are likely the most immediate psychological target for credibility evaluation (Lester et al., 1997; Reeves &
Secondly, agent credibility has been examined more thoroughly in the agent research than the other two factors of message source (Brave, Nass, & Hutchinson, 2005; Cowell & Stanney, 2005; Dehn & van Mulken, 2000; Kim, Baylor, & Reed, 2003; Mayer, Sobko, & Mautone, 2003). For example, Cowell and Stanney (2005) discussed a set of empirical studies that attempted to replicate human-human non-verbal behavior for increasing agents’ perceived credibility and presented the design suggestions for portraying agent credibility. Kim, Baylor, and Reed (2003) examined the effects of agent voice on students’ perceptions of agent credibility. The pedagogical agents in the study varied by their voice. They employed three different voices: strong human-voice, calm human-voice, and computer-generated voice. The study found that the agents with human voices (strong and calm) were perceived as significantly more credible than the agents with a computer-generated voice. However, there was no significant difference between strong and calm human voice in their effects on students’ perceptions of agent credibility.

Credibility is a psychological or interpersonal communication construct and it is defined as “the attitude toward a source of communication held at a given time by a receiver” (McCroskey, 1997, p. 87). It is an audience member’s perceptions of the communicator’s qualities (Fogg & Tseng, 1999). Credibility can also be defined as believability. Credible people are believable people; credible information is believable information. It has been found that believability is a good synonym for credibility in virtually all cases (Fogg & Tseng, 1999).

Although we commonly think of credibility as something a communicator has, it is more complex. Credibility is more than a psychological characteristic. It is also a communication variable. It is part of the two-way interaction between communicator and message recipients – a dynamic entity that emerges from the transaction between source and audience member. This means that communicators are not guaranteed credibility by virtue of who they are, their title, or academic pedigree.

Then, what are the main attributes of credibility? Communication researchers found that credibility has more than one dimension, more than a single layer (Buller & Burgoon, 1996; Gatignon & Robertson, 1991; R. Petty & Cacioppo, 1981; Self, 1996;
Credible communicators are perceived as having expertise, trustworthiness, goodwill, dynamism, extroversion, sociability, and composure (e.g., Berlo, Lemert, & Mertz, 1969; McCroskey & Young, 1981). By far the most important characteristics – the ones that have emerged in study after study or generated the greatest theoretical interest – are (a) expertise, (b) trustworthiness, and (c) goodwill or caring.

Expertise and trustworthiness have emerged with greatest regularity, and goodwill has been uncovered in systematic research by James McCroskey (McCroskey & Teven, 1999). Based on the studies as a whole, we can say that a credible communicator is one who is seen as an expert, regarded as trustworthy, and displays goodwill (or caring) toward audience members. Expertise is defined as knowledge or ability ascribed to the communicator (Fogg & Tseng, 1999). It is the belief that the communicator has special skills or know-how. The expertise dimension of credibility captures the perceived knowledge and skill of the source. There is abundant evidence that experts are perceived as credible and can influence attitudes (R. E. Petty & Wegener, 1998). Trustworthiness, the next key element in credibility, refers to the communicator’s perceived honesty, character, and safety. The trustworthiness dimension of credibility captures the perceived goodness or morality of the source. The final core communicator factor is goodwill, or perceived caring. Communicators who display goodwill convey that they have listeners’ interests at heart, show understanding of others’ ideas, and are empathic toward their audiences’ problems (McCroskey & Teven, 1999).

Agent expertise, trustworthiness, and caring (or goodwill) can be perceived through a number of non-verbal behaviors. For example, expertise is often perceived from the way the pedagogical agent wear (e.g., suit or casual) (e.g., A. L. Baylor & Kim, 2005) and what it is called (e.g., professor or peer-like name) (e.g., A. L. Baylor & Ebbers, 2003; Fogg & Tseng, 1999). Trustworthiness and caring tend to go in pairs. Empathic facial expressions make the pedagogical agent to be perceived more trustworthy and caring than neutral facial expressions (e.g., Brave, Nass, & Hutchinson, 2005; Cowell & Stanney, 2005). Eye contact can also affect agent trustworthiness and caring. For a pedagogical agent to be perceived credible – in terms of trustworthiness and caring - it should maintain eye contact with the learner, employ direct eye contact, which is not challenging, and avoid looking down (e.g., Cowell & Stanney, 2005).
Like emotions are generally seen as effective means to influence attitudes in persuasion studies (e.g., DeSteno, Petty, Rucker, Wegener, & Braverman, 2004), pedagogical agent research has also placed a focus on emotions expressed by a pedagogical agent (e.g., Brave, Nass, & Hutchinson, 2005; Cowell & Stanney, 2005)–through facial expressions and gestures - because researchers believe that pedagogical agents expressing emotions can evoke emotional responses from learners and learners’ emotional responses can have an impact on learning. Brave and his colleagues (2005) investigated the psychological effects of emotion in agents upon users. They employed and compared an empathic agent with a non-empathic agent with regard to their effects on the users’ perceptions of agent credibility assessed based on such dimensions as trustworthiness and perceived caring. The empathic agent had the appropriate facial expressions for the situation the users encountered. In empathic conditions, for example, the agent responded with either happiness or sadness to the user depending on the situation the user encountered. On the other hand, the non-empathic agent simply unemotionally responded to the user regardless of the situation the user encountered. The results of the study indicated that the empathic agent was perceived more credible than the non-empathic agent. Thus, in this study agent emotion will be manipulated to make differences in agent credibility between a more credible agent and a less credible agent by employing different facial expressions for the different types of agent in terms of credibility.

**Fear appeal as a message factor**

The message itself is also an important factor that can influence audience. There are three major types of message factors (Perloff, 2002): message structure (e.g., message sidedness, conclusion drawing, and order of presentation), message content (e.g., evidence, fear appeal, and framing), and language (e.g., speed of speech, powerful vs. powerless speech, and language intensity).

This study is interested in the issue of “intellectual property” including plagiarism and music downloading as an attitude object. This study suggests “intellectual property” as an attitude object that mainly serves a *utilitarian* function. The utilitarian
function can serve to maximize rewards or minimize punishments. The issue of intellectual property is all about laws and rules that prevent people from doing something illegal to avoid being “punished.” Among the message factors, a fear arousing message is a persuasive communication that attempts to “scare” people into changing their attitudes by conjuring up “negative consequences” that will occur if they do not comply with the message recommendations (Perloff, 2002). Thus, it is suggested that fear appeal in persuasive messages is an appropriate persuasive strategy for the attitude object, “intellectual property”, in this study. The present discussion focuses on both the theoretical and empirical literature bearing on the degree to which fear appeal messages affect the acceptance of a persuasive message.

Human communication research suggests that fear enhances attitude change and that high-fear appeals are more effective than low-fear appeals (e.g., Boster & Mongeau, 1984; Mongeau, 1998). People are emotional as well as cognitive creatures, and they do not always do what is best for them. Thus, fear appeals are a necessary persuasive strategy.

There are a couple of different explanations for the impact of fear appeals on attitudes (Mongeau, 1998). Early explanations for the impact of fear appeals center on the drive-producing and reducing qualities of fear appeals (Mongeau, 1998). Early drive models posit that strong fear appeals create fear within audience members and fear acts as a drive, which audience members must reduce. That is, audience members reduce fear by adopting the attitude and/or behavior advocated in the message. Because the reduction of the unpleasant drive is rewarding, the initial drive models predict that the greater the fear produced by the message the greater the attitude change. The initial drive models, however, failed to adequately account for conflicting findings relating fear to persuasion. Indeed, fear can either enhance or inhibit the effectiveness of a persuasive message (Janis, 1967; Leventhal, 1968). It may imply that fear arousing is necessary, but not sufficient to enhance the persuasiveness of the message.

The Parallel Response Model (PRM) proposed by Leventhal (1971) presumes that exposure to a fear appeal enhance or inhibit the effectiveness of a persuasive message by creating one of two primary processes: (a) fear control or (b) danger control. The fear control is an emotional process in which message recipients strive to reduce the
fear generated by the persuasive message. Thus, when engaging in the fear control, the message recipients concentrate on their own emotional reaction rather than the message. As a consequence, they are unlikely to concentrate on message recommendations. The danger control, on the other hand, represents a problem-solving process in which the message recipients scan the external environment for information pertinent to dealing with the threat presented in the persuasive message. When engaging in the danger control, they concentrate on the threat depicted by the message and, as a consequence, focus on message recommendations as a means of controlling the threat. The PRM is noteworthy by defining persuasion as both an emotional and a cognitive process. However, the PRM is incomplete because it does not properly identify the conditions under which fear control and/or danger control will be operative.

Fear appeals do not always produce attitude change. Not only can fear appeals fail because they arouse too little fear, they can also backfire if they scare individuals too much (Morris & Swann, 1996). According to Witte (Witte, 1994), fear appeals arouse fear by depicting a personally relevant and significant threat, and then following this description of the threat by outlining recommendations presented as feasible options for avoiding the threat. As this definition implies, the two key constructs in fear appeal research are perceived threat and perceived efficacy (Witte, 1994, 1998; Witte & Allen, 2000). Perceived threat results from two components in the persuasive message: severity information (information about the seriousness and magnitude of the threat and susceptibility information (information about the likelihood that the threatening outcomes will occur). The severity information refers to a message element that makes individuals feel they will be harmed if the threat is realized. The susceptibility information refers to a message element that makes them feel they are likely to experience the threat.

After threatening or scaring the person, the fear-appealing message must provide ways the individuals can avert the threat. Perceived efficacy can result from efficacy information in the persuasive message. Efficacy information is composed of two components: response efficacy information and self-efficacy information. Response efficacy information refers to whether or not an individual believes the recommended behavior or response will prevent the threat while self-efficacy information refers to
whether or not an individual believes they can perform the recommended response (Rogers, 1975, 1983). In short, a fear-arousing persuasive appeal describes a threat. Second, the fear appeal indicates that message recipients are likely to experience that threat. Third, fear appeals indicate that one way of avoiding that threat is to perform the change in attitudes recommended by the message source (Boster & Mongeau, 1984; O’Keefe, 1990). Table 2.1 shows examples of each component of fear arousing message.

Table 2.1. Example Statements of each of four fear arousing components

<table>
<thead>
<tr>
<th>Component</th>
<th>Example Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Threat</td>
<td>Severity Information: However, once you give a copy of your music CD to anyone else you get to violate those two federal laws. If you get caught you should go to jail or pay a huge fine. The average fine per song is $750.</td>
</tr>
<tr>
<td></td>
<td>Susceptibility Information: I know that undergraduate students like you tend to be more susceptible to such an illegal copy of music CDs than any other peoples mainly because you cannot refuse your friends’ request. In addition, you may think that nobody knows you committed to the illegal copy and those who got caught were just unlucky. Most people who got caught actually thought so. Take it seriously. You could be such an unlucky person.</td>
</tr>
<tr>
<td>Perceived Efficacy</td>
<td>Response Efficacy Information: Keeping in mind the Doctrine of Fair Use can help you avert such an unfortunate consequence like arrest and/or fine.</td>
</tr>
<tr>
<td></td>
<td>Self-Efficacy Information: The only thing you need to avert those consequences is not to give a copy of your music CDs as the federal laws prescribe. Your friends will understand why you had to turn down their requests</td>
</tr>
</tbody>
</table>

The Extended Parallel Process Model (EPPM) offers a valuable framework for understanding how fear appeals works (Sprinkle, Hunt, Simonds, & Comadena, 2007) by incorporating the previous models or theories mentioned above. The EPPM is most often applied to health research (Witte, 1994). This model also provides implications for instructional purposes, especially for student affective learning (Sprinkle, Hunt, Simonds, & Comadena, 2007)
danger control will be operative (Witte, 1998). According to the EPPM, the evaluation of a fear appeal initiates two appraisals of the message, which result in the domination of either danger control or fear control processes. The two appraisals begin when an individual is presented with a fear appeal depicting the components of threat (i.e., severity and susceptibility) and the components of efficacy (i.e., response efficacy and self-efficacy). First, individuals appraise the threat the message depicts. The greater the threat perceived, the more motivated individuals are to begin the second appraisal, which is an evaluation of the efficacy of the recommended response. When the threat is regarded as trivial or irrelevant (perceived as low), there is no motivation to process the message further and no response is made to the fear appeal. Once the threat is perceived by the individuals, perceived efficacy plays a key role in changing attitudes.

Those models described imply that the level of perceived threat is an important determinant when individuals select between danger control and fear control. Persuasive communication including threat statements only – consisting of severity and susceptibility information – is more threatening than one including both threat and efficacy (response efficacy and self-efficacy) statements while persuasive communication consisting of both threat and efficacy statements is more threatening than one with neither threat nor efficacy statements. In other words, it can be stated that persuasive messages containing threat statements only are strongly threatening, ones consisting of both threat and efficacy statements moderately threatening, and ones with neither threat nor efficacy statements not threatening. In the same vein, Sprinkle et al. (2007), Based on the EPPM, suggest that fear appeals that threaten students without an efficacy statement in the persuasive instructional communication are likely to engender an extremely negative response. It may be the case that without any means for avoiding the threat, students may become frustrated and even angry largely because they do not know how to avoid the threat on their own. In contrast, they suggest that when threat is coupled with efficacy statements it is likely that fear and efficacy interact to positively influence students’ attitudes.

In an attempt to test for these suggestions Sprinkle et al. (2007) examined the impact of threat and efficacy messages on student affective learning outcomes. In their study, threat (presence vs. absence) and efficacy statements (presence vs. absence) were
manipulated in a 2 x 2 factorial design. The results indicate that the instructional message containing both threat and efficacy statements resulted in significantly higher means for the affective learning outcomes than threat-only instructional message, efficacy-only instructional message, or the control treatment with neither fear nor efficacy statements. The affective learning outcomes included: motivation, attitudes toward course content, the behaviors recommended in the class, the instructor, and the likelihood of completing additional or related course work, the likelihood of performing the behaviors taught in the class, and the likelihood of taking another course with the instructor.

Even though there have been a few studies involving a message factor in relation to using pedagogical agents as a persuasive message source, for example, message sidedness (Nguyen, Masthoff, & Edwards, 2007), there have been no empirical studies involving fear appeals as a message factor in a pedagogical agent-based learning environment. Thus, it would be worth investigating the effects of fear appeals in the pedagogical agent research.

**Interactions between source credibility and fear appeal for attitude change**

Almost all of the main effect findings of source credibility and fear appeal suggest that a high credibility source is more persuasive than is a low credibility source in changing attitudes (Pornpitakpan, 2004), and fear appeals consisting of both threat and efficacy statements are more persuasive than persuasive messages with threat statements only and ones without threat and efficacy. Of equal interest, however, are the interaction effects of source credibility and fear appeal in this study.

Eagley, Wood, and Chaiken (1978) stated that the persuasive impact of the message is typically diminished whenever message recipients attribute reporting or knowledge biases to the source. That is, when source credibility is perceived as low, message recipients will discount the claims or arguments made in the message. Conversely, when source credibility is perceived to be high, message recipients tend to counterargue less with the claims and are therefore more easily influenced by the message (Grewal, Gotlieb, & Marmorstein, 1994). This proved to be true for fear appeals. In the literature review on the interaction between source credibility and fear appeal,
Sternthal et al. (1978) concluded that the greatest shift in attitudes toward a specific attitude object occurred when a highly credible source presented a strongly threatening message and threat levels did not make a difference when source credibility was low. For example, Miller and Hewgill (1966) showed, in their experiment, that subjects exposed to a mildly threatening communication given by a highly credible source changed their attitude significantly less than did subjects in the strong threat-high credibility condition, but significantly more than did a control group that did not receive the fear appeal. Subjects in the two low credibility-low threat conditions did not differ from each other, from subjects in the high credibility-low threat condition, or from subjects in the control group. In a recent literature review, Pornpitakpan (2004) confirmed these findings.

This phenomenon may also be applicable to this study. When agent credibility is low, learners would be relatively unpersuaded regardless of the level of threat induced. Furthermore, it appears that a credible agent is particularly likely to enhance attitude change when the threat is relatively high, but not too high.

**PURPOSE OF STUDY**

Based on the review of literature on human communication research, it is apparent that the two main factors (message source and message itself) influencing the process of attitude change in communication research are well aligned with pedagogical agent research. That is, research on pedagogical agents has placed primary emphasis on pedagogical agents as a message source and messages delivered by agents. Thus, the communication-persuasion paradigm has implications for pedagogical agent research focusing on attitude change as a learning outcome.

The purpose of the study was to investigate how (1) agent credibility (more vs. less credible) and (2) fear appeal - threat plus efficacy (*moderately threatening*) vs. threat only (*strongly threatening*) vs. neither threat nor efficacy (*not threatening*) - affect learners’ attitudes toward a specific social issue (affective learning) as well as message learning (cognitive learning) in a pedagogical agent-based learning environment. As mentioned above, the main focus of this study was on the effects of agent credibility as a message source and fear appeal as a persuasive message mainly because what actually
influences attitudes are the message source and message itself. The research hypotheses for this study were as follows.

**The Effects of Agent Credibility and Fear Arousing Message on Attitude Change**

**Hypothesis 1.1:** A more credible agent (MC) will be more effective in changing attitudes than a less credible agent (LC).

Regarding the effect of source credibility on attitude change, previous research in the persuasive communication has showed a very consistent result that a more credible source has more influence on attitudes toward a specific issue or event than a less credible source (Burgoon, Pfau, & Birk, 1990; Plax & Rosenfeld, 1980; Pornpitakpan, 2004; Sternthal, Phillips, & Dholakia, 1978). Research on human-computer interaction has found that people tend to apply human social rules to computer technologies and human-computer interaction resembles the interaction between human and human (Prendinger & Mitsuru, 2004; Reeves & Nass, 1996). Pedagogical agents can potentially serve as simulated social models having social interactions with learners by employing a variety of human-human communication attributes such as physical appearance, and verbal and non-verbal behaviors. Thus, it is expected that the finding from the human-human persuasive communication would be true for agent research.

**Hypothesis 1.2:** A moderately threatening instructional message (MT) will be more effective in changing attitudes than a strongly threatening instructional message (ST) and a not-threatening instructional message (NT).

Human communication research suggests that fear enhances attitude change and that high-fear appeals are more effective than low-fear appeals (e.g., Boster & Mongeau, 1984; Mongeau, 1998). However, fear appeals do not always produce attitude change. Not only can fear appeals fail because they arouse too little fear, they can also backfire if they scare individuals too much (Morris & Swann, 1996). As Sprinkle et al. (2007) suggest, when threat is coupled with efficacy statements it is likely that threat and
efficacy interact to positively influence students’ attitudes, while students may become frustrated and even angry largely because they do not know how to avoid the threat on their own when threat is not coupled with efficacy statements. Along this line, it is expected that moderately threatening messages containing both threat and efficacy statements will be more persuasive than strongly threatening with threat statements only or not-threatening messages without either threat or efficacy statements.

**Hypothesis 1.3:** Given a more credible agent (MC), a threatening instructional message (MT & ST) will be more effective in changing attitudes than a not-threatening instructional message (NT), while there will be no difference in attitude change across the three instructional message conditions given a less credible agent (LC).

When source credibility is perceived as low, message recipients will discount the claims or arguments made in the message. Conversely, when source credibility is perceived to be high, message recipients tend to counterargue less with the claims and are therefore more easily influenced by the message (Grewal, Gotlieb, & Marmorstein, 1994). More specifically, greater attitude change occurs when a highly credible source presents a threatening message (Pornpitakpan, 2004; Sternthal, Phillips, & Dholakia, 1978). Along this line, this hypothesis is established for the present study. Figure 2.3 provides a graphical representation of Hypothesis 3.

![Figure 2.3. A Graphical Representation of Hypothesis 1.3](image-url)
Actually, there is evidence that the greatest shift in attitudes toward a specific attitude object occurred when a highly credible source presented a strongly threatening message and threat levels did not make a difference when source credibility was low (Sternthal, Phillips, & Dholakia, 1978). Miller and Hewgill (1966) showed, in their experiment, that subjects exposed to a mildly threatening communication given by a highly credible source changed their attitude significantly less than did subjects in the strong threat-high credibility condition, but significantly more than did a control group that did not receive the fear appeal. Subjects in the two low credibility-low threat conditions did not differ from each other, from subjects in the high credibility-low threat condition, or from subjects in the control group. In a recent literature review, Pornpitakpan (2004) confirmed these findings.

According to these findings, it could be hypothesized that a strongly threatening instructional message with Threat statements only will be more effective in changing attitudes than a moderately threatening instructional message with both Threat and Efficacy statements given a more credible agent. However, this is considered contradictory to Hypothesis 1.2 stating that a moderately threatening instructional message will be more effective in changing attitudes than a strongly threatening instructional message. Therefore, in this hypothesis no distinction is made between the effects of the strongly threatening and moderately threatening conditions in relation to source credibility.

The Effects of Agent Credibility and Fear Arousing Message on Recall and Application Tests

Hypothesis 2.1: A more credible agent (MC) will be more effective for recall and application tests than a less credible agent (LC).

This hypothesis resulted from previous research on some individual variables influencing agent credibility, which include voice, attire, and label of expertise (e.g., Dr. Keller or Nick). Regarding agent voice, it has been found that a human voice is more effective for cognitive learning (e.g., recall and transfer tests) than a computer-generated
voice (Atkinson, Mayer, & Merrill, 2005; Kim, Baylor, & Reed, 2003; Mayer, Sobko, & Mautone, 2003). Baylor and Kim (2005) found that agent expertise can be enhanced by attire and label of expertise (e.g., Dr. Erickson) and that pedagogical agents with expertise were better for transfer tests than the counterparts (motivator and mentor). In their agent design, the expert agent wore a suit and was named “Dr. Erickson” while the other agents wore a casual and were named “Mike”. Even though attire and label of expertise was only part of the expert agent’s characteristics they treated attire and label of expertise as important aspects for portraying expertise.

Collectively, human voice, suit, and label of expertise enhance agent credibility as summarized in Table 3.2. Along this line, it is expected that a more credible agent – with human voice, suit, and label of expertise - will be better for cognitive learning that a less credible agent – with computer-generated voice, casual, and no label of expertise.

**Hypothesis 2.2:** There will be significant differences in recall and application tests among the three fear arousing message conditions.

The research on fear arousing message has placed its focus on its effect on attitude change rather than cognitive learning like recall and application. Thus, it is not easy to predict with a directional hypothesis how fear arousing message will work for recall and application tests. What can be expected, however, is that learners’ performance on recall and application tests will differ among the three fear arousing message conditions because students in a different message condition will process the message differently according to the level of fear appeal. The Parallel Response Model (PRM) proposed by Leventhal (1971) to explain how the exposure to fear arousing messages enhance or inhibit attitude changes provides some implications for the effects of fear arousing message on cognitive learning. The PRM assumes two different kinds of processes: fear control and danger control. The fear control is an emotional process in which message recipients strive to reduce the fear generated by the message. Thus, when engaging in the fear control, the message recipients concentrate on their own emotional reaction rather than the message. The danger control, on the other hand, represents a cognitive process in which the message recipients concentrate on the threat depicted by
the message, and thus focus on the message as a means of controlling the threat.

Whether the message recipients engage in the fear control or the danger control depends on which fear arousing message they receive and how they actually perceive the fear arousing message given. If fear arousing messages arouse too little fear the message recipients may not process the message any further. This may be the case for the message arousing too much fear. That is, if fear arousing messages arouse too much fear they may just ignore the message and make no further processing of the message to reduce their fear (Morris & Swann, 1996). Along this line, this study expects that there will be significant differences among the three fear arousing message conditions in recall and application tests, even though this hypothesis is limited to being undirectional.

**Hypothesis 2.3:** There will be significant interaction effects of agent credibility and fear arousing message on recall and application tests.

It has been found that message source credibility and fear arousing message interact with each other to elicit attitude changes by make individuals process the message differently. It is expected that this will be the case for recall and application tests.

The Relationship between Attitude Change and Recall & Application Tests

**Hypothesis 3:** The more learners would learn the messages, the more they will change their attitudes

The message-learning approach to attitude change suggests that a persuasive communication must gain a person’s attention and must be remembered in order to be actually persuasive. In other words, it emphasizes that attitude change entails learning messages arguments and notes that attitude change occurs in a series of steps from attention, comprehension, yielding, and retention (Perloff, 2002). In this sense, it is expected that there would be a positive relationship between cognitive learning (message learning) and affective learning (attitude change).
Table 2.2. The List of Acronyms of Treatment Groups

<table>
<thead>
<tr>
<th>Agent Credibility (2 levels)</th>
<th>Fear Appeal (3 levels)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not Threatening (Neither Threat nor Efficacy; NT)</td>
</tr>
<tr>
<td>Less Credible (LC)</td>
<td>LC-NT</td>
</tr>
<tr>
<td>More Credible (MC)</td>
<td>MC-NT</td>
</tr>
</tbody>
</table>
CHAPTER III
METHOD

Participants

A total of 353 undergraduates participated in the study and they were recruited from a total of 1,600 students enrolled in a computer literacy course at Florida State University. Any students who wanted to obtain an extra credit for their computer literacy course were allowed to participate in the study. The voluntary participants signed up for participation. Once they came to a computer lab at a designated time they were randomly assigned to one of six treatment groups by agent credibility (More vs. Less) x fear arousing message (Strongly Threatening, Moderately Threatening, vs. Not Threatening). Their participations were reported to their instructors and some extra credit for their course grade will be given to the participants as a compensation for participation.

The target population of this study was undergraduate students who are generally more susceptible to copyright infringements and the main content of the instructional modules given included topics more relevant to the target population, such as plagiarism and music downloading. Against these criteria eight (8) participants over 26 years old were excluded from data analysis. As a result, a total of 345 participants were included in data analysis. The average age of the sample was 19.76 (SD=2.76). There were 67.6% of female students and 32.4% of male students. Among 345 participants, 80.5% were Caucasians, 10.5% were African-Americans, 2.4% were Asian/Asian Americans, 1.2% were Hispanics, and 5.4% were other ethnic groups.

Research Design

This study employed a 2 x 3 factorial design with two independent variables. The independent variables included two manipulative variables: agent credibility (More vs. Less) and fear arousing message (Strongly Threatening, Moderately Threatening, vs. Not Threatening).
Not Threatening). The participants were randomly assigned to one of the six experimental conditions. Table 3.1 shows the factorial combinations of the two independent variables for the study.

Table 3.1. Factorial Combinations of Two Independent Variables

<table>
<thead>
<tr>
<th>Group/Sample Size</th>
<th>Less Credible</th>
<th>More Credible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear Appeal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Threatening</td>
<td>Group A (LC-NT)</td>
<td>Group D (MC-NT)</td>
</tr>
<tr>
<td>(Neither Threat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nor Efficacy)</td>
<td>Group B (LC-MT)</td>
<td>Group E (MC-MT)</td>
</tr>
<tr>
<td>Moderately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threatening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Threat + Efficacy)</td>
<td>Group C (LC-ST)</td>
<td>Group F (MC-ST)</td>
</tr>
<tr>
<td>Strongly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threatening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Threat only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>57</td>
<td>54</td>
</tr>
</tbody>
</table>

*Group A (LC-NT)*: The participants in this group studied the instructional module containing Not Threatening messages (NT) with neither threat and nor efficacy statements, which was delivered by a Less Credible agent (LC).

*Group B (LC-MT)*: The participants in this group studied the instructional module containing Moderately Threatening messages (MT) with both threat and efficacy statements, which was delivered by a Less Credible agent (LC).

*Group C (LC-ST)*: The participants in this group studied the instructional module containing Strongly Threatening messages (ST) with threat statements only, which was delivered by a Less Credible agent (LC).

*Group D (MC-NT)*: The participants in this group studied the instructional module containing Not Threatening messages (NT) with neither threat and nor efficacy statements, which was delivered by a More Credible agent (MC).

*Group E (MC-MT)*: The participants in this group studied the instructional module containing Moderately Threatening messages (MT) with both threat and efficacy statements, which was delivered by a More Credible agent (MC).

*Group F (MC-ST)*: The participants in this group studied the instructional module containing Strongly Threatening messages (ST) with threat statements only,
which was delivered by a More Credible agent (MC).

**Independent Variables**

The independent variables included agent credibility (more credible vs. less credible) and fear arousing message (Strongly Threatening, Moderately Threatening, vs. Not Threatening). The first independent variable agent credibility had two levels: (1) More Credible and (2) Less Credible. The second independent variable fear appeal had three levels: (1) Moderately Threatening (Threat plus Efficacy), (2) Strongly Threatening (Threat only), and (3) Not Threatening (neither Threat nor Efficacy).

**Portraying agent credibility**

With regard to agent credibility there is an issue of how to operationalize credible agents as opposed to less credible agents. Indeed, it is very difficult to operationalize both types of agent mainly because so many factors will influence agent credibility. As described above, the concept of credibility consists of three major dimensions including expertise, trustworthiness, and caring. The expertise dimension of credibility captures the perceived knowledge and skill of the message source and it is the belief that the communicator has special skills or knowledge. The trustworthiness dimension of credibility captures the perceived goodness or morality of the message source and it refers to the communicator’s perceived honesty, character, and safety. Finally, the goodwill dimension captures the perceived caring. Communicators who display goodwill convey that they have listeners’ interest at heart, show understanding of others’ ideas, and are “empathic” toward their audiences’ problem. Thus, various factors that can influence agent credibility consisting of three dimensions – expertise, trustworthiness, and caring - will be taken into consideration when portraying agent credibility. Those factors include, but not limited to: agent demographics like age, gender, and ethnicity; agent voice; agent non-verbal behaviors (e.g., facial expressions, gestures, eye movement, and the like).

Agent research sheds light on the design of credible agents even though in some
cases results from the previous research are confounding to each other. Cowell & Stanney (2005) suggest a set of general design guidelines for portraying agent credibility resulting from a comprehensive review on human-human communication research. In relation to agent credibility they propose three main categories of agent characteristics. The three categories include: agent demographic variable; agent physical appearance variable; and agent non-verbal behavioral variable.

Agent demographic variables are non-verbal cues that are not under an individual’s control nor behavioral in origin, such as age, gender, and ethnicity. Agent physical variables are also non-verbal cues such as facial/bodily attractiveness and attire. Cowell & Stanney (2005) suggest that credible agents should appear attractive, both facially and in body, to take advantage of attributes perceived to be associated with good look, and dress according to function, to take advantage of stereotypical attributions of expertise, even though they do not provide any decisive design guidelines regarding agent demographic variables (e.g., age, gender, and ethnicity).

According to Bandura (1997), attribute similarities between a social model and a learner, such as gender, ethnicity, and age, often have predictive significance for the learner’s efficacy beliefs and achievements. In this vein, pedagogical agents of the same gender or ethnicity or similar age as learners' might be viewed as more affable and could instill strong efficacy beliefs and behavioral intentions to learners.

There is considerable evidence that agent gender and ethnicity can influence learners’ perception of agent in terms of such affective aspects as facilitation of learning, self-regulation, motivation, and affability, as well as learning (e.g., A. L. Baylor & Kim, 2003a, 2003b; A. L. Baylor, Shen, & Huang, 2003; Lee & Nass, 1998). For example, Baylor and Kim (2003a) found in their empirical study on agent gender and ethnicity that male agents were perceived more “agreeable” than the female agents. Furthermore, the study results indicated that students with the male agents were more satisfied with their learning and rated the male agents more facilitating self-regulation than their female counterparts.

With respect to agent ethnicity, Lee and Nass (1998) showed that in an animated agent-based environment, participants who had same ethnicity agents than those with different ethnicity agents elicited more conformity to the agents' opinions and perceived
the agents as more attractiveness and trustworthy. In the same vein, Baylor and Kim (2003b) examined the effect of pedagogical agents' ethnicity on learners' perception of the agents. The results indicated that undergraduates who worked with pedagogical agents of the same ethnicity perceived the agents as more credible, engaging, and affable than those with agents of different ethnicity.

Agent age has been also considered an important agent appearance feature that can have an impact on learners’ perception of agent and consequently learning and motivation (e.g., A. L. Baylor & Plant, 2005). In an attempt to investigate whether pedagogical agents can be used as social models to influence college-age women’s attitudes and beliefs about engineering, Baylor and Plant (2005) took into consideration agent age as one of several agent appearance features. They found that students with the older agents that looked like in mid forties reported significantly more positive interest in engineering than those with the younger agents that looked like in mid twenties.

The present study, however, was not interested in examining the effects of agent gender, ethnicity, or age in relation to agent credibility. Thus, all the pedagogical agents used for this study were embodied to have the same gender, ethnicity, and age. Actually, there are different agent variables (e.g., voice, attire, facial expressions, etc.) associated with such agent appearance variables as gender, ethnicity, and age. That is, every single change to agent gender, ethnicity, or age will necessarily lead to many changes to various aspects of agent design. For example, when both male and female agents are employed agent voices (male vs. female) with different pitch, rate, or volume should be employed consequently, which are beyond the scope of the study. This will be true for agent ethnicity and age. Along this line, a White male agent at 30’s was used as a base model for all the experimental conditions in the present study, in order to control for any unintended variations that may result from employing different agent genders, ethnicities, or ages and influence agent credibility.

For agent non-verbal behavioral variables Cowell & Stanney (2005) identified five non-verbal behavioral mechanisms that are associated with credibility: facial expression, eye contact, gestures, paralanguage, and posture. In human-human communication the face is seen as the primary site for communication of emotional states (Knapp, 1978) and hence the primary signaling system for communication of
emotional states. In addition, Mehrabian (1967) suggests that facial expression offers 55% of the meaning of a message. Regarding facial expressions associated with agent credibility, Cowell & Stanney (2005) suggest that to convey credibility an agent should use smiles in appropriate situations (e.g., welcoming, saying goodbye, offering information) and avoid negative emotional expressions (e.g., anger disgust), and an agent’s facial model should be animated, avoiding the use of a single neutral facial expression to support a trusting environment.

Brave, Nass, and Hutchinson (2005) investigated the psychological effects of emotion in agents upon users. They employed and compared an empathic agent with an non-empathic agent with regard to their effects on the users’ perceptions of agent credibility assessed based on such dimensions as trustworthiness, perceived caring, and felt support. The empathic agent had the appropriate facial expressions for the situation the users encountered. In empathic conditions, for example, the agent responded with either happiness or sadness to the user depending on the situation the user encountered while the non-empathic agent simply unemotionally responded to the user regardless of the situation the user encountered.

Along this line, it is believed that empathic agents with appropriate facial expressions would be considered more credible than non-empathic agents with neutral facial expressions, especially in terms of two dimensions of credibility: trustworthiness and caring. In this study credible agents employed a variety of facial expressions in sync with what the agents presented while less credible agents employed quite neutral facial expressions throughout the presentation of information.

Eye contact is seen as a direct and powerful form of non-verbal communication (Leathers, 1997) and as influencing agent credibility. Based on the literature, Cowell and Stanney (2005) some general design guidelines: (1) an agent should maintain eye contact while interacting with users; (2) eye contact should be direct but not continuous to avoid challenging the user; and (3) an agent should avoid looking down. It appears that appropriate eye contact is associated with trustworthiness and caring as two dimensions of credibility. Along this line, a more credible agent was designed to fully comply with those design guidelines while some deliberate violations of the guidelines were made to a less credible agent.
To enhance agent credibility in relation to facial expression and eye contact, Cowell and Stanney (2005) also suggested that agent interface design should perhaps use close-up views of an agent face in place of a full body view. Thus, only the upper half-body was presented on the computer screen.

When it comes to agent voice, it has been found that pedagogical agents with human voices are perceived as significantly more credible than those with computer-generated voices (e.g., Kim, Baylor, & Reed, 2003). Especially, it appears that human voices are perceived as more trustworthy than computer-generated voices. Thus, in this study, human voices were used for more credible agent whereas computer-generated voices for less credible agents.

Cowell & Stanney (2005) categorize paralanguage into non-verbal behavioral variables. However, in the present study it was categorized into verbal behavioral variables because it is all about the sounds that an individual makes as they speak and the way they pronounce words, which all add crucial information to the message being communicated. The paralanguage for enhancing agent credibility involves using a moderately fast rate of speaking and appropriate variation in pitch, rate, and volume (Cowell & Stanney, 2005). Computer-generated voices are usually monotonous regarding variations in pitch, rate, and volume, compared to natural human voices with appropriate variations in these dimensions of paralanguage. Thus, differences between a more credible and a less credible message source in variations in pitch, rate, and volume can be made by using computer-generated and human voice for a less credible and a more credible agent, respectively. Regarding speaking rate, a more credible agent spoke at a moderate rate throughout the communication while a less credible agent at a little faster rate. For this study, a moderate speaking rate of a human voice was measured by having a person read a specific amount of text at a natural speaking rate. In addition, it appears that voice tone (strong or calm) can improve agent credibility in terms of the caring dimension of credibility (Kim, Baylor, & Reed, 2003). Kim and her colleagues compared calm human voice with strong human voice as well as computer-generated voice in a pedagogical agent-based environment and found that the calm human voice was perceived more soft, nice, and kind than the strong human voice. Thus, a calm human voice was employed for a more credible agent rather than a strong human voice.
It has been shown that agent *expertise* can be enhanced by the attire the agent is wearing (Baylor & Kim, 2005). Baylor and Kim attempted to operationalize and design three different agent roles: pedagogical agents as expert, mentor, or motivator. As the role of an expert implies expert agents should look like to have expertise in a specific subject matter. In that expertise contributes to credibility as one of the three major dimensions of credibility the design of the expert in their study suggests ways of enhancing agent credibility. In their agent design, the expert agent wore a suit that looked more formal while both the motivator and the mentor agents did a casual that looked more informal. Even though other factors like agent voice, animation, and message to be delivered by the agents affected agent expertise, it is apparent that the way the pedagogical agents wear also had great influence on agent expertise. Along this line, credible agents wore a suit while less credible agents did a casual in this study.

Finally, it is suggested that labels of *expertise* give people more credibility (A. L. Baylor & Ebbers, 2003; A. L. Baylor & Kim, 2003b; Fogg & Tseng, 1999). That is, titles that denote expertise (e.g., Dr., Professor, etc.) make people seem more credible. Nass, Reeves, and Leshner (1996) presented an interesting finding on this phenomenon even though they did not employ pedagogical agents for the study. They simply labeled a computer device as a specialist. The study showed that people perceived the device labeled as a specialist to be more credible than the device labeled as a generalist.

Table 3.2 shows how agent credibility was portrayed, in terms of three dimensions of credibility, by employing various verbal and nonverbal behaviors as well as physical appearance.
Table 3.2. Portraying Agent Credibility

<table>
<thead>
<tr>
<th>Base Design</th>
<th>More Credible</th>
<th>Less Credible</th>
<th>Credibility Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender*</td>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity*</td>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age*</td>
<td>Early 30’s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facial Expression</td>
<td>Empathic</td>
<td>Neutral</td>
<td>Trustworthiness Caring</td>
</tr>
<tr>
<td>Eye Contact</td>
<td>Complying with the guideline: (1) Maintain eye contact; (2) Direct and not challenging eye contact; (3) Avoid looking down</td>
<td>Some deliberate violations of the guidelines</td>
<td>Trustworthiness Caring</td>
</tr>
<tr>
<td>Voice</td>
<td>Calm Human Voice (Male)</td>
<td>Computer-generated Strong Voice (Male)</td>
<td>Trustworthiness Caring</td>
</tr>
<tr>
<td>Speech Rate</td>
<td>Moderate Rate</td>
<td>Faster Rate</td>
<td>Overall Credibility</td>
</tr>
<tr>
<td>Attire (Clothing)</td>
<td>Suit</td>
<td>Casual</td>
<td>Expertise</td>
</tr>
<tr>
<td>Label of Expertise</td>
<td>Professor</td>
<td>Peer-like name (e.g., Chris)</td>
<td>Expertise</td>
</tr>
</tbody>
</table>

*The present study controls for those agent appearance features.

Designing fear arousing message

For message content, fear arousing messages were employed. Fear appeals are a persuasive communication that tries to scare people into changing their attitudes by conjuring up negative consequences that will occur if they do not comply with the message recommendations (Perloff, 2002). The messages for each condition were generated according to what Witte (1998) suggested in the Extended Parallel Process Model (EPPM).

The independent variable fear arousing message had three levels: Moderately
Threatening (threat plus efficacy), Strongly Threatening (threat only), and Not Threatening (neither threat nor efficacy). The moderately threatening condition contained both threat (severity and susceptibility information) and efficacy (response efficacy and self-efficacy) elements. That is, in the threat-plus-efficacy condition, the fear arousing message first threat the students, convincing them that dangers lurk in the environment. After threatening or scaring the students, a recommended response was provided as a way they could avert the threat. The strongly threatening condition included the fear element consisting of severity and susceptibility information. That is, this condition lacked the efficacy element. The not threatening condition was the control condition with neither threat nor efficacy statements in the message to be delivered by the pedagogical agents. Table 3.3 operationalized the three different levels in terms of fear appeal. Appendix A presents the full scripts of the three fear arousing message conditions.

Table 3.3. Operationalization of Each Fear Appeal Condition

<table>
<thead>
<tr>
<th>Level of Fear Arousing</th>
<th>Message Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate Threatening (MT)</td>
<td><strong>Threat Statement</strong></td>
</tr>
<tr>
<td></td>
<td>- Severity Information</td>
</tr>
<tr>
<td></td>
<td>- Susceptibility information</td>
</tr>
<tr>
<td>Strongly Threatening (ST)</td>
<td><strong>Efficacy Statement</strong></td>
</tr>
<tr>
<td></td>
<td>- Response Efficacy</td>
</tr>
<tr>
<td></td>
<td>- Self-Efficacy</td>
</tr>
<tr>
<td>Not Threatening (NT)</td>
<td><strong>Threat Statement</strong></td>
</tr>
<tr>
<td></td>
<td>- Severity Information</td>
</tr>
<tr>
<td></td>
<td>- Susceptibility information</td>
</tr>
<tr>
<td></td>
<td><strong>Neither</strong> threat nor efficacy statements</td>
</tr>
</tbody>
</table>

Measures

Pre-measures

The pre-measures assessed before the treatment included: (1) participants’ demographic information, (2) prior knowledge in copyright, (3) prior experience with
pedagogical agents, (4) initial attitude toward the issue of copyright. Appendix D shows the actual items for demographic information, prior knowledge in intellectual property, and prior experience with pedagogical agents.

The attitude measure (Appendix G) was generated based on the expectancy-value theory. According to Fishbein and Ajzen (1975), attitude is a multiplicative combination of: (a) strength of beliefs that an object has certain attributes and (b) evaluations of these attributes. Attitude is represented by the following mathematical formula: \( A = \text{Sum } b(i) \times e(i) \), where \( b(i) = \) each belief and \( e(i) = \) each evaluation. Taking an example, the attitude measure assessed learners’ beliefs about copyright by asking them whether they think that keeping copyright laws makes themselves feel comfortable – from strongly disagree to strongly agree. Then, it measured their evaluations by asking them if they feel that how good keeping copyright laws is: from very good to very bad. This formula was helpful because it allowed for more precise tests of hypotheses. There is abundant evidence that combining beliefs and evaluations can provide an accurate estimate of attitudes (Perloff, 2002).

**Dependent measures**

The dependent variables included cognitive learning (recall and application), affective learning (attitude change), perceived fear of message, and perceived agent credibility.

Cognitive learning was assessed with a 10-tem recall test (See Appendix E) and a 2-item application test. Each of the items in the application test asked learners to describe what their judgments are and the justifications for the judgments given the scenario (See Appendix F).

For attitude change, the same attitude measure was implemented after the intervention to calculate the attitude change index, which is equal to “post attitude minus initial (pre) attitude.”

The learners’ perceived fear of message was measured with the instrument Witte (1994) developed to assess fear arousal. The instrument measures perceived fear by having participants rate the following mood adjectives (“not at all” to “very much”):
frightened, tense, nervous, anxious, uncomfortable, and nauseated (See Appendix I). The instrument is reliable (alpha=.88). It was implemented to all the experimental conditions to compare the learners’ perceived fear of the message delivered by the agents.

The perceived agent credibility measure (See Appendix H) was intended to assess how learners perceive the agents in terms of credibility. The agent credibility scale consisted of three sub-measures: trustworthiness, expertise, and goodwill (caring). Trustworthiness items were taken from Wheeless and Grotz’s (1997) Individualized Trust Scale and included four 10-point semantic differentials: trustworthy-untrustworthy, honest-dishonest, reliable-unreliable, and sincere-insincere. The index is sufficiently reliable for research (alpha=.77) (Brave, Nass, & Hutchinson, 2005). Caring items were comprised of five 10-point semantic differentials: compassionate-not compassionate, unselfish-selfish, friendly-unfriendly, cooperative-competitive, and the single 10-point Likert-scale item, warm. The index is very reliable as well (alpha=.88) (Brave, Nass, & Hutchinson, 2005). For expertise, three 10-point semantic differentials were used: intelligent-unintelligent, smart-dumb, and capable-incapable. The index is sufficiently reliable (alpha=.79) (Brave, Nass, & Hutchinson, 2005). The perceived agent credibility measure was implemented to all the experimental conditions.

Agent Development

A total of six different pedagogical agents varying by both credibility (less and more credible) and fear arousing message (not threatening, moderately threatening, and strongly threatening) were developed in Poser 6, which is a 3D animation tool. Agent credibility was manipulated by following the design suggestions shown in Table 3.2. Each agent in different fear arousing message conditions narrated different messages in terms of fear appeal. Agent lip movements and the recorded voice were synchronized in Mimic Pro, which is a lip-sync software program. All elements of the instructional module including agent and textual information were combined in Macromedia Flash for final publishing.

To ensure that agent credibility is portrayed and fear arousing message works as intended a pilot study were conducted with a sample of 20 participants from the same
population. The details for the pilot study are presented later.

**Instructional Materials**

The web-based instructional module was intended not only to provide the participants with information about intellectual property but also to elicit the participants’ attitude change toward the issue of copyright, where many college students are violating the law either without knowing they are doing so or even knowing it. Copyright as a subject matter is more about whether learners are persuaded to abide by it than whether they learn about it. Thus, the topic of copyright was selected as an attitude object for this study.

The web-based instructional module for this study was developed based on that used for a research study conducted by Baylor et al. (2005). The web-based instructional module consisted of three main parts: (1) Introduction to Intellectual Property; (2) Copyright as a type of IP; and (3) Realistic Scenarios Regarding Copyright. That is, the instructional module explained what intellectual property is and what the types of intellectual property are. Then, it focused on copyright as one type of intellectual property and explains more about copyright since copyright is more relevant to undergraduate students, who are the participants for this study. Finally, three realistic scenarios that the participants are likely to encounter in real life: electronic plagiarism, illegal music downloading, and illegal copy of software. The threat and/or efficacy statements as fear appeals were embedded mainly in these three scenarios regarding the issue of copyright.

In more detail, the not threatening message condition (Group A and E) had the instructional module containing the information of copyright only. The moderately threatening message conditions (Group B and E) had the instructional module containing both threat and efficacy statements in addition to the basic information, which was exactly the same across the experimental conditions while the strongly threatening message conditions (Group C and F) were given the instructional module containing threat statements only in addition the information of copyright.

The students were not given any instruction about the topic of intellectual
property or copyright in advance of this instructional module. The main role of agents in this study was limited to presenting the instructional messages intended to induce attitude change as well as enhance learners’ understanding of intellectual property and copyright. The instructional module took the students about 15 to 20 minutes to complete, depending on the condition they were in. Appendix B shows the actual screenshots of the web-based instructional module.

**Procedures**

This study was conducted as an extra credit activity for a computer literacy class in a computer lab equipped with 24 personal computers. The participants signed up online to schedule when they would come to the lab to complete the study. A brief orientation on the study was given at the beginning of the study, including introducing the purpose of the study and explaining the overall procedure for the study. Then, the participants were randomly assigned to one of the six treatment conditions.

The online informed consent form was given and they decided whether they would participate in the study by clicking on either “Disagree” or “Agree” button. All the participants agreed to participate in the study. Then, the pre-measures - including demographic information, prior knowledge in intellectual property, prior experience with pedagogical agents, and initial attitude toward intellectual property (copyright) - were given to them. After completing the pre-measures they went through the instructional module. Each participant was given the instructional module corresponding to his or her experimental condition. After the instructional module, they were asked to complete the post-measures intended to assess their cognitive learning outcome, attitude change, perceived fear, and agent persona in terms of credibility. The entire session took about an hour with some individual variations.

**Data Analysis**

This study employed a 2 x 3 factorial design with two independent variables including agent credibility (less vs. more credible) and fear appeal (not threatening vs.
Preliminary data analyses were conducted to detect problematic observations and to assess violations of the assumptions for statistical inferences. Then, a two-way ANOVA was used to identify the main effects of agent credibility and fear appeal and interaction effects between these two independent variables on both cognitive (recall and application tests) and affective learning (attitude change). The same statistical technique was used to assess the learners’ perceived fear of the messages. For agent credibility, a two-way MANOVA was conducted to assess how the participants perceived the agents in terms of credibility consisting of three sub-measures: expertise, trustworthiness, caring. The significance level for all the analyses is set at $\alpha < .05$.

In addition, Pearson Correlation was calculated between cognitive and affective learning (attitude change) to see how cognitive learning is related to affective learning because in many cases the level of message learning affects changes in attitude (Chaiken, wood, & Eagly, 1996).

**Pilot Study**

To ensure that agent credibility is portrayed and fear arousing message works as intended for the main study a pilot study was conducted with a sample of 20 participants from the same population as the main study. In the pilot study the two independent variables (agent credibility and fear arousing message) were treated separately in order to exclude any possible interaction effect of agent credibility and fear arousing message and both pedagogical agent and fear arousing message were designed and developed based on the agent design guidelines presented in Table 3.2.

For agent credibility two pedagogical agents were employed that differed in the level of credibility. The less credible agent showed neutral facial expressions with no eye blinking throughout the presentation of information, and sometimes looked up and down to avoid eye contact with the participants on purpose. A computer-generated male voice was employed that was strong and had fast speech rate (188 words / 75 seconds) compared to the human voice. The less credible agent wore a casual and was called a peer-like name “Chris.”
In contrast, the more credible agent showed empathic facial expressions with eye blinking that changed according to the content of the message, and maintained eye contact with the participants, and maintained eye contact throughout the presentation of the message. A human voice was employed that was calm and had moderate speech rate (188 words / 90 seconds) compared to the computer-generated voice with a faster speech rate (188 words / 75 seconds). The more credible agent wore a suit and was called “Professor Keller,” which sounded like more professional. Table 3.4 shows the screenshots of each pedagogical agent model and how each of them was portrayed differently in terms of those properties.

Table 3.4. Agent Design for Pilot Study

<table>
<thead>
<tr>
<th>Less Credible Agent</th>
<th>More Credible Agent</th>
<th>Credibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial Expression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral (throughout the instruction)</td>
<td>Empathic (changes according to message)</td>
<td>Trustworthiness Caring</td>
</tr>
<tr>
<td>Eye Contact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes looking up and down; no eye blinking; head turning</td>
<td>Maintain eye contact; some eye blinking; head turning</td>
<td>Trustworthiness Caring</td>
</tr>
<tr>
<td>Voice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer-generated Strong Voice</td>
<td>Calm Human Voice</td>
<td>Trustworthiness Caring</td>
</tr>
<tr>
<td>Speech Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faster 188 words/75 seconds</td>
<td>Moderate 188 words/90 seconds</td>
<td>Overall Credibility</td>
</tr>
<tr>
<td>Attire (Clothing)</td>
<td>Casual</td>
<td>Suit</td>
</tr>
<tr>
<td>Label of Expertise</td>
<td>Chris</td>
<td>Professor Keller</td>
</tr>
</tbody>
</table>

Both pedagogical agents narrated the same instructional message shown below. The instructional message covered the basic information of what copyright is and current
practice of illegal file downloading and sharing, which was neutral and had nothing to do with the independent variable of fear arousing message.

Hello, I’m glad you could join me. I’m Chris [or Prof. Keller]. Today I want to talk a little about copyright, especially about illegal music downloading and sharing, which has become a big issue in the digital age.

Copyright is one of two main branches of intellectual property. Copyright relates to artistic creations, such as books, music, paintings and sculptures, films and technology-based works such as computer programs and electronic databases. Briefly, copyright is known as author’s rights in respect of literary and artistic creations. The expression author’s rights refer to the creator of the artistic work, its author. It thus underlines the fact, recognized in most laws, that the author has certain specific rights in his or her creation which only he can exercise.

The internet makes it very easy to copy files of all types and share them with other people but that does not make it ok or legal to do so. A survey on file-sharing and downloading over the Internet shows that a striking 67% of Internet users who download music say they do not care about whether the music they have downloaded is copyrighted. Moreover, the number of downloaders who say they do not care about copyright has increased. Under this background, the struggle to enforce copyright laws in the digital age continues to be an uphill battle for content owners.

For the independent variable of fear arousing message three instructional messages were generated that were designed to be different from each other in terms of the level of fear arousing as shown in Appendix A (Screen # 11 & 12). The not threatening message (NT) was intended to deliver only the facts surrounding the issue of illegal music downloading and sharing and it did not contain any fear arousing components. The moderately threatening message (MT) contained all of the four components of fear arousing: severity information, susceptibility information, response efficacy, and self-efficacy information. The strongly threatening message (ST) contained the first two components – severity information and susceptibility information - of fear arousing message to arouse fear from the participants.

The participants were first asked to take the short lesson presented by either the more credible agent or the less credible agent, and then they were given the agent credibility measure. Second, they were asked to read carefully the instructional message given according to the fear arousing message condition they were assigned to, and then
they were given the perceived fear measure.

The learners’ perception of agent credibility was analyzed using a one-way MANOVA with an independent variable (agent credibility) and with three dependent variables (perceptions of agent expertise, trustworthiness, and caring). The results indicated that there was a statistically significant difference between the more credible agent condition and the less credible agent condition on the combined dependent variables: F(3, 16)=4.56, p=.017; Wilks’ Lambda=.54; partial eta squared=.46. When the results for the dependent variables were considered separately, there were significant differences between the more credible agent condition and the less credible condition in all of the three dependent variables (Table 3.5). The mean scores of all of the three dependent variables for the more credible agent condition were significantly higher than the less credible agent condition as shown in Table 3.6. As a result, it was concluded that the more credible agent condition was perceived more credible overall than the less credible agent condition.

Table 3.5 Multivariate and Univariate Analysis of Variance F Ratios for Perceived Agent Credibility

<table>
<thead>
<tr>
<th>Variable</th>
<th>MANOVA</th>
<th>Agent Expertise</th>
<th>Agent Trustworthiness</th>
<th>Agent Caring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>Agent Credibility</td>
<td>4.56*</td>
<td>13.78*</td>
<td>10.84*</td>
<td>11.75*</td>
</tr>
</tbody>
</table>

Table 3.6 Means and Standard Deviations for Perceived Agent Credibility

<table>
<thead>
<tr>
<th>Perceived Agent Credibility</th>
<th>Condition</th>
<th>Less Credible Agent (LC)</th>
<th>More Credible Agent (MC)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>Agent Expertise</td>
<td>9.18</td>
<td>2.93</td>
<td>11</td>
<td>14.33</td>
</tr>
<tr>
<td>Agent Trustworthiness</td>
<td>12.36</td>
<td>3.41</td>
<td>11</td>
<td>18.78</td>
</tr>
<tr>
<td>Agent Caring</td>
<td>12.73</td>
<td>3.82</td>
<td>11</td>
<td>22.00</td>
</tr>
</tbody>
</table>
A one-way ANOVA was conducted to analyze learners’ perceived fear of message. The results indicated that there was no significant difference in perceived fear of message among the three fear arousing conditions: \( F(2, 17) = 2.05, p = .16 \). However, there were meaningful mean differences among the three fear arousing conditions: not threatening message condition (\( M = 9.57, \ SD = 4.23 \)), moderately threatening message condition (\( M = 12.00, \ SD = 4.77 \)), and strongly threatening message condition (\( M = 15.43, \ SD = 6.85 \)), as presented in Table 3.7.

**Table 3.7 Means and Standard Deviations for Learners’ Perceived Fear of Message**

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Condition</th>
<th>M</th>
<th>SD</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Fear of Message</td>
<td>Not Threatening</td>
<td>9.57</td>
<td>4.23</td>
<td>7</td>
<td>12.00</td>
<td>4.77</td>
<td>6</td>
<td>15.43</td>
<td>6.85</td>
<td>7</td>
<td>12.35</td>
<td>5.73</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Moderately Threatening</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strongly Threatening</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

The findings from the pilot study with regards to agent credibility showed that the agent design guidelines specified in Table 3.2 and 3.4 worked well enough to make a distinction between the more credible agent and the less credible agent. So, no changes were made to the guidelines and the same agent design specifications were used to develop the pedagogical agents for the main study.

Even though there were no “statistically” significant differences among the three fear arousing message conditions, it was thought that the no significant results resulted from the small sample size – a total of 20 participants - for the pilot study, considering the mean differences among the three fear arousing message conditions as presented in Table 3.7. Thus, the design strategies for fear arousing message were retained and used to develop the three fear arousing message conditions for the main study.
CHAPTER VI
RESULTS

This study was intended to examine how (1) agent credibility (more vs. less credible) and (2) fear arousing message - threat plus efficacy (moderately threatening) vs. threat only (strongly threatening) vs. neither threat nor efficacy (not threatening) - affect learners’ attitudes toward a specific social issue (affective learning) as well as message learning (cognitive learning) in a pedagogical agent-based learning environment. Seven research hypotheses were formulated to answer the three main research questions: (1) How does agent credibility influence affective learning as well as cognitive learning?; (2) How does fear appeal influence affective learning as well as cognitive learning?; (3) How do agent credibility and fear appeals interact with each other to elicit attitude change?; and (4) Are cognitive learning and affective learning correlated?

Preliminary data analyses were conducted to detect problematic observations and to assess violations of the assumptions for statistical inferences. Then, a two-way ANOVA was used to identify the main effects of agent credibility and fear appeal and interaction effects between these two independent variables on both cognitive (recall and application tests) and affective learning (attitude change). The same statistical technique was used to assess the learners’ perceived fear of the messages. For agent credibility, a two-way MANOVA was conducted to assess how the participants perceived the agents in terms of credibility consisting of three sub-measures: expertise, trustworthiness, caring. The significance level for all the analyses is set at $\alpha < .05$. In addition, Pearson Correlation was calculated between cognitive and affective learning (attitude change) to see how cognitive learning is related to affective learning because in many cases the level of message learning affects changes in attitude.

This chapter is divided into three sections. In the first section, the results of preliminary data analyses prior to the statistical analysis of the dependent measures are reported. Several tests were also conducted to determine whether the assumptions for parametric statistics were upheld and an alpha level of .05 was used for all statistical tests.
In the second section, the results for each hypothesis testing are reported. This chapter ends with a summary of all the results.

**Preliminary Data Analyses**

The preliminary data analyses were conducted to resolve problems associated with missing subjects/data, identify problematic observations, and identify any violations of assumptions.

**Group equivalence test**

This study employed a randomized 2 x 3 factorial design. All the participants were randomly assigned to one of the six experimental conditions based on the order of participant’s classroom entry. Random assignment enhances the equivalence of groups prior to administering experimental treatments (Wiersma, 2000). Thus, this randomized factorial design was assumed to have six experimental groups in which participants were spread evenly in terms of their prior experience with pedagogical agent and prior knowledge on copyright, which was the subject matter of the instructional modules implemented to the participants.

The group equivalence was also verified statistically. Participants’ prior experience with pedagogical agent among the six experimental groups was compared using a one-way ANOVA. There were no significant differences among the six experimental conditions on prior experience with pedagogical agent, \[ F(5, 326) = 0.42, p = 0.84 \]. The level of prior knowledge on copyright was also compared among the six conditions using a one-way ANOVA and the results indicate that there are no significant differences in the level of prior knowledge on copyright among the six conditions, \[ F(5, 326) = 0.95, p = 0.45 \]. Overall, these statistical analyses confirm that all the six experimental groups were equivalent one another. Table 4.1 summarizes the descriptive statistics from the group equivalence test.
Table 4.1 Descriptive Statistics from Group Equivalence Test

<table>
<thead>
<tr>
<th>Prior Experience with Agent</th>
<th>Fear Appeal</th>
<th>Less Credible</th>
<th>More Credible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td>Not Threatening</td>
<td>4.78</td>
<td>.63</td>
<td>54</td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>4.82</td>
<td>.51</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>4.86</td>
<td>.44</td>
<td>57</td>
</tr>
<tr>
<td>Prior Knowledge on copyright</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Threatening</td>
<td>3.98</td>
<td>1.16</td>
<td>54</td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>3.67</td>
<td>1.14</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>3.70</td>
<td>1.18</td>
<td>57</td>
</tr>
</tbody>
</table>

Missing subjects/data analysis

All the participants agreed to provide data by checking on the “Yes” button in the online consent form and participated in the entire study from pre-questionnaire through instructional module to post-survey. Thus, there were no missing subjects in the study. With regards to missing data, it was technically impossible that there were any missing data since the participants were required to answer every single item given. That is, they were not allowed to proceed without answering all of the items given.

Participants deletion

Initially, this study had a total of 352 participants. The target population of this study was undergraduate students who are more susceptible to copyright infringements and the main content of the instructional modules given included topics more relevant to the target population, such as plagiarism and music downloading. Against these criteria eight participants over 26 years old were discarded: Case 35, 41, 61, 92, 152, 202, 230, & 268. As a result, a total of 344 participants were retained. Considering cell sizes for each group, the smallest groups, MC-NT and MC-ST, had 55 participants and the largest group, MC-MT, had 61 participants. To approximately equalize cell sizes for each
treatment group participants in some treatment groups were removed at random: three participants (Case 122, 156, & 177) in Group LC-ST and four participants (Case 252, 267, 276, & 282) in Group MC-MT. Even though randomly discarding participants can reduce the power of detecting group differences, it can be an option for addressing the issue of unequal sample sizes (Tabachnick & Fidell, 1996). As a result, a total of 337 participants were retained for the case analysis intended to detect univariate and multivariate outliers.

Case analysis

As mentioned above, three main statistical techniques were employed in the study. A two-way ANOVA was used to identify the main effects of agent credibility and fear appeal and interaction effects between these two independent variables on both cognitive (recall and application tests) and affective learning (attitude change). The same statistical technique was used to assess the learners’ perceived fear of the messages. For agent credibility, a two-way MANOVA was conducted to assess how the participants perceived the agents in terms of credibility consisting of three sub-measures: expertise, trustworthiness, caring. Pearson Correlation was also calculated between cognitive and affective learning (attitude change) to see how cognitive learning is related to affective learning because in many cases the level of message learning affects changes in attitude.

Outliers are commonly defined as cases that are more than plus or minus three standard deviations from the mean of the variable of interest and univariate outliers are cases with extreme values with respect to a single variable. This study had five (5) dependent variables: Perceived Fear, Agent Credibility, Attitude Change, Recall Test, & Application Test. Agent Credibility were three-dimensional, which consisted of three different subcategories - Expertise, Trustworthiness, and Caring - while the other four measures were all one-dimensional. Thus, the case analyses for Agent Credibility were performed to detect both univariate and multivariate outliers. On the other hand, for the other dependent variables, case analyses were performed to detect univariate outliers only.

Outliers were sought separately within each experimental group because data
analyses involved grouped data based on the two independent variables: Agent Credibility and Fear Arousing Message. For detecting univariate outliers a visual inspection of histograms and box plots was conducted and was followed by a statistical method of looking into z-scores of each case with each group. It is a common practice to consider cases with z-scores larger than 3.29 or smaller than -3.29 as an outlier when the sample size is large\textsuperscript{1}. To identify multivariate outliers Mahalanobis Distance for each case was used as a statistical method. Mahalanobis Distance is the distance of a case from the centroid of the remaining cases where the centroid is the point created by the means of all the variables and it is evaluated as $\chi^2$ with degrees of freedom equal to the number of variables. The criterion for multivariate outliers is Mahalanobis Distance at $p<.001$.

**Attitude change:** The visual inspection of histograms and box plots found that there were eight potential outliers: two cases (18\textsuperscript{th} & 55\textsuperscript{th}) in Group LC-NT, four cases (Case 62\textsuperscript{nd}, 90\textsuperscript{th}, 109\textsuperscript{th}, & 110\textsuperscript{th}) in Group LC-MT, and two cases (324\textsuperscript{th} & 327\textsuperscript{th}) Group MC-ST. Among these potential outliers only one case (18\textsuperscript{th} with z-score of 4.64) in Group LC-NT had a z-score greater than 3.29. As a result, the 18\textsuperscript{th} case was identified as an outlier.

**Recall test:** The visual inspection of histograms and box plots found that there were three potential outliers: one case (59\textsuperscript{th}) in Group LC-MT, one case (123\textsuperscript{rd}) in Group LC-ST, and one case (182\textsuperscript{nd}) in Group MC-NT. The inspection of z-scores found that the 59\textsuperscript{th} case (z=3.58) had a z-score greater than 3.29. Thus, the 59\textsuperscript{th} case was detected as an outlier.

**Application test:** The histograms and box plots showed that there were four potential outliers: one case (4\textsuperscript{th}) in Group LC-NT, one case (66\textsuperscript{th}) in Group LC-MT, one case (191\textsuperscript{st}) in Group MC-NT, and one case (306\textsuperscript{th}) in Group MC-ST. Among these potential outliers only the 4\textsuperscript{th} (z=3.38) was identified as an outlier from the inspection of z-scores.

\textsuperscript{1} This study has the sample size of 332.
**Perceived fear:** The visual inspection of histograms and box plots found that there were two potential outliers, one case (18th) in Group LC-NT and one case (137th) in Group LC-ST. The subsequent inspection of z-scores for each case within each group showed that there was no case with z-scores larger than 3.29 or smaller than -3.29. Therefore, it was assumed that there were no cases with extreme values on the dependent variable of Perceived Fear.

**Perceived agent credibility:** Agent Credibility was measured as a composite score consisting of three sub-measures: Agent Expertise, Agent Trustworthiness, and Agent Caring. Therefore, the case analysis for each of these sub-measures was conducted separately to detect potential univariate outliers first. The histograms and box plots for Agent Expertise showed that there were ten potential outliers: three cases (1st, 16th, & 57th) in Group LC-NT, one case (83rd) in Group LC-MT, one case (136th) in Group LC-ST, one case (292nd) in Group MC-MT, and four cases (310th, 311st, 327th, & 345th) in Group MC-ST. Among these potential outliers found from the inspection of histograms and box plots only one case (83rd with z-score of -3.46) in Group LC-MT was identified as an outlier as a result of the inspection of z-scores.

For Agent Trustworthiness, the histograms and box plots showed that there were five potential outliers: one case (38th) in Group LC-NT, two cases (68th & 83rd) in Group LC-MT, and two cases (135th & 136th) in Group LC-ST. Among these potential outliers only one case was identified as an outlier as a result of the inspection of z-scores: 83rd (z=-3.37) in Group LC-MT. For Agent Caring, the visual inspection of histograms and box plots found one case (128th) a potential outlier, but there were no cases with z-scores larger than 3.29 or smaller than -3.29.

Once the potential univariate outliers were located, the search for multivariate outliers began using a statistical procedure computing Mahalanobis Distance. The Mahalanobis Distance for each case was compared to the critical value of \( \chi^2(3^2)=16.266 \) at \( p<.001 \) and when the Mahalanobis Distance of the case was greater than the critical value it was considered a potential multivariate outlier. Only one case

---

2 The number 3 indicates the number of variables entered. Here the variables include the three sub-measures – Expertise, Trustworthiness, & Caring - within the Agent Credibility measure.
was found to be a multivariate outlier in excess of the critical value of 16.266: 128th (Mahalanobis $D^2=19.967$) in Group MC-ST.

Table 4.2 Univariate and Multivariate Outliers Identified for Each Dependent Variable

<table>
<thead>
<tr>
<th>Variables</th>
<th>Univariate Outliers</th>
<th>Multivariate Outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude Change</td>
<td>$18^{th}$ (LC-NT)</td>
<td></td>
</tr>
<tr>
<td>Recall Test</td>
<td>$59^{th}$ (LC-MT)</td>
<td></td>
</tr>
<tr>
<td>Application Test</td>
<td>$4^{th}$ (LC-NT)</td>
<td></td>
</tr>
<tr>
<td>Perceived Fear</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Agent Credibility</td>
<td></td>
<td>$310^{th}$ (MC-ST)</td>
</tr>
<tr>
<td>Expertise</td>
<td>$83^{rd}$ (LC-MT)</td>
<td></td>
</tr>
<tr>
<td>Trustworthiness</td>
<td>$83^{rd}$ (LC-MT)</td>
<td></td>
</tr>
<tr>
<td>Caring</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2 above summarizes the results from the case analyses intended to detect outliers for each dependent variable. Four cases with extremely low z-scores – either larger than 3.29 or smaller than -3.29 were found to be univariate outliers; one other case (Mahalanobis $D^2=19.967$) identified through Mahalanobis Distance as a multivariate outlier with $p<.001$. All five outliers were deleted. As a result, a total of 332 participants were retained for the subsequent data analyses after a series of data trimming process as shown in Table 4.3.

Table 4.3 Sample Sizes Retained After Each Data Trimming Process

<table>
<thead>
<tr>
<th>Group</th>
<th>Sample Size (n)</th>
<th>Initial</th>
<th>Over-Aged Subjects Deleted</th>
<th>Equalized Approximately</th>
<th>Outliers Deleted (Final)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC-NT</td>
<td></td>
<td>58</td>
<td>56</td>
<td>56</td>
<td>54</td>
</tr>
<tr>
<td>LC-MT</td>
<td></td>
<td>59</td>
<td>57</td>
<td>57</td>
<td>55</td>
</tr>
<tr>
<td>LC-ST</td>
<td></td>
<td>61</td>
<td>60</td>
<td>57</td>
<td>57</td>
</tr>
<tr>
<td>MC-NT</td>
<td></td>
<td>57</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>MC-MT</td>
<td></td>
<td>62</td>
<td>61</td>
<td>57</td>
<td>57</td>
</tr>
<tr>
<td>MC-ST</td>
<td></td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>54</td>
</tr>
<tr>
<td>Total (N)</td>
<td></td>
<td>352</td>
<td>344</td>
<td>337</td>
<td>332</td>
</tr>
</tbody>
</table>
Assumptions tests

All of the dependent variables were analyzed using ANOVAs except the dependent variable of Agent Credibility, which consists of three sub-measures including Agent Expertise, Agent Trustworthiness, and Agent Caring. Agent Credibility was analyzed using MANOVA. This section described the tests of assumptions that apply to the major statistical techniques used in this study and attempted to detect any violations of the assumptions and address them, if any, with possible remedies for the violations of the assumptions.

ANOVA assumptions tests

Four dependent variables – attitude change, recall test, application test, & perceived fear of message – were tested to detect any violations of assumptions associated with the statistical technique of ANOVA. The assumptions for ANOVA tests include independence, normality, and constant variance assumptions.

First, independence assumption states that the observations in the data set must be independent of one another. That is, each observation or measurement must not be influenced by any other observation or measurement. To identify possible sources of lack of independence a logical analysis of sampling and study circumstances was conducted. Normality assumption states that the population from which the sample is taken is normally distributed. To detect the violation of normality assumption the frequency distributions of each dependent variable for each group were inspected and Shapiro–Wilk statistics were used to test normality assumption for each variable. Lastly, ANOVA makes the assumption that the samples are obtained from populations of equal variances. The Levene’s tests were performed to test the assumption of equal variance

Independence assumption: This ANOVA assumption maintains that each observation or measurement must not be influenced by any other observation or measurement. Violation of this assumption is very serious. However, this study employed a logical design to
ensure that all the observations are independent of one another. Strictly speaking, the participants were not randomly selected from the population; rather they volunteered to participate in the study to obtain the extra credit for their computer literacy class. This, however, does not mean nonrandom sampling. The research participants worked individually throughout the study so they were not involved in any form of interaction with one another and there were not any group effects. There were no repeated measure designs involved for this study. Therefore, there was no evidence for violation of independence assumption.

**Normality assumption**: In addition to the inspection of the distributions of scores for each dependent variable and each experimental condition with histograms, Shapiro-Wilk statistics were inspected for each dependent measure of interest. For Attitude Change Shapiro-Wilk statistics indicated that Attitude Change scores for two groups (LC-MT & MC-MT) were not normally distributed. For Recall Test, Shapiro-Wilk statistics indicated that Recall test scores for four groups (LC-NT, LC-MT, LC-ST, & MC-NT) were not normally distributed. For Application Test, Shapiro-Wilk statistics indicated that Application test scores for all of the six groups were not normally distributed. For Perceived Fear, Shapiro-Wilk statistics indicated that Perceived fear scores for all of the six groups were not normally distributed. However, it is suggested that with large sample sizes the violation of normality assumption should not cause any major problem. Furthermore, this is quite common in large samples. The Shapiro-Wilk normality tests for attitude change, recall, application, and perceived fear of message are presented in Appendix J.

**Constant variance assumption**: Levene’s test of equal variances for the dependent variable of Attitude Change resulted in rejecting the null hypothesis that all variances are equal across the experimental groups, $p=.044$. The statistical technique of ANOVA is robust to the violation of constant variance assumption for approximately equal group sizes.

Levene’s test of equal variances for the dependent variable of Recall Test resulted in rejecting the null hypothesis for equal variances. The values of skewness for
Recall Test within each group were all positive. Even though the statistical technique of ANOVA is robust to the violation of equal variance assumption for approximately equal sample sizes, the decision was made to transform the raw scores of Recall Test because transformation is believed to improve the results of analysis substantially (Mabachnick & Fidell, 1996). Along this line, the raw scores of Recall Test were transformed by being square rooted (SQRT) in SPSS. Another run of Levene’s test showed that the equal variance assumption was met with the transformed data, with p=.422, which resulted in the fail-to-reject decision on the null hypothesis.

Levene’s test of equal variances for the dependent variable of Application Test resulted in the reject decision on the null hypothesis. Looking at the skewness of Application test scores within each group the scores for all the groups were positively skewed with some scores equal to zero. Thus, the raw scores were inversed using the equation, 1/(X+C), where X is a raw score and C is a constant added to each score so that the smallest score is 1. Another run of Levene’s test resulted in the fail-to-reject decision on the null hypothesis and the equal variance assumption was met. Levene’s test of equal variances for the dependent variable of Perceived Fear resulted in the fail-to-reject decision on the null hypothesis of equal variance, p=.721. Appendix K presents the Levene’s tests for attitude change, recall, application, and perceived fear of message.

**MANOVA Assumptions Test**

Another dependent variable, Agent Credibility, consisted of three sub-measures including Expertise, Trustworthiness, and Caring. Thus, Agent Credibility was treated as a multivariate measure and was tested to detect any violations of assumptions associated with the statistical technique of MANOVA. The assumptions for MANOVA tests include Independence, Normality (both univariate and multivariate), Linearity, and Multicollinearity Assumptions.

First, to identify possible sources of lack of independence a logical analysis of sampling and study circumstances was conducted like in the ANOVA assumptions test. For the test of normality assumption, both univariate and multivariate normality were checked. To detect the violation of univariate normality assumption the frequency
distributions of each dependent variable for each group were inspected and Shapiro–Wilk statistics were used to test univariate normality assumption for each variable. To detect the violation of multivariate normality assumption Mahalanobis distances were inspected.

The linearity assumption refers to the presence of a straight-line relationship between each pair of the dependent variables. This assumption was assessed by a graphical method of inspecting scatterplots between each pair of the dependent variables.

MANOVA works best when the dependent variables are only moderately correlated. With low correlations we should consider running separate univariate analysis of variance for the dependent variables of interest. When the dependent variables are highly correlated this is referred to as Multicollinearity. To check for Multicollinearity this study ran correlation and check the strength of the correlations among the dependent variables. Correlations up around .8 or .9 are reason for concern.

**Independence assumption**: As described in the independence assumption test for ANOVA, there was no evidence for violation of this assumption. That is, no serious issues were found like nonrandom sampling, repeated measure design, group effects, and any form of interaction with one another.

**Multivariate normality assumption**: Like in the normality assumption test for ANOVA, Shapiro-Wilk statistics were inspected in addition to the distribution of scores for each dependent variable and each experimental condition with histograms. Shapiro-Wilk statistics indicated that the agent expertise scores for any of the experimental conditions and the agent trustworthiness scores for Group LC-MT, MC-NT, and MC-ST were not normally distributed. On the other hand, the agent caring scores for all the experimental conditions were normally distributed. With large sample sizes the violation of this assumption should not cause any major problem (Gravetter & Wallnau, 2000; Stevenson, 1996). The Shapiro-Wilk normality tests for perceived agent credibility are presented in Appendix L.

**Linearity assumption**: The scatterplots between each pair of the dependent variables – Agent Expertise, Trustworthiness, & Caring – were inspected for each experimental
group. The scatterplots did not show any evidence of non-linearity, therefore, the assumption of linearity was satisfied.

**Multicollinearity assumption:** The correlations among the three measures of Agent Credibility were found to be moderate. They were all less than .8 as shown in Table 4.4. The multicollinearity among the dependent variables did not occur. Therefore, the assumption of multicollinearity was satisfied.

| Table 4.4 Correlation Coefficients among Three Measures of Agent Credibility |
|-------------------------------------------------|-----------------|-----------------|
| Measure                                         | Agent Trustworthiness | Agent Caring    |
| Agent Expertise                                 | .72*              | .49*            |
| Agent Trustworthiness                           |                   | .64*            |
| Agent Caring                                    |                   |                 |

*Correlation is significant at p<.01

**Homogeneity of variance-covariance matrices:** Box’s test (Appendix M) – generated as part of MANOVA output in SPSS - was used to test the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups. The p value is larger than .001 so the assumption of homogeneity of variance-covariance matrices was not violated.

For the specific investigation on any variance or correlation differences across the experimental conditions, Levene’s test was conducted. Levene’s test of the assumption of homogeneity of variance for each of the three sub-measures of perceived agent credibility resulted in failing to reject the null hypothesis, a result consistent with the assumption that the variances were equal over the groups (see Appendix N). The consistency between these results and the box’s test results supported that there is no evidence of a violation of constant variance-covariance matrix.

**Hypotheses Testing**

The descriptive statistics for all the dependent variables are presented in Table
The effect of agent credibility and fear arousing message on attitude change

In order to determine the effects of Agent Credibility and Fear-Arousing Message on Attitude Change (Hypothesis 1.1, 1.2, and 1.3), a two-way between-groups analysis of variance (ANOVA) was conducted. The results are presented by hypothesis.

Hypothesis 1.1 predicted that a more credible agent would be more effective in changing learners’ attitude toward the issue of copyright. However, there was no statistically significant main effect for agent credibility in attitude change, \([F(1, 326)=.62, p=.43]\). The mean score for the more credible agent conditions (M=4.66, SD=8.22) was not statistically different from that for the less credible agent conditions (M=5.41, SD=8.71). Therefore, Hypothesis 1 was not supported by the findings.

Hypothesis 1.2 predicted that a moderately threatening instructional message would be more effective in changing learners’ attitude toward the issue of copyright than a strongly threatening message and a not-threatening message. However, there was no
statistically significant main effect for fear arousing message, \([F(2, 326)=.49, p=.62]\). That is, the moderately threatening message conditions \((M=5.54, SD=10.06)\) did not differ significantly from either the strongly threatening message conditions \((M=5.11, SD=7.21)\) or the not-threatening message conditions \((M=4.45, SD=7.88)\). The findings did not support this hypothesis.

**Hypothesis 1.3** predicted that given a more credible agent (MC), a not-threatening instructional message (NT) would be less effective in changing attitudes than a moderately threatening instructional message (MT) and a strongly threatening instructional message (ST), while there would be no difference in attitude change across the three instructional message conditions given a less credible agent (L). This hypothesis was interested in the interaction effect of agent credibility and fear arousing message on attitude change, but the hypothesis was not supported by the findings. That is, the interaction effect of agent credibility and fear arousing message \([F(2, 326)=1.73, p=.18]\) did not reach statistical significance.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude Change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent Credibility</td>
<td>1</td>
<td>44.56</td>
<td>.62</td>
</tr>
<tr>
<td>Threatening Message</td>
<td>2</td>
<td>34.84</td>
<td>.49</td>
</tr>
<tr>
<td>Agent Credibility X Threatening</td>
<td>2</td>
<td>123.77</td>
<td>1.73</td>
</tr>
<tr>
<td>Error</td>
<td>326</td>
<td>71.66</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.7 Means and Standard Deviations for Attitude Change Measure

<table>
<thead>
<tr>
<th>Agent Credibility</th>
<th>Less Credible Agent (LC)</th>
<th>More Credible Agent (MC)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear-Arousing Message</td>
<td>M</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td>Not Threatening</td>
<td>4.13</td>
<td>7.66</td>
<td>54</td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>7.15</td>
<td>11.00</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>4.95</td>
<td>6.84</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>5.41</td>
<td>8.71</td>
<td>166</td>
</tr>
</tbody>
</table>
The effects of agent credibility and fear arousing message on recall and application tests

Recall and application tests were analyzed separately using a two-way between-groups analysis of variance (ANOVA) to determine the main and interaction effects of agent credibility and fear arousing message on recall and application tests (Hypothesis 2.1, 2.2, & 2.3).

*Hypothesis 2.1* predicted that a more credible agent would be more effective for recall and application tests than a less credible agent. This hypothesis was supported by the findings. There was a statistically significant main effect for agent credibility in recall test \( [F(1, 326)=18.66, p<.05] \). The mean score for the more credible agent conditions (\( M=2.17, SD=.54 \)) was significantly higher than that for the less credible agent conditions (\( M=1.93, SD=.49 \)). The effect size calculated from Cohen’s \( d \) was 0.47. There was also a statistically significant main effect for agent credibility in application test \( [F(1, 326)=5.52, p=.02] \). The mean score for the more credible agent condition (\( M=1.67, SD=.99 \)) was significantly higher than that for the less credible agent condition (\( M=1.37, SD=.88 \)). The effect size calculated with Cohen’s \( d \) was 0.32.

*Hypothesis 2.2* predicted that there would be the main effect for fear arousing message on recall and application tests. It was found that there was a statistically significant main effect for fear arousing message \( [F(2, 326)=3.51, p=.03] \) in recall test. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for the not-threatening message (\( M=2.16, SD=.47 \)) was significantly higher than that for the strongly threatening message (\( M=2.05, SD=.53 \)), \( p=.04 \). The effect size calculated from Cohen’s \( d \) was 0.22. There was no statistically significant main effect for fear arousing message in application test \( [F(2, 326)=1.39, p=.25] \).

*Hypothesis 2.3* predicted that there would be an interaction effect of agent credibility and fear arousing message in recall and application tests. In recall test, a statistically significant interaction effect was found, \( [F(2, 326)=.306, p=.048] \). Follow-up tests – one-way split ANOVAs - were conducted to explore the interaction effect further because one of the independent variables, fear arousing message, had three levels. The
data file was split by agent credibility and the effect of fear arousing message on recall test was examined for the more credible agent conditions and the less credible agent conditions. The one-way split ANOVAs indicated that there was a statistically significant simple effect for fear arousing message given the less credible agents, \([F(2, 163)=5.23, p<.01]\). Post-hoc comparison using the Tukey HSD test indicated that the mean score for the not-threatening message condition was significantly higher than that for the strongly-threatening message condition, \(p<.01\). On the other hand, there was no statistically significant simple effect for fear arousing message given the more credible agents, \([F(2,163)=1.84, p=.16]\). That is, the means of the recall test for the three message conditions were not significantly different from each other. In application test, however, there was no statistically significant interaction effect of agent credibility and fear arousing message, \([F(2,326)=3.06, p=.51]\).

Table 4.8 Two-Way Analysis of Variance for Recall and Application Tests

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>(F)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recall Test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent Credibility</td>
<td>1</td>
<td>4.86</td>
<td>18.66*</td>
</tr>
<tr>
<td>Threatening Message</td>
<td>2</td>
<td>.92</td>
<td>3.51*</td>
</tr>
<tr>
<td>Agent Credibility X Threatening Message</td>
<td>2</td>
<td>.80</td>
<td>3.06*</td>
</tr>
<tr>
<td>Error</td>
<td>326</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Application Test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent Credibility</td>
<td>1</td>
<td>.24</td>
<td>5.52*</td>
</tr>
<tr>
<td>Threatening Message</td>
<td>2</td>
<td>.06</td>
<td>1.39</td>
</tr>
<tr>
<td>Agent Credibility X Threatening Message</td>
<td>2</td>
<td>.03</td>
<td>.67</td>
</tr>
<tr>
<td>Error</td>
<td>326</td>
<td>.04</td>
<td></td>
</tr>
</tbody>
</table>

*: Statistically significant
**: The raw scores for Recall Test were transformed into SQRT
***: The raw scores for Application Test were transformed into \(1/(X+C)\)
Table 4.9 Means and Standard Deviations for Recall & Application Tests

<table>
<thead>
<tr>
<th>Agent Credibility</th>
<th>Less Credible Agent (LC)</th>
<th>More Credible Agent (MC)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td>Recall Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Threatening</td>
<td>4.46</td>
<td>1.85</td>
<td>54</td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>4.04</td>
<td>1.64</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>3.42</td>
<td>1.68</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>3.96</td>
<td>1.77</td>
<td>166</td>
</tr>
<tr>
<td>Application Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Threatening</td>
<td>1.17</td>
<td>.75</td>
<td>54</td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>1.65</td>
<td>1.04</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>1.28</td>
<td>.75</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>1.37</td>
<td>.88</td>
<td>166</td>
</tr>
</tbody>
</table>

The relationship between affective learning (attitude change) and cognitive learning (recall and application tests)

Pearson product-moment correlation coefficients were calculated to examine the relationship between affective learning and cognitive learning.

Hypothesis 3 predicted that the more learners learn the messages, the more they would change their attitudes. The correlations between attitude change and recall test (p=.88) and between attitude change and application test (p=.28) were not statistically significant (see Table 4.10). Thus, this hypothesis was not supported by the findings.

Table 4.10 Correlation Coefficients for Affective Learning and Cognitive Learning

<table>
<thead>
<tr>
<th>Attitude Change (N=332)</th>
<th>Pearson Correlation (Recall Test)</th>
<th>.01</th>
<th>.60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.88</td>
<td>.28</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>332</td>
<td>332</td>
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</tbody>
</table>
Summary of Hypotheses Testing

In summary, there were no significant main effects for agent credibility and fear arousing message and interaction effect between the two independent variables on attitude change (H 1.1, 1.2, & 1.3). For recall and application, a significant difference was found between the more credible agent condition and the less credible condition in both recall and application tests (H 2.1). The mean score for the more credible agent condition was significantly higher than that for the less credible agent condition. A significant difference was also found between the not threatening message condition and the strongly threatening message condition in recall test only (H 2.2). The mean score for the not threatening message condition was significantly higher than the strongly threatening message condition. There was a significant interaction effect of agent credibility and fear arousing message in recall test (H 2.3). Given the less credible agent, the mean score for the not threatening message condition was significantly higher than that for the strongly threatening message condition while there were no mean differences among the three fear arousing message condition given the more credible agent.

Regarding the relationship between attitude change and recall and application, the correlations between them were found not significant. A summary of each hypothesis test is presented in Table 4.11.
Table 4.11 Summary of Hypotheses Tests

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude Change</td>
<td>H 1.1: Main Effect for Agent Credibility</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>(MC &gt; LC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H 1.2: Main Effect for Fear Arousing Message</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>(MT &gt; NT &amp; ST)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H 1.3: Interaction Effect of Agent Credibility and Fear Arousing Message</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>(ST &amp; MT &gt; NT) in MC while (NT = MT = ST) in LC</td>
<td></td>
</tr>
<tr>
<td>Recall &amp; Application</td>
<td>H 2.1: Main Effect for Agent Credibility</td>
<td>Significant: MC &gt; LC in both recall and application tests</td>
</tr>
<tr>
<td></td>
<td>(MC &gt; LC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H 2.2: Main Effect for Fear Arousing Message</td>
<td>Significant: NT &gt; ST only in recall test</td>
</tr>
<tr>
<td></td>
<td>(Not NT = MT = ST)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H 2.3: Interaction Effect of Agent Credibility and Fear Arousing Message</td>
<td>Significant: In recall test, NT &gt; ST in LC while NT=ST=MT in MC)</td>
</tr>
<tr>
<td></td>
<td>Pattern of Means of NT, MT, &amp; ST in MC ≠ Pattern of Means of NT, MT, &amp; ST in LC</td>
<td></td>
</tr>
<tr>
<td>Relationship between Affective and Cognitive Learning</td>
<td>H 3: Significant Correlations between Attitude Change and Recall &amp; Application Tests</td>
<td>Not Significant: No relationship between affective and cognitive learning</td>
</tr>
<tr>
<td></td>
<td>Significant (r^2) between Attitude Change and Recall &amp; Application</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and between Attitude Change and Application</td>
<td></td>
</tr>
</tbody>
</table>

Learners’ Perceived Agent Credibility

To identify how the learners perceived the agent given in terms of credibility, a two-way MANOVA with three dependent variables was performed, which are three sub-measures of agent credibility.

The results indicated that there was a statistically significant difference across the three fear arousing message conditions on the combined dependent variables: \(F(6, 648)=2.19, p=.042\; Wilks’ Lambda=.96; partial eta squared=.02. When the results for the dependent variables were considered separately using the follow-up ANOVAs, it was indicated that significant differences occurred in agent expertise \([F(2, 326)=5.40, p=.005,\) eta squared=.03] and trustworthiness \([F(2, 326)=5.16, p=.006,\) eta squared=.03], but not in agent caring \([F(3, 326)=2.64, p=.073,\) eta squared=.02].
To identify pair-wise differences in agent expertise among the three fear arousing message conditions, Tukey HSD tests were conducted. The results showed that the mean score of agent expertise for the not threatening message condition (M=24.13, SD=4.34) was significantly higher than that for the strongly threatening message condition (M=21.95, SD=5.80). There were no significant differences between the not threatening message condition and the moderately threatening condition (M=23.28, SD=4.56) and between the moderately threatening message condition and the strongly threatening message condition. Tukey HSD tests for agent trustworthiness indicated that the mean score of agent trustworthiness for the not threatening message condition (M=30.50, SD=6.41) was significantly higher than that for the strongly threatening message condition (M=27.66, SD=7.62), and that the mean score for the moderately threatening message condition (M=29.88, SD=6.44) was significantly higher than that for the strongly threatening message condition. No significant difference was found between the not threatening message condition and the moderately threatening message condition. The means and standard deviations of perceived agent credibility are presented in Table 4.12.

The two-way MANOVA, however, did not find any significant main effect for agent credibility [F(3, 324)=1.60, p=.19, Wilks’ Lambda=.99, partial eta squared=.015] and interaction effect of agent credibility and fear arousing message [F(6, 648)=1.56, p=.156, Wilks’ Lambda=.97, partial eta squared=.014] on the combined dependent variables. Thus, no follow-up tests were performed for them. The results of MANOVA and ANOVA tests are summarized in Table 4.13.

Table 4.12 Multivariate and Univariate Analysis of Variance F Ratios for Perceived Agent Credibility

<table>
<thead>
<tr>
<th>Variables</th>
<th>MANOVA</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Agent Expertise</td>
</tr>
<tr>
<td>Agent Credibility</td>
<td>1.60</td>
<td>.39</td>
</tr>
<tr>
<td>Threatening Message</td>
<td>2.19*</td>
<td>5.40**</td>
</tr>
<tr>
<td>Agent X Message</td>
<td>1.56</td>
<td>3.50</td>
</tr>
</tbody>
</table>
Table 4.13 Means and Standard Deviations for Perceived Agent Credibility

<table>
<thead>
<tr>
<th>Agent Credibility</th>
<th>Less Credible Agent (LC)</th>
<th>More Credible Agent (MC)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>N</td>
</tr>
<tr>
<td><strong>Expertise</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>24.11</td>
<td>4.38</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>21.14</td>
<td>6.48</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>22.93</td>
<td>5.36</td>
<td>166</td>
</tr>
<tr>
<td><strong>Trustworthiness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Threatening</td>
<td>29.78</td>
<td>6.72</td>
<td>54</td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>30.51</td>
<td>6.56</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>26.51</td>
<td>7.48</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>28.90</td>
<td>7.12</td>
<td>166</td>
</tr>
<tr>
<td><strong>Caring</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Threatening</td>
<td>28.57</td>
<td>9.93</td>
<td>54</td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>31.02</td>
<td>9.86</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>25.67</td>
<td>9.62</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>28.39</td>
<td>9.99</td>
<td>166</td>
</tr>
</tbody>
</table>

Learners’ Perceived Fear of Message

A two-way between-groups analysis of variance (ANOVA) was conducted to identify how Agent Credibility and Fear-Arousing Message influenced learners’ perception of the fear-arousing message.

There was a statistically significant main effect for Agent Credibility on learners’ perceived fear [F(1, 326)=4.47, p=.035] as shown in Table 4.14. The effect size calculated from Cohen’s $d$ was 0.23. The less credible agent groups ($M=12.52$, $SD=4.97$) perceived the message more threatening than the more credible agent groups ($M=11.43$, $SD=4.31$). There was a marginally significant main effect for Fear-Arousing Message on learners’ perceived fear [F(2, 326)=2.85, p=.059]. There was no statistically significant interaction effect of Agent Credibility and Fear-Arousing Message on learners’ perceived fear [F(2, 326)=.14, p=.870]. The means and standard deviations for perceived fear of message are presented in Table 4.15.
Table 4.14 Two-Way Analysis of Variance for Perceived Fear Measure

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Fear</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent Credibility</td>
<td>1</td>
<td>96.06</td>
<td>4.47*</td>
</tr>
<tr>
<td>Threatening Message</td>
<td>2</td>
<td>61.25</td>
<td>2.85</td>
</tr>
<tr>
<td>Agent Credibility X Threatening Message</td>
<td>2</td>
<td>2.99</td>
<td>.14</td>
</tr>
<tr>
<td>Error</td>
<td>326</td>
<td>71.66</td>
<td></td>
</tr>
</tbody>
</table>

*: Statistically significant

Table 4.15 Means and Standard Deviations for Perceived Fear Measure

<table>
<thead>
<tr>
<th>Fear-Arousing Message</th>
<th>Less Credible Agent (LC)</th>
<th>More Credible Agent (MC)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td>Not Threatening</td>
<td>11.81</td>
<td>5.28</td>
<td>54</td>
</tr>
<tr>
<td>Moderately Threatening</td>
<td>12.40</td>
<td>4.84</td>
<td>55</td>
</tr>
<tr>
<td>Strongly Threatening</td>
<td>13.32</td>
<td>4.75</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>12.52</td>
<td>4.97</td>
<td>166</td>
</tr>
</tbody>
</table>
CHAPTER V
DISCUSSION

Introduction

This study investigated how agent credibility and fear arousing instructional message influenced affective learning (attitude change) and cognitive learning (recall & application tests) in a pedagogical agent-based learning environment. Learners’ perceived agent credibility and fear of instructional message were also measured.

The main focus of this study was on agent credibility as a message source factor and fear arousing instructional message as a message factor. Thus, the first three research questions were intended to identify the main effects of agent credibility and fear arousing message on affective learning (attitude change) and cognitive learning (recall and application tests), respectively, and the interaction effects of agent credibility and fear arousing message on the two distinctive learning outcomes. Regarding the correlation between affective learning and cognitive learning, it was expected that message learning would precede attitude change.

This section is to evaluate and discuss the findings of this study in light of the methodology, explain what the results mean and how they can be used. Limitations are also summarized and future research is suggested in this section.

The Effects of Agent Credibility and Fear Arousing Message on Attitude Change

The effect of agent credibility on attitude change

The results indicated that there was no significant difference between more credible agent and less credible agent in attitude change toward the issue of copyright, and did not support Hypothesis 1.1 that a more credible agent would be more effective in changing attitude than a less credible agent.

It is thought that this non-significant result can be attributed to the non-
significant difference between the more credible agent condition and the less credible agent condition in perceived agent credibility. This study assumed that the students in each agent condition (less credible vs. more credible) perceived the agent credibility significantly differently from each other. However, it turned out that there was no statistically significant difference between the two agent conditions in perceived agent credibility. This may indicate that the agent credibility were not portrayed correctly for each agent condition, even though the pilot study showed that there was a significant difference between the less credible agent and the more credible agent in learner’s perceived agent credibility and the agents for the main study were developed based on the same design guidelines as the pilot study.

From the results for learners’ perceived agent credibility, a significant main effect for fear arousing message was found on perceived agent credibility. The results indicated that the fear arousing message had a significant influence on their perceived agent credibility. This significant main effect for fear arousing message might hinder the students from perceiving agent credibility correctly and this might lead to the non-significant difference between the less credible agent condition and the more credible agent condition in attitude change.

Comparing the mean scores of attitude change between the less credible agent condition and the more credible agent condition, this result is contrary to the hypothesis that the more credible agent would be more effective than the less credible agent in changing attitudes. The mean for the less credible agent condition (M=5.41, SD=8.71) was higher than that for the more credible agent condition (M=4.66, SD=8.22), which was not statistically significant. This opposite result was obtained from the big mean difference between LC-MT condition and MC-MT condition. Given the moderately threatening message, the mean for the less credible agent (M=7.15, SD=11.00) was higher than that for the more credible agent (M=3.98, SD=8.86). As a matter of fact, the more credible agent worked better than the less credible agent in changing attitudes in both the not threatening message condition and the strongly threatening message condition.

This unexpected mean difference between the more credible agent and the less credible agent given the moderately threatening message may be understood partly by
looking into students’ perceived agent credibility. Overall, the students in LC-MT condition perceived the agent more credible than those in the other experimental conditions and the students in MC-MT condition perceived the agent less credible than those in the other experimental conditions, as shown in Table 4.13.

These results may indicate that there are some possible flaws in the design strategies for agent credibility, but there are considerable effects of perceived agent credibility on attitude change. This notion can also be supported by the result that the mean for the more credible agent is higher than that for the less credible agent given the not threatening message and the strongly threatening message.

In addition, there are still some possible outliers in LC-MT condition, which were not identified in the preliminary analyses, might have a significant influence on the group mean and result in this unexpected mean difference between the two agent conditions given the moderately threatening message, when considering the large standard deviation for LC-MT condition (SD=11.00) compared to those for the other experimental conditions. The investigation of individual cases found out that the first four participants with the highest attitude change scores belonged in LC-MT condition and six participants in LC-MT condition were included in the top ten highest attitude change group. The mean score of those six participants in LC-MT condition was 29.8. This was much higher than the mean of all the participants in the six experimental conditions (M=5.04) as well as the mean of the entire LC-MT condition (M=7.15).

Even though this study attempted to design two pedagogical agents differing in terms of the level of credibility, this study overlooked that the agent credibility is dependent on individuals’ perception of agent credibility. It could be possible that students in the less credible agent condition perceived the agent credible enough to change their attitudes toward the issue of copyright while students in the more credible agent condition perceived the agent credible not enough to work for the same purpose. The non-significant difference in perceived agent credibility between the more credible agent condition and the less credible agent condition might result from this nature of the concept of credibility.

Attitudes are never directly observed. They just can be inferred from thought or action because attitudes influence thought and action. However, it would be almost
impossible to observe how people behave in their everyday life to measure their attitudes toward a specific issue. Therefore, the only alternative way to measure would be to measure their perception of the issue or topic. It still has limitations. The participants in this study might not want to disclose what they really think about the issue of copyright. Chances are that they thought they would be judged from what they said in relation to the issue of copyright, even though it was promised not to share their responses with anybody.

From a different perspective, it is speculated that the participants in the main study did not pay attention to the agent throughout the instruction, and thus just did not perceive the agent credibility as intended unlike in the pilot study that consisted of a couple of screens presented by the agent. In addition, their interaction with the agent was very limited in terms of quality as well as quantity. The instruction where the interaction between the learner and the agent took place was approximately 15 minutes long or so. It is thought that that was not enough time to make changes to their attitudes toward the issue of copyright. The main role of the agents employed for the study was limited to presenting the information of copyright. There were no meaningful interactions between the learner and the agent except learners’ clicking on the next buttons to proceed to a series of screens.

The effects of fear arousing message on attitude change

_Hypothesis 1.2_ predicted that a moderately threatening message would be more effective in changing students’ attitude toward the issue of copyright than a strongly threatening message and a not threatening message. This hypothesis was not supported by the results. There was no significant difference between the moderately threatening message condition and the not threatening message condition and the strongly threatening message condition.

Human communication research suggests that fear enhances attitude change and that high-fear appeals are more effective than low-fear appeals (e.g., Boster & Mongeau, 1984; Mongeau, 1998). However, it is also suggested that fear appeals do not always produce attitude change. Not only can fear appeals fail because they arouse too little fear,
they can also backfire if they scare individuals too much (Morris & Swann, 1996). These somewhat conflicting findings from the previous research led to generating this hypothesis that a moderately threatening message would be most effective in changing attitudes. That is, exposure to a fear arousing message can enhance or inhibit the effectiveness of a persuasive message (Leventhal, 1971), depending on how threatening the message recipients actually perceived the fear arousing message.

The present study did not make significant differences across the three fear arousing message conditions in students’ perceived fear of message. The non-significant differences in their perceived fear of message might indicate that the three fear arousing message conditions were not designed as intended: the not threatening message eliciting no threat, the moderately threatening message eliciting moderate threat, and the strongly threatening message eliciting strong threat. Like the perceived agent credibility, individuals’ perceived fear of message can be different from one another even though they are all in the same message condition. It is thought that these internal and external factors contributed to the non-significant differences in attitude change among the three fear arousing message conditions.

Comparing the means of attitude change for the three fear arousing message conditions, the pattern of mean differences among the three message conditions was identical to that expected in the hypothesis. The mean score of the moderately threatening message condition was higher than the not threatening message condition and the strongly threatening message condition, although the mean differences were small. This pattern of mean differences may suggest that there would be a more significant difference in attitude change between the moderately threatening message condition and the not threatening and strongly threatening message conditions if there were a more significant difference between the moderately threatening message condition and the not threatening and strongly threatening message conditions. This notion can be supported by the results showing that the students in the moderately threatening message condition perceived the message more threatening than those in the not threatening message condition, but less threatening than those in the strongly threatening message condition.

This non-significant main effect for fear arousing message can be attributed to the factors discussed in the previous part on the main effect for agent credibility, like the
The interaction effects of agent credibility and fear arousing message on attitude change

It was expected that there would be a significant interaction effect between agent credibility and fear arousing message on learner’s attitude change toward the issue of copyright (*Hypothesis 1.3*). More specifically, it was hypothesized that given a more credible agent, a not threatening message would be significantly less effective in changing attitudes than a strongly threatening message and a moderately threatening message, while there would be no differences in attitude change across the three fear arousing message conditions given a less credible agent. However, the results did not support the hypothesis. There were no significant differences in attitude change across the three fear arousing message conditions regardless of which agent was given, less credible or more credible agent. It is thought that this non-significant interaction effect between agent credibility and fear arousing message on attitude change resulted from the non-significant differences in both perceived agent credibility and perceived fear of message across the experimental conditions.

Interestingly, it was found that the mean difference in attitude change between the moderately threatening message condition and the not threatening and strongly threatening message conditions was larger given the less credible agent than given the more credible agent. This is in contract to the hypothesis that expected more mean difference between the moderately threatening message condition and the other two message conditions given the more credible agent. As described in the previous part on the effect of agent credibility on attitude change, it is thought that this resulted from the significantly higher mean score of perceived fear of message for the less credible agent condition than that for the more credible agent condition and the overall effect of threat perceived from the message on attitude change.
The Effects of Agent Credibility and Fear Arousing Message on Recall and Application Tests

The effects of agent credibility on recall and application tests

The results indicated that there was a statistically significant difference between the more credible agent condition and the less credible agent condition in both recall and application tests and supported Hypothesis 2.1. That is, the mean score for the more credible agent condition was significantly higher than that for the less credible agent condition in both recall and application tests, both of which are considered cognitive learning outcomes. This seems to be consistent with the findings from pedagogical agent research that students’ performance on cognitive learning like recall and application tests is better when interacting with credible agents than when with less or not credible agents (e.g., Atkinson, Mayer, & Merrill, 2005; Kim, Baylor, & Reed, 2003; Mayer, Sobko, & Mautone, 2003). Actually, the previous research on pedagogical agent has not looked at the overall credibility of pedagogical agents. Rather individual verbal (e.g., voice) and non-verbal variables (e.g., attire and label of expertise) have been examined in the previous agent research to identify their effects on cognitive learning. On the other hand, the present study employed the verbal and non-verbal variables collectively that the previous agent research found effective for enhancing cognitive learning and contributing to the overall agent credibility.

As a matter of fact, the non-significant difference between the more credible agent condition and less credible agent condition in perceived agent credibility may undermine the significant findings on the effects of agent credibility on recall and application. However, it would be an ideal condition, but not a necessary condition to have a statistically significant difference between the two agent conditions in perceived agent credibility. Even though it was not statistically significant, there were consistent mean differences between the two agent conditions in all of the three credibility dimensions including expertise, trustworthiness, and caring and these small mean differences may be large enough to make significant differences in recall and application
between the two agent conditions.

**The effects of fear arousing message on recall and application tests**

It was hypothesized that there would be statistically significant differences among the three fear arousing message conditions in recall and application tests. The results indicated that there was a significant difference between the not threatening message condition and the strongly threatening condition in recall test only. The mean score for the not threatening message condition was significantly higher than that for the strongly threatening message condition in recall test. There were no statistically significant differences between the not threatening message condition and the moderately threatening message condition and between the moderately threatening message condition and the strongly threatening message condition in either recall or application test.

Comparing the mean scores of perceived fear of message for the three message conditions, it was found that the strongly threatening message condition was perceived most threatening, the moderately threatening message condition in the middle, and the not threatening message condition least threatening. With regards to the design of fear arousing message, this pattern of mean differences among the three message condition was desirable. However, the significant finding on the effect of fear arousing message in recall test showed that the more threatening the students perceived the message the fewer score they obtained in recall test.

The two models involving two distinct processes or controls (emotional and cognitive processes or fear and danger controls) – the Parallel Response Model (PRM) and the Extended Parallel Response Model (EPRM) – are of little help to understand this result. Instead, the nature of the recall test may support this finding. The recall test actually did not require the student to reach a deep understanding of the content of the instruction employed for the present study. It is possible that the threat statements included in the moderately threatening message condition and the strongly threatening message condition hindered the students from retaining what was relevant to the recall test by directing them to concentrate on the threat statements. Along this line, the
significant mean difference between the not threatening message condition and the strongly threatening message condition can be attributed to the “marginally” significant difference in perceived fear of message between the not threatening message condition (M=11.18, SD=4.91) and the strongly threatening message condition (M=12.69, SD=4.54).

The interaction effects of agent credibility and fear arousing message on recall and application tests

It was expected that there would be a statistically significant interaction effect between agent credibility and fear arousing message on recall and application tests. The interaction effect reached a significant difference in recall only. The results showed that the mean score for the not-threatening message condition was significantly higher than that for the strongly-threatening message condition given the less credible agent while there was no statistically significant simple effect for fear arousing message given the more credible agents. This result can be explained by the finding of the main effect for agent credibility on perceived fear of message. The learners’ perceived fear of message showed that the students in the less credible agent condition perceived the threat from the message more threatening than those in the more credible agent condition. And, the main effect for fear arousing message indicated that the students in the not threatening message condition learned more in recall than those in the strongly threatening message condition. That is, the significant difference between the not threatening message condition and the strongly threatening message condition made primarily by the less credible agent led to the significant difference in recall between the two message conditions. On the other hand, the more credible agent made the non-significant differences in perceived fear of message across the three message conditions smaller and this led to the non-significant differences in recall across the three message conditions.

The Relationship between Affective Learning and Cognitive Learning

This study hypothesized that there would be a positive relationship between
affective learning and cognitive learning. It was found, however, that there were no significant positive relationships between the two learning outcomes. The correlation between attitude change and recall test was almost zero ($r=-.01$) and the correlation between attitude change and application test was .60, which is quite large. Although the correlation between attitude change and application test was not statistically significant their positive relationship may imply that there is a meaningful relationship between affective learning and cognitive learning in higher levels – application is placed at a higher level in cognitive learning domain than recall. The positive relationship between attitude change and application is also supported by the pattern of the mean differences among the three message conditions in application test similar to that of the mean differences among the three message conditions in attitude change. In both attitude change and application test, the moderately threatening message condition had the higher mean than the not threatening message condition and the strongly threatening message condition. Along this line, it is thought that attitude change presumes cognitive learning in higher or deeper levels.

**Learners’ Perceived Agent Credibility**

Learners’ perceived agent credibility was measured to identify how they actually perceived the given agent in terms of credibility consisting of three sub-measures; expertise, trustworthiness, and caring. The present study did not find a statistically significant difference in any of the three sub-measures of agent credibility between the less credible agent condition and the more credible agent condition. That is, the main effect for agent credibility on perceived agent credibility did not reach a statistical significance. The main effect for agent credibility and interaction effect between agent credibility and fear arousing message were examined assuming that there would be a significant difference in perceived agent credibility between the two agent conditions. The non-significant difference, consequently, made it difficult to identify how agent credibility influences attitude change as well as recall and application tests.

An interesting finding was that fear arousing message had a significant influence on learners’ perceived agent credibility. The students in the not threatening message
condition perceived the agent significantly more credible in the two measures of 
expertise and trustworthiness than those in the strongly threatening message condition in 
the measures of expertise and trustworthiness. Overall it was found that the more 
threatening they perceived the message the less credible they perceived the agent in both 
expertise and trustworthiness measures. It implies that the students judged agent 
credibility based on their perception of fear of message more than based on their 
perception of agent credibility.

This study did not make a systematic observation while the participants worked 
on the instructional intervention. However, the informal observations made by the 
researcher may help illuminate why the fear arousing message worked over the agent 
credibility to influence their perceptions of agent credibility. It was observed that some 
participants did not pay close attention to their computer screen. Due to their inattention 
to their computer screen, they might not have had a good chance to recognize agent 
credibility. Along this line, more meaningful interactions between the learner and the 
agent need to be made to have the learner pay more attention to the agent and give the 
learner a chance to recognize agent credibility. Modifications to the design strategies for 
agent credibility may need to be made. It is believed, however, that learners’ attention to 
the agent should be the first area to be addressed.

**Learners’ Perceived Fear of Message**

Learners’ perceived fear of message was measured to identify how they actually 
perceived the message in terms of fear or threat. Overall the strongly threatening 
message condition had the highest mean, the moderately threatening message condition 
in the middle, and the not threatening message condition the lowest mean. However, the 
mean differences did not reach significance. That is, the main effect for fear arousing 
message was found not statistically significant. Like agent credibility, the main effect for 
fear arousing message and interaction effect between agent credibility and fear arousing 
message were investigated assuming that there would be significant differences in 
perceived fear of message across the three message conditions. As a consequence, the 
non-significant difference made it difficult to examine how fear arousing message
influences attitude change as well as recall and application tests.

What was interesting is that a significant main effect for agent credibility was found on perceived fear of message. The results indicated that the students in the less credible agent condition perceived the message more threatening than those in the more credible agent condition. It shows that credible pedagogical agents as message source can reduce threat or fear induced by the message.

**Limitations of the Study**

The present study had several limitations. First, the role of the pedagogical agents employed for the study was limited to presenting the instructional module to the learners. There were no meaningful interactions between the students and the agents and/or the instruction module except their clicking on the next buttons to proceed in the instruction. This limitation might prevent them from paying their attention to the agent throughout the instruction and thus it might hinder them from perceiving agent credibility as intended by the researcher. In the same vein, the students in the study might have difficulty further processing the information from the instructional module since the content of the instructional module was presented verbally by the agent and each screen displayed just some keywords as kind of headings, as shown in Appendix B. The present study intentionally did not provide much on-screen text to avoid making the students focus too much on the message on the screens, without looking at or listening to the agent. However, it might hinder them from perceiving threat and/or efficacy intended like in the case of agent credibility.

Another limitation of the study may come from the short intervention time. The instructional module took approximately 15 to 20 minutes depending on the experimental condition given. Given the research setting, it was the maximum time available for the intervention except the time for the pre- and post-questionnaires. Considering that the instructional module was intended for attitude change as well as recall and application, it was still a short period of time.

Third, the present study cared about attitude changes toward a specific issue, which is believed to be learned and acquired (Gagne, 1985; Perloff, 2002). There is no
objection to the notion that attitudes are learned. However, assessing attitudes and attitude changes may be a different story. The only option available to measure attitude, except direct observations, was to measure students’ perception of the issue of copyright. Because copyright is a legal issue they might not want to disclose what they really think about copyright.

Fourth, the present study, based on the previous research, attempted to design and develop two pedagogical agents as persuasive message source differing in the level of credibility and three fear arousing messages differing in the degree of arousing fear. The results of the pilot study validated the agent design specifications for portraying credibility consisting of three sub-dimensions (expertise, trustworthiness, and caring) and the message design specifications for arousing different degrees of fear. However, this study overlooked individual differences in perceptions of agent credibility and fear of message.

Lastly, this study used a base agent model with the gender of male, age of early 30’s, and ethnicity of White in order to control for the effects for agent gender, age, and ethnicity. It was necessary to keep those agent characteristics the same across the experimental conditions to make the study manageable. However, this could be a limitation of the study in relation to individual differences in perceptions of agent credibility. Both male and female students participated in the study, so they might perceive the agent given differently simply due to the fact that they had different genders. In addition, about 20% of the participants were not White. They might perceive the agent given less credible only because the agent was White. After all, using the base agent model might be one of the reasons the present study did not make a significant difference in perceived agent credibility between the two agent conditions.

**Implications**

The findings from this study provide several implications for pedagogical agent research and agent/message design in relation to affective learning as well as cognitive learning.

First, this study proposed the agent credibility design principles based on the
previous research on both agent research and human communication research. Even though this study did not make a significant difference in learners’ actual perception of agent credibility, the mean differences in perceived agent credibility indicate that the agent credibility design specified in this study is in the right direction. If this study had had control over individuals’ intrinsic differences in perception of agent credibility a significant difference would have been found between the two agent conditions. There has been much research on the effects of individual agent characteristics – both verbal and non-verbal – on recall and transfer. However, this study looked into many of the verbal and non-verbal agent characteristics collectively in one setting, and attempted to design credible agents and validate the agent credibility design. After all, this study shows that agent credibility can be manipulated by employing a variety of verbal and non-verbal agent behaviors or variables.

The capability of manipulating agent credibility provides an implication for pedagogical uses of agents. This study shows that agent credibility can make a significant difference in cognitive learning; unfortunately, it failed to prove the effect of agent credibility on affective learning (attitude change). Thus, it can be stated that cognitive learning can be enhanced by having credible agents present the instruction, but for now this may be limited to expository knowledge like copyright used for the present study.

Like agent credibility, this study shows that the fear arousing message design principles based on the Parallel Response Model and the Extended Parallel Response Model works to make differences in learners’ actual perception of fear of message across the three message conditions, even though the differences were not statistically significant. The results of this study show that the threat perceived by the learners is not of help for recall. It implies that statements arousing fear or threat in the instruction can hinder the learners from retaining simple facts from the instructional message. Especially, as supported by the finding of the significant interaction effect on recall between agent credibility and fear arousing message, when a pedagogical agent is perceived not credible by the learners the fear arousing statements in the instruction had more negative influence on their performance on recall.
Suggested Future Research

Future research is suggested based on the findings and discussions in the present study.

The present study employed two of the three main factors in the human communication-persuasion research. The two factors included in the study were message source and message factors and the excluded factor was recipients’ individual characteristics. This study assumed that the students in each of the six experimental conditions would perceive agent credibility and fear of message significantly differently from one another. There were differences among the experimental conditions; however, the differences were so small. It is thought that individual characteristics had a considerable influence on perceived agent credibility and fear of message. Along this line, it is suggested to include individual characteristics as one of the independent variables or consider the individual characteristics as covariates for controlling for them when looking into the effects of agent credibility and fear arousing message on attitude change.

In the present study, two agents differing in the level of credibility and three fear arousing messages differing in the degree of threat embedded in the message were developed and implemented and the students were randomly assigned to one of the experimental conditions. Considering individual differences in perceptions of agent credibility and fear of message, it would be suggested as a valid alternative study design to assign all the participants to one agent/message condition and measure their perceptions of agent credibility and fear of message, and then divide them into different groups according to their actual perception of agent credibility and fear of message. This way it would be possible to investigate how agent credibility and fear arousing message affect attitude change.

Regarding agent credibility, instead of assigning research participants to one of the agent conditions employed, allowing them to choose a pedagogical agent that they think looks most credible or least credible can be another way to identify the effect of agent credibility, like Baylor, Shen, and Huang did in their agent choice study (2003) where the participants were allowed to pick an agent they would like to learn from. In the
same vein, it would be meaningful to design several pedagogical agents intended to display different levels of credibility and ask learners which are more vs. less credible, prior to implementing any intervention through pedagogical agents.

This study attempted to identify the effects of agent credibility and agent credibility was manipulated with a variety of agent characteristics in one setting collectively. Mainly because this study did not find a significant difference between the more credible agent and the less credible agent in learners’ perceived agent credibility, it would be necessary to look into the effect of each of individual agent characteristics on perceived agent credibility to tease out differences in individual agent characteristics. For example, human voice and computer-generated voice can be compared in terms of their effects on perceived agent credibility and their subsequent effects on attitude change.

Lastly, it is suggested that a long-term effect of credible agents be examined by providing participants an opportunity to interact with the given agent for a long time like a month or semester, in that attitudes are usually formed or changed gradually through a relatively long period of time.

**Conclusions**

This study investigated how agent credibility and fear arousing message influence attitude change as well as recall and application in a pedagogical agent-based learning environment.

Attitude change in relation to agent credibility and fear arousing message was of primary interest of this study. This study, however, did not find the significant main effects for either agent credibility or fear arousing message and interaction effect between the two independent variables. This non-significant main and interaction effects can be explained by the non-significant differences among the experimental conditions in learners’ actual perceptions of agent credibility and fear of message in addition to agent and message design issues. Therefore, it is suggested to refine agent credibility and fear arousing message design to make each agent and message condition distinct from each other. In addition, individuals’ intrinsic differences in perceptions of agent credibility and fear of message need to be considered in order to fully understand the effects of agent
credibility and fear of message.

This study found the significant main effects for agent credibility in both recall and application tests. The more credible agent was more effective than the less credible agent in both tests. As far as cognitive learning is concerned, the results show that agent credibility matters. The main effect for fear arousing message was found significant in recall test only. The not threatening message was more effective than the strongly threatening message in recall test, but there were no significant differences between the not threatening message and the moderately threatening message and between the moderately threatening message and the strongly threatening message. Those non-significant differences can be explained by the corresponding non-significant differences in learners’ perceived fear of message. It was also found that there was a significant interaction effect between agent credibility and fear arousing message in recall. Given the less credible agent the not threatening message was effective than the strongly threatening message while there were no differences across the three message conditions given the more credible agent. This finding indicates that the less credible agent made the students perceived the message more threatening and the more threat they perceived from the message led them to learn less in recall test.

It was found that affective learning (attitude change) was not significantly correlated to cognitive learning (recall and application). The results showed that attitude change had little relationship with recall, but had a positive relationship – not significant - with application. Overall these little or non-significant relationships can be attributed to the non-significant differences among the experimental conditions in attitude change.

The learner’s perceived agent credibility showed that the agent conditions made the intended differences between the more credible agent and the less credible agent in each of the three sub-measures of agent credibility (expertise, trustworthiness, caring), even though the differences were not statistically significant. In all the three sub-measures of agent credibility the more credible agent was perceived as being with more expertise, trustworthiness, and caring than the less credible agent, comparing the mean scores for the two agent conditions. The non-significant difference between the two agent conditions may be explained by individuals’ intrinsic differences in perception of agent credibility. Interestingly, fear arousing message was found influencing learners’
perception of agent credibility significantly. That is, it was shown that the more threatening the message, the less credible they perceived the agent.

Lastly, the learners’ perceived fear of message showed that the fear arousing message conditions made the intended differences in learners’ perceived fear of message across the three message conditions, even though the differences did not reach a significance like in the perceived agent credibility. Individuals’ intrinsic differences in perception of fear of message may explain the not-significant differences in the perception of fear of message. It was also interesting that there was a significant main effect for agent credibility on the perception of fear of message. The students in the less credible agent condition perceived the message more threatening than those in the more credible agent condition.
APPENDIX A

FULL SCRIPTS OF THREE FEAR AROUSING MESSAGE CONDITIONS
**Fear Arousing Message**

<table>
<thead>
<tr>
<th>Screen #</th>
<th>Not Threatening</th>
<th>Moderately Threatening</th>
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<tr>
<td>1</td>
<td>This study is intended to see how you perceive both the animated character on the screen and the messages delivered by the animated character. You will take a lesson on copyrights that is delivered by an animated agent. Then you will be asked to answer some questions. <strong>Please wear the headset provided - or you have - and pay close attention to the animated character as well as what it says.</strong> When you're ready click on the &quot;Next&quot; button to get started. <strong>Next</strong></td>
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<td>2</td>
<td>Hello, I’m glad you could join me. I am Professor Keller [Chris]. Today I’m going to give an introduction to the subject of copyright and related rights. Then I’m going to present three specific copyright issues that you may typically run up against these days. This lesson will help you gain a basic understanding of copyright concepts, and understand if these laws matter to you by giving you a chance to think of copyrights more seriously. OK. Here are the basics.</td>
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<td>3</td>
<td>Intellectual property is property that your mind produces and intellectual property rights protect the interests of creators by giving them property rights over their creations. Intellectual property is usually divided into two branches, namely industrial property, which broadly speaking protects inventions, and copyright, which protects literacy and artistic works. Here we will put our focus on copyright. Copyright, one of two main branches of intellectual property, relates to artistic creations, such as books, music, paintings and sculptures, films and technology-based works such as computer programs and electronic databases. Briefly, copyright is known as authors rights in respect of literary and artistic creations. The expression authors rights refers to the creator of the artistic work, its author. It thus underlines the fact, recognized in most laws, that the author has certain specific rights in his or her creation which only he can exercise, such as the right to prevent a distorted reproduction. Other rights, such as the right to make copies, can be exercised by other persons, for example, a publisher who has obtained a license from the author.</td>
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<td>4</td>
<td>Industrial property protects inventions that may be defined in a non-legal sense as new solutions to technical problems. These new solutions are ideas that do not necessarily need to be represented in a physical embodiment. Unlike protection of inventions, copyright law protects only the form of expression of ideas, not the ideas themselves. The creativity protected by copyright law is creativity in the choice and arrangement of words, musical notes, colors and shapes. So copyright law protects the owner of property rights against those who copy or otherwise take and use the form in which the original work was expressed by the author. The legal protection of literacy and artistic works under copyright prevents only unauthorized use of the expressions of ideas. Copyright law can be simply declaratory. The law may state that the author of an original work has the right to prevent other persons from copying or otherwise using his work. So a created work is considered protected as soon as it exists, and a public register of copyright protected is not</td>
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For the purposes of copyright protection, the term "literacy and artistic works" is understood to include every original work of authorship, irrespective of its literacy or artistic merit. The ideas in the work do not need to be original, but the form of expression must be an original creation of the author.

The Berne Convention for the Protection of Literacy and Artistic Works, which is an international agreement about copyright, states that the expression literacy and artistic works shall include every production in the literacy, scientific and artistic domain, whatever may be the mode or form of its expression. The Convention also goes on to list the examples of works protected by copyright. The list includes books, choreographic works, musical compositions with or without words, painting and sculpture, photographic works, and works of applied works like illustration. The list, however, is not intended to be exhaustive.

The owner of copyright in a protected work may use the work as he wishes, and may prevent others from using it without his or her authorization. The rights granted under national laws to the owner of copyright in a protected work are normally exclusive rights to authorize a third party to use the work, subject to the legally recognized rights and interests of others.

There are two types of rights under copyright: economic and moral rights. Economic rights allow the rights owner to derive financial reward from the use of his works by others. Moral rights allow the author to take certain actions to preserve the personal link between the author and the work.

Most copyright laws state that the author or rights owner has the right to authorize or prevent certain acts in relation to a work. The right owner of a work can prohibit or authorize:

- Its reproduction in various forms, such as printed publications or sound recordings;
- The distribution of copies;
- Its public performance;
- Its broadcasting or other communication to the public;
- Its translation into other language;
- Its adaptation, such as a novel into a screenplay

There are some limitations on the rights protected under copyright. The first limitation is the exclusion from copyright protection of certain categories of works, which are not fixed in tangible form. For example, a work of choreography would only be protected once the movements were written down in dance notation or recorded on videotape. The second category of limitations concerns particular acts of exploitation, normally requiring the authorization of the rights owner, which may, under circumstances specified in the law, be carried out without authorization.

There are two basic types of limitations in this category: (1) free use, which carries no obligation to compensate the rights owner for the use of the work without authorization; and (2) non-voluntary licenses, which do require that compensation be paid to the rights owner for non-authorized exploitation.

Examples of free use include:
- Quoting from a protected work, provided that the source of the quotation and the name of the author is mentioned, and that the extent of the quotation is compatible with fair practice;
- Use of works by way of illustration for teaching purposes; and
- Use of works for the purpose of news reporting

In respect of free use for reproduction, many laws allow for individuals to reproduce a
work exclusively for their personal, private and non-commercial use. However, the ease and quality of individual copying made possible by recent technology has led the laws to narrow the scope of such provisions.

In addition to the specific categories of free use set out in national laws, the laws recognize the concept known as fair use or fair dealing. This allows use of works without the authorization of the rights owner, taking into account factors such as the nature and purpose of the use, including whether it is for commercial purposes; the nature of the work used; the amount of the work used in relation to the work as a whole; and the likely effect of the use on the potential commercial value of the work.

Non-voluntary licenses allow use of works in certain circumstances without the authorization of the owner of rights, but require that compensation be paid in respect of the use. Such licenses are called non-voluntary because they are allowed in the law, and do not result from the exercise of the exclusive right of the copyright owner to authorize particular acts.

Copyright does not continue indefinitely. The law provides for a period of time during which the rights of the copyright owner exist. The period or duration of copyright begins from the moment when the work has been created in a tangible form and it continues, in general, until some time after the death of the author. The purpose of this provision in the law is to enable the author’s successors to benefit economically from exploitation of the work after the author’s death. The duration of copyright provided for by national law is as a general rule the life of the author plus not less than 50 years after his death.

Well, I have explained the basics of copyright and related rights. From now on, I will present three specific issues of copyright that you may typically run up against in the Internet era.

Copyright and technology is a very hot topic today. For copyright owners, technology has dealt a lethal blow to the creator’s ability to control and prevent the copying of his or her works. The internet makes it very easy to copy files of all types and share them with other people but that does not make it ok or legal to do so. A survey on file-sharing and downloading over the Internet shows that many Internet users who download music say they do not care about whether the music they have downloaded is copyrighted. Moreover, the number of downloaders who say they do not care about copyright has increased. Under this background, the struggle to enforce copyright laws in the digital age continues to be an uphill battle for content owners.

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<th>Severity Information</th>
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<td>People argue that downloading simply supplements their regular music purchasing habits or serves as a form of sampling new music.</td>
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<td>Some have also been quoted as saying that the prices of music CDs are too high with too little profit going to the artists, while others say the music they want simply is not</td>
<td>[Severity Information] The legal battle to protect copyright was focused on the efforts of the Recording Industry Association of America. The Association has started targeting individuals who allegedly use file-sharing software to download and share copyrighted material. If people get caught, no matter how, for illegal music downloading/sharing they can face a lawsuit by the</td>
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Still others say that they are entitled to make fair use of the music they purchase by sharing it with friends over these networks.

Whatever the arguments, it is clear that millions of Americans have changed the way they find and listen to music and this change has made the content owners take legal actions against illegal music downloading and sharing.

recording industry group. The violators may be offered a chance to settle out of court. Actually, a female college student at University of Nebraska-Lincoln had to pay $3,000 to avoid being for 381 songs she downloaded illegally, $7.87 per song. In fact, people who do not take the offer face lawsuits and minimum damages of $750 for each copyrighted recording shared if they lose.

[Susceptibility Information]
You may think the recording industry group can’t catch everyone illegally downloading or sharing music. You may be right. Probably you read a news article about a female college student in University of Nebraska-Lincoln who was accused by the Recording Industry Association of America of illegally downloading 381 songs using the school’s computer network, as well as a file-sharing program called Ares Galaxy. Actually, the female student is just one of many students who have received letters from the recording industry group. If you have ever downloaded or shared music illegally and have not gotten caught yet, consider yourself lucky. Well, I know some of FSU students also have received letters from the recording industry organization. Any student on any campus in the country who is illegally downloading music may receive one of these letters. You could be one of them.

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<td>[Response Efficacy] The easiest way to avert such an unfortunate</td>
<td>[Severity Information] The legal battle to protect copyright was focused on</td>
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</table>
the efforts of the Recording Industry Association of America to challenge large file-sharing networks like Napster.

Though the Association won its case against Napster and effectively forced the site to shut down, a myriad of decentralized file-sharing services emerged and millions of Internet users simply migrated to the new systems. It lost an important case against the makers of peer-to-peer software like Morpheus and Grokster when a federal judge in Los Angeles ruled that the file-sharing software itself was legal, even if it was being used to distribute illegal copies of copyrighted music and movies.

The court ruling prompted a shift in the Association’s tactics from suing file-sharing companies to targeting individuals who allegedly use file-sharing software to download and share copyrighted material. As a result, the Recording Industry Association of America has started suing individual people consistently for years.

Probably you read a news article about a female college student in University of Nebraska-Lincoln who was accused by the Recording Industry Association of America of illegally downloading 381 songs using the school’s computer network, as well as a file-sharing program called Ares Galaxy.

The consequence is to quit illegal music downloading and sharing. If it is not that easy, good news is that there are some websites where we can get free music legally. These websites are compilations of free and legal MP3 music files. We can also feel free to share and distribute them with friends and family all we want. No more worries about being caught and no costs at all!

**[Self-Efficacy Information]**

I understand that you as a college student may be more likely tempted to be an illegal downloader and sharer. But I believe that you can overcome this temptation on your own will.

Moreover, you have good Internet search skills to find websites that allow you to download and share music files legally. Using such websites you can save yourself both money and the heartaches of worrying if you will get busted over illegal downloads.

For example, if you have got an email address ending in .edu, like your FSU Garnet email account, you can get free music legally from Ruckus.com. It is worth trying!

**[Susceptibility Information]**

You may think the recording industry group can’t catch everyone illegally downloading or sharing music. You may be right. Probably you read a news article about a female college student in University of Nebraska-Lincoln who was accused by the Recording Industry Association of America of illegally downloading 381 songs using the school’s computer network, as well as a file-sharing program called Ares Galaxy. Actually, the female student is just one of many students who have received letters from the recording industry group. If you have ever downloaded or shared music illegally and have not gotten
The letter from the Recording Industry Association of America to her said she might be sued but offered her the chance to settle out of court.

After all, she had no choice but to pay the cash settlement to avoid being sued. It was a hugely expensive lesson to her.

Let’s go on to the next copyright issue. With the advent of Internet, E-plagiarism has gained popularity in the recent years. Plagiarism is usually defined as the unauthorized use or close imitation of the ideas and language or expression of someone else. E-plagiarism started when Internet and computer technology expanded the acts of traditional plagiarism. It carries with it its own importance and disadvantages to the academic society.

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<td>The emergence of E-plagiarism is always on purpose, and fully understood by students who are actively participating in it. There is a difference between students who plagiarize and students who do not. Educators explain this difference. A student who attempts, even if clumsily, to identify and credit his or her source, but who misuses a specific citation format or incorrectly uses quotation marks or other forms of identifying material taken from other sources, has not plagiarized. Instead, such a student should be considered to have failed to cite and document sources appropriately. On the other hand, students who are fully aware that their actions constitute plagiarism, for example, copying published information into a paper without source attribution for the purpose of claiming the information as their own, or turning in material</td>
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<td>[Severity Information] Taking someone’s work as your own can lead to plagiarism even though what you took from someone’s work is just a small piece. Although one will successfully complete his or her academic tasks by plagiarizing others’ work using the Internet, one will experience dissatisfaction and fear in doing so. As a consequence, you can get a fail grade in your course and in a worse case you can be suspended for a semester or more. According to the law, plagiarism can get you sued against copyright laws. Once it turns out you are guilty you may be ordered to pay between $2,500 and $25,000.</td>
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<td>[Susceptibility Information] As in the case of illegal music downloading and sharing, you may think that nobody knows whether someone committed plagiarism or now, and thus you may be tempted to take some elements from others’</td>
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caught yet, consider yourself lucky. Well, I know some of FSU students also have received letters from the recording industry organization. Any student on any campus in the country who is illegally downloading music may receive one of these letters. You could be one of them.
| written by another student- | work to complete your assignments without referencing them. You know what, academics at all universities and colleges can now test students' work for cheating using software programs, aimed at combating the growing problem of internet plagiarism. Those programs offer a plagiarism detection service to all education institutions. Actually, the BlackBoard system we have been using also provides a plagiarism detection service to the FSU faculty. So you could be called by your professor for plagiarism anytime if you commit plagiarism. own, or turning in material written by another student- |
|---|---|---|
| are guilty of academic misconduct. | are guilty of academic misconduct. | |

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<td>In fact, many students do not have a good understanding of plagiarism. Some say that using an original resource for educational purposes falls into the category of fair use. Others say that copying the entire resource is violating copyright law, but copying just some of it is acceptable because it is a non-commercial use. Another reason why e-plagiarism happens among students is that they may experience personal conflicts such as expecting perfectionism as well as setting up unrealistic high expectations for themselves, as a result from peer pressure or willingness to compete. It is also true that e-plagiarism happens because of other possible factors. The possible factors influencing student behaviours and attitudes toward plagiarism include [Response Efficacy] The way of preventing plagiarism is really simple. Always give credit where credit is due. All ideas, judgments, and inferences of others that are not your own must be attributed. And, ask permission to use someone else’s work. A polite request is often granted. What dishonors us is not to indicate what we took from others’ work to improve our work, but to try to conceal this fact. [Self-efficacy Information] You may think it is difficult to reference someone else’s work in correct citation format. However, there is a belief that a student who attempts, even if clumsily, to identify and credit his or her source, but who misuses a specific citation format or incorrectly uses quotation marks or other forms of identifying material taken from other sources, has not plagiarized. Citation formats [Severity Information] Taking someone’s work as your own can lead to plagiarism even though what you took from someone’s work is just a small piece. Although one will successfully complete his or her academic tasks by plagiarizing others’ work using the Internet, one will experience dissatisfaction and fear in doing so. As a consequence, you can get a fail grade in your course and in a worse case you can be suspended for a semester or more. According to the law, plagiarism can get you sued against copyright laws. Once it turns out you are guilty you may be ordered to pay between $2,500 and $25,000. [Susceptibility Information] As in the case of illegal music downloading and sharing, you may think that nobody knows whether someone committed</td>
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ignorance, lack of personal investment in their education, situational ethics, and lack of consistent styles among and within various disciplines.

are not as difficult as you think and what is more important is that you tried to reference someone else's work.

plagiarism or now, and thus you may be tempted to take some elements from others' work to complete your assignments without referencing them. You know what, academics at all universities and colleges can now test students' work for cheating using software programs, aimed at combating the growing problem of internet plagiarism. Those programs offer a plagiarism detection service to all education institutions. Actually, the BlackBoard system we have been using also provides a plagiarism detection service to the FSU faculty. So you could be called by your professor for plagiarism anytime if you commit plagiarism.

Another copyright issue I want to talk to you about is copyright infringement of computer software programs, also known as software piracy. A 2007 survey on software piracy indicates that 61 percent of students reported never or rarely paying for commercial software programs, and that 35 percent of the software installed on computers worldwide was pirated (copied illegally) representing a loss of nearly $33 billion.

<table>
<thead>
<tr>
<th>16</th>
<th>Another copyright issue I want to talk to you about is copyright infringement of computer software programs, also known as software piracy. A 2007 survey on software piracy indicates that 61 percent of students reported never or rarely paying for commercial software programs, and that 35 percent of the software installed on computers worldwide was pirated (copied illegally) representing a loss of nearly $33 billion.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unless it has been placed in the public domain, software is also protected by copyright law. The owner of a copyright holds exclusive right to the reproduction and distribution of his or her work. Therefore, it is illegal to duplicate or distribute software or its documentation without the permission of the copyright owner. Almost without exception, the owner of a software title is the author, creator or publisher. When software is purchased, what is being sold is the right to use the</td>
</tr>
<tr>
<td>[Susceptibility Information] Software piracy among</td>
</tr>
</tbody>
</table>
The copyright infringement of software refers to several practices when done without the permission of the copyrighted holder. First, creating a copy and/or selling it are the act of software piracy and are unlikely to be fair use if the work remains commercially available. Second, creating a copy and giving it to someone else are also the act of software piracy. This constitutes copyright infringement in most cases. How about creating a copy to serve as a backup or renting the original software to friends? Software licenses often never restrict the usual right of a purchaser of a copyrighted work to make a backup copy or let others borrow.

### [Response Efficacy]

Software license agreements usually are not easy to understand because they use many legal terms. A good rule of thumb to follow is one software package per computer. It will help you avoid most copyright infringements you can commit without realizing. As a college student you can purchase academic versions of software, which are much cheaper. Another way is to use alternative free software programs to commercial software programs. For example, as an alternative to Microsoft Office, OpenOffice is available for free to everyone and it is as sophisticated as Microsoft Office.

### [Severity Information]

Florida Law says that if you copy software illegally, you face jail and fines. In Florida, you could get a Misdemeanor of the First Degree, go to prison for a year and be fined $1000 or more. OR You could get a Felony of the Second Degree where you can go to jail for up to 15 years and be fined at least $10,000. OR you could get a Felony of the Third Degree, which is up to five years in prison and a fine of at least $5000. That’s what the statute says.

### [Susceptibility Information]

Software piracy among college students is increasing, and the software publishing industry insists colleges...
the work. However, these practices can be infringement, depending on the case.

Copyright infringement of software is extremely common in many countries including the United States. Software piracy is illegal due to the perceived economic loss it inflicts on the copyright owner. Software authors suggest that copyright infringement negatively affects the economy by decreasing the profits that allow for further development and growth within the software industry. The United States is the country most affected, as they provide about 80% of the world’s software. Software counterfeiting is claimed to be a large problem by some, resulting in a huge revenue loss.

<table>
<thead>
<tr>
<th>Self-Efficacy Information</th>
<th>Once you decide to follow the recommendations I just mentioned copyright infringements have nothing to do with you anymore. The only thing you need is to make some time to research using search engines like Google, which you use in everyday life, in order to find the alternative ways.</th>
</tr>
</thead>
</table>

are responsible for the activities of their computer nets’ users. A strong majority of professors and administrators support enforcement of policies designed to prevent piracy with 62 percent saying the commercial software industry should take whatever steps are necessary to ensure students get their software legally. And with the software detecting devices available these days, it’s not such a leap to believe that you could get caught. Especially being a university student that’s usually automatically suspect to begin with! Do you want to risk the penalties if you’re caught?

| 19 | Eventually, copyright is dedicated to promoting creativity and innovation by ensuring that the rights of creators and owners are protected worldwide. You can be a copyright author in the near future as well as a user of someone else’s copyrighted work. Then, you may be insisting that copyright should be taken more seriously and protected. Hopefully, this talk helped you learn about copyright law and how it applies to you, and I also hope this gave you a chance to think about the issue of copyright more seriously. Thanks for your time. |

Note. The scripts in the table were developed based on those for the study conducted by Baylor, Kim, Son, & Lee (2006).
APPENDIX B

SCREENSHOTS OF INSTRUCTIONAL MODULE
<table>
<thead>
<tr>
<th>Screen</th>
<th>Less Credible Agent</th>
<th>More Credible Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This study is intended to see how you perceive both the animated character on the screen and the messages delivered by the animated character. You will take a lesson on copyrights that is delivered by an animated agent. Then you will be asked to answer some questions. Please wear the headset provided - or you have - and pay close attention to the animated character as well as what it says. When you're ready click on the &quot;Next&quot; button to get started.</td>
<td>This study is intended to see how you perceive both the animated character on the screen and the messages delivered by the animated character. You will take a lesson on copyrights that is delivered by an animated agent. Then you will be asked to answer some questions. Please wear the headset provided - or you have - and pay close attention to the animated character as well as what it says. When you're ready click on the &quot;Next&quot; button to get started.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Welcome! Copyright Lesson</strong></td>
<td><strong>Welcome! Copyright Lesson</strong></td>
</tr>
<tr>
<td>3</td>
<td><strong>What is Copyright?</strong> (continued)</td>
<td><strong>What is Copyright?</strong> (continued)</td>
</tr>
<tr>
<td>4</td>
<td><strong>What is Copyright?</strong> (continued)</td>
<td><strong>What is Copyright?</strong> (continued)</td>
</tr>
<tr>
<td>Screen 13</td>
<td>E-Plagiarism</td>
<td>E-Plagiarism</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Screen 14</td>
<td>E-Plagiarism (continued)</td>
<td>E-Plagiarism (continued)</td>
</tr>
<tr>
<td>Screen 15</td>
<td>E-Plagiarism (continued)</td>
<td>E-Plagiarism (continued)</td>
</tr>
<tr>
<td>Screen 16</td>
<td>Software Piracy</td>
<td>Software Piracy</td>
</tr>
</tbody>
</table>
APPENDIX C

USE OF HUMAN SUBJECTS IN RESEARCH - APPROVAL MEMORANDUM
Subject: Use of Human Subjects in Research - Approval Memorandum

From: Human Subjects <humansubjects@magnet.fsu.edu>

Date: Monday, February 18, 2008 10:09 am

To: cs032@fsu.edu

Cc: jkeller@fsu.edu

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8973 - FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 2/19/2008

To: Chanhee Son

Address: 2074 Midyette Road Apt. 1322 Tallahassee, FL 32301
Dept.: EDUCATIONAL PSYCHOLOGY AND LEARNING SYSTEMS

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
The Effects of Pedagogical Agent-Delivered Persuasive Messages on Learners' Attitude Change

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be Exempted per 45 CFR § 46.110(7) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 2/13/2009 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: John Keller, Advisor
HSC No. 2007.533

https://webmail.campus.fsu.edu/print.html 9/18/2008
APPENDIX D

DEMOGRAPHIC INFORMATION & PRIOR KNOWLEDGE/EXPERIENCE
## Demographic Information

<table>
<thead>
<tr>
<th>First Name:</th>
<th>Last Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender:</th>
<th>Male ( )</th>
<th>Female ( )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Last 4 Digits of Your SSN:</th>
<th>__________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Your Ethnicity:</th>
<th>Asian/Asian American ( )</th>
<th>African American ( )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Caucasian ( )</td>
<td>Hispanic ( )</td>
</tr>
<tr>
<td></td>
<td>Other (Please Specify)</td>
<td>______________________</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age:</th>
<th>Year in School:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Prior Experience with Pedagogical Agents

* Do you know what a pedagogical agent is?  
  Yes ( )  No ( )  
  If yes, describe below what you think it is.

* Please indicate the degree of your prior experience with pedagogical agents, if any.

<table>
<thead>
<tr>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>
1. List three types of intellectual property.

(1)
(2)
(3)

2. Copyright owners have:

(1) Exclusive rights to their materials
(2) Unlimited copyright protection for their creative expression
(3) Copyright protection with limitations such as a fair use
(4) All of the above

3. A copyrighted MP3 file you downloaded after paying for it can be emailed to your friends so that they can listen to it.

True (   ) False (   )

Please describe why you think so, based on what you learned from the instruction.

4. Once you purchase a copyrighted software program CD you can make a copy of it and give it to your friends anytime.

True (   ) False (   )

Please describe why you think so, based on what you learned from the instruction.

5. Define electronic plagiarism.

6. It is acceptable to present someone’s PowerPoint slides as your own without citations as long as you make some changes to them.

True (   ) False (   )
Please describe why you think so, based on what you learned from the instruction.

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. What does the Digital Millennium Copyright Act prohibit?</td>
<td></td>
</tr>
<tr>
<td>8. What does the Doctrine of Fair Use allow you to do?</td>
<td></td>
</tr>
<tr>
<td>9. According to Florida law, when people commit an offense against intellectual property, what would be the consequence of it?</td>
<td></td>
</tr>
<tr>
<td>10. You can borrow an original software program CD a friend of yours purchased in order to install it on your own computer.</td>
<td>True (   ) False (   )</td>
</tr>
</tbody>
</table>

Please describe why you think so, based on what you learned from the instruction.
APPENDIX F

APPLICATION TEST ITEMS
Please assume that you are in the situations described below. What are your judgments about whether you can do this or not? Based on the information from this module and your opinion, please explain why you think you can do this (or cannot do this).

**Scenario 1**
In your class on public speaking, you have to give a speech about computer animation. While researching the topic, you find a website with a great article about digital animation. You send an email to the author asking if you can use part of the article in your speech. The author has no problem with that and says that – you can use whatever you want. So you're about to use two paragraphs from the article word-for-word in your speech.

**Scenario 2**
You saw the movie *The Lord of the Rings: The Return of the King in the theater*. You liked it so much that you bought it on DVD as soon as it came out. Because you’re studying film at FSU’s film school, you store movies on your computer and use video editing software to find out how they were made. But you don’t burn the movies or give them to your friends. Now, you want to store *The Return of the King* in “My Documents” folder on your computer, which is shared on your apartment complex network.
This questionnaire includes five questions, each of which comes in pairs. You will be given a statement that expresses a BELIEF, and this will be followed by a question regarding your EVALUATION of the belief.

For each BELIEF statement, indicate the degree to which you agree or disagree with it by circling the appropriate number. For each EVALUATION statement, indicate the degree to which you believe this is good or bad by circling the appropriate number.

Example:

<table>
<thead>
<tr>
<th>Belief</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking cigarettes will make your friends like you better.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Very Good</th>
<th>Good</th>
<th>Neutral</th>
<th>Bad</th>
<th>Very Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that making your friends like you better is:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

For example, if you “Strongly Disagree” with the BELIEF statement, then you circle Number 1. Similarly, if you think the EVALUATION statement – making your friends like you better – is “Good”, and then circle Number 2.

Now, read each pair of items and circle the appropriate responses to indicate you beliefs and evaluations.

<table>
<thead>
<tr>
<th>Belief</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keeping copyright laws makes you feel comfortable</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Very Good</th>
<th>Good</th>
<th>Neutral</th>
<th>Bad</th>
<th>Very Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that making you feel comfortable is:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Belief</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keeping copyright laws makes your friends like you better</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Very Good</th>
<th>Good</th>
<th>Neutral</th>
<th>Bad</th>
<th>Very Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that making your friends like you better is:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Belief</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagiarizing helps you get a good grade</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Very Good</th>
<th>Good</th>
<th>Neutral</th>
<th>Bad</th>
<th>Very Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that getting a good grade is:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Belief</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copying a music CD you purchased and giving a copy of it to your friends make your friends like you better</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Very Good</th>
<th>Good</th>
<th>Neutral</th>
<th>Bad</th>
<th>Very Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that making your friends like you better is:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Belief</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downloading music or movies illegally saves you money</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Very Good</th>
<th>Good</th>
<th>Neutral</th>
<th>Bad</th>
<th>Very Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that saving money is:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
APPENDIX H

PERCEIVED AGENT CREDIBILITY MEASURE
Instructions: Please indicate how you perceived the agent by circling the number that best describes your perceptions.

1. Please indicate how you perceived the agent in terms of “Intelligence.”
   10 9 8 7 6 5 4 3 2 1
   Intelligent Unintelligent

2. Please indicate how you perceived the agent in terms of “Smartness.”
   10 9 8 7 6 5 4 3 2 1
   Smart Dumb

3. Please indicate how you perceived the agent in terms of “Capability.”
   10 9 8 7 6 5 4 3 2 1
   Capable Incapable

4. Please indicate how you perceived the agent in terms of “Trustworthiness.”
   10 9 8 7 6 5 4 3 2 1
   Trustworthy Untrustworthy

5. Please indicate how you perceived the agent in terms of “Honesty.”
   10 9 8 7 6 5 4 3 2 1
   Honest Dishonest

6. Please indicate how you perceived the agent in terms of “Reliability.”
   10 9 8 7 6 5 4 3 2 1
   Reliable Unreliable

7. Please indicate how you perceived the agent in terms of “Sincerity.”
   10 9 8 7 6 5 4 3 2 1
   Sincere Insincere

8. Please indicate how you perceived the agent in terms of “Compassionatness.”
   10 9 8 7 6 5 4 3 2 1
   Compassionate Not compassionate

9. Please indicate how you perceived the agent in terms of “Selfishness.”
   10 9 8 7 6 5 4 3 2 1
   Unselfish Selfish

10. Please indicate how you perceived the agent in terms of “Friendliness.”
    10 9 8 7 6 5 4 3 2 1
    Friendly Unfriendly

11. Please indicate how you perceived the agent in terms of “Cooperativeness.”
    10 9 8 7 6 5 4 3 2 1
    Cooperative Competitive

12. Please indicate how you perceived the agent in terms of “Warmness.”
    10 9 8 7 6 5 4 3 2 1
    Warm Not Warm
APPENDIX I

PERCEIVED FEAR OF MESSAGE MEASURE
Please indicate whether your Strongly Agree (SA), Agree (A), are Neutral (N), Disagree (D), or Strongly Disagree (SD) with each of the following statements.

<table>
<thead>
<tr>
<th>The message delivered by the agent made you feel</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>frightened</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tense</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nervous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>anxious</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uncomfortable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nauseated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX J

SHAPIRO-WILK NORMALITY TESTS
FOR ATTITUDE CHANGE, RECALL, APPLICATION, &
PERCEIVED FEAR OF MESSAGE
<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Condition</th>
<th>Shapiro-Wilk Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude Change</strong></td>
<td>LC-NT</td>
<td>.978</td>
<td>54</td>
<td>.418</td>
</tr>
<tr>
<td></td>
<td>LC-MT</td>
<td>.934*</td>
<td>55</td>
<td>.005</td>
</tr>
<tr>
<td></td>
<td>LC-ST</td>
<td>.979</td>
<td>57</td>
<td>.441</td>
</tr>
<tr>
<td></td>
<td>MC-NT</td>
<td>.976</td>
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</table>

*Note. LC: Less Credible / MC: More Credible  
NT: Not Threatening / MT: Moderately Threatening / ST: Strongly Threatening*
APPENDIX K

LEVIENE’S TESTS
FOR ATTITUDE CHANGE, RECALL, APPLICATION, &
PERCEIVED FEAR OF MESSAGE
Levene's Test of Equality of Error Variances for Attitude Change

<table>
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Note. The raw score of Attitude Change retained.

Levene's Test of Equality of Error Variances for Recall

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Note. The raw score of Recall was square rooted.

Levene's Test of Equality of Error Variances for Application

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Note. The raw score of Application was inverted.

Levene's Test of Equality of Error Variances for Perceived Fear of Message

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Note. The raw score of Perceived Fear of Message retained.
APPENDIX L

SHAPIRO-WILK NORMALITY TESTS
FOR THREE SUB-MEASURES OF
PERCEIVED AGENT CREDIBILITY
<table>
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*Note.* LC: Less Credible / MC: More Credible
NT: Not Threatening / MT: Moderately Threatening / ST: Strongly Threatening
APPENDIX M

BOX TESTS FOR THREE SUB-MEASURES OF PERCEIVED AGENT CREDIBILITY
Box's Test of Equality of Covariance Matrices For Perceived Agent Credibility

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APPENDIX N

LEVENE’S TESTS FOR THREE SUB-MEASURES OF PERCEIVED AGENT CREDIBILITY
Levene's Test of Equality of Error Variances for Perceived Agent Credibility

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<td>Agent Caring</td>
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APPENDIX O

INFORMED CONSENT FORM
AN INVESTIGATION OF THE EFFECTS OF PEDAGOGICAL AGENT-DELIVERED PERSUASIVE MESSAGES ON LEARNERS’ ATTITUDE CHANGE

Principal Investigator: Chanhee Son
Educational Psychology and Learning Systems, Florida State University

Dear Student,

The principal investigator, Chanhee Son, in the College of Education requests your participation in a research study at FSU entitled "The Effects of Pedagogical Agent-Delivered Persuasive Messages on Learners’ Attitude Change." The purpose of the research is to investigate the effectiveness of pedagogical agents (i.e., personified talking character) and persuasive messages on learning and attitude change. Participants of this course have been selected due to the fact that the content of the course reflects computer-related issues. Participants must be at least 18 years old to participate. As a compensation for participation participants will be given an extra credit for this computer-related course you are enrolled in.

The activities for which data will be collected involve using a computer and answering questions regarding your perceptions on pedagogical agent and persuasive message and will involve approximately 45 minutes of your time. There are minimal risks if you agree to allow your data to be included. The minimal risks may include anxiety or boredom when interacting with the computer agent. Some computer agent’s messages might also be upsetting to you. The researcher will be available to talk to you about any emotional discomfort you may experience while participating. The possible benefits of your participation in this research study (e.g., allowing your data to be included) are increased knowledge about using computer-based techniques to help improve learning. Further, your participation will contribute to the development of strategies for improving overall learning and enhancing attitude change toward a social issue.

The researcher, Chanhee Son, will do the following to maintain confidentiality of your records: collect and store data in a locked office, destroy any master list containing identifying information of participants. Confidentiality will be kept to the extent afforded by law. Your name, which is the only personally identifying information to be gathered from you, will be deleted immediately after the researcher double-checks what experimental condition you were in for this study. So the results of this research study may be published but your name or identity will never be revealed. Any questions you have concerning the research study or your participation in it, before or after your consent, will be answered by Chanhee Son, Department of Educational Psychology and Learning Systems, 307 Stone Building, (850) 284-6247 or Dr. John Keller, Department of Educational Psychology and Learning Systems, 307 Stone Building (850) 644-8790. If you have questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Office of the Vice President for Research, at (850) 644-8633.
By checking the box below “Yes” and then pressing the "Next" button, you indicate that you have read the above informed consent form and understand that you may withdraw your consent and discontinue participation at any time without penalty or loss of benefits to which you may otherwise be entitled. You can also opt out to not participate in the study by checking the box below “No.” In signing this consent form, you are not waiving any legal claims, rights or remedies. A copy of this consent form will be offered to you.

☐ Yes  ☐ No
REFERENCES


BIOGRAPHICAL SKETCH

EDUCATION

Educational Psychology & Learning Systems, Florida State University, Tallahassee, Florida
Dissertation Chair: John M. Keller, PH.D.
Dissertation Title: “The Effects of Pedagogical Agent-Delivered Persuasive Messages on Learners’ Attitude Change”

M.S. in Instructional Systems (May 2004)
Educational Psychology & Learning Systems, Florida State University, Tallahassee, Florida
Master’s Portfolio: Instructional Design & Development Competency Report

B.S. in Biology (Feb. 2000)
Korean University, Seoul, South Korea

AWARDS AND HONORS

Graduate Student Research Presentation Expenses Award (2005)
College of Education’s Council on Research in Education, Florida State University

Congress of Graduate Students, Florida State University

Hanil Co., Ltd. Seoul, South Korea

TEACHING/TRAINING EXPERIENCE

Instructor (Jan. 2007~Apr. 2009)
EME2040: Introduction to Educational Technology
Educational Psychology & Learning Systems, Florida State University, Tallahassee, Florida
  • Taught the undergraduate course “Introduction to Educational Technology” encompassing: using computer and web applications as instructional tools; applying a systemic instructional design; & implementing innovative instructional technologies

Teaching Assistant (Jan. 2006~Apr. 2006)
Childhood Education, Reading, and Disability Services, Florida State University, Tallahassee, Florida

- Assisted Prof. Carolyn Piazza in designing five (5) BlackBoard™ courses supplementary to face-to-face graduate courses including:
  - LAE 5319: Teaching Oral and Written Expression in the Elementary School
  - LAE 5415: Investigation in Children’s Literature
  - LAE 5738: Linguistic Research in Reading and Language Arts
  - RED 5109: The Development and Assessment of Emergent Reading and Writing
  - RED 5947: Seminar and Practicum in Reading and Language Arts

Teaching Assistant (Jan. 2005–Apr. 2005)

EME 6507: Multimedia Design & Development
Educational Psychology & Learning Systems, Florida State University, Tallahassee, Florida

- Implemented individual help sessions to graduate students on Macromedia MX 2004


Introduction to Course Management System & Course Website
iBOOKLAND Co., Ltd. Seoul, South Korea

- Designed and delivered a one-day train-the-trainer course on the company’s course management system to branch offices’ training staff; and Communicated with training staff to help them address training issues and improve their training skills


Mathematics & English Grammar Courses
Young-Jae Academy, Seoul, South Korea

- Taught Mathematics and English grammar to middle and high school students; and Tutored individual students at risk due to poor grades

RESEARCH EXPERIENCE

Research Assistant (Jan. 2007–May 2008)

IMPRINT (IMproved Performance Research INtegration Tool) Project
Funded by the U.S. Air Force, Learning Systems Institute, Florida State University

- Worked in the project team to develop training models/specifications for the U.S. Air Force to utilize in a computer simulation program (IMPRINT)
- Conducted literature review and synthesized findings; proposed experimental study designs; traveled to research sites to implement research studies and collect empirical data; and analyzed and interpreted data
- Drafted, reviewed, and revised research papers and technical reports


Writing Disposition Survey Research
Childhood Education, Reading, and Disability Services, Florida State University,
Tallahassee, Florida

- Assisted Prof. Carolyn Piazza in developing and implementing the Writing Disposition Survey
- Proposed research designs and statistical techniques for survey research

**Research Assistant** (Jan. 2004–Apr. 2006)

*Animated Pedagogical Agent Research with an Emphasis in the Use of Mobile Devices*

Center for Research of Innovative Technology for Learning (RITL), Learning Systems Institute, Florida State University, Tallahassee, Florida

- Led two research projects: “Pedagogical Agent Non-Verbal Communication Research” and “Handheld-Based Pedagogical Agent Research”
- Coordinated project team meetings and followed up on the meetings to make progresses as scheduled, and established research logistics
- Compiled and analyzed data; and Drafted, reviewed, and revised research papers

**Research Assistant** (May 2005–Apr. 2006)

*Cognitive Load Theory Research*

Instructional Systems, Educational Psychology & Learning Systems, Florida State University, Tallahassee, Florida

- Worked in the research team led by Prof. Zane Olina to design and conduct research studies on cognitive load theory
- Assisted in finalizing study materials; traveled to research sites to implement studies and collect data; and assisted in analyzing collected data

**Researcher** (Jan. 2003–Present)

*Mobile Learning Research*

Mobile Learning Research Lab ([http://www.m-learninglab.com](http://www.m-learninglab.com)), Seoul, South Korea

- Worked in the research team to design and conduct research studies on the use of mobile devices for educational purposes
- Proposed, designed, and conducted research studies; and analyzed data
- Drafted, reviewed, and revised research papers/reports
- Designed and developed the website of the research lab

### PROFESSIONAL EXPERIENCE

**Instructional Designer/Program Reviewer** (Mar. 2008–Aug. 2008)

Child Support Enforcement Program, Operational Procedures and Training, Florida Department of Revenue, Tallahassee, Florida

- Conducted a gap analysis of the Child Support Enforcement Automated Systems (CAMS) curricular (existing 8 web-based training courses) as it pertained to upcoming CAMS software upgrade
- Revised and modified the curricular to support the system upgrade using multimedia tools including Flash and Captivate


Office of Professional Development, Florida Department of Revenue, Tallahassee,
Florida

- Assisted in designing a web-based course on BlackBoard™ for Florida Tax Collectors, and conducting formative evaluation of the web-based course
- Communicated with subject matter experts and program evaluators to make sure the course content complies with state laws and/or rules

**Instructional Designer / Project Manager** (Feb. 2000~ May. 2002)
iBOOKLAND Co., Ltd. Seoul, South Korea

- Managed two instructional design & development projects for designing and developing: (1) a course management system and (2) a web-based course on reading clinics
- Participated in the design, development, and evaluation of a course management system and a web-based course on reading clinics

The Arm of Troop Information & Education of a Battalion, SungNam, South Korea

- Planned, implemented, and evaluated annual educational programs for 600 privates in the battalion commander

**PUBLICATIONS**

**Papers in Referred Journals**


**Papers in Referred Proceedings**


**PRESENTATIONS**

**International and National Conferences**


**PRODUCTIONS**

**Web-Based Training Development**
“Child Support Enforcement Automated Management System (CAMS)”
Child Support Enforcement, Florida Department of Revenues

**Pedagogical Agent-Supported Web-Based Instructional Module (Design)**
“Introduction to Intellectual Property”
Center for Research of Innovative Technologies for Learning, Learning Systems Institute Florida State University

**BlackBoard™-Based Online Instruction (Design & Development)**
“Property Tax for Florida Tax Collectors” Florida Department of Revenue

**Handheld-Based Instruction (Design & Development)**
“Introduction to Intellectual Property”
Center for Research on Innovative Technologies for Learning (RITL)
Available at [http://www.m-learninglab.com/portfolio/handhelds/](http://www.m-learninglab.com/portfolio/handhelds/)

**Website/Multimedia Design & Development**
- Mobile Learning Research Lab ([http://www.m-learninglab.com](http://www.m-learninglab.com))
- Center for Research on Innovative Technologies for Learning (RITL)
  Available at [http://www.m-learninglab.com/portfolio/flash/](http://www.m-learninglab.com/portfolio/flash/)

**PROFESSIONAL SERVICE**

**Graduate Student Volunteer of AECT (2005)**
Association for Educational Communications and Technology, Orlando, Florida.

**Volunteer for FSU Instructional Systems Reception at AECT (2004)**
Association for Educational Communications and Technology, Orlando, Florida.

**Graduate Student Volunteer of SITE (2003)**
Society for Information Technology and Teacher Education, Atlanta, Georgia.

**Graduate Student Volunteer of E-Learn** (2003)

**Forum Leader** (2001~2003)
E-Learning Forum, Samsung SDS (http://www.sds-epartner.com), Seoul, South Korea

**COMMUNITY SERVICE**

Tallahassee Korean Baptist Church, Tallahassee, Florida

**President** (Jun. 2005~May 2006)
Instructional Systems Korean Student Association, Florida State University, Tallahassee, Florida

**Assistant Treasurer** (Jan. 2004~Jul. 2007)
Tallahassee Korean Baptist Church, Tallahassee, Florida

**President** (Aug. 2005~Jul. 2007)
Korea University Alumni Association at FSU, Florida State University, Tallahassee, Florida

**Secretary** (Jun. 2004~May. 2005)
Tallahassee Korean Student Association, Florida State University, Tallahassee, Florida

**PROFESSIONAL MEMBERSHIP**

**In United States**
- Association for Educational Communications and Technology (AECT)
- Association for the Advancement of Computing in Education (AACE)
- American Society for Training & Development (ASTD)

**In Korea**
- The Korean Society for Educational Technology (KSET)
- Korea Association for Computer Education (KACE)