THE EFFECT OF FIELD-DEPENDENCY AND SEDUCTIVE

AUGMENTATION ON ACHIEVEMENT AND COMPUTER SELF-EFFICACY

IN A VIRTUAL WORLD

A Dissertation

by

ZAHRA MOGHADASIAN RAD

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2011

Major Subject: Curriculum and Instruction

The Effect of Field-Dependency and Seductive Augmentation on Achievement and

Computer Self-Efficacy in a Virtual World

THE EFFECT OF FIELD-DEPENDENCY AND SEDUCTIVE

AUGMENTATION ON ACHIEVEMENT AND COMPUTER SELF-EFFICACY

IN A VIRTUAL WORLD

A Dissertation

by

ZAHRA MOGHADASIAN RAD

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Approved by:

Co-Chairs of Committee, Ronald Zellner
　　　　　　　　　　　　B. Stephen Carpenter, II
Committee Members,　　Homer Tolson
　　　　　　　　　　　　Trina Davis
Head of Department,　　Yeping Li

December 2011

Major Subject: Curriculum and Instruction

ABSTRACT

The Effect of Field-Dependency and Seductive Augmentation on Achievement and

Computer Self-Efficacy in a Virtual World. (December 2011)

Zahra Moghadasian Rad, B.A., Tehran University; M.A., Tehran University; M.S.,

Texas A&M University

Co-chairs of Advisory Committee: Dr. Ronald Zellner
Dr. B. Stephen Carpenter, II

Keeping a learner interested—and therefore engaged—in content to be mastered generally improves learning. One way to keep a learner interested is using seductive augmentation, which refers to the addition of entertaining text, graphics, sound, music, video or animation that is either irrelevant or only tangentially relevant to the learning objectives.

Learner cognitive styles impact how individuals approach learning and problem-solving situations. With recent advances in technology, there has been an increased interest in the way such individual differences influence performance while learning. Research on the effects of cognitive styles has mainly focused on the role of field-dependence/independence.

One of the recent advances in technology is the availability of virtual worlds as learning environments. This study investigated whether seductive augmentation in Second Life, a commonly used virtual world, affects the learning performance of field-

dependent and field-independent education majors in an undergraduate class unit. A second focus of this study was to examine whether the computer self-efficacy of these learners changed after their two-month experience with the virtual world of Second Life.

To determine if seductive augmentation in Second Life affects the achievement of field-dependent and field-independent learners differently, two different settings were designed in two different regions of Second Life. One setting was free of seductive augmentation, but the other setting included seductive augmentation in the forms of music, animation, text, videos and games. Thirty-six participants self-selected to the seductive setting and 48 to the non-seductive setting. The participants were pre- and post-tested on the instructional content presented both in Second Life and in real life classes; furthermore, to examine the influence on learners' computer self-efficacy, pre- and post-computer self-efficacy surveys were administered.

The results of the study were obtained through two independent mixed-model factorial analyses of variance with repeats on the third factor (time) for achievement and computer self-efficacy scores. For the main effects, results indicated no significance for the between-group factors of field-dependency and seductiveness or for their interaction with either achievement scores or computer self-efficacy scores. The only significant factor was time as the main within-group factor for achievement scores. Therefore, the study did not find seductive augmentation effect in Second Life. In addition, there was no detectable change in the participants' computer self-efficacy as a result of their experience in this virtual world. The results of the present study contradict the findings of some previous research and support others.

DEDICATION

I dedicate this dissertation to:

My Husband, Reza

My twins, Neeki Sara and Neeku Rosa

The memory of my parents, Malak Najari and Hasan Moghadasian Rad

ACKNOWLEDGEMENTS

It is a pleasure to thank those who made this dissertation possible. First of all I am heartily thankful to my co-chairs Dr. Carpenter and Dr. Zellner whose encouragement, supervision and support from the preliminary to the concluding level enabled me to develop an understanding of the subject. Next, I would like to thank Dr. Tolson, my committee member, who always asked me to treat him as my chair. I am also grateful to Dr. Davis, another committee member, who was always very supportive of this project. Lastly, I offer my appreciation and blessings to my husband Reza, and my twins, Neeki and Neeku who were extremely patient, understanding, and cooperative during the completion of this project.

NOMENCLATURE

FD	Field-dependent
FI	Field-independent
FN	Field-neutral
ANOVA	Analysis of variance
MANOVA	Multi-variate analysis of the variance
CMC	Computer-based communication
MUD	Multi-user dungeon/dimension/domain
MUVE	Multi-user virtual environment
MMORPG	Massively-multiplayer online role-playing games
SL	Second Life
VRML	Virtual Reality Modeling Language
GEFT	Group Embedded Figures Test
CSA	Cognitive Styles Analysis
MOO	Object-oriented multi-user dungeon/dimension/domain
MMORPG	Massively multiplayer online role-playing game
WAN	Wide Area Network

TABLE OF CONTENTS

Page

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

CHAPTER I

INTRODUCTION

Cognitive styles and field-dependency

Students approach learning and information processing in different ways because of their individual preferred cognitive styles. Individual differences in cognition and learning should be taken into consideration in teaching and learning because they can influence students' learning and performance (Messick, 1976). Cognitive style is one of the factors related to students' preferences and the decisions and choices they make in their academic development (Witkin, 1976). Consequently, differences in cognitive styles and their application in developing teaching strategies compatible with these differences are of great importance to educational research (Witkin, 1977). Cognitive styles can be used to design instruction to best incorporate the learners' preferences (Akdemir & Koszalka, 2008). The fact that there is already a plethora of research on how cognitive styles affect learning (Witkin, 1976; Witkin, 1977; Witkin., Moore, Goodenough, & Cox 1977; Even, 1982; Messick, 1996; Graff, 2003; Somyürek et al., 2008; Rosenfeld & Rosenfeld, 2008; Chen, 2010) is an indication of the important role cognitive styles play in teaching and learning.

Messick (1996) referred to cognitive styles as "characteristic modes of perception, memory, thought, and judgment reflective of information-processing

_____

This dissertation follows the style of *American Educational Research Journal*.

regularities that develop in congenial ways around underlying personality trends" (p. 359). More simply, cognitive styles are ways of organizing and processing information and experience.

In a comprehensive review of a substantial body of research conducted on different cognitive styles, Riding and Cheema (1991) listed an extensive number of labels—such as tolerant/intolerant, cognitive complexity/simplicity, risk-taking/cautiousness and broad/narrow categorization—that are used by different researchers to refer to these styles. The participants of these studies ranged from high school to undergraduate students with an age range of 13 to 25.They concluded that the list could be grouped into two dimensions: a holist-analytic style dimension and a verbal-imagery style dimension. Holist-analytic style refers to whether an individual organizes information into wholes or into parts, and verbal-imagery style refers to whether an individual tends to represent information verbally or in mental pictures. Field-dependency/field-independency falls under the holist-analytic dimension. Field-dependency and its role in educational settings have been studied the most among cognitive styles (Witkin, Moore, Goodenough, & Cox, 1977; Chen, 2010).

Field-independency is defined as "a consistent mode of approaching the environment in analytical, as opposed to global, terms" (Messick, 1976, p.14). Whereas field-dependent (FD) people experience events globally, usually with no differentiation, field-independent (FI) people have a tendency to perceive figures as concrete or distinct from the background. Morgan (1997) gave an example of how an FI learner is capable of identifying fruit on a vine or tree even though the colors may not be that different from

the leaves and branches. However, it would be more difficult for an FD learner to view a single piece of fruit from surrounding foliage or the tree.

The idea of individualizing instruction, driven in part by technology advances, has been the focus of educators' attention (Chung et al., 2010) since the birth of the concept of "individualized instruction" in education in the 1970s (Squire et al., 1998). Increasing advances in virtual environments through technologies that enable users to interact with electronic devices with images rather than text, such as three-dimensional graphical user interfaces, have heightened the need to better understand issues concerning individuals in virtual worlds (Chen, Czewinski & Macredie, 2000). The role of field-dependency in computer-based instruction has been the focus of many studies for more than two decades (Miller, 1997; Clarck, Seat &Weber, 2000; Handal & Herrington, 2004; Akdemir & Koszalka, 2010). However, the findings of the research on the role of field-dependency in computer-based instruction have not been consistent.

Virtual worlds: Second Life

The availability of advanced graphical tools has provided additional instructional resources, such as virtual worlds that have recently attracted significant attention in the education community (Thackray, Good & Howland, 2010). Bell (2008) defined a virtual world as "a synchronous, persistent network of people, represented as avatars, facilitated by networked computers" (p. 2). Virtual worlds offer immersive and rich visual experience to their users (Nelson & Erlandson, 2008). Referring to virtual worlds such as Second Life (SL) as "brave new world[s]," Lee (2009) described them as "the next

frontier in communication, social networking, electronic commerce, and education" (p. 4).

SL, a three-dimensional virtual world created entirely by its membership, is gaining more attention in educational contexts and is the most accessible among the virtual worlds (Campbell, 2009). More than 100 universities in the United States and other countries either own or rent virtual lands, and there are numerous educational groups in SL (Baker et al., 2009).

Three-dimensional virtual worlds, like SL, bring new opportunities for teaching and learning (Esteves & Fonseca, 2009) and offer many advantages, such as the ability to personalize learning—to tailor it to the individual learner's needs (West-Burnham, 2005). However, Wang and Braman (2009) cautioned, "The innovative side of SL can sometimes be a distraction in a class" (p. 244). Wang, Song, Stone and Yan (2009) emphasized selecting the appropriate virtual environment for a learning activity because there are many objects in these three-dimensional worlds that can interfere and disrupt students learning. For example, they warn against holding a class at a beach in SL where dolphins regularly jump out of the water. Virtual courses can potentially cater to the needs of different kinds of students; therefore, it is particularly important and relevant to better understand learner issues in virtual worlds. (Nachmias & Shany 2002).

Seductive details/augmentation

Dewey (1913) emphasized the important role that interest plays in the learning process. Instructional designers design learning materials with the intention of ensuring that learners find those materials engaging and interesting (Thalheimer, 2004). One

technique to increase learners' interest is to use seductive details. Seductive details are defined as "highly interesting and entertaining information that is only tangentially related to the topic but is irrelevant to the author's intended theme" (Harp & Mayer, 1998, p. 3). For example, with regard to the process of lightening formation, "Every year approximately 150 Americans are killed by lightening" is considered a seductive detail because the information is irrelevant to how lightening is formed (Harp & Mayer, 1997).

Thalheimer (2004) used the term "seductive augmentation" to refer to non-supporting but vivid text, graphics, context-related sound, music and video in a multimedia learning environment. The term is distinguished from "seductive details," which refers to interesting but irrelevant words and sentences in a text. "Seductive augmentation effect" refers to disrupting a learner's construction of cause-and-effect chain due to the addition of seductive augmentation.

The findings on seductive details/augmentation effect have not been definitive to this point. Towler and Kraiger (2008) investigated the effects of seductive details on recall tests and transfer tasks in a multimedia learning setting in a study of 46 male and female undergraduate students and one graduate student with an age range of 20.6 recruited from psychology classes at a mid-western university in the United States. They found no effect of seductive details on recall tests. However, they found support for inclusion of seductive details to benefit transfer tasks.

On the other hand, other scholars have concluded that seductive details are detrimental to learning. In a study of 109 male and female college students recruited from the Psychology Subject Pool at the University of California, Mayer, Heiser and

Lonn (2001) concluded that the students who received seductive details produced fewer creative solutions on a transfer test than students who did not receive seductive details. Still, some scholars have failed to find any kind of seductive details/augmentation effect at all (Wade & Adams, 1990; Garner & Gillingham, 1991; Lusk, 2008).

To sum up, researchers still need to investigate if there is any seductive details/augmentation effect and, if yes, whether it facilitates or debilitates learning. Furthermore, SL has recently been promoted as an effective learning/teaching environment that can facilitate learning both from the teacher and independently (Herold, 2009). Also, field-dependency, a construct in which visual perception plays an important role, is a suitable fit to be studied in these environments (Ogle, 2002).

Using SL as a platform, the present research investigated whether seductive augmentation effect in this virtual world would lead to differences in the achievement of FD and FI undergraduate education majors. It further studied whether these learners' computer self-efficacy would change after their two-month experience with SL.

Self-Efficacy

Bandura (1977b) refers to self-efficacy as "the conviction that one can successfully execute the behavior required to produce the outcomes" (p.79). Self-efficacy deals with what people *can* do rather than what they *will* do and is considered to be context-specific (i.e., one may be efficacious in one context but not in another) (Bandura, 1994). Zimmerman and Cleary (2006) observed that self-efficacy is not only domain-specific but also context- and task-specific. For example, a student may have low self-efficacy with regard to learning mathematics in a competitive classroom but

higher self-efficacy in a cooperative context. With regard to task specificity within a particular domain, for example, an individual may have high self-efficacy perceptions in addition and subtraction problems but low perceptions in multiplication and division problems.

The role of self-efficacy in online and computer-based environments has been studied by some scholars (Lin & Overbaugh 2009; Teo, 2009; Crippen et al., 2009; Downey et al., 2009; Vekiri & Chronak, 2008; Spence & Usher, 2007; Brinkerhoff, 2006). The findings are mixed, with some of these studies concluding that computer self-efficacy improves as a result of interaction with computers and some finding no correlation at all. Also, much research has already been done on how field-dependency affects learning in computer-based instruction (Angeli & Valanides 2004; Truel, 2001; Ford & Chen 2001; Shih & Gamon, 2001) with mixed findings. Whereas some of these studies concluded that online and computer-based learning environments favor FI learners compared to FD learners, others have failed to reach the same conclusion. Therefore, if and how the experience of FD and FI learners in a virtual world can affect their computer self-efficacy still needs to be investigated.

Statement of the problem

Taking into consideration the goal of maximizing student performance by individualizing instruction as a means of improving computer-related skills, the present study was conducted in the virtual environment of SL to determine whether seductive augmentation in SL affects FD and FI education majors' performance in an achievement test.

The present study also focuses on whether computer self-efficacy of FD and FI learners might be affected because of their experience in an emerging technology context: the virtual world of SL. Virtual worlds are considered an emerging field because despite their popularity and the ongoing research on them, only a tiny minority of people use them as an integral part of their professional lives (Wankel & Kingsley, 2009). Because SL is one of the most popular multi-user virtual environments (MUVEs) (Wang, Song, Stone and Yan 2009), it was used as the virtual platform for this study.

Research questions

In terms of the two dependent variables of the study, the following seven questions were asked:

1. Do learners in the seductive group perform significantly different from those in the non-seductive group?

2. Do learners who differ in Field-dependency perform significantly different?

3. Is there significant interaction between Seductiveness and Field-dependency?

4. Do learners perform significantly different from Time1 (before their experience with SL) to Time 2 (after their experience with SL)?

5. Is there significant interaction between Time and Seductiveness?

6. Is there significant interaction between Field-dependency and Time?

7. Is there significant interaction between Seductiveness, Field-dependency and Time?

Significance of the study

This study is significant in three ways: 1) contribution to research on SL and education, 2) implications for individualizing instruction and 3) contribution to research on seductive augmentation. First, as Kien (2009) observed, some advanced capitalist nations already live their everyday life in highly virtualized environments, even though they do not acknowledge their presence. Virtual worlds are not a dream anymore, yet, as Sherman and Tillies (2007) put it, despite the fact that SL is currently used so widely in education, commerce, government, etc., more research is needed on virtual worlds. The present study can contribute to the research on whether SL as a medium of instruction delivery can help to individualize instruction for different cognitive styles.

A second contribution of this study is to provide some implications for individualizing instruction for different cognitive styles by comparing the effectiveness of virtual environments for different levels of field-dependency. Different individuals may use different routes and navigation tools in virtual environments (Ford, 2000) that can highlight the importance of optimizing and individualizing instruction. Learning efficiency and effectiveness can be enhanced by accommodating individual needs. "Imagery and three-dimensional models, such as those created through Virtual Reality Modeling Language (VRML), are compatible with visual and spatial styles" (Nachmias and Shany, 2002, p.318); therefore, virtual worlds in general, and SL in particular, may provide specific learner styles with pedagogical advantages (Campbell, 2009).

Thirdly, as Thalheimer (2004) showed in his comprehensive study of field-dependency, the findings on seductive augmentation are still not definitive. Whereas

some studies found debilitative seductive details effect (Moreneo et al., 2000, 2002), other researchers such as Towler and Kraiger (2008) found that inclusion of field-dependency even benefited transfer performance. Still, some studies found no seductive details effect (Garner & Gillingham, 1991; Lusk, 2008). Therefore, this study can add to the findings with regard to the effect of seductive augmentation on learning.

Theoretical framework

Krapp, Hidi and Renninger (1992) established the conceptual framework of interest by distinguishing between *individual interest*—personal preferences and interests and how they affect cognitive performance—and *situational interest*—the role that the interestingness of a situation plays in cognitive performance across subjects. They further specified that situational interest is primarily generated by certain conditions and concrete objects in the environment and is more subject to change compared with individual interest, which is relatively stable. Reviewing prior research on interest, Schraw, Flowerday and Lehman (2001) concluded that student choice, text organization and prior knowledge increase situational interest and that the malleability of situational interest enables teachers to increase interest in their classrooms.

Kintsch (1980) posited that, in terms of situational interest, interest occurs in two different ways: "emotional interest" and "cognitive interest." Whereas *emotional interest* refers to direct emotional impact that a story may make on us, such as sex and violence, *cognitive interest* refers to a motivation to get information caused by a cognitive and emotional state of uncertainty about the meaning of a text. This type of interest has nothing to do with the topic of a text. In a study of 36 undergraduate students in an

intermediate psychology class, Garner and Gillingham (1991) concluded that, as Kintsch (1980) had argued, with everything else being equal, moderate topic knowledge in a descriptive text is associated with high cognitive interest and that high cognitive interest is associated with high recall of text information.

According to *Emotional Interest Theory*, adding interesting but irrelevant details to a text energizes readers, and, as a result, they pay more attention and learn more. Harp and Mayer (1997) observed, "The increase in emotional interest influences the reader's cognition; that is, the increase in enjoyment causes the reader to pay more attention to and encode more of the material in the passage" (p. 93). Seductive details increase the readers' enjoyment of the material and influence their affect.

On the contrary, *Seductive Details Hypothesis* posits that adding interesting but irrelevant details to a boring text to make it more attractive interferes with the recall of important information. This hypothesis is based on *Cognitive Interest Theory*, which states interest in a passage is the consequence of understanding that passage (Harp & Mayer, 1997).

Definition of terms

- **Seductive details:** highly interesting but unimportant/irrelevant information added to a text to gain the reader's attention.

- **Seductive details effect:** the effect that seductive details have on the reader by seducing his/her attention away from main idea of the text.

- **Seductive augmentation:** photos, sounds and video added to a multimedia learning environment to make it more interesting.

- **Seductive augmentation effect:** the effect that seductive augmentation has on the learner by seducing his/her attention away from the main idea.

- **Cognitive style**: the relatively stable strategies, preferences and attitudes that determine an individual's typical modes of perceiving, remembering and problem-solving.

- **Field-independence:** the extent to which a person perceives part of a field as discrete from the surrounding field rather than as a whole; the extent to which a person perceives analytically.

- **Field-dependence:** the extent to which a person perceives part of a field embedded in it; the extent to which a person perceives globally.

- **Self-efficacy:** belief in one's capabilities to achieve certain goals and produce effect.

- **Computer self-efficacy:** a judgment of one's capabilities to use computers.

- **Virtual world:** a three-dimensional computer-based simulated environment through which users, represented through avatars, interact and create objects they can use or share with other avatars.

- **Second Life:** an online virtual world in which users interact with each other through avatars.

Conclusions and review of the remaining chapters

Advances in technology have facilitated individualizing instruction. Virtual worlds as educational settings have attracted a lot of attention. There are mixed findings on the effect of seductive augmentation and the role of the learner's field-dependency in

learning. Also, there are inconsistencies in the results of studies on whether computer self-efficacy of the learners may change as a result of their experience with computer-based instruction.

Chapter II reviews the literature on the role of field-dependency and seductive details/augmentation in learning, as well as whether computer self-efficacy of the learners may change after their experience with computer-based instruction, all within the context of the virtual world of SL. Chapter III of this study furnishes a detailed explanation of the research methodology. Chapter IV presents data analysis procedures and findings of the study. Finally, Chapter V discusses and interprets the results in light of previous research findings, research questions and the theoretical framework of the study.

CHAPTER II

REVIEW OF LITERATURE

To provide a collective understanding of the role of cognitive styles in computer-based learning environments, this chapter presents a review of relevant studies related to field-dependency, seductive details/augmentation, self-efficacy (particularly computer self-efficacy) and Second Life (SL). This section begins with a general definition of cognitive styles and then provides reviews of different types of cognitive styles, a definition of field-dependency and its different types, a history of how the concept of field-dependency was introduced into the field of psychology and a comprehensive review of the studies reported on the role of field-dependency in computer-based learning.

Cognitive styles

Cognitive style has been used interchangeably with the term *learning style* by some authors (e.g., Entwistle, 1981) and has been differentiated as two different concepts by others (e.g., Das, 1988). *Cognitive Style Theory* describes the relationship between the learner and the environment and how the role of the individual in various experiences is central to this relationship (Morgan, 1997). Individual learners may act differently in the same learning situation because of their particular cognitive styles, and they may also utilize alternate techniques to perform in diverse situations. Cognitive styles do not reflect one's level of intelligence; they simply indicate how individuals vary in their approaches to acquiring knowledge from relevant instructional resources.

Witkin (1976) defined cognitive styles as "characteristic modes of functioning that we reveal throughout our perceptual and intellectual activities in a highly consistent and pervasive way" (p.39). Cognitive styles "indicate the person's mode of understanding, thinking, remembering, judging, and solving problems" (Saracho, 1989, p.75).

Messick (1996) referred to cognitive styles as "characteristic modes of perception, memory, thought, and judgment reflective of information-processing regularities that develop in congenial ways around underlying personality trends" (p. 359) or, in simple words, cognitive styles are ways of organizing and processing information and experience. Even (1982) posited that cognitive styles determine the way an individual relates to others, goes for a career and raises children. Tennant (1988) defined cognitive styles as "an individual's characteristic and consistent approach to organizing and processing information" (p. 89). Morgan (1997) defined the term "cognitive" as the processes individuals apply to process information. Furthermore, he defined "styles" as "employing personal characteristics in the acquisition of knowledge" (p.6) and approaching learning situations in a way different from others. Even (1982) referred to "styles" as "preferred patterns of behavior" (p.14). In this study, cognitive style refers to how one acquires knowledge, conceptualizes information and uses it to solve problems.

Messick (1996) drew a distinction between cognitive styles and abilities by delineating their characteristics. Whereas abilities are unipolar competencies and are concerned with *how much* is learned, cognitive styles are bipolar "performance

variables" and are concerned with *how* the learning takes place. Abilities are domain-specific, but cognitive styles cut across ability, personality and interpersonal behavior domains. Furthermore, abilities are "value-directional," meaning that having more of an ability is better than having less. Cognitive styles, on the other hand, are "value-differentiated," meaning that the adaptiveness of each pole depends on the specific situation and the cognitive requirements of the task (Messick, 1976).

Empirical research has identified several dimensions of cognitive styles. Messick (1976) put cognitive styles into 19 different classes: field-dependency/field-independency, element articulation/form articulation, relational/analytic-descriptive/categorical-inferential conceptualization, breadth of categorization, conceptual differentiation, compartmentalization, conceptual articulation, conceptual integration, cognitive complexity/simplicity, leveling/sharpening, scanning, reflection/impulsivity, risk-taking/cautiousness, tolerance for unrealistic experiences, constricted/flexible control, strong/weak automatization, conceptual/perceptual-motor dominance, sensory modality preferences and converging/diverging.

Among all these cognitive styles, field-dependency, which refers to how individuals separate an item from an organized field (Witkin, 1950), has attracted the most attention to itself in educational settings (Pithers, 2002).

Field-dependency: Field-dependent and field-independent learners

Field-dependency has been the most extensively studied cognitive style and has had the widest application to educational problems (Witkin, Moore, Goodenough, & Cox, 1977). It refers to "a general dimension of individual functioning involving degree

of autonomy from versus reliance on external referents" (Goodenough & Witkin 1977). Field-dependency determines whether an individual approaches the environment in an analytical or a global manner.

The earliest work on field-dependency was focused on how people locate the upright in space in a traditional visual perception context (Witkin, 1950). The initial portion of this study utilized a rod-and-frame configuration consisting of a luminous square frame and a luminous rod. Both the frame and the rod were presented to the subject in a completely dark room and could be rotated clockwise or counterclockwise independently around the same center point. The subject was asked to position the rod in the frame where he/she perceived it as perpendicular to the floor. In a second part of the study, the subject was seated in a chair that was suspended in a small room. Both the chair and the small room could be tilted clockwise or counterclockwise independently. The subject was seated in the chair, and both the chair and room were brought to a series of specific tilted settings. The subject was then asked to adjust the chair to a position where he/she perceived it as being upright or perpendicular to the ground.

In both experiments, an item was surrounded by a visual field, and the aim was to determine to what extent the perception of the item was influenced by the surrounding framework. In both experiments, many subjects perceived the rod or their own bodies as being upright only when they were fully aligned with the surrounding tilted environment—the frame or the room. On the other hand, there were subjects who were able to bring the rod or their body more or less to the actual upright position regardless of the orientation of the frame or surrounding room.

The third experiment on field-dependency, different in construction from the first two but in essence the same, involved showing a simple figure to the subject, removing it, introducing a complex figure and asking the subject to identify the simple figure within the complex one. Based on these experiments, field-dependency was used to refer to the tendency of the subject to identify an item based on the surrounding field, and field-independency was used to refer to the tendency to identify items independent of the surrounding field.

Field-dependent (FD) and field-independent (FI) learners are not quite different in memory and learning ability, but they are different in learning different things, and they achieve their learning goals by applying different strategies (Witkin, 1976). FD learners are different from FI learners in important personal characteristics as well. Compared with FI learners, FD learners mostly use external sources of information for self-definition. Table 2.1 summarizes certain characteristics and behaviors associated with FD and FI learners.

Table 2.1
Selected characteristics and behaviors associated with learning styles of field-dependency and field-independency (Witkin, 1976, 1977)

FD	FI
Adheres to the organization of the field	Overcomes or restructures the organization of the field
With people orientation	Impersonal orientation
Sensitive and attuned to the social environment	Rather detached from social environment
Dependence on external referents and sources to arrive at an attitude or judgment	Dependence on internal referents and sources to arrive at an attitude or judgment
More attentive to social cues provided by others	Less attentive to social cues provided by others
Preference for solitary and impersonal situations	Preference for interpersonal situations

The most common measure of field-dependency is Witkin's Group Embedded Figures Test (GEFT). Subjects taking the GEFT are presented with a series of complex geometrical patterns and are asked to locate simple shapes embedded within each of them (Figure 2.1). In this test, field-independence performance (i.e., the ability to identify the embedded shapes) is used as the measure of field-dependency. Another tool developed to measure field-dependency is Riding and Cheema's (1991) Cognitive Styles Analysis (CSA). The CSA uses two sub-tests to measure field-dependency directly rather than inferring it from poor field-independency. The first sub-test consists of pairs of complex geometrical figures that the individual is asked to judge as being either the same or different. The second sub-test presents pairs of items that each consists of a simple geometrical shape and a complex geometrical figure; the individual is asked to indicate whether or not the simple shape is contained in the complex one (Ford & Chen, 2001). However, test retest reliability of the CSA has been questioned (Cook, 2008).
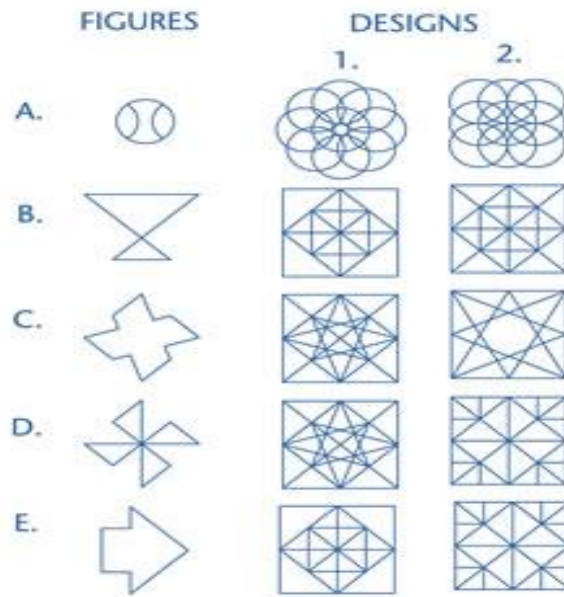
Figure 2.1. **Sample GEFT questions**

Computer-based instruction and field-dependency

As the previous section shows, field-dependency of learners plays an important role in their learning and how they analyze and solve problems. With the introduction of computers as educational tools during the past two decades, the roles of the teacher and the learner have been reformulated. Computers are used as tools for learning rather than devices to learn about. However, whether computer-based environments can support different learning styles still needs more investigation (Handal & Herrington, 2004). The following paragraphs review different studies conducted on the role of field-dependency of learners in computer-based settings and how it may affect learning.

Liu and Reed (1994) examined the differences between FI and FD learners' use of hypermedia in learning English as a second language. Sixty-three international graduate and undergraduate students from different majors at a mid-Atlantic university

studying English in the Intensive English program learned vocabulary in a hypermedia-assisted language learning environment. The results of the study indicated that in a hypermedia environment, different cognitive style groups used different media, tools and learning aids to learn vocabulary. Even though different cognitive style groups performed equally well on the post-test achievement vocabulary test, they approached learning differently, using different aspects of hypermedia and using it with different frequencies. The findings of the study revealed cognitive styles may have an impact on these learners' ways of learning and that hypermedia-assisted instruction could help learners with different cognitive styles and different needs.

Miller (1997) investigated the possibility of agricultural distance education programs better suiting FI rather than FD students. The participants were 191 agriculture students at a mid-western university enrolled in one or more of the eight agricultural courses delivered through distance education technologies. Although the orientation of agricultural learners in distance education programs was structured more toward an FI cognitive style, FD learners were equally satisfied with the distant delivery of instruction. The findings of the study revealed distance learning programs can be developed to meet the needs of both FD and FI students.

To determine the effects of interactivity in a hypermedia environment on the performance of FD and FI learners, Hall (2000) presented 139 undergraduates registered in a geography course with a computer program that contained jigsaw puzzles made from maps. The study randomly varied the type of interactivity available to learners when solving the puzzles. FI learners completed the puzzle solving tasks significantly

faster and more accurately than FD learners. However, no difference was found between FI and FD learners with regard to how many times they used interactive controls.

Clark, Seat and Weber (2000) studied 53 liberal arts students and 157 second-semester freshmen engineering students to investigate whether the GEFT had the potential to be used as the predictor of success in engineering programs. The findings indicated that engineering students, whose orientation was structured more toward an FI cognitive style, did significantly better on the GEFT compared with liberal arts students who were mostly FD learners.

Shih and Gamon (2001) found that even though 75% of their 99 subjects who took a web-based course were FI learners, there were no significant differences in achievement between FD and FI learners. They also found that both groups of learners learned equally well in web-based courses. The population for this study included 99 students taking biology and zoology courses at a land-grant university. More than 60% of the population were on-campus students, and almost 40% were off-campus (long-distance) students, with 32 of the 39 off-campus students being high school students.

In a study of 110 Israeli junior high school students, Nachmias and Shany (2002) investigated the relationship between their performance and thinking style in a virtual learning environment. Two of the thinking styles they concentrated on, global thinkers/FD learners and local thinkers/FI learners, showed individual differences in virtual learning environments, with local thinkers outperforming global thinkers in most aspects of virtual learning.

Handal and Herrington (2004) conducted a rather comprehensive review of literature on how hypermedia instructional environments cognitively engage FD and FI learners. This study used both male and female seventh graders and eighth graders, pre-service teachers and undergraduate university students majoring in subjects such as biology, zoology, English, computer literacy and medicine. The population size ranged from 33 to 177. They concluded that although research findings were not completely conclusive, most findings indicated that hypermedia learning environments provide more opportunities for FI learners to succeed. They suggested even though it would be tempting to recommend hypermedia-based instruction should be used with FI learners and not with FD learners, it should be taken into consideration that learning environments, cognitive styles and technology are variables that may change over time.

In a study of first-year students registered in an introductory programming course at the University of Glasgow, Mancy and Reid (2004) found the scores of subjects on GEFT to be highly correlated with their achievement scores, meaning FI subjects performed significantly better in a programming exam compared with FD learners.

In a study of 130 male and female teacher trainees ranging from freshmen to seniors being trained to teach English at elementary and secondary schools at Abant Izzet Baysal University in Turkey, Altun and Cakan (2006) found no relationship between cognitive styles of FD/FI and their academic achievement or attitude toward computers.

Akdemir and Koszalka (2007) studied whether some instructional strategies serve the FI learners more effectively compared to FD learners. The study included 12

master and Ph.D. students registered in a graduate-level online course entitled Design and Management of Distance Education at a northeastern university in the United States. Their findings indicated that matches between students' cognitive styles and instructional strategies had no role in learners' perception of their own learning outcomes, level of effort and involvement or level of interaction in the course. They concluded that both FD and FI students gain equal learning benefits from the instruction when different instructional strategies are used to match their characteristics.

Therefore, research findings with regard to the role the learner's field-dependency plays in a computer-based environment are mixed. Moreover, the question of learners' field-dependency affecting their achievement in the virtual world of SL has not been investigated yet.

Because the present research studied the role that field-dependency may play in the achievement of learners in two different settings (i.e., seductive and non-seductive computer-based learning environments), the next section elaborates on the meaning of seductive details/augmentation. Research findings on the role of seductive detail/augmentation in learning are put into three groups: 1) those that failed to find any kind of seductive detail/augmentation effect 2) studies that found a facilitative effect on learning for seductive detail/augmentation effect and 3) studies that found a debilitative effect on learning for seductive detail/augmentation effect.

Seductive details

Dewey (1913) considered interest a content- and domain-specific motivational characteristic. With a caveat on artificial and often unsuccessful attempts to make

learning more interesting, Dewey (1913) emphasized the important role of interest in learning. Hidi (1990) emphasized the importance of interest in accounting for our preference for certain types of information over others and the role it plays in our mental activities. Park (2005) stated that interest increases learning and that instructional designers design learning materials with the goal of keeping the learners engaged with those materials.

Empirical studies of interest concluding that higher levels of interest are associated with better learning led to speculation about seductive details (Schraw, 1998). The term *seductive details* refers to interesting yet irrelevant details added to a text to make it more attractive to the reader (Garner, Brown, Sanders & Menke, 1992). *Seductive details effect* refers to reduction in the comprehension of a text due to seductive details (Harp & Mayer, 1997). One way to make a scientific lesson more interesting is to add appealing words and illustrations to it. The goal is to boost the reader's general level of arousal to encourage her or him to attend to more information from the text (Harp & Mayer, 1997).

Thalheimer (2004) used the term *seductive augmentation* to refer to non-supporting but vivid text, graphics, context-related sound, music and video in a multimedia learning environment to distinguish it from "seductive details" that refers to adding interesting but irrelevant words and sentences. *Seductive augmentation effect* refers to disrupting learner's construction of cause-and-effect chain due to the addition of seductive augmentation.

Schraw (1998) made a distinction between context-dependent and context-independent seductive details. Context-dependent seductive details are interesting pieces of information that are directly related to the training content, yet irrelevant to the learning objectives. Context-independent seductive details, however, are interesting pieces of information that have nothing to do with the training content. For example, "Mail Merge can be used to create numbered raffle tickets" is considered a dependent seductive detail with regard to the content of a class on how to use Microsoft Mail Merge, but "Top graduate schools often accept up to only 10 applicants per year" is considered an independent seductive detail with regard to the content of the same class.

Harp and Mayer (1998) examined possible theoretical explanations for why seductive details effect happens. They argued that seductive details interfere with selecting, organizing or integrating—the three processes needed for effective text comprehension. Distraction Hypothesis posits that seductive details interfere with the selection stage of reading "in 'seducing' the reader's selective attention away from important information" (p.415). According to Disruption Hypothesis, seductive details interrupt the transition from one idea to another. The Diversion Hypothesis suggests that "seductive details prime the activation of inappropriate prior knowledge as the organizing schema for the lesson" (p.415). Instead of building a representation of the text around the main idea, the reader builds it around the seductive details contained in the text.

The studies that found seductive details can be divided into two groups: studies that did not find seductive details/augmentation effect (Schraw, 1998; Garner &

Gillingham, 1991) and those that did. The studies that found seductive

details/augmentation effects are themselves divided into two groups. The first group

consists of studies claiming that seductive details/augmentation effect leads to more

interest and attention on the part of the learner and this, in turn, leads to better learning

(Towler & Craiger, 2008). The second group involves studies positing that seductive

details/augmentation effect disrupts the learning process because the learner pays more

attention to the more interesting but irrelevant material instead of focusing on the main

ideas (Alexander & Kulikowich, 1994; Harp & Mayer, 1998; Moreno & Mayer, 2002).

No seductive details/augmentation effect

This section reviews the studies whose findings did not reveal any seductive

details/augmentation effect, whether positive or negative. They have used different types

of seductive augmentation, such as text, illustrations or video clips, and different types

of base instructional materials, for example, narrative biography texts, expository texts

or multimedia narrated animation.

To carefully control for both interest and importance, Wade and Adams (1990)

asked 52 male and female college students at a large public university to rate a

biographical text for either interest first or importance first. Based on the subjects'

ratings, four categories of sentences were established: high importance/high interest,

high importance/low interest, low importance/high interest and low importance/low

interest. In the next experiment, they examined recall of 48 male and female college

students at the same university, either immediately after reading the same text used in

the first experiment or a week after. Both seductive details and main ideas rated as

interesting in the first experiment were the most memorable by the subjects participating in the second experiment. The authors concluded that there was no debilitative effect due to seductive details.

To find out whether the inclusion of seductive details affected recall of other text segments, Schraw (1998) tested 72 undergraduates enrolled in an introductory educational psychology class in four groups. First, the subjects read one of the four versions of a story for comprehension: with seductive details, with no seductive details, with context-dependent details and with context-independent details. Next, they solved multiplication problems for 5 minutes and completed a free recall task with no time limit. The results revealed that seductive details had no impact on the recall of main ideas.

Park (2005) investigated the effect of the presence of seductive detail graphics on student achievement measured through recall and comprehension tests in multimedia environments. The participants were 127 male and female college undergraduate students ranging from freshmen to seniors with an average age of 19.72 enrolled in computer literacy classes at a southeastern university in the United States. There was no significant effect for seductive detail graphics on achievement or recall scores for students who were presented with seductive detail graphics compared to those who were not.

In a study of 167 undergraduate students enrolled in a non-majors' health education course at a mid-Atlantic university, Lusk (2008) investigated whether the inclusion of seductive details in a multimedia environment affected recall, transfer and

learner interest. The results indicated no significant effect of seductive details on recall, transfer or learner interest.

Facilitative seductive details/augmentation effect

The studies in this section review the research whose findings indicated facilitative effects for seductive augmentation for transfer tasks in a multimedia environment. They have both used a multimedia setting to study seductive augmentation effect.

Towler and Craiger (2008) studied the effect of seductive augmentation on transfer performance and acquisition of declarative knowledge. Forty-seven male and female undergraduates with an average age of 20.6 from psychology classes at a mid-western university participated in the first experiment. The subjects were randomly assigned to either a non-seductive condition or a seductive condition. Based on what group they were assigned to, they completed a 15-minute audio-visual training on Microsoft Excel, either with or without seductive augmentation. Next, they completed a declarative knowledge test followed by two transfer tasks. Results of the study indicated that performance of the participants in the seductive condition was not significantly different from that of the participants in the non-seductive condition in the declarative test. In fact, the seductive group performed slightly better than the non- seductive group. Furthermore, subjects in the seductive condition performed significantly better on a transfer task than did those in the non-seductive condition. In other words, seductive details improved transfer performance.

Towler (2009) recruited 72 females and 60 males with an age range of 18 to 44 from different psychology courses at the University of Colorado. They assigned the subjects to either a seductive or a non-seductive group and to one of the delivery style conditions, either expressive or inexpressive (i.e., speaking in a monotone voice with lots of "ums" and "ahs"). The results indicated that the subjects who listened to an expressive trainer did better on problem-solving tasks in the seductive details condition than the seductive-details-free condition.

Debilitative seductive details/augmentation effect

This section reviews the studies whose findings proved debilitative effects on learning for seductive details/augmentation effect. The findings of the following studies indicate that seductive details/augmentation distracts the attention of the learner from the main ideas and objectives of the teaching and diminishes learning.

Garner, Gillingham and White (1989) examined the effect of seductive details on reading in two separate experiments. In the first, 20 graduate students were assigned to two groups (10 each) to read a passage with or without seductive details and were then asked to remember the most important ideas about the text (macro-processing). Subjects who read the text with seductive details could remember fewer important ideas from the text compared with the other group. In the second experiment, seventh graders were randomly assigned to read one of three different versions of the same text: text with seductive details and minimal ideas, text with no seductive details and minimal signaling of main ideas and text with no seductive details and signaled main ideas. The subjects who read the text with seductive details were less successful in the accomplishment of

the macro-processing task of remembering the main ideas from the text. They concluded that seductive details hindered comprehension of the main points of the text.

Garner, Alexander, Gillingham, Kulikowich and Brown (1991) in two separate experiments investigated how interesting but unimportant details and their placement in a text could affect recall of the text. In the first experiment, 48 undergraduate students were randomly assigned to four groups. Each group was presented with either an interesting or an uninteresting text, with interesting details either embedded in paragraphs or as an aside. Next, they asked their subjects to read whatever text assigned to them and remember the important information in it. In general, the results indicated that interesting details were remembered more than important generalizations, whether separated from paragraphs presenting important information or embedded in them.

Two-hundred twenty-eight undergraduate students participated in the second experiment. The only procedural difference was administering a domain knowledge test to subjects to measure their domain knowledge. High-knowledge students remembered more important information and more accurately compared with low-knowledge students. However, both groups remembered more interesting details than important generalizations.

Garner, Brown, Sanders and Menke (1992) did a comprehensive review of literature on how knowledge acquisition from books is negatively affected by seductive details and how this effect is stronger in younger learners compared with older ones. With a caveat on totally removing seductive details from text, they emphasized the importance of interest in learning and made suggestions regarding to how teachers can

help their students to be selective by making a distinction between importance and interestingness. For example, teachers can "think aloud" about important ideas and interesting ideas or they can model how importance and interestingness diverge.

Wade, Schraw, Buxton and Hays (1993) in two separate experiments investigated the interaction effect of interest and importance on skilled readers' recall and strategy use. In the first experiment, 43 college students from an education course at a public university read a passage presented to them sentence by sentence on a computer screen. The sentences would fall under one of the following categories: main themes (high importance/high interest), factual details (high importance/low interest), seductive details (low importance/high interest) and boring trivia (low importance/low interest). The subjects were then given a recall test. The results of the first experiment revealed that the subjects recalled interesting materials more frequently than uninteresting materials in general. They recalled seductive details the most and factual details (high interest/high importance) the least. They spent the longest amount of time reading factual details followed by seductive details. Compared to main themes and boring trivia, seductive details took longer to read.

To find out what type of reading strategy skilled readers would use, the researchers used the same materials and procedures for the free written recall as in the first experiment except that the passage was presented to the subjects in regular manuscript form. Thirty undergraduate students participated in the second study. Every subject was individually tested and interviewed. After completing the recall tasks, the subjects were given a passage with four highlighted sections to read and were then

questioned about the interest and importance of the sentences and how much time and effort they thought they dedicated to every highlighted section. The results showed the same recall patterns as the first experiment: high interest/low importance > high interest/high importance > low interest/low importance > low interest > high importance. The interview results indicated that the readers seemed to use the criteria of importance and difficulty to allocate their time and effort, except for seductive details. That is, they would spend a considerable amount of time on interesting yet unimportant details even though they considered them highly memorable and unimportant. The researchers concluded adding seductive details may be detrimental to the learning of important information.

Harp and Mayer (1997) gave four different types of descriptive texts to a group of 74 college undergraduates recruited from a psychology subject pool at the University of California: text with no seductive information, text with seductive information, text with seductive illustrations or text with both seductive text and illustrations. The results indicated that individuals reading texts that contained textual seductive details, visual seductive details or both performed significantly worse than those in the seduction-free condition in terms of both recall and problem-solving performance. They further posited that seductive details effect is created because of the increase in emotional interest in the reader. The reader pays more attention to the seductive details rather than the main purpose of the text.

Harp and Mayer (1998) carried out four different experiments with both male and female subjects recruited from the psychology subject pool at the University of

California. In the first three experiments, they investigated the effect of seductive details on recall and problem-solving by providing their subjects, divided into four groups, with four different versions of the same passage.

- Experiment 1**:** base passage, seductive details passage, base passage with main ideas highlighted, seductive details passage with main ideas highlighted.

- Experiment 2**:** base passage, seductive details passage, base passage with a statement of learning objectives, seductive details passage with a statement of learning objectives.

- Experiment 3**:** base passage, seductive details passage, base passage with signals, seductive details passage with signals.

In all these experiments, subjects who read passages with seductive details recalled less and performed worse in problem-solving tasks compared with those who read the main passages. In the fourth experiment, they found out that placing seductive details at the beginning of the passage would create stronger and more negative seductive details effect than placing them at the end of the passage. They concluded that seductive details "interfere with learning by priming inappropriate schemas around which readers organize the material" (p. 414).

In a set of two studies, Moreno and Mayer (2000) examined the inclusion of auditory adjuncts, such as background music in multimedia. In the first experiment in a study of 75 male and female students with a median age of 18 recruited from a psychology subject pool at the University of California, the subjects received multimedia presentations on a lightning formation process that included background music, sounds,

both or neither and immediately took tests of transfer, retention and matching. Results indicated that inclusion of background music had a negative effect on recall and transfer of information, whereas inclusion of environmental sounds had no significant effect on the recall and transfer of the same material. Inclusion of both music and environmental sounds had the greatest detrimental effect on both recall and transfer of the material. However, they did not find any significant main effect for inclusion of music, environmental sounds or both for matching tests.

In the second experiment, the researchers used the same psychology subject pool to recruit 75 different subjects, and the materials they used for their study was on hydraulic brake systems. The results indicated that the participants remembered significantly less material and produced fewer problem solutions when narration was combined with music or mechanical sounds compared with narration with no music or no mechanical sounds. There was no significant interaction between music and sounds for either recall or transfer tests. They did not find any significant main effect for inclusion of music, environmental sounds or both for matching tests. They decided that adding entertaining but irrelevant auditory material to a multimedia instructional unit led to lower student learning. Their results confirmed the Cognitive Theory of Multimedia Learning that predicts auditory adjuncts can negatively affect learner's auditory working memory.

To enhance the student learning of lightning formation, Mayer, Heiser and Lonn (2001) inserted several short video clips, which were conceptually irrelevant to the topic yet interesting, either before or during an animated presentation of lightning formation.

The participants were 78 male and female college students with a mean age of 18.4 recruited from a psychology subject pool at the University of California. The results of retention and transfer tests supported the Seductive Details Hypothesis, claiming that insertion of irrelevant but interesting materials primes the activation of inappropriate prior knowledge as the organizing schema for the lesson and consequently leads to poor learning.

Harp and Maslich (2005) randomly assigned 50 undergraduates at California State University to two groups. One group was presented with an audio-based lecture while the other group was presented with an audio seductive augmentation lecture. They asked the subjects in both groups to write down as many main ideas as they could remember. They also gave their subjects four problem-solving questions to answer. The subjects who heard a lecture containing seductive details recalled significantly fewer main ideas and did significantly worse in problem-solving questions compared with those who heard the lecture without seductive details.

Sanchez and Wiley (2006) investigated the effect of seductive details on the comprehension of the high working memory capacity and low working memory capacity of 72 undergraduate students (36 from each) at the University of Illinois. Results indicated that low-working-memory-capacity readers were negatively affected by seductive details. They attended to seductive illustrations more frequently and for a longer duration than those high in working memory capacity. The result for the high-working-memory-capacity group surprisingly seemed to even suggest seductive details might positively affect their learning, although the result was not statistically reliable.

Using an interest-based motivation theory, Shen, McCaughtry, Martin, and Dillion (2006) examined the effect of seductive augmentation on student learning. Two-hundred forty male and female sixth, seventh and eighth graders from two urban middle schools in a metropolitan area in the midwestern United States were randomly assigned to two groups. One group watched a video clip with seductive details, and the other watched one with no seductive details. The students recalled fewer main ideas and scored lower in problem-solving transfers in the seductive details condition than those in the non- seductive details condition.

Lehman, Schraw, McCrudden and Hartley (2007) studied how seductive augmentation affected online processing of a technical, scientific text in two different experiments. In the first experiment, 40 undergraduate education majors at a western university were given a text to read and then rate the text sentences for interest and importance. In the second experiment, 53 undergraduate students from an introductory educational psychology class at a southwestern university were randomly assigned to either a control and or a treatment group. The treatment group who had received text with seductive augmentation did worse on a recall test and deep processing of information compared with the control group who received text with no seductive augmentation. The researchers concluded that seductive augmentation had a detrimental effect on both recall and deeper processing of text.

Reviewing the studies that had investigated the seductive details effect, Goetz and Sadosky (1995) concluded that those studies did not provide solid evidence for seductive details effect. They referred to the failure of these studies to include a non-

seductive details control group as the most important flaw they suffered from. They furthermore referred to dual code theory to support the idea that poor recall of important but uninteresting information is not because of the fact that interesting but unimportant details seduce the readers away from the main idea, but is instead because concrete and interesting details are simply recalled easier compared with abstract details. Dual code theory (Pavio, 1986) postulates that knowledge is simultaneously processed by two separate systems: verbal and visual. The former processes and stores linguistic information, but the latter processes and stores images and pictorial information. The dual coding of information is because of the interrelations and connections of the two systems.

After a rather comprehensive review of literature on the studies done on seductive details from 1989 to 1998, Schraw and Lehman (2001) concluded that more research was still needed to identify under which conditions seductive details are beneficial or detrimental. Likewise, Thallheimer (2004) reviewed the research on seductive details and seductive augmentation from 1991 to 2002. He concluded that the findings were still contradictory.

The researcher in the present study further extended the review of literature on seductive details/augmentation effect through 2008 (Appendix A). However, there are still mixed results on whether there is such an effect and, if there is one, whether it helps learning or hinders it.

For the present study, the researcher chose the virtual world of SL as a specific form of computer-based instruction to look at the role that the field-dependency of the

learners may play in their achievement in seductive and non-seductive settings.

Therefore, the next section defines virtual worlds and their role in education. It further

reviews some previous research with regard to field-dependency or seductive

augmentation in virtual worlds.

Second Life

In the late 1970s, Richard Bartle and Roy Trubshaw developed the first multi-

user dungeon/dimension/domain (MUD) at the University of Essex to facilitate multi-

player role-playing games run over computer networks (Bartle, 1999). Advances in

technology have led to the evolution of MUDs, resulting in the emergence of diverse

human computer interfaces, such as object-oriented MUDs (MOOs), MUVEs, and

massively multiplayer online role-playing games (MMORPGs), etc. MUVEs are a form

of online multimedia-based entertainment, also called virtual worlds.

Bell and Robins (2008, in Peachy et al., 2010) enumerate four specific

characteristics for virtual worlds. First, virtual worlds are persistent, meaning they exist

whether a user is logged in or not. Second, they exist on Wide Area Network (WAN),

meaning they are accessible on a large scale and not restricted by a firewall. Third, they

are massively multi-user, meaning a very large number of users interact with one another

through them. Finally, avatars, cartoonlike characters, represent users in virtual worlds.

Warburton (2009) stated even though virtual worlds have been around since the

early 1980s, their definition is still controversial. Kien (2009) defined virtual

environments as "a form of human-computer interaction consisting of a computer-

generated visual and audio simulation of three-dimensional space, in which users have

interactive experiences" (p. 11). He referred to interactivity as the distinguishing characteristic of virtual environments that separates them from other forms of human-computer interaction.

Peachey, Broadribb, Carter, and Westrapp (2010) divided virtual worlds into two separate groups: game virtual worlds and social virtual worlds. Multi-user online games such as Eve Online, Ultima, City of Heroes and World of Warcraft are virtual game worlds in which players play with other virtual players and also with game-generated characters called non-player characters. Players fight and defeat enemies, which results in gaining points, enabling them to get more abilities and weapons.

Social virtual worlds, such as SL and Entropia, remove the game to replace it with social tools and content creation tools. Therefore, in game virtual worlds, the players experience content created by game designers, but in social virtual worlds, users can use available tools to actively create content.

Launched on June 3, 2003, and accessible via the Internet, SL is a visual-based three-dimensional virtual world/meta-verse/digital universe created by its members who assume an identity in this virtual world by creating a customized avatar or personage to represent themselves. White (2008) observed that the SL platform is an Internet-based, multi-user, three-dimensional world through which creativity, collaboration, socializing, and self-government are facilitated.

SL was created and hosted by Linden Labs, a privately held American company headquartered in San Francisco, California, and founded in 1999 by Philip Rosedale. Already coming up with the idea of creating a meta-verse, Rosedale was inspired by

Neal Stephenson's science-fiction novel *Snow Crash* (1992), which painted a compelling

picture of what such a virtual world could look like in the near future.

SL consists of virtual spaces that are often called simulators (sims) or islands.

The lands are sold to residents/users by Linden Labs. Originally, SL was a bifurcated

environment with two grids: Main Grid for adults and Teen Grid for 13- to 18-year-olds.

In January 2011, Linen Labs closed Teen Grid. To participate in SL, users must

download and install the required software/client for free from secondlife.com or from

other SL clients, such as http://games.softpedia.com/get/Online-Games-Clients/Second-

Life-Client.shtml.

Avatars, the virtual representations of users, can go from one sim to another

using the teleport button. Avatars may take the form of anything such as an animal

(Figure 2.2), a plant, or a human (Figure 2.3). The residents may also choose to resemble

themselves as they are in real life or they may want to change, for example, their sex and

physical attributes. Avatars can communicate via voice/text, local chat and instant

messaging.

Figure 2.2. **An animal avatar in Second Life**
Raven, P. (Photographer). (2009). *Kim Stanley Robinson to appear in Second
Life… as a coyote* [Snapshot]. Retrieved September, 2011, from
http://futurismic.com/2009/01/12/kim-stanley-robinson-to-appear-in-second-life-
as-a-coyote)

Figure 2.3 **Two human avatars in Second Life**

Second Life in education

Virtual worlds have enabled academic institutions to explore the benefits of an immersive environment in which participants can interact even when they are physically thousands of miles away (Wankel & Kingsley, 2009). SL Wiki (http://wiki.secondlife.com) lists more than 150 universities worldwide that have a virtual campus in SL in 2011.

Whereas in typical learning environments, predetermined curricula mandate formative and summative outcomes, everything in SL is created by its users (Carpenter, 2009). Not only can instructors create games and simulations in SL, students can create content (Livingstone & Kemp, 2008). "When tied to pedagogical aims … creation and recreation of the … [SL] can allow the learning environment itself to become a medium through which learning is manifested and knowledge is created" (Weiss, 2009, p. 24). As these scholars indicate, SL can provide both the learners and the educators to be actively involved in creating content for teaching and learning.

Warburton (2009) referred to characteristics such as exposure to authentic culture and content, rich interactions, simulation, visualization and content production to explain why SL is one of the most attractive propositions to educators. Bradshaw (2006) enumerated SL's educational attraction as engagement, a 24/7 global online meeting place, creativity, experimentation and simulations/observations. She referred to immediacy, expanded horizons, self-awareness and personal/social capabilities as specific benefits of SL to learners.

Research on Second Life

As previous paragraphs show, virtual worlds in general and SL in particular are gaining increasing attention in educational settings because of their potential to provide opportunities for both learners and educators that otherwise may not be easily obtained in real-world learning settings. Research is actively conducted on virtual worlds in education, business, government, etc. Below, a review of some of the studies on virtual worlds and SL in educational settings is offered.

With a caveat on generalizing their findings due to the limited number of participants in a study of 20 undergraduate students at Georgia State University taking a course called Computer Skills for Information Age and 20 male and female undergraduate freshmen English majors aged from 19 to 23 at Yantai University in China, Wang and Braman (2009) found that integration of SL activities into course syllabi improved students' learning experiences and led to higher learning motivation and better performance.

In a study of River City, an interactive computer simulation for middle school science students, Nelson (2007) found that 25% of the subjects using this virtual world did not use its guidance component. Two-hundred eighty-seven public middle school students (147 girls and 140 boys) in a mid-Atlantic state participated in this study. Interviewing a random subset of these subjects, he found out that some of them did not use the guidance tool because they did not notice it—they were concentrating on the three-dimensional world itself instead of the available guidance tools.

Lee (2009) used SL to deliver a core MBA operations management course at a major northeastern university to find out if SL could enhance the learning objectives of the course. Asked if SL had helped the subjects meet the course objectives, they replied that some did and some did not. Her findings also indicated that almost all subjects unanimously agreed that virtual worlds should be included in the curriculum because they are going to be widely used in future.

Campbell (2009) investigated to see what pre-service teachers thought about using SL as a potential tool once they started teaching. The participants included 66 fourth-year pre-service education majors enrolled in a course called Interactive Technologies. Student questionnaires, focus group interviews and online journals were used to collect the data. Results revealed that the subjects were open to this technology and that half of them reported that they would use a virtual world technology in their future teachings.

Herold (2009) investigated whether 61 undergraduate male and female students at Hong Kong Polytechnic University would welcome the idea of their instructors applying virtual worlds in their classes. Almost all the subjects had difficulty creating an account in the virtual world of SL. Throughout the study that consisted of 30 virtual tutorials, almost 50% of the students were struggling with SL and only 20% of the students after individual tutoring were able to attend the tutorials and complete the required tasks. Most of the subjects had a strong negative feeling towards SL.

Therefore, virtual worlds may be capable of providing collaborative education and adapting to meet the needs of different individuals. Educators and scholars are

carefully considering the educational applications of virtual worlds. Whereas some studies have revealed that the learners have a positive attitude toward virtual worlds (for example, Campbell, 2009), others have concluded the learners have not welcomed them. Further, research is still needed to apply all the potentials of virtual worlds to education and learners.

Because the present study also investigated whether the experience of FD and FI learners in a virtual world affected their computer self-efficacy, the next section discusses the concept of self-efficacy and reviews the research on computer self-efficacy in computer-based learning environments.

Self-Efficacy

Albert Bandura (1977a) defined perceived self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). Therefore, self-efficacy is what an individual can do with the skills he/she possesses, not what skills he/she has. Simply knowing what to do is not the same as being efficacious in dealing with one's environment. Bandura (1986) considered self-efficacy the most influential aspect of self-knowledge in people's everyday life.

Zimmerman and Cleary (2006) referred to self-efficacy as "belief in one's effectiveness in performing specific tasks" (p. 45). Pajares (2006) observed self-efficacy as an important determinant of what goals and courses of action people pursue in their lives. People opt for activities in which they feel competent and shy away from those they do not. He further emphasized the role of beliefs people hold with regard to their accomplishments to predict their behaviors and choices rather than their actual

capabilities. Bandura (1977a) posited that beliefs have a much more important role in people's motivation level and actions than what is objectively true. Self-efficacy consists of "a generative capability in which cognitive, social and behavioral sub-skills must be organized into integrated courses of action to serve innumerable purposes" (Bandura, 1986, p. 392). However, it does not mean that simply believing in one's capabilities and not necessarily having the required skills and knowledge would help an individual accomplish a task; rather, it means that self-efficacy beliefs determine what people do with their acquired knowledge and skills.

Collins (1982) investigated the problem-solving of 100 middle school subjects with different mathematical abilities. Children who considered themselves efficacious were more successful than those who doubted their math abilities. As Collins' study shows, perceived self-efficacy operates in part independently of underlying skills.

Self-efficacy is believed to be situation-specific, meaning an individual may have different self-efficacy beliefs in different situations. Bandura (2006) stated, "The efficacy belief system is not a global trait but a differentiated set of self-beliefs linked to distinct realms of functioning" (p. 307). Zimmerman and Cleary (2006) observed that self-efficacy is not only domain-specific but also context- and task-specific. For example, a student may have low self-efficacy with regard to learning mathematics in a competitive classroom but higher self-efficacy in a cooperative context. With regard to task specificity within a particular domain, for example, an individual may have high self-efficacy perceptions in addition and subtraction problems, but low ones in multiplication and division problems.

Sources of self-efficacy

Bandura (1986) enumerated four sources of self-efficacy: enactive attainments, vicarious experience, verbal persuasion and physiological states. Enactive attainments refer to previous successful experiences an individual has had accomplishing tasks and are considered the most effective way of creating a strong sense of self-efficacy.

Whereas successes lead to a robust belief in an individual's self-efficacy, failures deteriorate it. However, easy successes do not participate in the development of self-efficacy because they may lead to expecting quick results and getting discouraged by failure. Overcoming obstacles through perseverance is essential to developing a resilient sense of self-efficacy. Likewise, extremely difficult tasks do not boost self-efficacy because of the uncertainty of success on a future attempt.

Vicarious experience means observing a role model successfully accomplishing a task. Observing similar others succeed through sustained effort reinforces self-efficacy, whereas observing others fail despite high efforts undermines self-efficacy. Competent models teach observers to manage environmental demands and acquire better means to succeed.

Verbal persuasion fortifies self-efficacy by persuading individuals that they possess the capabilities to overcome obstacles and master given activities. The person who provides the persuasion should be observed by the receiver of the feedback as someone who is qualified to do so; otherwise, he/she may be discounted on the grounds that he/she is not completely aware of the task demands.

Physiological states can also partly affect how individuals judge their capabilities. High arousals due to stressful or taxing situations affect performance negatively. Consequently, individuals evaluate their capabilities more positively when not under stressful conditions and look at themselves as less self-efficacious when beset by aversive arousals. Factors such as sources of arousal, the level of arousal, circumstances under which arousal takes place and past experiences play different roles in how physiological and affective states affect self-efficacy appraisals.

Self-efficacy and computer-based instruction

In a study of 100 male and female graduate and undergraduate students enrolled in Chinese Language and Culture Studies at Monash University in Australia, Henderson, Huang, Grant and Henderson (2009) found that students' self-efficacy beliefs regarding the use of Chinese language in a real-life context was improved through collaborative language activities in SL.

Young et al. (2009) examined whether the type of educational game, two-dimensional versus three-dimensional, would significantly affect the self-efficacy of seventh and eighth graders who participated in the study. The results indicated that girls had an increase self-efficacy when they played in SL compared with the two-dimensional game format. The boys, however, had decreased self-efficacy after playing with the three-dimensional game format.

Hudges, Stackpole-Hudges, and Cox (2008) looked into how learners' success may be affected by self-efficacy for online technologies, academic self-efficacy, academic self-regulation and cognitive style when instruction is delivered through

podcasts. The participants were 16 white females with an average age of 20.5 enrolled in one section of an introductory undergraduate course, Communication Processes, Development and Disorders, at a medium-sized state university in the mid-Atlantic region of the United States. Only cognitive style proved to be a statistically significant predictor of achievement. The two cognitive styles investigated in this study were field-dependence and Ffield-independence. The results indicated that FI learners were learning better than FD learners when instruction was delivered through podcasts. The researchers suggested that because of the context-specificity of self-efficacy, changes in the mode of education and training may affect learners' self-efficacy beliefs.

Deture (2004) investigated the entry-level self-efficacy of 73 male and female students with an age range of 18 to 57 registered in six web-based distance education courses at a community college regarding computer technologies and online learning. The results of her study indicated that FI students had higher self-efficacy for online technologies than FD students, although they did not get higher grades in their achievement tests. She concluded that the scores for cognitive styles and online technology self-efficacy were poor predictors of students' success in online courses.

Hendry et al. (2005) designed a study in which 12 groups of participants received training in cognitive styles through computer-based instruction while the other 12 did not. The participants consisted of 124 freshmen from the introductory eight-week unit of the medical and dental programs. The results of their study indicated that this intervention had no effect on learners' study self-efficacy. However, the study revealed

that training in cognitive styles helped the subjects to affirm their views about their own stylistic preferences.

In a study of 78 male and female undergraduate business freshmen enrolled in an introductory computer course at a university in China, Shiue (2002) examined the effects of students' cognitive style preferences and their prior computer course experience on the subjects' development of computer self-efficacy. Two types of cognitive styles, abstract versus concrete, were focused on in this study. The results confirmed that cognitive styles and prior computer course experience had a positive role in the development of computer self-efficacy. The study concluded that abstract learners perform better at interacting with computers compared with concrete learners.

Jackson (2002) randomly assigned 123 male and female undergraduate students registered in an introductory psychology course to receive either an e-mail note designed to enhance efficacy beliefs or a neutral e-mail note after they had taken an exam and completed a self-efficacy survey. Based on the belief that top-performing students may do well with or without self-efficacy strategies and least-prepared students may lack the required skills to do well, he decided that students with average abilities may probably benefit from a teacher's efforts to enhance efficacy beliefs. Subjects were assigned to three categories on the basis of earlier performance levels: above average, average and below average. They took another exam and completed a post-self-efficacy survey. The results indicated that self-efficacy beliefs were significantly related to performance in previous exams and affected by the efficacy-enhancing communication.

Applying Bandura's social cognitive theory, Lee (2000) studied the effect of MUD, a multi-user real-time virtual world, on users' computer self-efficacy and concluded that MUD experience raises users' computer self-efficacy because computer interfaces such as monitors and keyboards mediate all their experiences.

Ertmer, Evenbeck, Cennamo, and Lehman (1994) examined the effects of computer experience on students' self-efficacy evaluation for the specific technologies of e-mail and word processing. The participants in the study were 32 undergraduate students with an age range of 18 to 33 enrolled in Computer Applications in Physical Education at a mid-western university (59% male and 41% female). The subjects in the treatment group sent e-mails to the instructor to correspond with him throughout the semester. It was assumed that their computer self-efficacy would enhance because of the increased time on task while using computers. It was also predicted that frequent interaction with the instructor would help students to have a more positive view of their efforts to master new computer technologies. The results indicated subjects who utilized word processing and e-mail technologies more frequently had a more positive attitude toward computer technologies. However, total time-on task did not prove to directly affect self-efficacy judgments.

In a study of 157 female and 147 male college students enrolled in an introductory psychology class, Hill, Smith and Maan (1987) demonstrated the importance of efficacy beliefs in the adoption of an innovation. The study was designed to examine the role of efficacy beliefs in people's readiness to use computers. Even though self-efficacy beliefs are believed to be context- and domain-specific, the

researchers concluded they could be general enough to affect an individual's adoption of decisions with regard to a wide variety of technologically advanced products.

The above studies have investigated different variables such as learners' gender, major, age and cognitive style in both traditional and computer-based settings to investigate any changes in learners' computer self-efficacy with computer-based instruction. However, they have all come up with mixed results.

Chapter III of this study furnishes a detailed explanation of the research methodology, the population and sampling procedures, what data were collected and the steps in the procedure and statistical analyses and method for presenting data.

CHAPTER III

METHODOLOGY

Chapter III outlines the research methods used in testing the hypotheses and seeks responses to the research questions that drove the study and inspired the hypotheses. It describes the development of the instrument, an assessment of the reliability and validity of the instrument, how data were collected and data analysis procedures. The following sections are included: participants, instrumentation, design of the study and data analysis.

In terms of the two dependent variables of the study, achievement and computer self-efficacy, the following seven questions were asked:

1. Do learners in the seductive group perform significantly different from those in the non-seductive group?

2. Do learners who differ in Field-dependency perform significantly different?

3. Is there a significant interaction between Seductiveness and Field-dependency?

4. Do learners perform significantly different from Time1 (before their experience with Second Life (SL)) to Time 2 (after their experience with SL)?

5. Is there a significant interaction between Time and Seductiveness?

6. Is there a significant interaction between Field-dependency and Time?

7. Is there a significant interaction between Seductiveness, Field-dependency and Time?

Participants

The participants were undergraduate students enrolled in a three-credit-hour required course called Language Acquisition and Development in the College of Education at a public university located in the southern central United States. They were selected from two sections of the course, with 59% Interdisciplinary Studies (INST) majors, 38.6% Education Interdisciplinary Studies (EDIS) majors, 1.2% Spanish (SPAN) majors and 1.2% Mathematics (MATH) majors. The convenience sampling method was used for sampling the students.

The final data analyses included data only from participants who agreed to participate in the study by submitting the online consent form in the spring of 2011. A total of 84 students with an age range of 19 to 22 voluntarily participated at the beginning of the study, one of whom was not included in the final data analyses because she did not complete one of the tests. Of the total 83 participants, 4.8% were African-American, 1.2% was African, 8.5% were Hispanic and 85.5% were Caucasian. A majority of the students were juniors (53%), followed by sophomores (29%) and seniors (18%).

Instrumentation

An online participant questionnaire solicited demographic information about the participants' age, gender, major and classification. The questionnaire also included questions about the individuals' level of computer skills and knowledge, the number of previous online classes they had taken and the number of language acquisition and development courses they were taking during the spring semester of 2011.

Achievement in this study was defined as the student performance in an initial unit that consisted of the content of the first four chapters of the course book entitled *Pearson Custom Education: ESL Methodology for EDCI 462* by Peregoy and Boyle (2010). To measure achievement in this unit, an online 40-item multiple-choice test was developed by the researcher (Appendix B) and administered to all participants, once at the beginning of the semester and a second time after the first four chapters of the course book were completed.

The researcher developed a test bank with 125 questions on the first four chapters of the course book. It was administered to 98 undergraduate education majors in fall of 2010 at the university where the present study was conducted. To analyze the effectiveness of the test questions, item analysis was performed. Too easy and too difficult questions, determined by item difficulty level, and those with low or negative discrimination values were deleted or modified.

Face validity was used to determine content validity of the multiple-choice achievement test. Three professors, who had been teaching English as a second language (ESL) courses at the university where this study was conducted, examined the questions for content validity. Based on their feedback and data analysis, 79 items were deleted. Of the remaining 46 items, the researcher selected 40 items to make sure all four chapters of the course book were covered by the test. The test had a Chronbach's alpha coefficient of 0.85, which is a fairly good value for a multiple-choice test's reliability.

To measure field-dependency, the Group Embedded Figures Test (GEFT) was administered to subjects. The GEFT was chosen for this study because psychometrical

properties of the instrument have been investigated and widely accepted in cross-cultural settings (Altuan and Cakan, 2006).

The GEFT booklet consisted of three sections. The first section included seven simple practice items for which the participants would not be graded. Both second and third sections included nine items each, totaling 18 items. The total score for each participant would be calculated as the total number of simple forms correctly traced in the second and third sections. It was a timed test with 5 minutes allocated to Section Two and five minutes to Section Three. The omitted items and incomplete traces made by the participants were considered incorrect. To score the GEFT tests, the GEFT booklet's guidelines were followed. Participants that fell one-half standard deviation and above the mean were considered field-independent (FI), those one-half standard deviation and below the mean were considered field-dependent (FD) and the ones in between were considered field-neutral (FN).

To measure computer self-efficacy, an online Likert-scale (1 to 10) computer self-efficacy questionnaire was developed based on Bandura's (2006) guidelines on self-efficacy assessment (Appendix C) and was administered to both seductive and non-seductive groups before and after their experience in SL. The computer self-efficacy survey consisted of four sections: course management system/eLearning knowledge (12 questions), software knowledge (11 questions), hardware knowledge (nine questions) and SL virtual world knowledge (14 questions). To determine its reliability, it was administered to 351 male and female undergraduate chemistry majors at the university where the study was conducted during the fall of 2010. Applying PASW Statistics 18

data analysis software, Cronbach's alpha value was calculated to be 0.91. The self-efficacy questionnaire was developed using Qualtrics survey developer software.

Design of the study

This study was designed as a $2 \times 3 \times 2$ mixed-model factorial analysis of variance (ANOVA) with repeats on the third factor (time). There are three factors: seductiveness (seductive or non-seductive) and field-dependency (FD, FN and FI) and time (pre- and post-). There are two dependent variables: achievement scores and computer self-efficacy. The participants were randomly assigned to six groups (Table 3.1).

Table 3.1
/**Design of the study**

Field-dependency		Time	
Seductiveness		**Pre**	**Post**
SD **NSD**	**FD**		
SD **NSD**	**FN**		
SD **NSD**	**FI**		

Note. SD=Seductive, NSD= Non-seductive, FD=Field-dependent, FN=Field-neutral, and FI=Field-independent

Independent variables

There were three factors in this study: field-dependency, seductiveness, and time. Field-dependency had three levels: FD, FI and FN. Seductiveness had two levels: presence of seductiveness and absence of seductiveness in the virtual environment. And time had two levels: pre- and post-.

Two different settings were designed in SL for this study. The setting free of seductive augmentation was a virtual indoor classroom with seats arranged in a circle, detailed PowerPoint slides on the first four chapters of the course book and a viewer with video clips directly or indirectly supporting the concepts covered in these chapters (Figures 3.1 and 3.2). This setting can be visited at http://maps.secondlife.com/secondlife/12th%20Man/136/91/26.

The indoor class, looking like a traditional class, was located on the virtual campus of the university where this study was conducted. It was one of the many classes the university had designed for instructors who would like to have virtual meetings and classes in SL. Outside the classroom contained replica buildings of the real buildings on campus. The researcher had limited freedom to build and create objects in the indoor classroom.

Some of the viewer clips used in the non-seductive setting directly covered the concepts of the course book. For example, two important course concepts the learners were supposed to know were basic interpersonal communicative skills (BICS) and cognitive, academic, language proficiency (CALP). One of the video clips was a lecture on these two concepts by the scholar who coined these terms. Other viewer clips indirectly covered important course concepts. For example, there was a funny clip demonstrating how "hello" can mean different things in different settings and, therefore, it was teaching the concept of *pragmatics,* an important term for the learners to learn in this course.

Figure 3.1. **The non-seductive setting in Second Life: Inside view**

Figure 3.2. **The non-seductive setting in Second Life: Outside view**

The seductive setting was located on a sim called Glasscock Island. The outdoor classroom with an ocean view included seductive augmentation in the form of games, video clips, pictures and music, in addition to slides and video clips that the first setting had (Figures 3.3 and 3.4). Some elements were defined to have seductive roles in the seductive setting used for the seductive group for course activities. If the learners clicked any object in this setting, video clips would play, pictures would show or music would play.

The games included in this setting were irrelevant to the content of the course; they were just there to play with. For example, there was a tic-tac-toe board in the seductive setting. There were also some video clips that were not either directly or indirectly related to the course content. For example, there was a short clip on how women are unfairly treated in a Middle Eastern country. There was also a picture viewer with pictures of the class instructor and her family from a trip to a country in the Middle East. The researcher had full rights to create and build in the seductive setting. The non-seductive setting can be visited at:

http://maps.secondlife.com/secondlife/Glasscock/55/74/23.

Figure 3.3. **The seductive setting in Second Life**

Figure 3.4. **The seductive setting in Second Life: The ocean view**

To validate whether the designed elements in the seductive setting had seductive roles, both seductive and non-seductive settings were shown to three instructors who had been teaching the same ESL course and course book used in this study for several years. In the case of any disagreement on the role of an element, seductive or non-seductive, among these instructors, the element was either modified or deleted.

There were three levels of field-dependency in this study: FD, FN and FI. Originally, the study was designed with a focus on FD and FI learners. However, after the GEFT was administered to the participants, approximately one third of them were field neutral. Therefore, the field-dependency was divided into three levels instead of two.

Dependent variables

There are two dependent variables in this study: achievement and computer self-efficacy. Achievement was measured by an achievement test pre- and post-administered to the participants. Computer self-efficacy was measured by a computer self-efficacy survey pre- and post-administered to the subjects.

Procedure

Both classes participating in this study, with 36 students in the non-seductive group and 48 in the seductive group, were face-to-face classes that used the eLearning/Blackboard course management system for communication between and among the students and the course instructor. Both groups met face to face, as well as virtually in SL, for the first 2 months of the spring semester of 2011. They were taught

by the same instructor, had the same syllabus, course book, discussion board articles, midterm exam and end-of-the-semester exam.

To collect data on computer self-efficacy and field-dependency of the participants, a research assistant attended both sections of the course and briefed the subjects on the study and its purposes. It was explained there would be no extra credit for participating in the study but that their participation would greatly help both learners and educators. The data were always collected during class time, requiring the participants to invest no extra time.

Both classes took the online computer self-efficacy survey during the first session of the spring semester of 2011 in a computer lab where the class was scheduled to meet. After the instructor finished introducing the course syllabus, a research assistant explained the study to the subjects and encouraged them to participate. He explained if the students wanted to participate in the study, they first had to submit an electronic consent form. They were told the study needed them to complete two short online surveys and one paper-and-pencil cognitive style test. They were also reminded if they wished to withdraw from the study at any point, it was their right and doing so would not affect their course grades.

The instructor reiterated no one had to complete the survey unless they wanted to and that participating in the study (or not) would not affect their course grade. She explained the research assistant had sent the link to the survey to the instructor and that she had forwarded it to their school e-mail accounts. All of the students (100%) completed the 5-7-minute computer self-efficacy survey.

To determine the field-dependency of the students, the research assistant (in a separate session) explained the GEFT and how long it would take and also reminded them that the GEFT was one of the steps of the study that they agreed to participate in when they electronically submitted the consent form during completion of the first online survey. It was again explained to the participants there would be no extra credit for completing the GEFT and that they could withdraw from the study if they wished. Students were also informed that, if they were interested, they could get the results of the GEFT by directly contacting the research assistant. Again, 100% of the students took the GEFT. One student was absent in one section, and she was deleted from the study.

The participants were asked to fill in the identifying information on the cover page of the GEFT booklet, read the test directions on the first three pages and immediately stop when they got to the end of the directions. After the research assistant made sure the participants had no questions, they were told they would have 2 minutes to complete the first seven practice problems. At the research assistant's signal, the participants began. Meanwhile, he gave additional explanations to those who seemed to have difficulty with the practice items. At the end of 2 minutes, everybody was asked to stop. Exactly the same procedure was repeated for the second and third sections of the GEFT booklet, with 5 minutes allocated to each section as directed in the booklet instruction page.

Both classes met in a computer lab for 50 minutes once per week during the course of the study to practice using SL. Meanwhile, the non-seductive group had seven 60-75-minute virtual classes/meetings in the non-seductive setting, and the seductive

group had the same number of classes/meetings in the seductive setting. Because they were rather large classes, the virtual classes were offered at different time slots and followed exactly the same lesson plans to make sure that the islands in which the seductive and non-seductive settings were located would support enough avatars. Both sections were scheduled to meet back to back on Monday, Wednesday and Friday in the morning throughout the fall semester. The seven virtual classes offered were replaced with seven of these face-to-face meetings.

The instructor never lectured in these meetings; instead, students were involved in discussions, some hands-on activities and group-work. Both text and voice were used for interaction purposes.

Furthermore, the instructor of the class sent an e-mail to an SL listserv called SL Educators (SLED) and asked the other subscribers if anybody was interested in collaboration within SL. The researcher decided to e-mail SLED because it is a listserv for educators interested or currently using SL to communicate with each other, to find new colleagues and to share their experiences using SL for educational purposes.

The goal was to provide the students with opportunities to practice their SL skills while working on the course content. A professor responded with a class with 12 graduate students registered in a course called Emerging Technology and Global Collaboration at West Chester University in Pennsylvania. The two instructors met in SL and, after sharing their syllabi, they decided what activities their students were required to accomplish in SL.

The two sections were divided into 12 groups, and each group was paired up with one graduate student who also had the role of group leader. All groups were required to read the same assigned articles and watch video clips on the application of emerging technologies in education, especially ESL courses, and how virtual worlds in general and SL in particular could be used to help ESL students. Then they would meet in SL, discuss the assigned articles/clips and post to eLearning discussion boards. All groups were required to have at least three 1.5-hour virtual meetings throughout the semester. Depending on what sections the students were in, they would meet either in the non-seductive setting (Figure 3.5) or in the seductive setting (Figure 3.6). Because no data were collected from the graduate students, no information on these students is included in this study.

Figure 3.5. **Graduate and undergraduate students in the non-seductive setting**

Figure 3.6. **Graduate and undergraduate students in the seductive setting**

Both groups took an achievement test on the first four chapters of the course book *Pearson Custom Education: ESL Methodology for EDCI 462* by Peregoy and Boyle (2010) during the first session of the spring semester. The learners covered the first four chapters of the course book in face-to-face classes while using some class resources in eLearning and completing some class activities and assignments in SL. The seductive group, however, was exposed to seductive augmentation in SL while the non-seductive group was not. The participants took the same achievement test and computer self-efficacy test for the second time after 2 months.

Data analysis

There were three independent categorical variables in this study: seductive augmentation with two levels (seductive and non-seductive), field-dependency with three levels (FD, FN and FI) and time with two levels (pre- and post-). There were two dependent variables: achievement scores and computer self-efficacy scores. Data used included results of an online computer self-efficacy survey (pre- and post-), a multiple-choice achievement test (pre- and post-) and a paper and pencil cognitive style test.

Because no correlation was detected among pre-computer self-efficacy scores and pre-achievement scores, two independent mixed-model factorial ANOVAs were used to analyze the data in this study to compare means for achievement and computer self-efficacy of FD, FN and FI learners after their experience with SL within and across seductive and non-seductive groups.

CHAPTER IV

RESULTS AND CONCLUSION

The present study investigated the effects of seductive augmentation and field-dependency of the learners on their achievement and computer self-efficacy in a virtual world. Two mixed-model factorial ANOVAs with repeated measures on the third factor (time) were used for data analysis to find the answers to the following questions:

1. Do learners in the seductive group perform significantly different from those in non-seductive group?

2. Do learners who differ in Field-dependency perform significantly different?

3. Is there significant interaction between Seductiveness and Field-dependency?

4. Do learners perform significantly different from Time 1 (before their experience with SL) to Time 2 (after their experience with SL)?

5. Is there significant interaction between Time and Seductiveness?

6. Is there significant interaction between Field-dependency and Time?

7. Is there significant interaction between Seductiveness, Field-dependency and Time?

This chapter is presented in three separate sections. The first section presents the results of preliminary data analyses conducted prior to the statistical analysis of the dependent measures and the steps taken to make sure the parametric statistics meet ANOVA and mixed-model assumptions. The second section reports results of the primary data analyses, and the third section summarizes the results.

Pre-processing data and evaluation of model assumptions

The raw data set includes students' names, their course sections, their field-dependency and their achievement and computer self-efficacy scores (Appendix E). The next section investigates if the data used in this study meet mixed-model ANOVA assumptions.

Mixed-model analysis of variance assumptions

Mixed-model ANOVA requires that the repeated measure variables be interval-level and the between-subject variable be any level that defines groups (i.e., dichotomous, nominal, ordinal or grouped interval). In this study, the repeated-measures variable, time, is interval-level, and the between-measures variables, seductiveness and field-dependency, are nominal. They both satisfy the variable requirements.

The assumption of Sphericity for the within-groups factor for the repeated measures relates to the equality of the variances of the differences between levels of the repeated measures factor. It requires that the variances be equal for each set of different scores. Violations of the Sphericity assumption increase the chance of making a Type I error. Mauchly's Test of Sphericity tests the null hypothesis that the variances of the differences are equal. Therefore, if the result of this test is statistically significant ($p < 0.05$), the null hypothesis can be rejected, and it can be concluded that Sphericity has not been met. In this study, because the within-subject variable, time, had just two levels, Sphericity was automatically met and there was no need to report Mauchly's test.

To control for the next assumption (homogeneity of variance between groups) and make sure that each of the samples had the same variance or that the underlying

errors were all uncorrelated with homogeneous variances, Leven's test was used. In this

study, as Tables 4.1 and 4.2 show, because the significance level was greater than 0.05,

the groups exhibit homogeneity of variances.

Table 4.1
Levene's Test of Equality of Error Variances for achievement

	F	df1	df2	Sig.
PreAch	.303	5	77	.910
PostAch	1.491	5	77	.203

Note:PreAch = pre- achievement, PostAch = post-achievement

Table 4.2
Levene's Test of Equality of Error Variances for computer self-efficacy

	F	df1	df2	Sig.
PerCSE	.853	5	77	.517
PostCSE	.413	5	77	.838

Correlation between dependent variables

To determine whether a mixed-model multi-variate ANOVA (MANOVA) or two

independent mixed-model factorial ANOVAs were needed for this study, the correlation

between the two dependent variables, computer self-efficacy and achievement, was

calculated (Table 4.3). Because the results indicated no correlation ($p = .14$) between the

two dependent variables, the researcher carried out two independent mixed-model

factorial ANOVAs.

Table 4.3
Correlation between pre-achievement and pre-computer self-efficacy

		PreAch	PreCSE
PreAch	Pearson Correlation	1	.16
	Sig. (2-tailed)		.14
	N	83	83
PreCSE	Pearson Correlation	.16	1
	Sig. (2-tailed)	.14	
	N	83	83

Note. PreAch = Pre-achievement, PreCSE = Pre-computer self-efficacy

Primary data analysis

Two independent $2 \times 3 \times 2$ mixed-model factorial ANOVAs with repeats on the third factor (Time) at the 0.05 probability level ($p = 0.05$) were conducted to evaluate the main effects of Seductiveness, Field-dependency, and Time, and their interaction effects on computer self-efficacy and achievement of the participants.

Mixed-model analysis of variance for achievement

The data in Table 4.4 report descriptive statistics on the means and standard deviations for test scores for pre-achievement and post-achievement tests.

Table 4.4
Descriptive statistics for mixed-model ANOVA for achievement

	Seductiveness	Field-dependency	Mean	Std. Deviation	N
PreAch	NSD	FD	9.61	2.00	13
		FI	10.20	1.21	12
		FN	10.90	1.30	11
		Total	10.20	1.61	36
	SD	FD	9.71	1.61	16
		FI	10.61	1.46	17
		FN	9.50	1.59	14
		Total	9.97	1.59	47
	Total	FD	9.67	1.76	29
		FI	10.44	1.35	29
		FN	10.12	1.60	25
		Total	10.07	1.59	83
PostAch	NSD	FD	17.07	1.28	13
		FI	17.16	1.89	12
		FN	16.95	2.16	11
		Total	17.06	1.74	36
	SD	FD	15.59	2.45	16
		FI	16.85	1.68	17
		FN	16.42	1.95	14
		Total	16.29	2.07	47
	Total	FD	16.25	2.11	29
		FI	16.98	1.74	29
		FN	16.66	2.02	25
		Total	16.63	1.96	83

Note. PreAch = Pre-achievement, PostAch = Post-achievement

Table 4.5 presents the ANOVA results for the main effect of the within-groups factor, Time, and the interaction effects of Time/Seductiveness, Time/Field-dependency and Time/Seductiveness/Field-dependency for achievement.

Table 4.5
Tests of within-groups effects for achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power
Time	1757.73	1	1757.73	933.66	.00*	.92	1.0
Time * Seductiveness	2.29	1	2.29	1.21	.27	.06	.19
Time * Field-dependency	.21	2	.11	.05	.94	.002	.05
Time * Seductiveness * Dependency	10.28	2	5.14	2.73	.01	.06	.52
Error(Time)	144.96	77	1.88				

Note. P<.05*

The probability for the time main effect is less than 0.05, which indicates

significant differences occurred in learners' achievement across Time. The probabilities

for Time/Seductiveness, Time/ Field-dependency and Time/Seductiveness/ Field-

dependency interactions were all greater than 0.05, indicating that these interactions did

not have any significant effects for achievement.

The data in Table 4.6 present the ANOVA results for between-groups variables,

Seductiveness and Field-dependency, and the interaction effects of Seductiveness/Field-

dependency for achievement.

Table 4.6
Tests of between-groups effects for achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power
Intercept	29066.25	1	29066.25	6696.10	.00*	.98	.00
Seductiveness	11.67	1	11.67	2.68	.10	.03	.36
Field-dependency	14.64	2	7.32	1.68	.19	.04	.34
Seductiveness * Field-dependency	7.41	2	3.70	.85	.43	.02	.19
Error	334.23	77	4.34				

Note. P<.05*

As data in Table 4.6 show, the probabilities for both Seductiveness and Field-dependency as main factors and also their interaction effects are greater than 0.05, indicating that the main effects for Field-dependency and Seductiveness and also their interaction effect for achievement were not significant.

A 2 × 3 × 2 mixed-model factorial ANOVA (Seductiveness: seductive/non-seductive, Field-dependency: FD/FN/FI, Time: pre-/post-) revealed the following data for interaction effects of Time/Seductiveness F (1, 77) = 1.21, p > .05, Partial Eta-squared = .01; Time/Field-dependency F (1, 77) =.058, p > .05, Partial Eta-squared = .002; Time/Seductiveness/Field-dependency F (2, 77) = 2.73, p > .05, Partial Eta-squared = .06, and Seductiveness/Field-dependency F (2, 77) = .85, p > .05, Partial Eta-squared = .02. There was no overall difference in the achievement scores of FD, FN, and FI learners either in seductive or the non-seductive settings.

Analysis of data further revealed the main effect for Seductiveness was not significant: F (1, 77) = 2.68, p > 0.05, Partial Eta-squared = 0.02. Therefore, there was no overall difference in the achievement scores of FD, FN and FI learners in the seductive setting compared with the non-seductive setting. Moreover, the main effect for Field-dependency was not significant: F (2, 77) = 1.68, p > 0.05, Partial Eta-squared = 0.04. In other words, there was no overall difference in the achievement scores of learners across the three levels of field-dependency in both seductive and non-seductive settings. However, a significant main effect for Time was obtained: F (1, 77) = 933.66, p > 0.05, Partial Eta-squared = 0.92. These data indicate the post-achievement scores of all subjects were significantly higher (M = 16.64) than pre-achievement scores (10.08).

Mixed-model analysis of variance for computer self-efficacy

The data in Table 4.7 report descriptive statistics on the means and standard

deviations for test scores for pre-achievement and post-computer-self-efficacy tests.

Table 4.7
Descriptive statistics for mixed-model ANOVA for computer self-efficacy

	Seductiveness	Field-dependency	Mean	Std. Deviation	N
PreCSE	NSD	FD	5.46	1.42	13
		FI	6.38	1.19	12
		FN	7.35	1.74	11
		Total	6.34	1.62	36
	SD	FD	7.04	1.56	16
		FI	6.45	1.96	17
		FN	6.95	1.47	14
		Total	6.80	1.68	47
	Total	FD	6.33	1.67	29
		FI	6.42	1.66	29
		FN	7.12	1.58	25
		Total	6.60	1.66	83
PostCSE	NSD	FD	7.38	1.29	13
		FI	7.85	1.14	12
		FN	8.10	1.11	11
		Total	7.76	1.19	36
	SD	FD	7.55	1.42	16
		FI	7.67	1.42	17
		FN	8.05	1.17	14
		Total	7.74	1.34	47
	Total	FD	7.47	1.34	29
		FI	7.74	1.29	29
		FN	8.08	1.12	25
		Total	7.75	1.27	83

The data in Table 4.8 present the ANOVA results for the main effect of the

within-groups factor, Time, and the interaction effects of Time/Seductiveness,

Time/Field-dependency, and Time/Seductiveness/ Field-dependency for computer self-

efficacy scores.

Table 4.8
Tests of within-groups effects for computer self-efficacy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power
Time	54.80	1	54.80	76.18	.00*	.49	1.00
Time * Seductiveness	1.94	1	1.94	2.70	.10	.03	.36
Time * Field-dependency	1.15	2	.57	.79	.45	.02	.18
Time * Seductiveness * Field-dependency	5.47	2	2.73	3.80	.02	.09	.67
Error(Time)	55.39	77	.71				

Note. P<.05*

The probability for the time main effect is less than 0.05, which indicates significant differences occurred in learners' computer self-efficacy across time. The probabilities for Time/Seductiveness, Time/ Feld-dependency, and Time/Seductiveness/ Field-dependency interactions were all greater than 0.05, indicating they did not have any significant interaction effects for computer self-efficacy.

The data in Table 4.9 present the ANOVA results for the between-groups factors, Seductiveness and Field-dependency, and the interaction effects of Seductiveness/Field-dependency for computer self-efficacy.

Table 4.9
Tests of between-groups effects for computer self-efficacy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power
Intercept	8384.57	1	8384.57	2394.16	.00	.96	1.00
Seductiveness	1.60	1	1.60	.45	.50	.00	.10
Field-dependency	15.73	2	7.86	2.24	.11	.05	.44
Seductiveness *Field- dependency	9.62	2	4.81	1.37	.25	.03	.28
Error	269.66	77	3.50				

As the data in Table 4.9 show, the probabilities for both Seductiveness and Field-dependency as main effects and also their interaction effect were greater than 0.05, indicating the main effects for Seductiveness and Field-dependency and also their interaction effect for computer self-efficacy were non-significant.

A $2 \times 3 \times 2$ mixed-model factorial ANOVA (Seductiveness: seductive/non-seductive, Field-dependency: FD/FN/FI, Time: pre-/post-) revealed the following for interaction effects of Time/Seductiveness $F (1, 77) = 2.7$, $p > 0 .05$, Partial Eta-squared $= 0 .03$; Time/Field-dependency $F (1, 77) = 0 .8$, $p > 0 .05$, Partial Eta-squared $= 0 .02$; Time/Seductiveness/Field-dependency $F (2, 77) = 3.8$, $p > 0.05$, Partial Eta-squared $= 0 .09$, and Seductiveness/Field-dependency $F (2, 77) = 2.24$, $p > 0.05$, Partial Eta-squared $= 0.03$. There was no overall difference in the computer self-efficacy scores of FD, FN, and FI learners either in seductive or the non-seductive settings.

Also the main effect for Seductiveness was not significant $F (1, 77) = 0 .45$, $p > 0.05$, Partial Eta-squared $= 0.006$. Therefore, there was no overall difference in the computer self-efficacy scores of the learners in the seductive setting compared to the non-seductive setting. Furthermore, the main effect for Field-dependency was not significant $F (2, 77) = 2.24$, $p > 0.05$, Partial Eta-squared $= 0.05$. In other words, there was no overall difference in the computer self-efficacy scores of learners across the three levels of field-dependency in both seductive and non-seductive settings.

The probability for the time main effect was less than 0.05, indicating computer self-efficacy of all subjects had changed across Time with an increase from Time 1 to Time 2. The probabilities for Time/Seductiveness, Time/ Field-dependency and Time/

Seductiveness/ Field-dependency interactions were all greater than 0.05, indicating these interactions had no significant effects for computer self-efficacy.

Summary of results

Analyses of data conducted by applying two separate $2 \times 3 \times 2$ mixed-model factorial ANOVAs, one for achievement scores and one for computer self-efficacy scores, revealed no significance for the main effects and their interaction effects on the achievement and computer self-efficacy scores of the participants. The only significant effect was for the Time factor for both achievement and computer self-efficacy scores. The pre-test scores of all learners on the achievement test and computer self-efficacy survey were significantly higher than their post-test scores.

The flowchart in Appendix D presents all the stages of this study from inception of the problem to discussion of results. Chapter V discusses the results of the study and interprets them, elaborates on the implications of the results and findings and provides suggestions for further research on the topic.

CHAPTER V

DISCUSSION AND CONCLUSIONS

The present study was conducted in a virtual environment to determine whether seductive augmentation in Second Life (SL) affected field-dependent (FD) and field-independent (FI) Education majors' achievement and computer self-efficacy after their experience in SL.

Chapter V summarizes the results and discusses the findings in light of previous research findings and the theoretical framework used for this research. The overall findings are discussed in terms of the seven research questions that guided the study. It elaborates on the findings of the study on seductive augmentation effect, field-dependency, computer self-efficacy and achievement.

The researcher studied whether seductive augmentation in the virtual world of SL affected the performance of learners with different levels of field-dependency (FD, FN, and FI) in an achievement test. It further investigated whether computer self-efficacy of the learners with different levels of field-dependency was affected because of their experience in SL. The results of two mixed-model factorial ANOVAs, used for data analysis, revealed no significant main effect for Seductiveness or Field-dependency and no interaction effect among them on achievement and computer self-efficacy scores of the learners. The main factor of Time was significant for both achievement scores and computer self-efficacy scores of the learners. The research questions are re-examined in light of findings.

1. Do learners in the seductive group perform significantly different from those in non-seductive group?

According to the two mixed-model factorial ANOVAs, Seductiveness of the learning environment as one of the main between-group factors had no significant effect on the achievement scores and computer self-efficacy of the learners. In other words, there was no difference in the achievement scores and computer self-efficacy scores of the learners in the seductive setting compared to those in the non-seductive setting.

2. Do learners who differ in Field-dependency perform significantly different?

According to the two mixed-model factorial ANOVAs, Field-dependency of the learners as one of the main between-group factors had no significant effect on the achievement scores and computer self-efficacy scores of the learners. In other words, there was no significant difference in the achievement scores and computer self-efficacy scores of FD, FN, and FI learners.

3. Is there significant interaction between Seductiveness and Field-dependency?

The results of the two mixed-model factorials ANOVAs revealed no significant interaction effect for Seductiveness of the learning environment and Field-dependency of the learners. In other words, there was no difference in the achievement scores and computer self-efficacy scores of FD, FN, and FI learners in either seductive or non-seductive settings.

4. Do learners perform significantly different from Time 1 (before their experience with SL) to Time 2 (after their experience with SL)?

Data analysis revealed time as the main within-group factor had a significant effect on both achievement scores and computer self-efficacy scores of the learners. Both achievement and computer self-efficacy scores of the learners had increased across time (from Tome 1 to Time 2).

5. Is there significant interaction between Time and Seductiveness?

Results of the two mixed-model factorial ANOVAs revealed no significance for the interaction effect of Time and Seductiveness. In other words, there was no difference in the achievement scores and computer self-efficacy of the learners in the seductive setting compared to those in the non-seductive setting from T1 to T2.

6. Is there significant interaction between Field-dependency and Time?

According to the two mixed-model factorial ANOVAs there was no significance for the interaction effect of Time and Field-dependency. In other words, there was no difference in the achievement scores and computer self-efficacy of the FD, FN, and FI learners from T1 to T2.

7. Is there significant interaction between seductiveness, field-dependency and time?

The results of the study did not find any interaction effects for seductiveness and field-dependency and time. In other words, there was no significant difference in the achievement scores and computer self-efficacy of the FD, FN, and FI learners in the seductive setting compared to those in the non-seductive setting from T1 to T2.

The results of the study could not provide support for the *Seductive Details Hypothesis*. According to this hypothesis, insertion of irrelevant but interesting materials

primes the activation of inappropriate prior knowledge as the organizing schema for the lesson and consequently leads to poor learning. The results further failed to provide support for the *Emotional Interest Theory,* according to which adding interesting but irrelevant details to a text energizes readers as a result of which they pay more attention and learn more.

Achievement discussion

The findings of this study contradict with those of Garner, Gillingham, and White (1989), Garner and Gillingham (1991), Garner, Brown, Sanders, and Menke (1992), Wade, Schraw, Buxton and Hays (1993), Alexander & Kulikowich (1994), Harp and Mayer (1997), the first two experiments by Schraw (1998), Harp and Mayer (1998), Moreno and Mayer (2000), Mayer, Heiser, & Lonn, (2001), Harp and Maslich (2005), Shen, McCaughtry, Martin, and Dillion (2006), Sanchez and Wiley (2006), and Lehman, Schraw, Mccrudden, and Hartley (2007). These researchers found debilitative seductive effects on learner achievement. They used printed text, printed text and photos, multimedia text, audio narration, visuals, animation and noise to create seductive detail/augmentation effect. The results of this study also disagree with Towler and Craiger (2008) and Towler (2009) who found facilitative effects for seductive augmentation on achievement of their learners.

The studies mentioned in the previous paragraph exposed the subjects to seductive details/augmentation from a couple of minutes to 50 minutes and then they immediately tested recall, transfer tasks, or both in order to measure achievement. However, the present study took place over a period of two months. So length of time

during which the learners were exposed to seductive augmentation and also the retention interval time could be two of the reasons the findings of this study are different from the previous studies conducted and cited by other scholars. It is possible that during the first visits of the learners to the seductive setting, the designated seductive elements attracted their attention and interested them but as they paid more visits to this setting, the seductiveness of the setting diminished for these learners.

Furthermore, none of the above studies used a virtual world as a setting to expose the learners to seductive augmentation. Therefore, the type of computer-based setting used to deliver instruction and perform class activities may have had a role in whether or not there was a seductive augmentation effect.

Most of the seductive elements used in the seductive setting were context-independent, for example, pictures of the class instructor and her family from her trip to a Middle Eastern country. As Schraw (1998) stated context-dependent and context-independent seductive details may have different impacts on learning. Therefore, the kind of seductiveness used in the study may have impacted the results.

One more factor that may have affected the learners' responses to seductiveness is the manner in which it was presented to them. Whereas some seductive elements in the seductive setting were easily detectible, for example, the tic-tac-toe board, some were not. For example, there was a small beach ball in the ocean which would trigger a video clip to play only if clicked on.

Moreover, the type of activities in which the learners got engaged may have led to the results obtained in this study. The class instructor never lectured on the course

content in SL. Rather lectures were delivered in face-to-face sessions and then learners would be involved in activities in SL that would indirectly increase their understanding of the course content.

This researcher could find no seductive augmentation effect, either facilitative or debilitative, on the achievement of FD, FN, and FI learners in either seductive or non-seductive settings in the virtual world of SL. The findings support Wade and Adams (1990), Garner and Gillingham (1991), the third experiment in Schraw (1998), Park (2005), and Lusk and Daniel (2008) who also did not find any seductive details/augmentation effects in their studies.

Computer self-efficacy discussion

Although research has indicated self-efficacy has an important role in academic achievement in traditional learning environments, whether it can play the same role in online learning environments is yet to be investigated (Hodges, 2008). This study extended the scope of previous research on computer self-efficacy (for example, Miller, 1997; Handal and Herrington, 2004; Shih & Gamon, 2001) by including learners' field-dependency as a learner's characteristic and by exposing the learners to seductive augmentation in a virtual world.

In this study, there was an increase in computer self-efficacy of the participants across time irrespective of the type of learning environment, i.e. seductive or non-seductive, and field-dependency of the learners, i.e. FD, FN, and FI. Playing three-dimensional games (Young et al. 2009), learning with low-competency pedagogical agents -computerized cartoonlike characters- (Park, 2005), tutoring on electronic mail

and word processing (Ertmer et al. 1994), using editing software (Brinkerhoff, 2006), and general computer training (Kartsen & Roth, 1998) have all provided evidence to increase computer self-efficacy. However, in this study the computer-based instruction took place in a virtual environment. Therefore, the type of application could have affected the role that a computer-based instruction can have on the participants' computer self-efficacy. Learners' experience in a two-dimensional learning environment can be very different from their experience in a three-dimensional environment.

SL is not a game unlike many other available virtual worlds. Therefore, the type of virtual world used for this study may have led to seductiveness of the learning environment and also field-dependency of the learners having no effect on their computer self-efficacy.

Shaw and Giaquinta (2000) and Sam, Shukri and Nordin (2005) found discipline of study may be a more important factor in determining computer self-efficacy. In their study, undergraduates studying computer-related disciplines had higher computer self-efficacy compared to those with non-computer-related majors. The learners' discipline of study may have had a more important role than their field-dependency and also seductiveness of the learning environment in the study.

Some researchers have found experience of the learners in a computer-based environment does not necessarily enhance their computer self-efficacy. Higher levels of Internet usage (Sam, Shukri and Nordin, 2005) and online text-based discussion modes (Lin & Overbaough, 2009) were found not to increase computer self-efficacy. Contrary

to these studies, the present study provided evidence of increase in the learners'

computer self-efficacy after their experience with SL.

Limitations of the study

Result interpretations of this study are subject to some limitations and

assumptions. First, since this was a convenience sample and participants self-selected

into the study, it may not be an accurate representation of all undergraduate education

majors. Second, the conclusions are limited to the population presented by the sample in

this study. Generalization of findings to other populations requires replicating results.

Third, to determine which elements in the seductive setting in SL were exposing

the learners to seductive augmentation only experts' opinions were obtained. A better

practice would be to ask a similar population to decide which elements are course-

content related (non-seductive) and which ones are not (seductive) as the first stage of

the study and then compare a seductive setting with a non-seductive setting. In this

study, the researcher asked three professors who had been teaching the same course used

in this study for many years to visit the seductive setting designed in SL and determine

whether an element had a seductive role or not.

Fourth, the present study did not determine the degree of seductiveness for the

seductive elements in the seductive setting. Context-independent seductiveness is more

seductive compared to context-dependent seductiveness.

Finally, this study did not track the avatars of the learners in either seductive

setting or non-seductive setting to determine whether there was any change in the

learners' interest in the seductive elements during the time the study was conducted. As

mentioned before, it is possible the seductive elements were more interesting to the learners at the beginning of the study but lost their attraction as the learners paid more visits to this setting.

Suggestions for further research

This study focused on the field-dependency of the learners as the learner characteristic. Future research might involve other cognitive styles such as reflective/compulsive or risk-taker/cautious. Since cognitive styles determine how learners acquire and process information, future studies that focus on learners with learning styles other than field-dependency may obtain different results.

Furthermore, this study investigated seductiveness within a virtual world. Future research may compare seductiveness of virtual and non-virtual computer-based instruction. Experience of learners with a two-dimensional environment may be very different from their experience in a three-dimensional environment.

Except for four, all of the subjects were female. Future studies may include equal or proportional numbers of male and female students to see if there would be any difference between different genders. Finally, this research was conducted over the period of two months. Future research can manipulate length of time experimenting with shorter or longer experience with SL.

Conclusions

This study investigated the role of seductive augmentation and the learners' field-dependency on their achievement scores after their experience in the virtual world of SL.

It also looked for possible changes in FD and FI's computer self-efficacy after their interaction with a form of computer-based instruction, i.e. SL.

The results failed to support any main or interaction effects for seductive augmentation and learners' field-dependency on their achievement scores and computer self-efficacy scores. The main reason for the findings may be the type of setting used to expose the learners to seductiveness i.e. virtual world of SL. Therefore, future research may compare exposing learners to seductiveness in virtual and non-virtual settings. Moreover, instead of SL, other virtual worlds can be used to expose the learners to seductiveness. Also future research may focus on a different kind of learners' cognitive style, for example, reflexive versus compulsive.

Time as within-group factor was significant. In other words, there was an increase in the achievement scores and computer self-efficacy scores of the learners across time. However, time did not interact with learners' field-dependency and the seductiveness of the learning environment. Maturation may be the cause of the change in achievement and computer self-efficacy scores over time because the study took place over a period of two months.

There is still no consensus in research findings on whether there is any seductive augmentation effect. Some studies have found seductive augmentation effect and some have failed to do so. There are even contradictory results among the studies that have found seductive augmentation. Whereas a majority of them have concluded seductive augmentation diminishes or hinders learning, there are some that have concluded including seductive augmentation in the learning environment facilitates learning.

Furthermore, whether a learner's experience in a computer-based instruction setting leads to higher levels of computer self-efficacy is still in question and needs further research. Some findings indicate human-computer interaction increases computer self-efficacy of the learner. However, there are some other studies that have failed to find any cause-effect relation between computer self-efficacy and experience in a computer-based environment.

This study could not find any seductive augmentation, whether facilitative or debilitative, in SL. If seductive augmentation is believed to be one of the biggest challenges of virtual worlds for learning (Olbrish, 2008), maybe SL, at least, is not that susceptible to it. Therefore, educators can take advantage of SL affordances to better use emerging technologies for educational purposes.

REFERENCES

Akdemir, O. & Koszalka, T. A. (2008). Investigating the relationships among instructional strategies and learning styles in online environments. *Computers & Education 50,* 1451–1461.

Alexander, P. A. & Kulikowich, J. M. (1994). Learning from physics text: A sysnthesis of recent research. *Journal of Research in Science Teaching, 31(9),* 895-911.

Altun, A. & Cakan, M. (2006). Undergraduate students' academic achievement, field dependent/independent cognitive styles and attitude toward computers. *Educational Technology & Society*, *9 (1), 289-297.*

Angeli, C. & Valanides, N. (2004). Examining the effects of text-only and text-and-visual instructional materials on the achievement of field-dependent and field-independent learners during problem-solving with modeling software. *Educational Technology Research and Development, 52(4),* 23–3.

Baker, S.C., Wentz, R. K. & Woods, M. M. (2009). Using virtual worlds in education: Second Life as an educational tool. *Teaching of Psychology, 36, 59-64.*

Bandura, A. (1977a). Self –efficacy: Toward a unifying theory of behavioral change. *The Journal of Psychological Review*, 84(2), 191-215.

Bandura, A. (1977b). *Social learning theory*. Englewood Cliffs, NJ: Printice Hall, Inc.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall Inc.

Bandura, A. (1989).Human agency in social cognitive theory. *American*

Psychology, 44(9), 1175-1184.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior*, *4,* 71-81.

Bandura, A. (2006). Guides for constructing self-efficacy scales. In F. Pajeras & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307-333). Scottsdale, Arizona: Information Age Publishing, Inc.

Bartle, R. (1999). Early MUD history. Retrieved from http://www.mud.co.uk/richard/mudhist.htm

Bell, M. W. (2008). Toward a definition of "virtual worlds". *Journal of Virtual Worlds Research, 1(1),* 1-5.

Bradshaw, D. (2006). *Virtual Worlds – Real Learning! Pedagogical reflections.* Retrieved from http://virtualworlds.flexiblelearning.net.au/reports/VWRL_pedagog_reflect.pdf

Brinkerhoff, J. (2006). Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration beliefs and practices. *Journal of Research on Technology in Education, 39(1),* 22-43.

Campbell, C. (2009). Learning in a different life: Pre-service education students using an online virtual world. *Journal of Virtual Worlds Research, 2(1),* 3-17.

Carpenter, St. B. (2009). Virtual worlds as educational experience: Living and learning in interesting times. *Journal of Virtual Worlds research, 2(1),* 3-4.

Chen, C., Czerwinski, M. & Macredie, R. (2000). Individual differences in virtual environments: Introduction and overview. *Journal of the American Society for*

Information Science, 51(6), 499-507.

Chen, L. H. (2010). Web-based learning programs: use by learners by various cognitive styles. *Computers and Education, 54,* 1028-1035.

Clarck, S., seat, E. & Weber, F. (2000). *The performance of engineering students on the group embedded figures test.* Retrieved September 12, 2011, from

 http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=897625

Collins, J. (1982). Self-efficacy and ability in achievement behavior. Paper presented at the annual meeting of the *American Educational Research Association,* New York.

Cook, D. A. (2008). Scores from Riding's cognitive styles analysis have poor test-retest reliability. *Teaching and Learning in medicine, 20(3),* 225-229.

Crippen, K. J, Biesinger, K, D., Muis, K. R. & Orgill, M. (2009). The role of goal orientation and self-efficacy in learning from web-based worked examples. *Journal of Interactive Learning Research, 20(4),* 385-403.

Das, J. P. (1988). Simultaneous-successive processing and planning. In R. Schmech (Eds.), *Learning strategies and learning styles.* New York: Plenum Press.

DeTure, M. (2004). Cognitive style and self-efficacy: Predicting student success in online distance education. *The American Journal of distance Education, 18(1),* 21-38.

Dewey, J. (1913). *Interest and effort in education. Massachusett* : The Riverside Press.

Downey, J. P. & Zeltmann, S. (2009). The role of competence level in the self-efficacy–skills relationship: an empirical examination of the skill acquisition process and its implications for information technology training. *International journal of Training and Development, 13(2),* 96-110.

Ertmer, P. A., Evenbeck, E., Cennamo, K. S. & Lehman, S. (1994). Enhancing self-efficacy for computer technologies through the use of positive classroom experiences. *Educational Technology Research and Development, 42(3), pp.* 45-62.

Esteves, M., Fonseca, B., Morgado, L. & Martins, P. (2009). Using second life for problem based learning in computer science programming. *Journal of Virtual Worlds research, 2(1),* 4-25.

Even, M. J. (1982).Adaptive cognitive style theory in practice. *Lifelong Learning: The Adult Years,* 14-27.

Ford, N. (2000). Cognitive styles and virtual environments. *Journal of the American Society for Information Science, 51(6),* 543-557.

Ford, N. & Chen, S. Y. (2001). Matching/mismatching revisited: An empirical study of learning and teaching styles. *British Journal of Educational technology, 32(1),* 5-22.

Garner, R., Alexander, P. A., Gillingham, G. M., Kulikowich, J., M. & Brown, R. (1991). Interest and learning from text. *American Educational research Journal, 28(3),* 643-659.

Garner, R., Brown, R., Sanders, S., & Menke, D. (1992). "Seductive details" and learning from text. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest*

in learning and development (pp. 239-254). Hillsdale, New Jersey: Lawrence Erlbaum

Associates.

Garner, R., Gillingham, M. G. (1991). Topic knowledge, cognitive interest, text

recall: A microanalysis. *Journal of Experimental education, 59(4),* 310-319.

Garner, R., Gillingham, M. G. & White, C. S (1989). Effects of "seductive

details" on macroprocessing and microprocessing in adults and children. *Cognition and*

Instruction, 6(1), 41-57.

Goetz, E. T. & Sadosky, M. (1995). The perils of seduction: Distracting details or

incomprehensible abstractions? *Reading Research Quarterly, 30 (3),* 500-511.

Goodenough, D. R. & Witkin, H. (1977). *Origins of the field dependent and field*

independent cognitive styles. Retrieved November 3, 2009, from

http://www.eric.ed.gov/PDFS/ED150155.pdf

Graff, M. (2003). Learning from web-based instructional systems and cognitive

style. *British Journal of Educational Technology, 34(4),* 407-418.

Hall, J. K. (2000). *Field-dependence/independence and computer-based*

instruction in geography. (Doctoral Dissertation). Retrieved from ProQuest database.

(UMI No. 9974192).

Handal, B. & Herrington, A. (2004). On being dependent or independent in

computer based learning environments. *E-Journal of Instructional Science and*

Technology, 7(2).

Harp, S. F. & Maslich, A. A. (2005). The consequences of including seductive

details during lecture. *Methods and Techniques, 32(2),* 100-102.

Harp, S. F., & Mayer, R. E. (1997). The role of interest in learning from scientific text and illustrations: On the distinction between emotional interest and cognitive interest. *Journal of Educational Psychology. 89,* 92-102.

Harp, S. F. & Mayer, R. E. (1998). How seductive details do their damage: A theory of cognitive interest in science learning. *Journal of Educational Psychology, 90(30),* 414-424.

Henderson, M., Huang, H., Grant, S. & Henderson, L. (2009*). Language acquisition in second life: Improving self-efficacy beliefs.* Proceedings ascilite Auckland. Retrieved December 10, 2009, from http://www.ascilite.org.au/conferences/auckland09/procs/henderson.pdf

Hendry, G. D. et al (2005). Helping students understand their learning styles: Effects on study self-efficacy, preference for group work, and group climate. *Educational Psychology, 25(4),* 395-407.

Herold, D. K. (2009). Virtual education: Teaching media studies in second life. *Journal of Virtual Worlds research, 2(1),* 3-17.

Hidi, S. (1990). Interest and its contribution as a mental resource for learning. *Review of educational research, 60(4),* 549-571.

Hill, T, Smith, N. D. & Maan, M. F. (1987). Role of efficacy expectations in predicting the decision to use advanced technologies : The case of computers. *Journal of Applied Psychology y, 72 (2),* 307-313 .

Hudges, C. B, Stackpole-Hudges, C. L. & Cox, K. M. (2008). Self-efficacy, self-regulation, and cognitive style as predictors of achievement with podcast instruction. *Journal of Educational Computing Research, 38(2),* 139-153.

Jackson, J. W. (2002). Enhancing self-efficacy and learning performance. *The Journal of Experimental Education*, *70(3),* 243–254.

Kien, G. (2009). Virtual environment: The machine is our world. In S. Tettegah & C. Calongne (Eds.), *Identity, learning and support in virtual environments* (pp. 9-22). Rotterdam, the Netherlands: Sense Publishers.

Kintsch, W. (1980).Learning from text, levels of comprehension, or: why anyone would read a story anyway. *Poetics, 9,* 87-98.

Lehman, S., Schraw, G., Mccrudden, M. T. & Hartley, K. (2007). Processing and recall of seductive details in scientific text. *Contemporary educational psychology, 32,* 569-587.

Lee, K. M. (2000). MUD and Self-efficacy. *Educational Media International, 37(3),* 177 -183.

Lee, P. D. (2009). Using second life to teach operations management. *Journal of Virtual Worlds Research, 2(1),* 3-15.

Lin, S. Y.& Overbaugh, R. C. (2009). Computer-mediated discussion, self-efficacy and gender. *British Journal of Educational Technology, 40(6),* 999–1013.

Liu, M.& Reed, W.M .(1994). The relationship between the learning strategies and learning styles in a hypermedia environment. *Computers in Human behavior, 10(4),* 419-434.

Livingstone, D. & Kemp, J. (2008). Integrating web-based and 3-D learning environments: Second Life meets Moodle. *Upgrade, 9(3),* 8-14.

Lusk, D. L. (2008). T*he effects of seductive details and segmentation on interest, recall and transfer in a multimedia learning environment.* (Doctoral dissertation, Virginia polytechnic institute and state university). Retrieved from http://scholar.lib.vt.edu/theses/available/etd-04032008-092756/unrestricted/etd.pdf

Mancy, R. & Reid, N. (2004). Aspects of Cognitive Style and Programming. In E. Dunican & T.R.G. Green (Eds). Proc. PPIG 16, p. 1-9.

Mayer, R., Heiser, J. & Lonn, S. (2001). Cognitive constraints on multimedia learning: When presenting more material results in less understanding. *Journal of Educational Psychology, 93(1),* 187-198.

Messick, S. (1976). Personality consistencies in cognition and creativity. In Messick, S. & Associates (ED.), *Individuality in learning* (pp. 4-22). San Francisco, California: Jossey-Bass Publishers.

Messick, S. (1996). Bridging cognition and personality in education: The role of style in performance and development. *European journal of Personality, 10, 353-376.*

Miller, G. (1997). Are distant education programs more acceptable to field-independent learners. *Proceedings of selected research and development presentations at the 1997 National Convention of the Association for Educational Communications and Technology*, Albuquerque, NM. ERIC, ED 409854.

Moreno, R. & Mayer, R. E. (2000). A coherence effect in multimedia learning: The case of minimizing irrelevant sounds in the design of multimedia instructional messages. *Journal of Educational psychology, 92(1),* 117-125.

Moreno, R. & Mayer, R. E. (2002). Verbal redundancy in multimedia learning: When reading helps listening. *Journal of educational Psychology, 94(1),* 156-163.

Morgan, H. (1997). *Cognitive styles and classroom learners*. Westport, Connecticut: Greenwood Publishing Group, Inc.

Nachmias, R. & Shany, N. (2002). Learning in virtual courses and its relationship to thinking styles. *Journal of Educational Computing Research, 27(3),* 315-329.

Nelson, B. (2007). Exploring the use of individualized, reflective guidance in an educational multi-user virtual environment. *The Journal of Science Education and Technology, 16(1),* 83–97.

Nelson, B. C. & Erlandson, B. E. (2008). Managing cognitive load in educational multi-user virtual environments: Reflection on design practice. *Educational Technology Research and development, 56,* 619-641.

Ogle, T. (2002). *The effects of virtual environments on recall in participants of differing levels of field-dependence*. (Doctoral Dissertation). Retrieved from ProQuest database. (UMI No. 3047988).

Olbrish, K. (2008). Seductive augmentation principle: don't use extraneous, distracting sound or visuals. Retrieved September, 2011, from http://learningintandem.blogspot.com/2008_10_01_archive.html.

Pajares, F. (2006). Self-efficacy during childhood and adolescence. In F. Pajeras & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 339-367). Scottdale, Arizona: Information Age Publishing, Inc.

Park, S. (2005). *The effects of seductive augmentation and agent role on learning interest, achievement, and attitude*. (Doctoral Dissertation). Retrieved from ProQuest database. (UMI No. 3216635).

Pavio, A. (1986). Mental representations: A dual coding approach. New York City, New York: Oxford University Press.

Peachey, A., Broadribb, S., Carter, C. and Westrapp, F. (2010). Second Life in The Open University: How The Virtual World Can Facilitate Learning For Staff and Students in Wankel, C. and Kingsley, J. (Eds.) *Higher Education: Teaching and Learning in Virtual Worlds*. UK: Emerald.

Raven, P. (Photographer). (2009). *Kim Stanley Robinson to appear in Second Life… as a coyote* [Snapshot]. Retrieved September, 2011, from
   http://futurismic.com/2009/01/12/kim-stanley-robinson-to-appear-in-second-life-as-a-coyote

Riding, R. & Cheema, I. (1991). Cognitive styles: An overview and integration. *Educational Psychology, 11(3&4),* 193-215.

Sam, H. K., Othman, A. E. A, & and Nordin, Z. S. (2005). Computer Self-Efficacy, Computer Anxiety, and Attitudes toward the Internet: A Study among Undergraduates in Unimas. *Educational Technology & Society*, *8 (4),* 205-219.

Sanchez, C. A. & Wiley, J. (2006). An examination of the seductive details effect in terms of working memory capacity. *Memory and Cognition, 34 (2), 344-355.*

Saracho, O. N. (1989). Cognitive Style: Individual differences. *Early Child Development and Care,* 53, 75-81.

Schraw, G. (1998). Processing and recall differences among seductive details. *Journal of Educational Psychology, 90(1),* 3-12.

Schraw, G., Flowerday, T. & Lehman, S. (2001). Increasing situational interest in the classroom. *Educational Psychology Review, Vol. 13(3),* 211-224.

Schraw, G. & Lehman, S. (2001). Situational interest: a review of the literature and directions for future research. *Educational Psychology Review, 13(1),* 23-52.

Shaw, F. S. & Giacquinta, J. B. (2000). A survey of graduate students as end users of computer technology: New roles for the faculty. *Information Technology, Learning, and Performance Journal, 18(1),* 21-39.

Shen, B., McCaughtry, N., Martin, J., Dillion, S. (2006). Does "Sneaky Fox" facilitate learning? Examining the effects of seductive details in physical education. *Research Quarterly for Exercise and Sport, 77(4),* 498-506.

Sherman, G. & Tillies, R. (2007). Educational research and evaluation data collection procedures in second life. *Proceedings of the Association for the advancement of Computing in Education's World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education.* Quebec City, Canada.

Shih, C. C. & Gamon, J (2001). Web-based learning: Relationships among student motivation, attitude, learning styles, and achievement. *Journal of Agricultural education, 42(4),* 12-20.

Shiue, Y. (2002). The effects of cognitive learning style and prior computer experience on Taiwanese college students' computer self-efficacy in computer literacy courses. *Educational Technology Systems*, *31(4),* 393-409.

Spence, D. J. & Usher, E. L. (2007). Engagement with mathematics courseware in traditional and online remedial learning environments: relationship to self-efficacy and achievement. *Journal of Educational Computing Research, 37(3),* 267-288.

Tennant, M. (1988). *Psychology and adult learning*. London: Routledge.

Teo, T. (2009). Examining the relationship between student teachers' self-efficacy beliefs and their intended uses of technology for teaching: a structural equation modeling approach. *The Turkish Online Journal of Educational Technology, 8(4),* 7-15.

Thackray, L., Good, J., Howland, K. (2010). Learning and Teaching in Virtual Worlds: Boundaries, Challenges and Opportunities. In A. Peachy, D. Livingstone, J. Gillen, S. Smith-Robbins (Eds.), *Researching learning in virtual worlds* (pp. 139-158). London, Springer.

Thalheimer, W. (2004). *Bells, whistles, neon, and purple prose: When interesting words, sounds, and visuals hurt learning and performance— a review of the seductive-augmentation research*. Retrieved July 12, 2010, from http://www.work-learning.com/seductive_augmentations.htm

Towler, A. & Kraiger, K. (2008). *The effects of seductive details on recognition tests and transfer tasks*. Retrieved May 15, 2010, from http://www.hqda.army.mil/ari/pdf/TR_1232.pdf

Towler, A. (2009). Effects of trainer expressiveness, seductive details, and trainee goal orientation on training outcomes. *Human Resource Development Quarterly*, 65-84.

Truel, A. D. (2001). Student attitudes toward and evaluation of internet-assisted instruction. *The Delta, Pi, Epsilon Journal, 33(1),* 40-49.

Vekiri, I. & Chronaki, A. (2008). Gender issues in technology use: perceived social support, computer self-efficacy and value beliefs, and computer use beyond school. *Computers and Education, 51(3),* 1392-1404.

Wade, S. E., & Adams, R. B. (1990). Effects of importance and interest on recall of biographical text. *Journal of Reading Behavior: A Journal of Literacy, 22*(4), 330-353.

Wade, S. E., Schraw, G., Buxton, W. M., & Hayes, M. T. (1993). Seduction of the strategic reader: Effects of interest on strategies and recall. *Reading Research Quarterly, 28,* 92-114.

Wang, Y. & Braman, J. (2009). Extending the classroom through second life. *Journal of Information Systems Education, 20(2),* 235-247.

Wang, C. X., Song, H., Stone, D. & Yan, Q. (2009). Integrating Second Life into an EFL program in China: Research collaboration across the continents. *Techtrends, 53(6), p.* 14-19.

Wankel C. & Kingsley, J. (Eds.). (2009*). Higher education in virtual worlds: Teaching and learning in Second Life.* Bingley: Emerald Group Publishing Limited.

Warburton, St. (2009). Second Life in higher education: assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. *British Journal of Educational Technology, 40(3),* 414-426.

Weiss, A. (2009). If the walls could talk. In S. Tettegah & C. Calongne (Eds.), *Identity, learning and support in virtual environments* (pp. 23-32). Rotterdam, the Netherlands: Sense Publishers.

White, B.A. (2008). *Second life: A guidance to your virtual world*. Indianapolis: Que publishing.

Witkin, H. A, (1950). Perception of the upright when the direction of the force acting on the body is changed. *Journal of Experimental Psychology, 40,* 93-106.

Witkin, H. A, (1976). Cognitive style in academic performance and in teacher-student relations. In Messick, S. & Associates (Eds), *Individuality in learning* (pp. 38-72). San Francisco, California: Jossey-Bass Publishers.

Witkin, H. A, (1977). Cognitive styles in the educational settings. *New York University Education Quarterly,8(3),* 14-20.

Witkin, H. A., Moore C. A., Goodenough, D. R. & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. *Review of Educational Research, 47 (1),* 1-64.

Young, W., Peng, L.W., Carroll, S., Franklin, T., Liu, C. & Chelberg, D. (2009). An investigation of self-efficacy using educational video games developed by the KG-12

STEAM project. In I. Gibson et al. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2009*, Chesapeake, VA: AACE.

Zimmerman. B. J. & Cleary, T. J. (2006). Adolescents' development of personal agency: The role of self-efficacy beliefs and self-regulatory skills. In F. Pajeras & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 45-69). Scottdale, Arizona: Information Age Publishing, Inc.

APPENDIX A

SUMMARY OF STUDIES ON SEDUCTIVE DETAILS/AUGMENTATION

Study	Year	Title of the article	result
Garner, Gillinham and White	1989	Effect of seductive detail in macroprocessing and microprocessing in adult and children	Seductive details (SD) were remembered better and interfered with recall of main ideas
Wade & Adams	1990	Effects of importance and interest on recall of bibliographical text	More SDs were remembered than other text segments. Main ideas were remembered better than factual details and boring trivia.
Garner, Alexander, Gillingham, Kulikowich & Brown	1991	Interest and learning from text	Interesting details were remembered more than important generalizations regardless of their location.
Garner & Gillingham	1991	Topic knowledge, cognitive interest, and text recall: A microanalysis	No SD effect
Garner, Brown, Sanders, & Menke	1992	Seductive details and learning from text	SD were remembered more than important ideas
Wade, Schraw, Buxton & Hays	1993	Seduction of the strategic reader: effect of interest on strategies and recall	SD took longer to read and were remembered better than main ideas
Alexander &Kulikowich	1994	Learning from physics text: A synthesis of recent research.	SD were remembered more than important ideas
Harp and Mayer	1997	The Role of Interest in Learning From Scientific Text and Illustrations: On the Distinction Between Emotional Interest and Cognitive Interest	The SD group remembered more SD than main ideas and performed worse on problem solving tasks
Schraw	1998	Processing and Recall Differences Among Seductive Details	Experiments 1 and 2 found a debilitative SD effect. Experiment 3, failed to find a debilitative effect for seductive details.
Harp and Mayer	1998	How Seductive Details Do Their Damage: A Theory of Cognitive Interest in Science Learning	The SD group remembered more SDs than MIs and performed worse on problem solving tasks
Moreno and Mayer	2000	A Coherence Effect in Multimedia Learning: The Case for Minimizing Irrelevant Sounds in the Design of	SD had detrimental effect on recall and transfer but no effect on matching

		Multimedia Instructional Messages	tests
Mayer, R., Heiser, J. & Lonn, S	2001	Cognitive constraints on multimedia learning: When presenting more material results in less understanding	SDs led to poor learning
Park, S.	2005	The Effects of Seductive Augmentation and Agent Role on Learning Interest, Achievement, and Attitude	There was no significant effect for seductive graphics on achievement and recall scores for students who were presented with seductive graphics compared to those who were not.
Shannon F. Harp and Amy A. Maslich	2005	The Consequences of Including Seductive Details During Lecture	SD group remembered significantly fewer main ideas and provided fewer acceptable solutions for problem solving than non-SD
Shen, B., McCaughtry, N., martin, J., Dillion, S.	2006	Does "Sneaky Fox" facilitate learning? Examining the effects of seductive details in physical education	Subjects recalled fewer main ideas and scored lower in problem solving transfers in the SD condition than the non-SD.
Sanchez and Wiley	2006	An examination of the seductive details effect in terms of working memory capacity Sanchez and Wiley	Negative effects on low-working memory capacity and PROBABLY positive effects for high-working memory capacity
Lehman, Schraw, McCrudden & Hartley	2007	Processing and recall of seductive details in scientific texts	SDs have a detrimental effect on recall and deep processing. SD group spent less time reading non-SD than SD
Lusk, Daniel	2008	The Effects of Seductive Details and Segmentation on Interest, Recall and Transfer in a Multimedia Learning Environment	SD had no effect on recall, transfer and interest
Towler and Kraiger	2008	The Effects of Seductive Details on Recognition Tests and Transfer Tasks	No effect of SD on recall tests. SDs benefited transfer tasks.

APPENDIX B

INST 462

EXAM 1, SPRING 2011

1. When a new student arrives, the teacher should do all of the following except ….

 A. Find out basic facts about him/her.

 B. Get information about his/her prior schooling.

 C. Make him speak as soon as possible

 D. Get familiar with basic features of the home culture

2. Communication difficulties may persist even after a student has acquired the

basics of English because……..

 A. The teacher and the student may use different socio-cultural rules about how

  to use the language.

 B. The teacher is linguistically at a more advanced level compared to the student.

 C. The teacher and the student's languages are so different that communication

  becomes impossible.

 D. The basics that the student has acquired are not enough to enable him to start

  any amount of communication.

 3. Whether two language varieties are dialects of the same language or not can be

 determined by ……………….

A. Mutual intelligibility of the two varieties

B. Political status behind the two varieties

C. Grammatical systems of the two varieties

D. All of the above

E. Only A&B

4. The fact that out of the five TESOL standards four address CALP whereas only one

addresses BICS indicates it is …………….

A. Of great importance to master the academic language needed to succeed in four

core content areas.

B. Not important to master the kind of English needed for social and intercultural

purposes.

C. Neither of the above.

5. Which of the followings indicate(s) the difficult situation(s) the learners have to deal

with to master a target language?

A. Only figurative language

B. Only pragmatics

C. Only maintenance of the home language

D. Both A&B

E. A, B & C

6. Which of the following statements is **NOT** true about "No Child Left Behind"?

A. It has definitely improved learning among all students by mandating

achievement

B. It determines whether a school can get state funding or not.

C. Puts a lot of emphasis on standardized high-stakes testing.

D. Imposes an accelerated learning rate on language learners.

7. Which of the following statements is **NOT** true about subtractive bilingualism?

A. Primary language is eventually lost.

B. It is common among immigrants.

C. The learner shifts away from his home culture.

D. It is a social, cultural and economic asset.

8. From an innatist perspective children …………..

A. Model sentences they have heard parents or other caregivers use

B. Imitate what they have heard around them and create original utterances

C. Don't use grammar to inform their utterances

D. Construct grammar through a process of hypothesis testing

9. Corrections that focus on meaning tend to be …………to learn compared to those that

focus on grammar alone.

A. More difficult

B. Impossible

C. Easier

10. The Audiolingul method is based on which of the following Second Language Acquisition (SLA) theories?

A. Innatist

B. Behaviorist

C. Interactionist

11. How are errors treated in behaviorist perspective of SLA?

A. They are absolutely ignored.

B. The most important ones are corrected.

C. They are all immediately corrected.

D. Only those that stop communication are corrected.

12. Krashen's Acquisition-Learning Hypothesis states that ……..

A. Fluency comes out of learning.

B. Learning is formal and acquisition is informal.

C. Learning and acquisition are not really different.

13. Which of the Krashen's hypotheses supports the i+1 concept?

A. The Comprehensible Input Hypothesis

B. The Affective Filter Hypothesis

C. The Natural Order Hypothesis

D. The Monitor Hypothesis

14. Which of the following is a type of rote learning?

    A. Problem analysis

    B. Analogy

    C. Repetition

15. Behaviorists believe that language acquisition/learning is …………….

    A. Based on imitation.

    B. A type of rote learning.

    C. An inborn capacity.

    D. Both A&B

    E. Both A&C

16. Based on our textbook which of the following statements is **<u>NOT</u>** true?

    A. Both first and second language learners/acquirers go through a silent period.

    B. During silent period learners can understand but are not able to produce

    language

    C. Second language learners should be pushed to go through the silent period

    faster.

17. Krashen's Affective Filter Hypothesis states that ………………….

    A. There should be emotional support for learners in a learning environment.

    B. The teacher should filter the materials she/he is going to teach.

C. Learning takes place faster if the learner is under some stress.

D. Teachers should not affectively be involved with students' problems

18. Which of the following statements **IS** true?

A. Learning is informal.

B. CALP takes longer than BICS to master.

C. Acquisition is formal.

19. Which of the following statements **IS** true about correcting mistakes made by language learners?

A. Grammatical mistakes should be corrected first.

B. Any kind of mistake should be corrected immediately.

C. There is no need to correct any mistake.

D. Mistakes that hinder communication should be corrected.

20. According to behaviorists …………..

A. By acquiring a finite set of rules, children can produce an infinite set of sentences.

B. Children are born with a language acquisition device.

C. Children are born with blank minds.

D. Both A&B

21. Supporters of which of the following theories believe that children are biologically programmed to learn a language?

    A. Behaviorists

    B. Innatists

    C. Interactionists

22. According to the interactionist perspective of first language acquisition…………

    A. Nature has an important role in the development of children's first language

    B. Imitation has the most important role in the development of a first language

    C. Nurture has an important role in the development of children's first language

    D. All of the above

    E. Both A&C

23. The Affective filter can be lowered for ESL students by …………….

    A. Respecting their silent period

    B. Letting them use their home language

    C. Appreciating the culture they bring to the class

    D. All of the above

24. If a teacher teaches material that is too difficult for her/his ESL learners to understand, which of Krashen's hypotheses is she/he disregarding?

    A. The Comprehensible Input Hypothesis

    B. The Affective Filter Hypothesis

C. The Natural Order Hypothesis

D. The Monitor Hypothesis

25. Creative construction theory …………….

A. Claims that second language acquisition is similar to first language acquisition

B. Is in the same line with contrastive analysis hypothesis

C. States that areas of difficulty in second language development are predictable

D. is used to account for first language development

26. Pragmatics refers to ……………..

A. Grammatical rules governing structures of a language

B. Study of the sound system of a language.

C. How context influences interpretation of meaning

27. All of the following are among the factors and processes influencing English learners

in school except ………

A. Social context

B. Students' nationality

C. Age

D. Treatment of language learning errors

28. Language in the attic …………

A. Is a great technique to teach a second language

B. Honors students' home languages

C. Is used to teach a dialect

D. Is used to classify isolates

29. You are talking to a non-native speaker of English and he/she is not able to understand what you mean. You rephrase your sentence to help him/her understand and keep the process of communication going. Which of the following aspects of communicative competence are you using?

A. Grammatical competence

B. Strategic competence

C. Sociolinguistic competence

D. Discourse competence

30. English is an official language used widely in government, education, business and mass media in the Philippines but it is not the first language of the country. The Philippines is a/an…………… circle country

A. Inner

B. Expanding

C. Outer

31. Language proficiency ……….

A. Is the ability to make grammatically correct sentences.

B. Includes both rules of language use and usage.

C. Is the development of four language skills.

D. Is impossible to be achieved through formal instruction.

32. Context embedded situations ……………

A. Make use of scaffolds

B. Include extra visual and paralinguistic clues

C. Cannot affect the language learning process

D. Both A & B

33. Jigsaw is a cooperative technique in which ………

A. One segment of a learning task is assigned to each group member

B. Experts from each group meet to compare notes

C. Both A & B

D. An expert from each group provides the other group with a report

34. Older language learners who know how to read in their first language ………

A. May develop written competence in English earlier than oral competence

B. Never develop oral competence in English first

C. Always develop written competence in English first

D. Always develop oral competence in English first

35. In order to develop the oral skills of our language learners, we should teach them …………of the language.

A. Form and functions

B. Social context and form

C. Social context and functions

D. Social context, form and functions

36. In the following conversation between a toddler and his mom, what is the mom doing?

Child: Birthday cake Megan house.

Mom: We had birthday cake at Megan's house. What else did we do at Megan's house?

Child: Megan dolly.

Mom: Megan got a doll for her birthday, didn't she?

A. She is directly correcting the child's mistakes.

B. She is constructing grammar through a process of hypothesis testing.

C. She is helping the child to use his internal grammar editor (Monitor hypothesis)

D. She is assisting the child to communicate through conversational scaffolding.

37. Content-based instruction …………. To language learners

A. Uses target language to teach content

B. Uses mother tongue to teach content

C. Is used to teach just content

D. Is used to teach just language

38. Vygotsky's idea of the zone of proximal development is similar to Krashen's notion

of the ……………………. Hypothesis.

    A.   Monitor

    B.   Comprehensible Input

    C.   Natural order

    D.   Affective filter

39. Which of the following activity(ies) is/are context embedded?

A. A boy showing and explaining a picture to a friend

B. A teacher defining the concept of gravity to her students

C. An inventor demonstrating his invention to an audience

D. Both B & C

E. Both A&C

40. Which of the following errors made by a child acquiring his/her mother tongue is

considered a developmental error?

    A. saying "cow" meaning "cat"

    B. Using goed instead of went

    C.   Both A& B

APPENDIX C

COMPUTER SELF-EFFICACY APPRAISAL INVENTORY

Below you can see a list of common tasks that you might perform when using a

computer. In the column **Confidence,** rate how confident you are that you can do them

as of now by recording a number from 0 to 10 using the scale given below:

0	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*

| *Cannot do* at all | *Moderately* **can do** | *Highly certain* can do |

A. Course management systems knowledge

I am confident I can …..   **Confidence (0-100)**

1. Submit homework electronically.   …………………..

2. Download course material and save them on my computer.   …………………..

3. Upload my picture to the class roster.   …………………..

4. Locate E-learning tutorials and watch them.   …………………..

5. Send email to other students in the class   . …………………

6. Open and read announcements.   …………………..

7. Post to the class discussion boards.   …………………..

8. Locate my grades in E-learning.   …………………..

9.   Take online tests with no difficulty.   …………………...

10. Engage in real time conversations with other students. …………………...

11. Create dated reminders about events on class calendar. …………………...

12. Know how to look for new items placed under the course content.   …………………...

B. Software knowledge

I am confident I can …..   **Confidence (0-10)**

13. Set up a computer connection to the Internet.   …………………...

14. Use a computer operating system (such as Windows or Apple).   …………………...

15. Install a software program correctly.   …………………...

16. Use computer software (such as Excel) to analyze data (numbers). …………………...

17. Mange cookies (small personal files) on the Internet.   …………………...

18. Use antivirus software on a computer.   …………………...

19. Bookmark a website.   …………………...

20. Troubleshoot computer problems.   …………………...

21. Install on and remove programs from a computer.   …………………...

22. Add animation to a PowerPoint presentation.   …………………...

23. Add a video clip to a PowerPoint presentation.   …………………...

C. Hardware knowledge

I am confident I can …   **Confidence (0-100)**

24.   Scan documents.   …………………...

25.   Use the advanced features of printing.   …………………...

26.   Set up a computer network in my home.   …………………...

27.   Set up a new computer system right out of the box.   …………………..

28.   Understand typical computer words for hardware such as

       plug-n-play devices.   …………….............

29.   Use a computer modem to connect a computer to the Internet. …………………...

30.   Set up a printer.   …………………...

31.   Set up a webcam on a computer.   …………………...

32.   Set up audio devices on a computer.   …………………...

D.   Virtual World knowledge

I am confident I can ….. in the virtual world such as Second Life.   **Confidence (0-100)**

33. Create an avatar.   …………………...

34. Move around with no difficulty.   …………………...

35. Take snapshots.   …………………...

36. Teleport another avatar to where I am.   …………………...

37. Create a landmark.   …………………...

38. Build very simple things, such as a picture frame.   …………………...

39. Find clothing and other accessories for free.   …………………...

40. Create a note card.   …………………...

41. Open note cards and read them.   …………………...

42. Engage in voice conversation with another avatar.   …………………...

43. Transfer an item, such as a t-shirt, to another avatar.   …………………...

44. Teleport from one place to another place.   …………………...

45. Save items in my inventory.   …………………...

46. Change my avatar's appearance.   …………………...

APPENDIX D

VISUAL PRESENTATION OF DIFFERENT STAGES OF THE STUDY

| Major phases of research activities |

Preparation

The researcher included Second Life (SL) activities and assignments in the syllabus of the course she taught for spring and fall, 2010 to determine its appropriateness for her study

The researcher designed the study and obtained approval from IRB

Different stages of the study were conceptualized; research questions and hypotheses were formulated, and samples were identified

Instruments needed to carry out the study were identified and established:
1. Computer self-efficacy survey (CSES) was prepared, administered to more than 400 students and its reliability was determined
2. GEFT was purchased from the publishing company to determine field-dependency of the learners
3. Achievement test was prepared by the researcher and reviewed for item analysis

Two different settings in separate islands were designed in Second Life:
1. The non-seductive setting: a traditional class with chairs, a video viewer for course related materials and PowerPoint viewer with slides on the first four chapter of the course book
2. The seductive setting: an open air class in front of an ocean with games, pictures and video clips unrelated to course materials plus everything included in the non-seductive spot

Convenience sampling was used to assign students registered in two sections of INST 462 into two groups. Forty-eight students in one section were assigned to the seductive group (SD) and 36 in the other section to the non-seductive group (NSD).

Implementation

The NSD group met once a week for two months in an SL virtual indoor classroom with seats arranged in a circle, detailed PowerPoint slides, and a viewer with video clips directly or indirectly supporting the concepts covered in the first four chapters of the course book.

Throughout this time these students also attended their section of face-to-face lectures on the first 4 chapters of the course book and posted to discussion boards through eLearning. The instructor would never lecture in virtual meetings; instead students were involved in discussions, some hands-on activities and group-work with West Chester University students

The SD group met once a week for two months in an SL virtual outdoor class with an ocean view with games, video and music clips unrelated to the course content, and pictures scattered all of the setting which also included all slides and video clips that the NSD setting provided.

Throughout this time these students also attended their section of face-to-face lectures on the first 4 chapters of the course book and posted to discussion boards through eLearning. The instructor would never lecture in virtual meetings; instead students were involved in discussions, some hands-on activities and group-work with West Chester University students

Evaluation & Analyses

At the end of the two-month instructional period both groups took the same CSES and the same 40 items multiple-choice test over the first four chapters of the course text.

Data were analyzed using two independent mixed-model factorial ANOVAs, and conclusions were made

APPENDIX E

RAW DATA OF THE STUDY

PreAch	PostAch	PreCSE	PostCSE	Seductiveness	Dependency
7	16	8.2	8.7	SD	FN
9	15.5	6.2	7.1	SD	FD
10	16	7.9	8.9	SD	FN
11	18.5	6.7	8.1	SD	FI
13	19.5	8.4	8.9	SD	FI
9.5	15.5	5.4	6	SD	FN
9	17.5	9	9.3	SD	FD
11.5	15.5	6.2	7.5	SD	FI
8.5	13.5	7.2	7.6	SD	FD
9	15.5	4.6	5.7	SD	FD
13	17.5	6	7.4	SD	FI
7.5	17	6.2	8.5	SD	FN
9.5	17.5	8.4	8.2	SD	FI
10	18.5	7.9	9.1	SD	FN
10	15	7.2	6.9	SD	FD
10.5	20	9.3	9.9	SD	FD
10	16.5	4.5	4.7	SD	FI
7.5	13	9.6	9.2	SD	FI
10.5	16	4.1	7.5	SD	FI
11.5	16.5	9.3	9.2	SD	FD
5.5	11.5	5.2	7.9	SD	FD
11	12.5	6	8	SD	FD
9.5	14	7.8	9	SD	FI
10	17.5	7	8.5	SD	FN
11	17.5	6.2	8.1	SD	FI
26	17	9.2	8.5	SD	FI
10.5	18	7.7	8.9	SD	FI
8	19	7.8	8.5	SD	FN
10	17.5	5.1	7.3	SD	FI
10	16.5	6.2	8.4	SD	FI
8.5	15	5.3	7.8	SD	FN
12.5	17.5	4.1	5.1	SD	FN
11	19	4.4	5.8	SD	FI
10.5	18	5.9	5.4	SD	FD

PreAch	PostAch	PreCSE	PostCSE	Seductiveness	Dependency
11	17.5	6.2	6.7	SD	FD
10.5	17.5	2.3	4.5	SD	FI
11	11.5	9	8.1	SD	FN
9	15.5	7	8.5	SD	FI
11	17.5	9.5	9.3	SD	FD
9.5	16.5	7.5	7.5	SD	FN
12	16	9	9.2	SD	FN
9	14	7.6	6.1	SD	FD
8	13.5	5.3	5.7	SD	FD
9	15	6	8.6	SD	FN
10	13	7	8.5	SD	FD
12	18.5	7.2	7.5	SD	FD
8.5	19	6	8.3	SD	FN
11.5	17.5	6.5	8	NSD	FN
9.5	16.5	5.9	9.5	NSD	FI
8.5	12	7.5	9.6	NSD	FN
11	19	4.2	7.6	NSD	FI
9	16.5	6	8.3	NSD	FI
13	17	6	7.4	NSD	FN
9	17.5	5.8	9.5	NSD	FD
11	14	4.8	5.4	NSD	FD
4	16	3.1	6.7	NSD	FD
10	17	5.2	7.9	NSD	FD
11	17.5	3.5	6.1	NSD	FD
11.5	19.5	5.2	8.4	NSD	FN
9	18	4.5	5.2	NSD	FD
10	16.5	5.5	7.8	NSD	FD
9.5	15.5	6.7	6.9	NSD	FN
10.5	18	7.6	7.9	NSD	FD
9.5	17.5	6.5	8.5	NSD	FI
9.5	14.5	6.2	8	NSD	FI
11.5	18.5	8.2	8.4	NSD	FN
10.5	17.5	5	5.8	NSD	FI
11.5	16	6	7.8	NSD	FD
10.5	16	8.4	9.2	NSD	FN
11.5	20	6	6.3	NSD	FI
9.5	17	8.6	6.3	NSD	FI
7.5	17	5.7	7.9	NSD	FD

PreAch	PostAch	PreCSE	PostCSE	Seductiveness	Dependency
11	18.5	4.7	6.8	NSD	FD
12	19.5	9.3	9.4	NSD	FN
9.5	17.5	4.4	5.9	NSD	FN
9	15.5	8.2	8.4	NSD	FI
11	19.5	6.6	8	NSD	FI
9.5	14	6.5	9	NSD	FI
11	15.5	9.9	7.6	NSD	FN
10	19	8	9.1	NSD	FD
13	18.5	6.9	8.5	NSD	FI
10.5	17	6.6	7.9	NSD	FD
11.5	18	8.8	8.4	NSD	FN

VITA

Name: Zahra Moghadasian Rad

Address: Teaching, Learning, and Culture Department, Texas A&M University

Mail Stop 4232, College Station, TX 77843-4232

Email Address: moghadasian@yahoo.com

Education: B.A., English Literature, Tehran University, Tehran, Iran, 1991

M.A., Teaching English as a Foreign language, Tehran University,

Tehran, Iran, 1997

M.S., Management Information Systems, Texas A&M University,

2003

Ph.D., Curriculum and Instruction, Texas A&M University, 2011