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Abdulrahman S. Al-Amer

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Ph.D degree in Educational Systems Development

Richard A Price
Major professor

Date 4/15/00

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THE EFFECTS OF WORD PROCESSING USE ON TEXTUAL REVISION ACROSS LANGUAGES: ARABIC AS A FIRST LANGUAGE AND ENGLISH AS A SECOND LANGUAGE (ESL)

By

Abdulrahman S. Al-Amer

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Educational Systems Development

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ABSTRACT

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By

Abdulrahman S. Al-Amer

This study examined the effects of a word processing environment on revision processes of undergraduate and graduate students in both Arabic as a first language (AFL) and English as a second language (ESL). The study was designed to integrate a variety of quantitative and qualitative research methods and procedures in order to reach convergent or even contradictory results and to enrich the interpretation of the study results. Graeco-Latin Square randomization procedures were used to minimize the effects of subjects, topics, and treatment (combination of language and method) orders. The data was collected through interviews, thinking-aloud protocols, observational notes, and subjects' writing essays on videotapes and papers.

The subjects' revisions were classified according to Faigley and Witte's (1981, 1984) taxonomy of revision changes. Data classified as surface and meaning revisions were examined separately by using two factorial statistical models to avoid ambiguity that may have resulted from the combination of surface and meaning on the interpretations of the results. The factorial Analysis of Variance (ANOVA) and Log-Linear Models for repeated measures were used to examine the effects of word processing on surface and meaning revisions respectively across the two languages. As

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an additional test, a holistic approach was carried out to evaluate the quality of the subjects' essays in both languages.

The results of the study indicated that there were significant differences between word-processed and pen-and-paper essays with regard to the subjects' surface and meaning revisions across the two. The effects of writing methods on either surface or meaning revisions in both languages were stronger than on language effects. This may have been due to the subjects' past experiences in word processing.

Using a factorial design repeated measure (ANOVA), the results revealed that there were no significant differences on writing quality between pen-and-paper and word processed essays in both lanuages. In this study both quantitative and qualitative methods were consistent in that, first, the subjects benefited from word the processing environment for revision in English as a second language more than in Arabic as first language. This may be attributed mainly to the subjects' lack of typing skills in Arabic more than English as a second language (ESL).

Second, the subjects did not fully take advantage of the word processing environment for meaning revision. This probably resulted from the absence of formal instruction or training on how to use the word processing environment effectively when writing and revising.

DEDICATION

To all my big family with love

At the outset, the
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ACKNOWLEDGEMENTS

At the outset, there were many people who deserved my genuine gratitude for their help and support while conducting this dissertation study.

First and foremost, I am deeply grateful to my adviser Dr. Leighton Price whose profound comments, supports, encouragement, superb guidance and sense humor throughout the journey of this research project were invaluable.

I am especially thankful to my committee members Dr. Patrick Dickson, Dr. Zhoa Yong and Dr. Laura Apol whose their constructive comments and suggestions played an important role in the compellation of this thesis.

I want to express my appreciation to all the subject students who showed a great deal of cooperation and commitment while conducting the study.

Finally, I am most grateful to my wife Nora and my children Ghadah, Abdulmajeed and my lovely baby Buthaina, as well as to my bothers Abdulaziz, Mohammed and Abdullah, and my sisters Nora and Shikha, and to all of my relatives and friends who prayed for me and for my small family whenever they remembered us. This research project would not have been completed without their intense love, encouragement, patience and support.

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CHAPTER I

Introduction

In this information age there is a growing demand for effective written communication (Williams, 1991) in both academic and real-life contexts. According to Bridwell and Duin (1985) "... computers are, or will be, the means by which students will produce most of the formal writing they do as their productive careers span into the 21st century" (p. 116). Since the advent of the personal computer as a writing tool in the early 1980s, researchers have explored the effects of word processing on writing and revision (Bridwell-Bowles, 1989, 1991). Word processing has become widely used as both a writing and revision tool by novice and experienced writers alike (Hill, et al., 1991; Hult, 1988).

Pressley et al. (1995) speculated that "revising probably is the writing process most affected by word processors" (p. 178). At the heart of the writing process, revision is intended to improve the quality of written texts (Sommers, 1985; Hillocks, 1995; Hayes & Flower,1986). Pennington (1996) characterized revision,in a word-processing environment, as a continuous problem-solving process that occurs throughout text evolution.

A typical word-processing environment provides writers with a variety of textual revision capabilities that range from simple changes such as finding and correcting punctuation, spelling, and grammatical errors, and adding or deleting words, sentences or phrases to major changes such as reorganizing sentences within a paragraph or

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paragraphs within a text (Montague, 1990; Bangert-Drowns, 1993). Faigley and Witte (1984) drew a distinction between surface and meaning revision. They basically characterized surface revision as the revision changes that "do not alter the meaning of a text" and meaning revision as any revision changes that change the meaning of a text.

Montague (1990) and Pennington (1996) shared Daiute's (1986) contention that a word-processing environment facilitates surface-revision changes by providing writers with a variety of capabilities (e.g., a spell check, thesaurus, format) to making surface-revision changes. This allows writers to focus on meaning revisions by reducing the cognitive load devoted to the correction of mechanical errors.

These different word-processing capabilities have motivated researchers of writing and revision in both first and second languages to investigate their potentials for writing and revision processes. Phinney and Khouri (1993) maintain that "a major gap in much ESL composition research... is the lack of information about the students' writing processes in their first language" (p. 271). Phinney and Khouri (1993) emphasized the great need for more research that compares the writing processes of students "in their first and second languages, both by hand and on computer" (p. 271).

Computer Proficiency

Using a computer for writing entails having a variety of skills at acceptable level of competence in order to use the computer effectively for this task. Phinney (1989) holds that "Writing on a computer, then, poses two problems: dealing with a new technology and at the same time trying to do something which requires special skills" (p. 84). Research on a word processing environment emphasized the importance of a writer's

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Familiarity with computer technologies at high level of proficiency as a vital necessity for taking advantage of a computer for writing activities (Phinney, 1989; Williamson & Pence, 1989; Pennington, 1996). With new advances in computer technologies for writing, surface familiarity with a computer as the medium of writing is not sufficient to exploit these technologies for writing (Pennington, 1993;1996). Pennington called for the movement from surface level to deep level of computer usage in writing. She sees that "The target for advanced behavior is that computer use will simulate not only the physical act of writing, but also the cognitive activity which inspires generation, exploration, and synthesis of novel ideas into linguistic expression." (p. 170). Familiarity with the keyboard is an essential part in the call for familiarity with the computer writing environment. Many researchers hold that students should develop touch typing level or automaticity of keyboarding proficiency to effectively benefit from word processing capabilities (Daiute, 1985; Joram et al., 1992; Phinney & Khouri, 1993; Pennington, 1996; Erthal, 1998). Pennington maintains that "...the manipulation and control of the medium by experienced user is unconscious, automatic, and rapid, thereby freeing of both time and attention for other physical and mental activities" (p. 168). The notion of automaticity in computer writing environment is expanded to include not only physical activities, but also the automatic performance of writing processes, revision strategies and metacognitive skills associate with them (Pennington, 1993, 1996).

Definition of Terms

Revision. Revision in writing refers to mental and physical activities a writer goes though to make any change in a writing work. This general definition of revision is

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Surface changes. Faigley and Witte (1981, 1984) defined surface changes as revision changes that "do not affect the meaning of a text" (1984, p. 97).

Meaning changes. Faigley and Witte (1981, 1984) defined meaning changes as revision changes that "affect the meaning of a text" (1984, p. 97)

The Problem

The key purposes of the study are, first, to explore and compare the effects of word-processing use on the revision process, surface and meaning revision, of students across two languages, Arabic as a first language (AFL) and English as a second language (ESL), and, second, to gain insights about and compare the revision processes of Arab students as they revise their essays with word processing and pen and paper in both Arabic and English as a second language.

Despite the strong agreement among theorists and writing instructors that revision is a major part of the writing process for improving text (Murray, 1978; Hillocks, 1995; Hayes & Flower; 1986), contemporary research confirms that revision remains a problem for first and second-language student writers at all levels (Phinney, 1989; Hayes et al., 1987; Christiansen, 1990; Zamel, 1983; Daiute, 1983). As in first language research (Hayes et al., 1987; Flower et al., 1985) on revision college student writers of English as a second language (ESL) who use conventional writing tools (pen and paper) tend to avoid revising their essays because, as Chadwick and Bruce (1989) noted "[R]ewriting apprehension and the drudgery of copying seem to play a large part in dissuading

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students from revising their texts" (p. 18). Of those who revised, they overwhelmingly focused on surface changes (Gaskill, 1986; Hall, 1987; Phinney, 1989; Al-Semari, 1993).

Gaskill (1986) and Hall (1987), who studied the revision process of ESL college student writers using pen and paper, reported similar results: the striking majority of the students' revisions were surface changes.

Al-Semari (1993), examining revision strategies of eight advanced Saudi students in Arabic as a first language (AFL) and English as a second language (ESL) who used pen and paper in writing, confirmed the findings of Gaskill (1986) and Hill (1987). He found that the revision of subjects in both AFL and ESL was vastly dominated by surface revisions. More specifically, he reported that surface revisions made by ESL student writers represented 89% of the total revisions in English. In other words, meaning revisions represented 11% of the entire revisions in English. Moreover, in both languages his students showed some "organization, expansion and coherence problems" (Al-Semari, 1993, p.144).

Several researchers of writing and revision in English as a first and second language drew a connection between the difficulty of the revision task and the notion that revision is physically and cognitively demanding (Daiute, 1983, 1985, 1986; Chadwick & Bruce, 1989; Pennington, 1993, 1996).

As in first language (Daiute, 1983, 1985, 1986), second-language revision (Pennington, 1996) is a difficult task because a writer carries out physical (e.g., copying, writing tool demands and time confinement), cognitive (e.g., planning, generating ideas, paying attention to the purpose, audience, organization of the text, and remembering the

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conventions of writing) and psychological activities (e.g., writing anxiety) simultaneously in limited capacity short-term memory while s/he writes/revises the text.

Many investigators of word processing writing in both first and second-language research argue that if used effectively, word processing reduces the cognitive load of short-term memory by eliminating or minimizing the physical, psychological, and cognitive constraints of revision. This may allow writers to concentrate on the more cognitive or so-called global problems of their writing (Daiute, 1986; Daiute, 1983; Bean, 1983; Bangert-Drowns, 1993; Montague, 1990; Pennington, 1993, 1996). Pennington (1993a) hypothesized that ESL writers are more cognitively loaded when they write than first-language writers, because their second language ability is weaker. As a result, the use of a computer as a writing tool may help ESL writers to manipulate their greater cognitive load as they engage in writing.

Phinney and Khouri (1993) studied two experienced and two novice ESL college students using word processing in writing and revision and found that the two novice students devoted less time to revision. The researchers "found that computer experience affected the amount and type of revision more than language proficiency did" (Phinney, 1996, p. 140).

Joram et al. (1990) speculated that a lack of experience with word processing may limit writers to concentrate on surface revisions. Other researchers hypothesized that keyboard skills in general and typing skills in particular may interfere with the writing processes and affect the revision and writing quality (McAllister & Louth, 1988; Montague, 1990).

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Research Questions

This study posed two types of research questions: quantitative and qualitative.

Quantitative. The quantitative research methods addressed the questions of surface and meaning revisions with regard to the methods of writing (word processing versus pen-and-paper) language of writing (Arabic as a first language versus English as a second language) and the interaction between methods and languages of writing in both languages.

a) Research question for methods of writing

Depending on the method used to compose essays (word processing versus pen-and-paper), are there significant differences in both surface and meaning revision processes for both Arabic as a first language (AFL) and English as a second language (ESL)? Significant differences were expected in methods of writing.

b) Research question for languages of writing

Depending on the language used to compose essays (Arabic as a first language and English as a second language), are there significant differences in both surface and meaning revision processes for both word processing and pen-and-paper writing? Significant differences were expected but not significant to the results of the study.

c) Research question for interaction between languages and methods of writing

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Qualitative. The qualitative part of the study addressed the subjects' revision types and where and when they occurred in both first and second language in ether pen and paper and word processing essays. Furthermore, the qualitative part explored subjects' revision as a recursive process and the flow of their revisions as top down or bottom up strategies in all essays. Moreover, it addressed the functions of words subjects used frequently with both surface and meaning revision in the two languages, Arabic and English as a second language. Eventually, the subjects' perspective with respect to the benefits and constrains of word processing as well as their audience awareness were explored.

Both qualitative and qualitative questions were spelled out in detail in the methods chapter.

Importance of This Study

The importance of the study was based on recent research emphases and recommendations for further research on word processing in relation to writing processes, including revision.

Until recently, most writing process studies in general and revision process with word processing in particular were conducted with native English writers. However, writing researchers began exploring the revision processes of ESL students at different levels of writing proficiency and of education as they composed with a word processor, comparing them to the revision processes of those using first languages.

A review of the related literature revealed that no study has been conducted to examine and compare the effects of word processing in both Arabic as a first and English

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Additionally, most of the studies about revision processes of ESL students as they compose with a word processor were based only on written products rather than as a result of examining revision as a cognitive process. The current study is based on a combination of the writing product and cognitive process of revision; for example, the revision changes classification carried out on subjects' essays and thinking-aloud protocols. Thinking aloud protocols refer to the students' essays and verbalizations of their thoughts while they performed writing tasks (Flower & Hayes, 1980a).

This study attempted to provide a detailed description and a comprehensive data analysis by combining research methods from quantitative and qualitative paradigms. In order to provide a complete picture, several first and second-language researchers called for integrating quantitative and qualitative research methodologies to investigate the relationship of word processing to writing and revision (Pennington, 1996; Hawisher, 1989; Herrmann, 1990). In the context of English as a second language (ESL), Pennington suggested using multiple methods to examine the effects of the computer on students' writing.

In responding to those recommendations, this study used a variety of data-gathering techniques and integrated multiple analysis methods from quantitative (descriptive and inferential statistics) and qualitative (e.g., thinking-aloud protocols, interview, observation) paradigms in addition to technological devices such as scan converter, camcorder, and tape recorder to capture the subjects' revisions that may not appear on paper. The Dictionary of Computer and Internet Terms defined "scan

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converter" as "a device that accepts video signals from a computer and converts them into television standard format (NTSC, PAL, SECAM) so that the computer screen display can be used in videotapes and television broadcasts" (p. 411). A full picture of the technological devices and procedures used in this study will be discussed later in detail.

Bangert-Browns (1993) noticed that several studies combined surface revisions with meaning revisions when they examined the effects of word processing on revision processes that introduced interpretation problems. For example, they did not differentiate between deleting or adding letters and deleting or adding paragraphs. In this study, to avoid such a problem, surface revisions and meaning revisions were classified and tested separately.

Need for the Study

The findings of this study may assist researchers, teachers, instructional designers, and software and curriculum developers to develop and integrate curriculum, instruction, and computer technology to meet the needs of students and allow them to take advantage of the word processor' capabilities for writing/revising in both Arabic and English as a second language. Further, the study attempted to discover how subjects functioned differently or similarly across the two languages while revising their essays within a word processing environment. Moreover, the results of this study may provide a reference for and encourage further research. This study may also contribute to the attempt to build a complete body of knowledge about revision processes with word processing in both languages.

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Limitations of This Study

This study was limited by:

- The time span of writing: the subjects were given approximately one hour to write and revise their essays.
- The length of each essay: the subjects were instructed to limit their essays to around 300 words.
- The sample of study was mainly limited to Saudi graduate and undergraduate students at one major Midwestern university.
- The subjects speak Arabic as a first language (AFL) and English as a second language (ESL).

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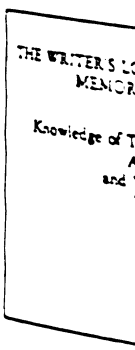

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CHAPTER II

REVIEW OF LITERATURE

Cognitive Model of Writing Processes

Several models of cognitive processes of writing emerged in the literature during the last twenty-five years. Until now, the most detailed and influential model was Hayes and Flower's (1981) model of writing processes (Figure 1).

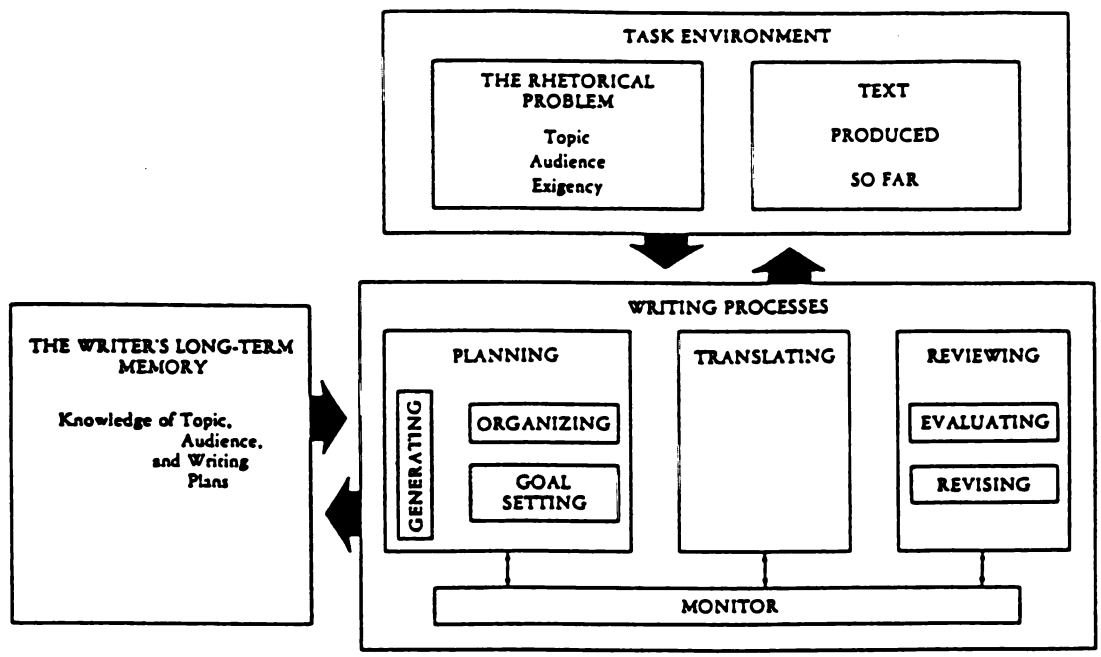

Figure 1: Flower and Hayes' model of writing processes Flower and Hayes (1981, p. 370).

This model of the writing process, similar to other writing process models, is based on the assumption that writing is a problem-solving process in which "writers make

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a mental picture of their tasks, set goals, design strategies to reach their goals, and evaluate their progress" (Sitko, 1994, p. 230).

Using thinking-aloud as research cognitive method, Hayes and Flower conducted a series of studies on adults' writing process. They defined thinking aloud protocols as the subjects' essays and verbalizations of their thoughts while they perform a writing task (Flower & Hayes, 1980a)

Based on their studies and other studies of the cognitive process of writing, Hayes and Flower constructed their model of the cognitive writing process of adult writers. Their model consists of three major components: the task environment, the writer's long-term memory, and the writing process (Hayes & Flower, 1983; Flower & Hayes, 1981). Regularly, as a writer composes, each component repeatedly interacts with and affects the others.

Flower and Hayes (1983) described the writing process as a complex, recursive (nonlinear) cognitive process that is composed of three major processes: planning, translating and reviewing. The planning and reviewing processes consist of subprocesses. The main processes and subprocesses are hierarchically structured and frequently overlapped.

Planning

Flower and Hayes (1981) called planning "the act of building ... internal representation." (p. 372). Planning usually develops at the outset of the composition process, but may occur throughout the composing processes. According to Hayes and Flower (1981) planning consists of the following subprocesses:

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Generating ideas about the text. This subprocess involves encoding the new information at hand and retrieving related knowledge stored in long-term memory (Flower & Hayes, 1981; Stein, 1986).

Organizing ideas. This subprocess involves putting ideas into groups or a hierarchical structure. Flower and Hayes (1981) indicated that the organizing process is much more than ordering ideas. Organizing the content is influenced by the audience that the writer wants to reach and guided by the goals for writing that the writer has created (this will be discussed below).

Setting up writing goals. Writers create goals for their texts that affect the audience and guide their writing activities (Hayes & Flower, 1983). Using protocol analysis techniques in writing composition, Hayes and Flower (1986) found that writing is goal directed. This is a continuous process that may take place at any time during the writing process (Flower & Hayes, 1981).

Translating

In order to produce the intended text, writers convert their thoughts into written language. (Hayes & Flower, 1980). The most difficult task of this process that writers encounter is to convey the knowledge representations that result from the planning process and are represented in nonverbal modes to verbal forms (Stein, 1986).

Reviewing

According to Flower and Hayes (1981), the review process is composed of two subprocesses, evaluation and revision. Reviewing involves evaluating what was planned

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or written (Hayes & Flower, 1983). Reviewing is initiated when the text or plan is evaluated (Flower and Hayes, 1981). When a writer discovers there is dissonance between what was intended and what was actually written, reviewing usually leads to revisions (Hayes et al., 1987; Hayes & Flower, 1983). The role of reviewing is to improve the written text's overall quality (Hayes & Flower, 1980).

Monitoring is an executive control that manages the shift of the writer's focus of attention from process to process or subprocess (Hayes & Flower, 1983). Sitko (1998) referred to the monitor as "metacognitive awareness of how and when to invoke strategies appropriately" (p. 96). For example, when a writer completes a paragraph, s/he may either generate a new paragraph or reread the paragraph for revision.

Although none of writing process theorists integrated computer technologies as part of the writing environment into their models, a number of writing researchers proposed that cognitive models of writing, such as Hayes and Flower's model, embrace the computer as the writing environment that "provide(s) a rich body of material from which to build a cognitive basis for a computer writing environment" (Smith & Lansman, 1989, p. 33) and support the main writing processes (Glynn et al., 1989).

Recently, Hayes (1996) proposed a new model of writing. The new model was built on Hayes and Flower's (1980) model of writing. However, the new model of writing gave "greater attention to the role of working memory in writing, inclusion of the visual-spatial dimension, the integration of motivation and affect with the cognitive processes, and a reorganization of the cognitive processes which places greater emphasis on the function of text interpretation processes in writing" (Hayes, 1996).

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Theory of Revision

The theoretical framework of this study is based on cognitive theory and the concepts of textual revision. Since some similarities exit between the writing process in both first and second languages, several researchers of both pen and paper and word processing have adopted the theory, design and findings of the research in the first language (Phinney, 1989; Krapels, 1990). Over the last twenty-five years, several cognitive theorists developed rich, thoughtful models of the revision process that may be applied as the grounds for exploring research on the relationship between word processing environment and the revision process.

In her model of the writing process, Emig (1971) used "reformulation" referring to revision changes. She proposed reformulation as a superordinate term for three tasks that differed in size: first, correcting is the smallest in which the writer eliminates the "discrete mechanical errors and stylistic infelicities" (p 43). Second, revision is a larger task in which major changes occur in discourse, such as a change in point of view or the organization of a text. Third, rewriting is the largest task involved in reformulation. Rewriting regularly occurs when the writer changes the text as a whole or as a segment (Emig, 1971).

Murray theorized that writers engage in the following three stages when they compose text: prevision, vision and revision. He further divided revision into two major components: internal revision, which encompasses "everything writers do to discover and develop what they have to say" (p. 91), and external revision which he referred to as editing, proofreading, and audience communication.

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Nold (1986) stressed that revision not only involves surface changes, but also meaning and organizational changes. He referred to the notion of dissonance as a stimulus for revising text at both the global and surface levels.

In recent years, the Hayes and Flower model (1983) characterized reviewing as "the act of evaluating either what has been written or what has been planned" (p. 209). They maintained that reviewing is initiated by the evaluation of the written text or plan (Flower & Hayes 1981). When a writer discovers any dissonance between what was intended and what was actually written, reviewing regularly leads to revision (Hayes et al., 1987; Hayes & Flower, 1983).

Scardamalia and Bereiter (1986) introduced "reprocessing" as a conceptual framework for mental and actual textual changes. They referred to reprocessing as "what goes on mentally rather than being tied to differences in surface behavior" (p. 790). They further characterized revision as a "special case of reprocessing, applied to actual text" (p. 790). They speculated that reprocessing includes all aspects of textual changes from editing surface errors to reforming goals. Thus, reprocessing involves textual changes at the surface and global levels mentally and actually.

The notion of dissonance or incongruity has been widely recognized by theorists and researchers of writing and revision processes as a necessary cue or trigger for making a revision. Perl and Egendorf (1986) hinted at dissonance through their use of the term retrospective structuring. They referred to the retrospective structuring as a mental process in which writers are inspired to return to their texts to make sense of what they have already written in order to move forward (Perl & Egendorf, 1986). Sommers (1980)

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contended that textual revision at any stage of composing occurs "when the writer recognizes incongruities between intention and execution" (p. 385).

Bridwell (1980) and Beach and Bridwell (1984) indicated that revision changes are caused by the dissonance that occurs when writers feel that some contradictions between their intentions and their written texts need to be resolved. Hayes and Flower (1986) hold that "revision...can be triggered not only by dissonance between intention and text but also by the discovery of better things to say, by the negative evaluation of a plan, and by failure to comprehend the text" (p. 1111).

Hayes (1996) developed a new model of revision. Unlike the Hayes et al. (1987) old model of revision, the new model used more mental schema, emphases on reading comprehension, problem solving or decision making process, long-term memory and text production. The new model implied that the idea that revision initiated by relevant cues that activate revision task schema stores in long-term memory in order to solve text problems. However, like the previous models of revision, the new one did not address the non-native revision model and did not include writing technologies as an integral environment of their models of revision.

Audience awareness, purpose and writing tasks as causes of dissonance that may lead writers to make changes in their texts have been emphasized by a number of researchers. Nold (1979) assumed that in the writing of subjects aged thirteen years or older, textual changes (e.g., adding or changing information, changing text organization) may result from audience awareness. Paralleling this theory, Monahan's (1984) study of revision strategies of basic and competent twelfth-grade writers for different audiences

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Although contemporary theorists of composition used different terms and constructed somewhat different theories of writing processes, they generally viewed revision as a problem-solving and recursive process that occurs to solve the dissonance between what has been intended in mind and what has been written (Fitzgerald, 1992). Pennington (1996) characterized revision, in a word-processing environment, as a continuous problem-solving process that occurs throughout text evolution.

Word Processing and Revision

There is a strong consensus among researchers that revision in writing is a complex and cognitively demanding process (Flower & Hayes, 1980b; Faigley & Witte, 1980; Matsuhashi & Gordon, 1989). Because of the limitation of working memory, Bangert-Drowns (1993) speculated that word-processing environments may free writers to devote more attention to "higher level aspects of writing (e.g., organization and clarity) by simplifying mechanical tasks" (p. 86).

Chadwick and Bruce (1989) claimed that a word processing environment changes the writing processes by providing writers with a variety of capabilities. For example, word processing as a revision tool facilitates the recursive (nonlinear) process, which is the major characteristic of the writing process theory. That is, writers move stiffly in linear sequence when they write with pen and paper (Glynn et al., 1989). However, with word processing, writers move back and forth around their texts (Pennington, 1996; Glynn et al., 1989; Chadwick & Bruce, 1989). Likewise, the insert, copy, paste, cut and

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spilt screen functions of word processing enable writers to move around their words, clauses, sentences, paragraphs, or even sections of text to change the text's meaning or organizational purpose (Daiute 1985; Frase, 1992).

Recently, a variety of what Glynn et al. (1989) called "supportive writing environments" are integrated into typical word-processing systems, such as the spell checker, grammar and style checkers, thesaurus, dictionary, translator (Glynn et al., 1989; Hawisher et al., 1996), high storage capacity, and speed information processing and retrieving in addition to word processing functions and peripherals. These environments may allow ESL writers to manage their cognitive load while they write/revise their texts (Pennington, 1993a). Pennington proposed that the changes word processing causes in a writer's physical, cognitive, and attitude toward writing may lead to better writing quality.

However, some researchers have argued that although the word processor provides various revising capabilities, like student writers in the first language, students in English as a second language (ESL) and basic users of word processing typically do not take advantage of those features to make global revisions (Phinney & Khouri, 1993; Phinney, 1989; Joram et al., 1990). Phinney and Khouri (1993) studied two experienced and two novice ESL college students in the use of word processing in writing and revision. They reported that the novice students focused on surface revisions when compared to the experienced students. Joram, et al. (1990) speculated that a lack of experience with word processing cause writers to concentrate on surface revisions.

Pennington (1996) maintained that whereas handwriting promotes the top-down (hierarchical) writing/revision processes, word processing supports bottom-up strategy or what she called the open-ended approach. She described the bottom-up as an open-ended

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approach which is "... a relatively unplanned free-form text which is then shaped by revision ..." (p. 84). According to Pennington (1996), the word processing environment supports the bottom-up process in which the language, content and organization of a text emerge in natural sequence that involves "less preplanning, more in-process planning, and problem solving" (p. 85) and more possibilities for revising the written content. She held that the word-processing environment with this natural writing approach may provide an important support to non-native writers to improve their writing quality.

Pennington (1996) further added that the revision process in the word processing environment also moved from micro-to-macro revision since writers focus first on the segment of the text that appears on the computer screen and then in the entire paragraph or text as a whole. Pennington (1996) maintained that within a word processing environment, the bottom-up process seems to be more naturally supported than the top-down hierarchical structured process in planning, generating and revising a text.

Review of Related Literature

The review of literature focused on the studies that examined the effectiveness of word processing on students' revision in writing in both Arabic and English as a Second Language (ESL) at the graduate and undergraduate levels. A review of related literature showed that, up to now, a dearth of research existed on Arabic in particular and English as a second language in general that compared the effects of word processing use on textual revision across languages. The literature review was limited to related studies conducted on graduate and undergraduate students in both first and second languages.

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The literature review is organized under the following segments: first language literature review and second language literature review.

First Language Literature Review

Since there is no relevant literature in Arabic on the research of the relationship of computers to the revision process in writing, the researcher relied on the literature in English as a first language.

Using a case study approach, Collier (1983) investigated the effects of word processing on the revision strategies of four female college student writers. The students were varied in their writing abilities (one with superior skills, two average skills and one demonstrating weak writing skills). None had prior experience with word processing. Collier hypothesized that word processing would significantly increase the four writers' number and complexity of revision strategies and thus enhance the quality of the students' essays as a whole. Collier limited his study to four operations (kinds) of revision: addition, deletion, substitution, and reordering applied to six domains or levels which involved, punctuation, words, phrases/clauses, T-units, idea clusters and paragraphs. At the outset of the study sessions the researcher provided two meetings, such as introduction to and practice of key functions of word processing. After the introduction, the researcher asked the subjects to revise their former works, which were handwritten, using conventional methods (pen and paper). During the six-week sessions, the researcher required the subjects to submit original drafts of six handwritten essays and to revise them with word processing. During two sessions, the researcher collected a thinking-aloud protocol from the subjects on audiotapes as they revised their essays.

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During the last session the researcher videotaped the computer screens while the subjects revised their essays with word processing.

Collier's study gave mixed results. He found that the use of word processing did not improve the quality of the students' revisions. However, the number and complexity of revision operations as well as the manipulation of written material at the level of words, phrases, and clauses increased in comparison to students' handwritten essays. The student with the superior writing skills was the better writer who took advantage of word processing in her revision; the students with the weakest writing skills benefited the least from using word processing in revision.

Pufahl (1984) essentially criticized Collier's study for not emphasizing the revision. He argued that Collier did not place explicit weight on the revision task as the students worked on word processing. Consequently, the role of the students seemed to produce typed copies rather than using the word processor as an important element of the writing task.

Bridwell et al. (1989) studied the effects of word processing on the revision processes of college student writers (juniors and seniors) enrolled in three writing classes. All the students had no or little experience with word processing. The researchers surveyed the students in the three classes to explore their problems with word processing and whether or not they would take advantage of word processing capabilities for revising their writing. Seventy-five percent of the students in the three classes responded to the survey questions. The findings of the survey analysis revealed that the students described word processing as beneficial to their writing, revising, and editing methods. A large proportion of the students in the survey reported that word processing saved time,

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was quick and easy as a writing and revising tool, and improved the quality of their writing. However, due to the quickness of the computer in various aspects such as editing, one-third of students believed that the word processor interfered with their writing processes in such a way that it motivated them to focus on polishing features rather than allowing them sufficient time to pay more attention to the major problems of their texts. Joram et al. (1990) maintained that lack of word processing skills may lead student writers to focus on surface revision.

In addition to the survey method, Bridwell et al. (1989) used the case study approach to investigate the writing and revision processes of five college students. The assignments used were short business letters. During the writing and revising sessions researchers used two programs. The first program recorded all keystrokes while the students wrote on the word processor, and the second program replayed all writing activities that took place on the word processor screen. While the researchers conducted the interviews with their case studies, they used the replay feature as a recall technique with two of the subjects. All the revision changes made by the case study subjects either in hand writing or in word processing were classified according to Bridwell's (1980) taxonomy of revision changes. The findings of the case studies with respect to revision processes indicated that the number of surface revisions increased. Likewise, the students showed more concern about the formatting or the visual appearance of their letters (Bridwell & Duin, 1985, Bridwell et al., 1989). However, the researchers found that word processing "did not significantly improve the revising abilities of selected college juniors and seniors." (Bridwell et al. 1987, p. 82).

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Using an experimental design, Hawisher (1987) studied "the effects of word processing on revision strategies of 20 freshmen college students. The participants were randomly assigned into one of two equivalent groups. Each student in each group wrote and revised four essays, two with word processing and two with conventional tools (pen and typewriter). The researcher used Faigley and Witt's (1984) schema to classify the type of revisions the students made in their essays with both methods. In addition, she used the analytic scoring scale to rate the writing quality of the student drafts. The results indicate that the two groups made more revisions with the pen and typewriter compared to their revisions with word processing. However, the researcher found no significant differences between the writing quality of the drafts produced by students with either word processing or with pen and typewriter. She found that there were no significant differences in the types of revisions students changed with and without word processing.

In a somewhat similar study, McAllister and Louth (1988) examined the effect of word processing on the revision quality of college basic writers. Over two semesters, the study involved 120 students in three teachers' classes. The three teachers worked under similar conditions and used the same textbook. During the first semester, the teachers taught their students word processing, paragraph writing and revising skills and provided practice exercises on these skills. During the second semester, each class was divided into two experimental groups who wrote and revised their paragraphs with word processing and one control group who did not. The researcher trained seven graduate students on a holistic scale to grade the six groups' written and revised paragraphs in the first and final drafts. The investigators found that there were no significant differences between the three groups in the quality of their revisions in the fall of the year. However, they found

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"significant difference in the quality of revisions between the experimental groups and control group in the spring" (McAllister & Louth, 1988, p. 417). They concluded that in laboratory context, word processing significantly affected the revision quality as a whole.

Walker (1997) used a case study methodology to study the differences between revising essays on screen and on paper. The subjects of the study were eight college freshmen who enrolled in a developmental class. During two weeks, the subjects wrote ten writing assignments. Two students were selected from among the eight students and studied in depth. Data were collected mainly through interviews and essay assignments of the students. Faigley and Witte's (1984) scheme of revision was used to classify the students' revisions. The results of the study revealed that "eighty-one percent of those (revisions) made on-screen were above the mechanical or word level" (Walker, 1997, p. 33). She reported that "when students worked on-screen, they tended to add more information and recreate paragraphs. They did, however, often fail to see all of the surface-level changes that were necessary" (Walker, 1997, p. 33). She speculated that with instruction and technical support, students can improve their writing quality by making better revisions on computer screens.

In a program evaluation study, Bernhardt et al. (1989) studied the effects of using computers to teach introductory college composition. The study included 24 classes; 12 were used as control groups, and another 12 were used as experimental groups. The two types of classes "received the same instructions and were tested under the same conditions (p. 115). Data were collected from a variety of sources, including students' pre-posttests on writing and writing anxiety; records on attendance, tardiness, and withdrawals; homework and essay assignment completion; students' self reports and

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teacher evaluations; class observations; and questionnaires. After the students performed their pre-test essays, they had the choice to use either computers or pens-and-paper to revise and improve their essays. Results of the study revealed that the students who used computers revised and improved their posttest essays significantly better than those groups who used pen and paper.

Second Language Literature Review

In a microcomputer lab, Piper (1987) observed intermediate ESL students enrolled in two writing classes for two terms learning and using word processing in writing. Part of the observation examined revision aspects with word processing. Piper noticed that some students used word processing to improve their understanding of text structure through the use of formatting, moving and inserting functions. Moreover, she observed that word processing can eliminate the burden of drafting and redrafting and produce a neater document with less effort. This observation is consistent with Daiute's (1983) contention that word processing lessens the physical burden of copying by making revision easier.

Using a case-study approach, Benesch (1987) examined the effects of word processing on the writing processes and attitudes toward writing of three intermediate college ESL students. The students were selected from a remedial ESL writing class who revised extensively with pen and paper. The data were collected by multiple methods: handwritten drafts from the students' previous works, interviews, word-processed drafts, observations and videotapes of the word processor screens. The students received an introduction on the use of word processing software and were directed to use it in their

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writing assignments. The results of the study were mixed. Benesch reported that although all the students revised extensively with pen and paper and demonstrated positive attitudes toward the computer, none used the computer effectively as a revision tool. One used the computer to generate ideas, the second used it for surface revisions, and the third approached the computer in order to become familiar with software and hardware technology.

Smith (1993) studied the writing and revision processes and strategies of 21 college students with English as a first and second language (seven subjects were English speakers, seven Chines speakers, and seven Spanish speakers) before and after adding Grammatik IV®, a computerized grammar checker that is mainly designed to check common textual-local problems (e.g., diction, grammar, and styles) rather than global problems (e.g., content, organization, and meaning). During two 60 minutes sessions, each student wrote six essays. Within both language groups, based on holistic score the students were divided into two groups of basic and skilled writers. The information about writing and revision processes were gathered through different research methods, including interviews, videotapes of the computer screen, thinking-aloud protocol and holistic scoring of the written essays. Using the videotapes and thinking aloud protocol, the student writers' revising strategies were coded according to a classification system. Results indicted that skilled writers in both language groups continued to concentrate on the global problems of their essays after adding the grammar checker to their writing environment. However, the study showed no significant effects for skilled writers in both language groups. In contrast, the basic writers in both language groups paid more attention to local problems in their essays when using the grammar checker. More

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During a quarter term, Lam (1992) used class data and case studies to investigate college ESL students' revision patterns and to examine the effects of teacher comments, discourse types (expressive, persuasive, and transactional), and writing tools on students' revision strategies. Class data were gathered from two ESL classes and case-study data were collected from various methods including observations, interviews, writing samples, and computer stroke records of five students selected from the two classes. To analyze data from the two classes, Lam used descriptive statistics (means and medians) and inferential analysis methods (t-test and multivariate analysis of variance). Moreover, the teacher's comments were analyzed on the basis of types of feedback and degree of explicitness. The results revealed that the ESL students performed both local and global revisions on their essays. However, they relied notably on teacher comments for their revisions. Furthermore, the majority of the case studies showed no differences in their revisions as a result of the change in discourse types. It was noteworthy that the students made more revisions with the word processing in the first drafts and revised more recursively in the second drafts.

Using an experimental research design, Rahman (1991) investigated the effects of the computer on the writing of college ESL students over one semester. For the use of repeated-measures analysis, two advanced ESL writing classes were randomly assigned to experimental and control groups. Each group consisted of nine volunteer students. The experimental group used word processing to write and revise four essays; the control group used pen and paper or a typewriter. The students in both groups were asked to

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revise and submit their first and second drafts. Rahman's study focused on four aspects of writing: writing quality, errors, revision changes between drafts, and the number of words in each essay. He also examined the writing anxiety of students in both groups. As a measure of writing anxiety, all the students in both groups took writing apprehension tests at the beginning and end of the semester. Results showed that there was no significant difference with regard to the overall quality of the essays between the experimental and control groups. There were no significant differences between the two groups on the basis of errors and revision changes. Although both groups showed significant differences between the original drafts and the revised (second) drafts, the results indicted that the rating of writing quality of the revised drafts was significantly higher than for the first drafts. The students primarily made more surface revisions than meaning revisions in their essays.

Chadwick and Bruce (1989) conducted a study during a ten-week semester at Hong Kong University to examine the effects of word processing on students' writing quality, attitudes toward writing, and the revision process of nonnative students. This comparative study used two groups: a control group which consisted of 13 freshmen students from industrial and mechanical engineering departments who used only pen and paper as writing and revising tools, and an experimental group, that contained 12 freshmen students from civil- and electrical-engineering departments who used word processing,. Both groups were taught by the same instructor. The instructor used similar content and instructional methods. While teaching and writing of the control group took place in a conventional classroom, the teaching and writing of the experimental group occurred at the computer lab. Data were collected through multiple methods, such as pre-

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and post-course questionnaires, students' written drafts, holistic scoring of writing proficiency and Faigley and Witte's (1981) taxonomy of meaning revision changes. Using the t-test and the Mann-Whitney U-test, Chadwick and Bruce compared the two groups statistically. The results indicated that the word processing program did not immediately or directly affect the students' writing quality. The authors attributed this result to the study's short-term course (10 weeks) and to lack of student experience with using a computer to write an essay. However, researchers speculated that if word processing positively affected students' attitudes toward writing, then students' writing quality would improve in the long run. Moreover, the study's findings showed that although there were no significant differences in the effects of word processing on students' attitudes toward writing processes, students in the experimental group showed more positive opinions with regard to the improvement and effectiveness of their ability to write. The results also indicated that word processing positively affected writing quality. Most notably, the results of the study revealed that, in general, the experimental group performed more changes at both the micro-and macrostructure levels in meaning, but the most significant changes occurred at the macrostructure level.

Using the case study method, Phinney and Khouri (1993) studied four undergraduate students of English as a second language (ESL) as case studies to explore the role of language proficiency and computer experience on the revision process. The four students were selected after a questionnaire was administrated to all the students in the class of writing composition with computer for English as a second language (ESL). The subjects were two students with prior experience writing with a computer (two years or more) and two students with no prior experience writing with a computer. In addition,

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two of the selected students were experienced writers and the other two were inexperience writers. The data were collected through interviews, questionnaires, and videotapes of the students' writings. In the same study, videotapes were transcribed and coded using Faigley and Witte's (1984) taxonomy for revision changes after adding a few categories for computer functions and length of changes to the taxonomy. The researchers reported that "The two inexperienced computer users spent less time revising, made more surface changes, and used the computer functions less than the experienced users" (Phinney & Khouri, 1993, p. 257). "They found that computer experience affected the amount and type of revision more than language proficiency did" (Phinney, 1996, p. 140).

Using the word processor as a writing and revising tool, Kehagia and Cox (1997) examined the effects of the ESL writing expertise, text importance given by students, and familiarity with computers on ESL college students' revision types. Mainly, pre- and post-questionnaires in addition to actual experiments were used to collect the data. The results of correlation and regression analysis indicated that, first, there is a significant correlation between all types of revision changes, expect micro- and macrostructure revision changes. Secondly, the effect of importance of text for the students was significant on the total revision changes. However, the ESL writing expertise and familiarity with computers showed no significant effects on revision changes.

The overall results of the research on the effects of the word processing environment on writing quality and revision of students in English as first and second language are mixed. As with the first-language research (Bangert-Browns, 1993), the

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Taken together, these studies were limited to studying the effects of word processing on revision changes in either the first language or second language. However, examining the effects of a word processing environment on university students' revisions across two languages for the same students has not been conducted. In addition, most of the studies on either the first or second language that classified revision changes appeared on paper to have lost some of the revision process richness. In order to capture the richness of writing processes, including the revision process, a variety of technologies used will be described in detail in the next chapter.

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CHAPTER III

RESEARCH METHODOLOGY AND DESIGN

Introduction

The design of this study was a combination of quantitative and qualitative research approaches to provide a rich description and comprehensive data analysis of the subjects' revision processes and practices. The primary purpose of this study was to investigate the effects of a word processing environment use on the revision process of Arab university students as they composed with word processing and with pen and paper in both their native Arabic as a first language and English as a second language (ESL). This chapter is devoted to the research methods/procedures used in this study. More specifically this chapter addresses the research design, research questions, subjects of the study, topics of writing, and data collection and analysis methods.

Research Design

The research design of this study involved a variety of research methods and procedures from both quantitative and qualitative methods. The study's primary aims of integrating multiple methods from quantitative and qualitative paradigms of research were to seek convergent findings through the use of triangulation and to discover new insights and even contradictions to enrich the interpretations of the results (Creswell, 1994). Triangulation refers to the use of multiple research methods and multiple sources

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which are intended to increase the internal validity of convergent results (Greene et al., 1989; Creswell, 1994).

The following quantitative methods were included. First, Graeco-Latin Square randomization procedures to minimize the order effect of subjects, topics of writing, language of writing (Arabic and English as a second language), and methods of writing (pen-and-paper and word processing) were used. Randomization procedures were important to data collection by both quantitative and qualitative methods. Second, factorial models were used to examine the effects of word processing on surface and meaning revision separately. Third, paired t-test tested whether there was a significant difference between subjects' typing speed in Arabic and in English as a second language, as well as the effect of a word processing environment on the overall writing quality of subjects' essays.

The qualitative methods used consisted of the interview, thinking-aloud protocols, classification of the subjects' revisions, observational notes and the subjects' survey.

Quantitative analysis methods mainly used the data collected through qualitative methods, such as thinking-aloud protocols, subjects' essays.

Research Questions

This study proposed two types of research questions: quantitative and qualitative.

Quantitative Research Questions

Quantitative research methods addressed the questions of surface and meaning revisions with respect to the methods of writing (word processing versus pen-and-paper),

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languages of writing (Arabic as a first language versus English as a second language), and the interactions among the methods and languages of writing.

Research question for methods of writing. Depending on the method used to compose essays (word processing versus pen-and-paper), are there significant differences in both surface and meaning revision processes for both Arabic as a first language (AFL) and English as a second language (ESL)? Significant differences were expected in methods of writing.

Research question for languages of writing. Depending on the language used to compose essays (Arabic as a first language or English as a second language), are there significant differences in both surface and meaning revision processes for both word processing and pen-and-paper writing? Significant differences were expected in languages of writing, but not critical to the results of the study.

Research question for interaction between languages and methods of writing. Are there significant interactions between languages and methods in both surface and meaning revisions?

Qualitative Research Questions

The qualitative research methods addressed the following questions:

What types of revisions will students make with pen-and-paper and with word-processed essays in both Arabic as a first language and English as a second language?

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When and where does each type of revision occur in both Arabic and ESL for the students with word-processed and pen-and-paper essays?

Will students revise more recursively in word-processed essays than in their pen-and-paper essays in both Arabic as a first language and English as second language?

Will word processing support top-down or bottom-up processes of revision?

Which functions of word processing will the subjects use for surface revisions and how frequently in both Arabic as a first language and English as second language?

Which functions of word processing do the subjects use for meaning revisions and how frequently in both Arabic as a first language and English as second language?

Will the subjects show audience awareness in both word-processed and pen-and paper essays in both languages?

What are the subjects' responses regarding the benefits and constraints of using word processing to revise in both Arabic as a first language and English as second language?

Quantitative and Qualitative Methods

Given the nature of revision as cognitive and physical activities, the word processing environment, the research problem, the characteristics of the subjects, the research questions, and the context of the study altogether imposed a combination of certain types of research methods from the quantitative and qualitative paradigms.

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Quantitative Methods

As previously discussed, one of the difficulties associated with several previous studies was that they combined surface and meaning revision changes when they examined the effects of a word processing environment on revisions, which cast a shadow of ambiguity on their results (Herrmann, 1990; Bangert-Browns, 1993; Ferris & Hedgcock, 1998). For both languages, to eliminate the effect of combining surface and meaning revision data on the results of the current study, the effects of the word processing environment on surface and meaning-revision changes were tested separately.

Since a factorial design is applicable when independent variables are two or more with categories, since the variability due to nuisance variables (subjects, topics and order of treatments) can be blocked or minimized by the use of Graeco-Latin Square randomization procedures, and since the subjects performed repeated treatments, this study used a combination of factorial experiment and block designs for repeated measures (Ott, 1988) to statistically examine the effects of the word processing environment on subjects' surface or meaning revision changes across two languages, Arabic as a first language and English as a second language .

Factorial design Analysis of Variance (ANOVA) for repeated measures was used to investigate the effect of a word processing environment on the subjects' surface revisions while a factorial design Log-linear model type was used to examine the effect of the word processing environment on the subjects' meaning revisions.

The dependent variable is either a surface or a meaning revision according to the revision type in question. But for both the statistical models (Analysis of Variance or Log-Linear) used in this study to examine the effects of word processing on surface and

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meaning revision respectively, the independent variables (factors) were composed of two categorical variables: methods of writing (word processing and pen-and-paper) and language (Arabic as a first Language and English as a Second language). All of the factors in both models were examined at 0.05 level of significance.

Data Collection Methods

The subjects' essays were gathered not only on paper, but also on videotapes and classified according to the taxonomy of Faigley and Witte (1981, 1984) for revision changes. Bangert-Drowns (1993) noted that in several related previous studies, the use of the count method to measure the frequency of revision changes occurring on paper copies introduces an interpretive problem "because students may make revisions while crafting an electronic document on computer that disappear on the final paper copy" (Bangert-Drowns, 1993, p.85). To avoid this particular problem, the classification of the students' revisions in all the essays was conducted on the videotapes that captured the students' writing/revision activities.

Qualitative Methods

In addition to the quantitative data which were mainly collected through the essays on paper and a camcorder and scan converter on videotapes, the qualitative data were gathered throughout thinking-aloud protocols, interviews, observations and surveys of the subjects. These methods of data collection provided valuable sources of data for both quantitative and qualitative methods of analysis. The qualitative data were collected through the following methods.

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Thinking-aloud protocol. Until now, one of the most important methodologies to capture the thinking processes of revisers in writing composition was thinking-aloud protocol (Hayes et al., 1987). In this study, a thinking-aloud protocol was applied to capture the thinking activities of the subjects while composing their essays. To achieve this task, each subject was asked to say aloud what he was thinking about while writing/revising his essays. For both pen and paper and word processing essays, an audio recorder and video camera were used to capture the voices of the subjects while they verbalized their thinking. The videotapes contained both the students' writing/revision activities and their verbalizations (instructions and procedures for thinking aloud protocols are laid out later in detail in this chapter).

During the writing/revision period, the researcher stood behind the subject at an angle of forty-five degrees. From his position, the researcher could see the TV screen, control the camcorder and stimulate the subject to keeping thinking aloud when he stopped for five seconds or more. To avoid any distraction to the subjects as they wrote their essays, the TV set was placed behind them, so that when a subject sat in front of the computer monitor, he could not see the TV screen. In addition, to prevent any feedback voice to the microphone coming from the TV, the TV volume was completely turned down.

Interview. The researcher interviewed the subjects individually at the beginning of the experiment. Before conducting each interview, the researcher explained to the subjects in general terms the purpose of the study and their roles as participants. The interview focused mainly on the students' demographic/background information and on

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their computer and word processing experience in both Arabic as a first language and English as a second language. All interviews took place in a private office where the experiment was conducted and lasted about fifteen minutes. The interview questions were essentially derived from the research questions in the quantitative and qualitative sections and served the purposes of this study.

The interview used a structured format. The questions were worded and the sequence was developed in advanced in written format, and the subjects were asked the same questions in the same order (see Appendix A). Since the interview questions sought to gather certain demographic information, the researcher used pen and paper to record the subjects' responses.

The fundamental demographic information obtained from the interviews will be displayed in this chapter in Table 3.

Observation. While each student performed a task (composing or revising and thinking aloud), the researcher took observational written notes about how the student would conduct the task in both Arabic as a first language and English as a second language with both pen and paper and word processing. The observations were guided by the study's purposes, conceptual framework and questions (Merriam, 1998). In addition to the observational notes collected during each subject's task, the researcher rearranged and added more notes as soon as the subject left the experimental setting. Following Merriam's (1998) marks, the observational notes took different forms, including descriptions, direct quotations, and the observer's comments. The aim of observational notes as a method of data collection was to gain valuable insights about the subjects'

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revision processes and practices that with the combination of the other research methodologies may enhance the overall interpretation of results of the study or highlight certain subjects' revision practices.

Survey. The purpose of the survey was to provide valuable information about the subjects' experiences with pen and paper and word processing in Arabic as a first language (AFL) and English as a second language (ESL), and their opinions and satisfactions about the experiment in order to show a more complete picture about word processing effects on revision across two languages: Arabic as a first language and English as a second language. The survey contained both closed-and-open-ended questions.

The survey was divided into two sections according to the type of questions. The first section named (A) contained closed-ended questions. The second section named (B) consisted of open-ended questions. Questions a1, a2, b8, and b9 focused on the students' general practice with word processing. Questions a3, a4, a5, b1, b2, b3, b4, b5, b6, and b7 addressed the students' revision practices in both word processing and pen and paper in general or in both Arabic as a first language and English as a second language. Questions a6, b10, and b11 were concerned with the students' experience, opinions, and satisfactions with this experiment. (A copy of the survey appears in Appendix B.)

Graeco-Latin Square Randomization Procedures

According to Vogt (1993), in an experimental study whenever there is more than one treatment for the same subject, the effects of treatment orders will confound with the

treatment effects. The literature of research methodology indicates that Latin Square design can be used to minimize two nuisance sources of variability (Montgomery, 1991). However, the Graeco-Latin Square design allows controlling three nuisance sources of variability. In the present study, it became apparent that there were three extraneous sources of variation due to subject, topic of writing and treatment orders. The treatments involved combinations of languages (Arabic as a first language or English as a second language) by methods of writing (pen and paper or word processing) for each subject. The Graeco-Latin Square design is, therefore, the proper procedure to balance out (eliminate) these order effects.

As Table 1 illustrates, the sixteen subjects were randomly assigned to the rows and the topics were randomly assigned to the columns. For each subject, the combinations of language by method were called "treatments." For all the subjects, the treatments were randomly assigned in such a way that each subject was exposed only once to each topic in one language (either in Arabic or in English) and with one method, either with pen and paper or word-processing as writing methods.

Table 1. The Graeco-Latin Square randomization for the subjects of the study on treatment, topic, and method of writing orders

Notations for Table 1

Topics	Languages and Methods of writing
t1= topic1 t2= topic2 t3= topic3 t4= topic4	A= Arabic E= English H= Pen and Paper W= Word Processing

	Treatment Order (with topics)			
Subjects	1st	2nd	3rd	4th
1	EH / t1	EW / t4	AW / t2	AH / t3
2	EW / t2	EH / t3	AH / t1	AW / t4
3	AW / t3	AH / t2	EH / t4	EW / t1
4	AH / t4	AW / t1	EW / t3	EH / t2
5	EH / t2	AH / t4	AW / t1	EW / t3
6	AH / t3	EH / t1	EW / t4	AW / t2
7	AW / t4	EW / t2	EH / t3	AH / t1
8	EW / t1	AW / t3	AH / t2	EH / t4
9	AW / t2	AH / t3	EH / t1	EW / t4
10	AH / t1	AW / t4	EW / t2	EH / t3
11	EH / t4	EW / t1	AW / t3	AH / t2
12	EW / t3	EH / t2	AH / t4	AW / t1
13	EW / t4	AW / t2	AH / t3	EH / t1
14	AW / t1	EW / t3	EH / t2	AH / t4
15	EH / t3	AH / t1	AW / t4	EW / t2
16	AH / t2	EH / t4	EW / t1	AW / t3

As Table 1 shows, the total Graeco-Latin Square was 64 treatments. The 16 subjects were randomly assigned to the Graeco-Latin-Square by using simple random procedures; hence, each subject was exposed to four treatments.

Subjects of the Study

The subjects of the study were 16 male students from the Gulf Cooperation Council Counties (GCCC). The list of Saudi Students Associates (SSA) in a Midwestern city was used to select the subjects for the study. Before conducting the study, the researcher questioned the students individually about whether they would voluntary participate as subjects and whether they were experienced with word processing. This initial inquiry resulted in 16 undergraduate and graduate students from three Arab countries: Saudi Arabia, Kuwait and Oman. The number of students from each country are shown below.

Table 2. Subjects' nationalities

Country	Number of student(s)
Saudi Arabia	14 students
Kuwait	1 student
Oman	1 student

The sample of this study was limited to those students who satisfied the following conditions:

a) Speak Arabic as a first language (AFL) and English as a second language (ESL).

b) The students have basic word processing skills.

c) The students have acceptable efficiency levels of written English as a second language (ESL) or have completed a language program in English as a second language (ESL).

d) The students have a desire to voluntarily participate in the study as subjects.

d) The students all enrolled academically at either graduate or undergraduate levels at an American university.

The data gathered from the subjects through the interview method revealed vitally demographic characteristics. At the time of this study, the subjects' ages ranged from 20 to 37 years. Ethnically, all the students were Arabic and spoke Arabic as a first language (AFL) and English as a second language (ESL). All the students belonged to the middle socioeconomic status in their countries. As the study was conducted, the subjects' average experience with the use of a computer was approximately seven years and ten months, whereas their average of word processing experience was five years and one and one-half month. They were all enrolled in undergraduate or graduate classes at a major university in the Midwest. The graduate students represented about 68.7% and the undergraduate students represented approximately 31.2% of the total students who participated in this study. Although the subjects came from similar cultural and socioeconomic backgrounds, they were varied in their academic majors and their experience with computers, word processing and writing. To maintain anonymity, each subject was given a number corresponding to the number assigned randomly for him in Graeco-Latin square procedures.

The following table summarized subjects' demographic information that collected by the interviews.

Table 3. The subjects' demographic information

Subjects	Age	Major	Level. educ.	Writing scores	Com. Exp in y	W.P exp in y
1	35	Soc	Grad	83	3	3
2	20	Acc	Under	87	2	2
3	34	Eng	Grad	5.5	13	7
4	22	Finc	Under	85	6	4
5	35	Eng	Grad	85	14	10
6	34	Agr.	Grad	80	5	5
7	37	Eng.	Grad	4/7	17	5
8	37	Educ.	Grad	75	5	4
9	24	Eng.	Under	83	4	4
10	33	Stat.	Grad	80	13	5
11	33	Eng.	Grad	65	10	10
12	31	Midic	Under	80	3	3
13	28	Eng.	Grad	613	9	9
14	32	Bus	Under	3/7	3	3
15	34	Eng.	Grad	4/7	13	5
16	27	Math	Grad	85	6	3

The subjects showed a notable cooperation and commitment while the experiment was conducted.

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Setting of the Study

The study was conducted in a private office. This office was selected because it represented a typical student office, and the setup of the experiment and technologies could remain unchanged during the period of the experiment. For more efficient data collection, the setting of the experiment was equipped with a variety of technological devices.

The Technologies Used in This Study

Rationale for using technologies in this study. A variety of technological devices were used in this study. These devices were a desktop computer with a fifteen-inch monitor, an inkjet printer, a combination of TV/VCR, a camcorder with a corded condenser, an omni-directional (pick up sound evenly from all directions) microphone, a video scan converter, and an audiotape recorder. Microsoft Word 6.0 for Windows was installed in the computer as the word processing program used for writing essays.

The choice of these devices was intended to avoid the difficulties associated with a great deal of previous research (Herrmann, 1990; Bangert-Drowns, 1993; Herrmann,1990, Klem & Moran, 1991; Pennington, 1996; Ferris & Hedgcock, 1998) and to improve the efficiency of the data collection.

Bangert-Drowns (1993) argued persuasively that several studies of the relationship between word processing and revision used a counting method to measure the revision frequency between the first and second drafts of the written samples. However, this method introduced ambiguous interpretation because it did not take into consideration the type and quality of revisions. It merely equalized a simple surface

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revision, such as adding a period or coma, and a major meaning revision, such as adding or deleting a paragraph. It also ignored revision changes that occurred on the screen but never appeared on paper. In order to avoid such problems in this study, the researcher used a video scan converter to capture any revision activity that took place on the screen. In this regard Piolat (1991) noted "To understand how writers improve texts as a whole, the execution of revising tasks must be studied on-line, whether the revision is done on a word processor or by hand" (p.266). Klem and Moran (1991), Ferris and Hedgcock (1998) stressed the importance of choosing appropriate instruments and methodologies to examine how writers use and take advantage of a computer in writing while working on computer screen.

The set up of the technologies. The technological set up for documenting the subjects' writing/revising activities was divided into parts. First, in the pen-and-paper essays, for both Arabic and English as a second language, a Hi 8mm video camera (camcorder) was used simultaneously to record the writing activities as they occurred on the paper and to capture the subjects' voices as they thought aloud. The camcorder was placed on a tripod behind each subject's right or left shoulder (depending on whether he was right or left handed writer), directed only at the paper pad where the subjects wrote and revised their essays. Thus, the faces and bodies of the subjects did not appear in the videotapes. The camcorder that recorded the subjects' writing activities was also connected to a TV/VCR. This connection allowed the experimenter to monitor the subjects' writing activities and record their progress. To enhance the clarity of the

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students' scripts on the television screen, the subjects were supplied with fine point black markers to be used as writing/revising tools and pads of paper on which to write/revise.

Second, to capture each subject's writing/revision activities on videotape while they took place on the word processor, a scan converter was used. The function of the scan converter was to covert the graphic signals of the computer into standard television signals (NTSC) that could be displayed on a television or recorded on videotape. Hence, with the scan converter, the students' writing and revising activities with the word processor were simultaneously displayed on the television and recorded by the VCR on videotape for later research analysis.

The TV/VCR combination was set up as follows: (a) The video output cable from the scan converter was plugged into the video input jack in the VCR. (b) Audio was recorded by a camcorder. (c) The audio output cable from the camcorder was plugged into the audio input jack in the VCR.

To prevent the camcorder from automatically stopping while recording the writing/revising of word-processed essays in each writing task, an empty videotape was inserted in the camcorder. The camcorder was directed to the wall because the subjects' activities on the computer screen were transferred by the scan converter to the VCR where they recorded and seen on the television screen simultaneously. Hence, the camcorder fed the VCR with the subjects' voices that captured through the microphone. In the videotapes inserted in the camcorder only the voices of the subjects were recorded and used as back up tapes for thinking aloud protocols.

Third, the audio recording procedures for both word processing and pen-and-paper essays used a small condenser microphone to pick up the subjects' voices as they

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verbalized their thoughts while they wrote their essays. The microphone was plugged into the camcorder by a 25-foot cable with a built-in power supply battery to amplify the sound in the microphone (Zettl, 1995). The major weakness of this type of microphone is the life span of its battery is relatively short. Therefore, the battery was checked before any writing task began. An earphone was sometimes plugged into the earphone jack in the TV to monitor the quality of the sound being recorded.

As the subjects were seated and before they received their writing topics, the microphone was clipped to the top of each student's clothing, about ten inches below the mouth.

As an extra precaution against failure to capture the students' voices as they thought aloud, an audiotape recorder with a built in microphone was used. The audio recorder placed in front of the subjects beside the monitor screen.

Before each meeting, the researcher prepared, tested, and adjusted all the equipment and tools to prevent any distraction while the students performed their tasks.

In order to promote a relaxed environment, the researcher greeted each subject individually and explained his role to him for the experiment. Also, to familiarize the subject with the equipment used in the experimental setting, the researcher provided a brief and general introduction about the technologies used in the study.

The Writing/Revision Software

Microsoft Word 6.0 was used as the writing/revising tool in the study. The choice of Microsoft Word 6.0 was based on its popularity and use among the students in both Arabic and English languages. It offers a variety of capabilities for writing /revising and

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with various support programs to manipulate texts and graphics. The main support programs for English are spelling and grammar checkers, thesaurus, Arabic-English dictionary and spelling checker for Arabic text.

The user interface in both the Arabic and English versions were identical in the screen components. The default language that appeared on the user interface was English. That means the language of the menus, icons, and functions of this software was English. The rationale for selecting English as a default language in this study was that based on the information obtained from the interviews with the subjects, most of their experiences were with word processing in English more than in Arabic.

The Keyboard

To minimize the physical burden of writing and revision for the subjects, a Microsoft natural keyboard was used in this study. It is a full-size keyboard ergonomically designed to fit the natural position of hand rests. The keyboard came with built-in wrist support and adjustable legs. The keyboard layout included both the Arabic and English alphabetical standards. However, the rest of the keyboard keys, such as the numerical, symbol, and the function keys remained the same as in a typical Microsoft English keyboard. Not one of the subjects objected to the type or design of the keyboard. A Microsoft wired mouse was added to the computer and used by all the subjects.

The Task of Writing

The writing tasks for all subjects involved four topics. They were persuasive-argumentative in nature. Each of the 16 subjects independently wrote and revised four

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argumentative-persuasive essays. In all topic questions, the subjects were instructed to take a position in their essays with regard to the topic issues and to convince an audience to adopt that position. (Refer to appendix D for the list of the topic questions.) The topic questions were designed to be similar to those questions used in the TOEFL Test of Written English Guide (1996). The writing topics were designed to be appropriate to all of the study's subjects and involved common issues. Before conducting the experiment, the topic questions were written and reviewed in English and translated into Arabic. In this study, each subject wrote and revised four different topics. The order of topics, languages (Arabic and English) and methods (pen-and-paper and word processing) of writing were guided by Graeco-Latin Square procedures, which are described in above.

Basically, each subject wrote two topics using pen and paper, one in Arabic and another in English, and two with word processing, one in Arabic and another in English. It should be mentioned that the subjects of this study executed word processing essays in both Arabic as a first language (AFL) and English as a second language (ESL) only on the word processor without using pen and paper or other writing tools, even for the outlining.

At the outset of each writing session, whether the pen-and-paper or word-processed essays, the subjects were given a list of written instructions to follow while writing their essays (see Appendix C). The instructions asked the subjects to write and revise approximately 300 words per essay, to verbalize their thoughts while writing or revising without analyzing or explaining, and to limit their time to about one hour to complete and submit any essay. The subjects were allowed to select schedules that were convenient for their writing meetings. The purpose and the audience were specified in

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each assignment. All of the word processing essays were printed immediately after received from the subjects and saved to floppy disks.

Training the Subjects

The training of subjects consisted of two parts. The first part was concerned with training the subjects on thinking-aloud protocol. At the beginning of the experiment and before a subject began writing the first topic, the researcher trained each subject on how to say aloud what was going in his mind as he wrote and revised the topic with either pen and paper or with word processing. For training purposes, each subject was given a topic to write about that was similar to but other than those used in the study. Based on Hayes' et al. (1987) directions for performing thinking-aloud protocols, a set of written instructions was given and explained to the subjects individually. These instructions included:

- Please say aloud what you are writing and revising.
- Please say aloud what you are thinking as you write and revise your essays.
- Please do not explain or analyze. Just say aloud what you are thinking.
- If you stop verbalizing your thoughts for five seconds, I will remind you to say aloud what you are thinking.
- You will have approximately one hour to complete each essay and submit a final draft.

The major aims of the training sessions were to ensure that the subjects were familiar with the word processing keyboard and its functions, not typing speed or accuracy. The average time for training on thinking-aloud for all subjects is around 12 minutes.

The second part of training was oriented to ensure familiarity with the Microsoft Word environment. Prior to the experiment, the researcher questioned each subject about his familiarity with this type of word processing software. Furthermore, for the purpose of the practice, each subject was given a topic similar to but other than those used in the study to write a brief paragraph using word processing. From the observations, all the subjects were familiar with the English version and some with Arabic version of the Microsoft Word as word processing tool, but at different levels of efficiency. Some subjects showed less experience with the Arabic version. The hands-on practice on word processing lasted between 10 to 15 minutes, depending on the subject's familiarity with word processing. One student spent about 30 minutes practicing on word processing in Arabic.

Revision Classification

The classification of the subjects' revisions in Arabic as a first language (AFL) and in English as a second language (ESL) in both word processing and pen-and-paper essays was guided by Faigley and Witte's (1984) taxonomy of revision changes in a text.

Table 4 presents Faigley and Witte's (1984) taxonomy of revision changes.

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Table 4. Surface changes and meaning changes

I.	Surface Changes:	
	A. Format changes	(00)
	1. Spelling	(01)
	2. Tense, number, and modality	(02)
	3. Abbreviation	(03)
	4. Punctuation	(04)
	5. Format	
	One. Paragraph	(05)
	Two. Others	(06)
	B. Meaning-preserving changes	(10)
	1. Additions	(11)
	2. Deletions	(12)
	3. Substitutions	(13)
	4. Permutations	(14)
	5. Distributions	(15)
	6. Consolidations	(16)
II.	Meaning Changes:	
	A. Microstructure changes	(20)
	1. Additions	(21)
	2. Deletions	(22)
	3. Substitutions	(23)
	4. Permutations	(24)
	5. Distributions	(25)
	6. Consolidations	(26)
	B. Macrostructure changes	(30)
	1. Additions	(31)
	2. Deletions	(32)
	3. Substitutions	(33)
	4. Permutations	(34)
	5. Distributions	(35)
	6. Consolidations	(36)

Building upon their works and those of several researchers in revision classifications and text structures, particularly Bridwell (1980) and Sommers (1980), Faigley and Witte (1981, 1984) constructed their taxonomy for analyzing textual

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revisions. Contrary to Bridwell's and Sommers' taxonomies, which classified textual revisions on the basis of linguistic levels (e.g., word, clause, phrase, sentence) and operations (e.g., addition, deletion, substitution, order), Faigley and Witte's taxonomy classified textual revisions not only on the basis of linguistics features, but also "according to their effect on the meaning of the text" (Faigley et al., 1985, p, 55). The taxonomy of Faigley and Witte partitioned the textual revision into two main categories: surface changes and meaning changes.

Surface Changes

Faigley and Witte (1981) characterized surface revisions as those changes that do not change the meaning of a text. The surface change contains two subcategories, formal changes and meaning-preserving changes. Formal changes are conventional or mechanical editing changes in a text, such as the changes in spelling, verb tense, number, modality, abbreviation, punctuation and format. For example, a change in modality from "are" to "can be" in the following: "Video games are [can be] educational,...". Another example, was a change in verb tense. One subject said: "I was not aware that I have [had] to behave differently to cope with the environment change."

Furthermore, Faigley and Witte (1984) classified "format changes" into two subcategories: paragraphing and other. As mentioned earlier, Faigley and Witte classified the changes in paragraph formats under formal-surface level revision changes which do not change the meaning of text. Following the conventions of both Gaskill (1986) and Al-semari (1993) with regard to paragraphing formatting changes in Faigley and Witte's (1981, 1984) taxonomy of revision changes, in this study, the researcher considered

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paragraphing formating changes as the changes made to paragraphical formats, such as word order, indentation, italic, bold, and underline, spacing, adding bullets or numbers, asterisks, brackets and hyphenate a text (adding hyphen to the end of line when it is needed) that do not change the meaning of the text. If paragraphing formatting changes alter the meaning of a text, they should be classified as microstructure changes, such as breaking a paragraph into two or more paragraphs or moving paragraph from place to another (Gaskill, 1986).

Faigley and Witte (1984) considered capitalization changes as spelling changes and the "expansions of abbreviations to their full forms" (p. 98) as an abbreviation change. Miswritten words were not counted in all essays and languages used in the study, because the subjects did not intend to make the changes in their essays.

Meaning-preserving changes are those changes that paraphrase the concepts in a text but do not change the meaning. Meaning-preserving changes were divided into subcategories: additions are those changes that add to a text what can be inferred by a reader. Deletions are those changes that remove information from a text that need to be inferred by the reader. Substitutions occur when words, phrase, or sentences are replaced with others that carry the same meaning, such as changing the word "topics" to the word "issues." Permutation takes place with the rearrangement of words, phrases or sentences in a text. Distribution occurs when one part of a text (e.g., words, phrases, or sentences) is allocated into two or more parts of a text. Consolidation results from the combination of two or more phrases or sentences into one sentence but the meaning remains the same (Faigley & Witte, 1981, 1984; Stratman & Hamp-lyons, 1994).

Meaning Changes

In contrast to surface changes. Faigley and Witte (1981, 1984) described meaning changes as those changes that alter the meaning of a text. Faigley and Witte broke down meaning changes into two subcategories: microstructure changes and macrostructure changes. A microstructure change does not affect the summary of the text; a macrostructure change is a change that affects the summary or the gist of the text. Both changes include six operations: additions, deletions, substitutions, permutations, distributions, and consolidations. The following is an example of microstructure change:

This subject wrote the first sentence (a) as a topic sentence and then deleted the whole sentence and wrote the second sentence (b) differently:

a) Most societies deal with elderly people as a problem.

b) Nowadays, old people are being dealt with differently than couple years ago when the family is the only responsible for dealing with them.

An example of a macrostructure change is that a subject switched his argument to the opposite position, which changed the gist or summary of the essay. "I think that the uniform wear especially in this level is not good for different reasons ..." Then, he said "From my personal experience in wearing a uniform in the school during twelve year, I think it is better for the student and the school to see all the student(s) look the same."

Revision changes may occur only in writer's head before the text is put into written form. As this practice appeared through subjects' verbalizations, the revisions made were classified according to the same classification system, Faigley and Witte's (1981,1984) taxonomy of revision changes. For instance, one subject said "...food, no, I think it's better to say diet instead of food." Examples of revision classfication from subjects' essays appear in Appendix H.

In their taxonomy, Faigley and Witte (1984) defined clauses as "constructions with finite subjects and verbs" (p.101). Phrases were defined as "constructions longer than one word without both a finite subject and a verb" (p.101).

Essentially, Faigley and Witte's taxonomy drew a distinction between two main types of revisions: surface changes, which do not alter a meaning of a text, and meaning changes, which alter a text's meaning (Faigley and Witte, 1981, 1984). Faigley and Witte (1981) acknowledged that their taxonomy of textual revision is not "the definitive methodology for studying revision" (p.401). They suggested that to study revision, their taxonomy could be combined with other research methodologies, such as protocol analysis.

Although Faigley and Witte's (1981, 1984) taxonomy was adopted by many studies of the relationship between the word processing environment and revision in writing, their taxonomy of revisions seem to be designed to be used mainly for the revisions with handwriting tools (pen and papers).

With the advent of new technologies for text manipulations, new capabilities have been added to the word processing environment, such as adding images, graphics, sounds, and motion pictures in a document. Thus, a new taxonomy of revision changes should be advanced to classify the revisions that result from the use of these new capabilities of word processing environments.

Writing Quality

In order to draw a complete picture about the effect of word processing on revision, the quality of the subjects' essays in both Arabic as a first language (AFL) and English as a second language (ESL) were holistically evaluated.

Holistic scoring is widely used to evaluate the overall quality of the essays. Diederich (1974) described holistic evaluation in writing as "rating on general impression" (p. 100). Using similar words, Charney (1984) defined holistic rating as "a quick, impressionistic qualitative procedure for scoring or ranking samples of writing" (p.67) based on carefully developed criteria. Holistic scoring requires at least two trained raters scoring each essay independently. It yields a single score of the overall quality of writing by producing the average of all holistic scores given to a particular essay (Carlson & Brideman, 1986, p. 143).

Hamp-Lyons (1993) laid out the basic assumption underlying holistic scoring: "Holistic reading is based on the view that there are inherent qualities of written text which are greater than the sum of text's countable elements, and that this quality can be recognized only by carefully selected and trained readers, not by any objectifaible means" (p. 79). The features involved in prose, such spelling, grammar, organization, are related to all the others and must be scored according to the overall quality rather than to any separate feature (Burry & Quellmalz, 1983).

Scoring the Subjects' Writing Quality

In order to determine the overall quality of each subject's essays in both the first and second drafts, each essay was scored independently by two male raters. The first rater

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holds a Ph.D. degree in Education, Masters degree in English as a second language. He taught Arabic for several years. The second rater was a Ph.D. candidate in English literature who taught writing composition for years to college students of English as second language. Both raters had similar experience in teaching and evaluating writing in Arabic and English as a second language for Arabic native speakers. The raters used the Test of Written English (TWE) scoring guide and procedures (1996) to holistically score the students' essays. TWE was developed by the Educational Testing Service (ETS) to evaluate the overall quality of nonnative speakers of English writing (Stansfield, 1986). This instrument provides a six-point scale for rating the general quality of a student's essays in which 1 represents the lowest score and 6 represents the highest score.

Prior to the actual scoring of the subjects' essays, the researcher explained to the raters to that their role is to score holistically the essays according to the Test of Written English Guide (1996). The researcher provided the raters with detailed written instructions about the scoring guide. After the discussion of the scoring guide with the raters, the researcher asked them to score two sample essays similar but not identical to those used in the study. The scores assigned to the two sample essays by the raters were one point different for each essay. That means the two raters showed an acceptable level of agreement on use of the Test of Written English Guide (1996) for overall evaluation of the subjects' writing quality.

During the actual scoring, each essay was scored independently by two raters. If the scores of the two raters differed by less than two points, the average of the two scores be calculated and assigned as the score of that essay. Whenever two scores of an essay

differed by more than one point, the essay was scored by a third rater and all scores that belong to that essay were averaged.

To maintain the subjects' anonymity, the same numbers assigned randomly for the subjects in Graeco-Latin Square randomization procedures were used. All the typed essays were copied and randomly arranged before they were placed in folders and submitted to the raters. The subjects' writing quality scores were not official or represent the Test of Written English (TWE).

CHAPTER IV

RESEARCH RESULTS AND ANALYSIS

This study integrated multiple methods from quantitative and qualitative paradigms of research to examine the effects of a word processing environment on native Arabic speaking students on their revision processes across two languages: Arabic as a first language (AFL) and English as a second language (ESL). The purposes of the use of mixed design study were to seek convergent findings, new insights, contradictions, and expansions to the study. The use of multiple research methods was intended to enhance the internal validity through obtaining convergent results (Greene et al., 1989; Creswell, 1994). This chapter will report the classification of the subjects' revision and the study's results as well as provide discussion of both quantitative and qualitative research findings.

Classification of Revision

Subjects' revisions in both Arabic as a first language (AFL) and English as a second language (ESL) with either pen-and-paper or word processing environments were classified according to Faigley and Witte's (1981, 1984) taxonomy of revision changes. The table in Appendix F provides detailed types of subjects' classified revisions.

For the purpose of statistical examination, the subjects' classified revisions presented in Appendix E were combined according to the language of writing (Arabic as a first language or English as a second language) and to the method of writing (pen-and-

paper or word processing) into two major types of revision, surface and meaning revisions. The layout of the combined raw data in surface or meaning changes appears in Table 5.

Table 5 shows that the subjects made more surface revisions with word processing in both Arabic as first language (AFL) and English as second language (ESL) in comparison to their surface revisions with pen-and-paper in the same languages. Also, it revealed that the subjects performed more surface and meaning revisions with both word processed and pen-and-paper essays in English as a second language (ESL) than in Arabic as a first language (AFL).

Although the subjects performed more meaning changes with word processing in both languages in contrast to their corresponding meaning changes with pen-and-paper, the meaning changes were less than expected in both languages, especially in Arabic essays with either pen or paper and word. This may be due to the combination of laborious cognitive and typing or rewriting works associated with the meaning changes in writing.

Table 5. Data of subjects' surface and meaning revisions for both languages and methods of writing

Key for table:

P = Pen and paper	**W** = Word processing
S = Surface revisions	**M** = Meaning revisions
A = Arabic	**E** = English

Language	METHODS OF WRITING/REVISING			
	PEN AND PAPER		WORD PROCESSING	
	Surface	Meaning	Surface	Meaning
Arabic	5	0	55	0
	22	2	28	2
	19	0	58	0
	13	2	53	2
	5	1	40	2
	28	1	57	1
	20	0	50	1
	14	1	97	1
	14	1	76	4
	19	2	49	2
	12	0	26	3
	33	1	66	1
	13	1	24	1
	10	1	82	2
	11	1	31	4
	32	3	71	4
English	9	0	60	1
	22	1	33	2
	14	0	50	2
	23	0	104	3
	21	3	68	5
	18	0	128	7
	22	0	53	1
	22	0	67	3
	39	1	82	6
	18	0	56	2
	15	0	47	2
	46	1	58	2
	36	1	57	2
	6	0	48	2
	23	2	65	4
	32	2	52	4

Quantitative Findings

As mentioned earlier, surface and meaning revisions were tested separately in order to avoid the problem found in several of previous studies, the idea that combining surface and meaning revision may cast a shadow of ambiguity on the interpretation of a study.

Surface-Revision Results

The Analysis of Variance (ANOVA) factorial design for repeated measures was used to examine the research questions with regard to the following.

Methods of writing. Depending on the method used to compose essays (word processing versus pen-and-paper), were there significant differences in surface revision processes for both Arabic as a first language (AFL) and English as a second language (ESL)?

Languages of writing. Depending on the language used to compose essays (Arabic as a first language (AFL) and English as a second language (ESL), were there significant differences in surface revision processes for both word processed and pen-and-paper writing?

Interaction between languages and methods of writing. Were there insignificant interactions between languages and methods in surface revisions?

The results of Analysis of Variance (ANOVA) is summarized in Table 6 as shown below.

Table 6. The results of Analysis of Variance (ANOVA) for repeated measures.

Source	DF	Sum of Square	Mean Square	F Value	Pr > F
Model	24	212.16	8.84	5.88	0.0001
Error	39	58.64	1.50		
Corrected total	63	270.80			

R-Square	Coef.Var	Root MSE	Ysquare Mean
0.78	20.65	1.27	5.94

Source	DF	Sum of Square	Mean Square	F Value	Pr > F
Subject	15	35.25	2.35	1.56	0.13
Tre. Order	3	0.49	0.16	0.11	0.95
Topic	3	0.88	0.29	0.20	0.90
Language	1	7.60	0.60	5.06	0.03
Method	1	167.93	167.93	111.69	0.0001
Lang*Method	1	0.003	0.003	0.00	0.96

Inspection of the ANOVA model results revealed that the writing/revision method effect was statistically significant ($F = 111.69$ with $p = 0.0001, < 0.05$). This indicated that there was a highly significant difference between pen-and-paper and word-processed essays with respect to surface-revision in both languages: Arabic as a first language

(AFL) and English as a second language (ESL). This result is more likely due to the contention that word processing lends itself to surface revision by providing a variety of capabilities, such as delete, insert, and support programs, spelling and grammar checkers, thesaurus, and formatting (Phinney, 1989; Montage, 1990; Haas, 1996). As a result, the first hypothesis was supported by the presented data.

Furthermore, the result showed that the language effect was significant ($F = 5.06$ with $p = 0.03 < 0.05$) on surface revision for both Arabic as a first language (AFL) and English as a second language (ESL). The significant language effects on surface revision in both languages may have resulted from the speculation that non-native speakers of English tended to revise more, because they were more likely weaker than native speakers in their second language and writing proficiency.

However, the interaction between the language and method was insignificant ($F = 0.00$ with $p = 0.96, < 0.05$). The insignificant interaction between the language and method of writing effects means that the word processing effects are the same for both Arabic as a first language (AFL) and English as a second language (ESL). The identical effects of the word processing environment on surface revisions for the two languages may be due for two reasons.

First, the capabilities and user interface of the word processing program used in this study were the same for both languages. Consequently, the subjects used the word processing capabilities in the same ways in both languages. That means that transfer of word processing skills associated with surface revisions more likely occurred across Arabic as a first language (AFL) and English as a second language (ESL).

Second, the surface revisions are generally low-level thinking activities (Piolat, 1991). The word processing capabilities used with surface revision changes, such as spelling checker, space back, and delete were simplified in recent versions of the word processing environment in such a way that they involved one or two steps.

In other words, the identical effects of the word processing environment on surface revision changes in both languages can be attributed to the notion that there were most likely no complex cognitive or physical-revision activities involved in the performance of surface revisions in either Arabic as a first language (AFL) or English as a second language (ESL). Therefore, the interaction hypothesis was not supported by the Analysis of Variance (ANOVA) outcomes.

The data also indicated that the subjects' effect ($F = 1.56$ with $p = 0.13, > 0.05$), the order of treatment effect ($F = 0.11$ with $p = 0.95 > 0.05$), and topic effect ($F = 0.20$ with $p = 0.90 < 0.05$) were all insignificant. That means the use of Graeco-Latin Square and its procedures of random assignment of subjects to treatments in combination with ANOVA factorial design to block the variability due to subject, topic, and treatment orders had the desired effects.

A Tukey post hoc test was used to find out whether there were significant differences between the means of the two languages and the means of the two methods of writing with respect to surface revision. The results of the Tukey test showed that on the average there was a significant difference between Arabic as a first language (mean = 5.59) and English as a second language (mean = 6.28) with significant level ($p = .03 < .05$) with regard to surface revision. That means the subjects did more surface revision in their essays in English as a second language than in Arabic as a first language.

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Also, according to Tukey test results, on the average there was a significant difference between pen-and-paper (mean = 4.32) and word processing (mean = 7.58) with significant level ($p = .0001 < .05$) with respect to surface revision. That is, the subjects performed more surface revisions with word processing than with pen-and-paper in their essays.

In sum, the results of Analysis of Variance (ANOVA) showed that, overall, although the effects of both method and language of writing were statistically significant, the effect of method ($F = 111.69$ with $p = .0001$) of writing was stronger than the effect of language ($F = 5.06$ with $p = .03$) on surface revision.

The Tukey test showed that, on the average, the subjects performed more surface revision in their essays in English as a second language (ESL) than in Arabic as a first language (AFL) and with word processing than with pen-and-paper environments.

Checking the assumptions of the model. Before running the statistical model (ANOVA) to examine the study's hypothesis of whether there were differences between subjects' pen-and-paper and word processed essays in both Arabic as a first language (AFL) and English as a second language (ESL) with regard to surface-revision changes, the raw data collected from the subjects' work with surface revisions were inspected to determine whether they satisfied the Analysis of Variance (ANOVA) assumptions of normality, independent and variance equality of raw data.

Visual inspections of the residual plots displayed that the assumptions of linearity, normality, equality of variances were not met.

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The root square transformation technique was used to normalize the distribution of raw data and stabilize their variances (Bowerman et al., 1986). The key purpose of data transformation was to satisfy the inspected assumptions and then to maintain the validity of inferential statistical tests used in the study (Bowerman et al., 1986).

After using the root square technique to transform the raw data, the assumptions of normality, independence and variance equality of data residuals were checked and found they were reasonably met. For example, a close examination of the plot (figure 2) of the residual versus the four treatments of writing showed no obvious trends or patterns.

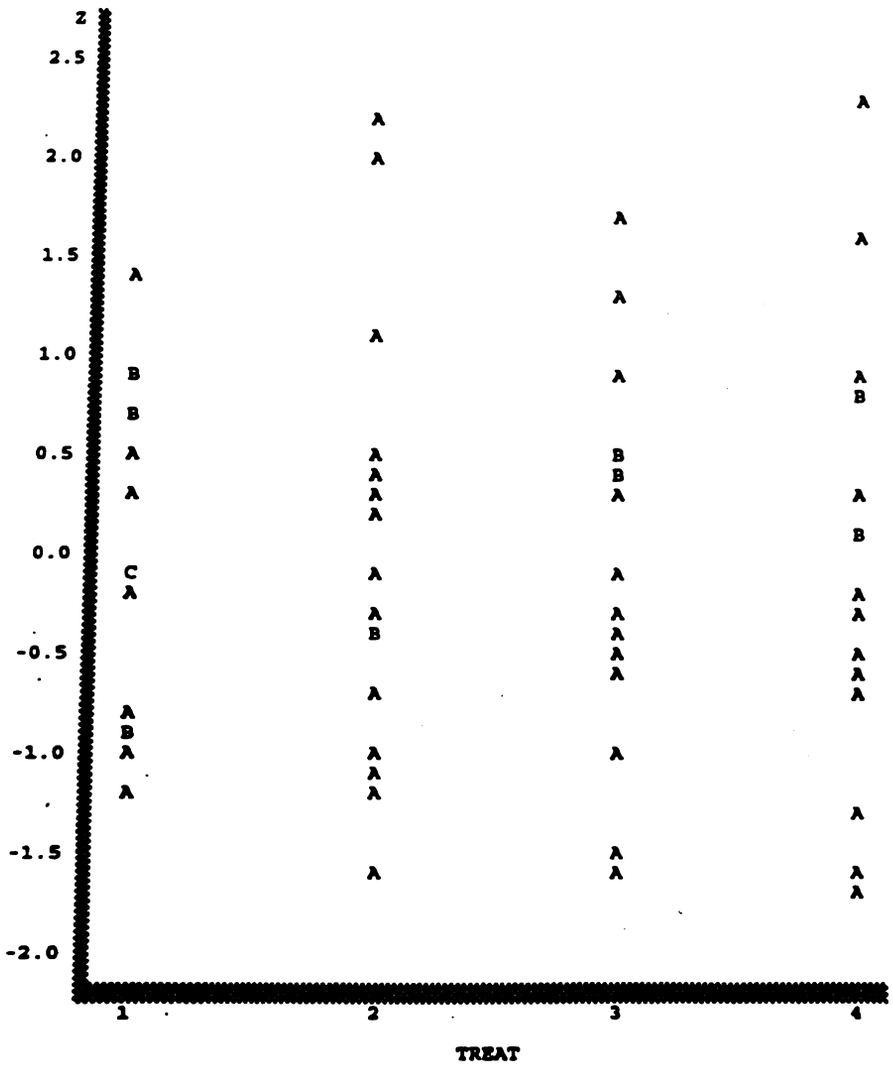

Figure 2. Plot of residual value versus treatments

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Meaning-Revision Results

In meaning-revision changes, the values of the dependent variable were count-type data (number of meaning-revision changes) that occurred within fixed time (about one hour for each essay) with rare occurrences types of revision (meaning changes). The raw data distribution followed the Poisson probability distribution. With these features of the data, the Log-Linear Model was the best choice to examine the effects of word processing on meaning-revision changes across the two languages: Arabic as a first language (AFL) and English as a second language (ESL). This model addressed the following questions.

Methods of writing. Depending on the method used to compose essays (word processing versus pen-and-paper), were there significant differences in meaning revision processes for both Arabic as a first language (AFL) and English as a second language (ESL)?

Languages of writing. Depending on the language used to compose essays (Arabic as a first language and English as a second language), were there insignificant differences in meaning revision processes for both word processing and pen-and-paper writing?

Interaction between languages and methods of writing. Were there insignificant interactions between methods and languages in meaning revisions?

The results of the Log-Linear Model for meaning revision are shown in Table 7.

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Table 7. The results of Log-Linear Model for meaning revision.

Source	DF	Chi-Square	Pr > Chi
Subject	15	31.53	0.007
Topic	3	2.37	0.50
Tre.order	3	1.64	0.65
Language	1	0.07	0.79
Method	1	20.49	0.0001
Lang.*Method	1	2.94	0.09

The results of running a Log-Linear Model with SAS statistical software (see Table 7) was that the effect of writing method on meaning revision was significant (Chi-S = 20.49 with P = 0.0001 < .05). That means there was a significant difference between handwriting and word processing with respect to meaning-revision changes across the two languages: Arabic as a first language (AFL) and English as a second language (ESL). This result confirmed that there were significant differences in meaning revision processes for both AFL and ESL.

Neither language effect (Chi-S = .072 with p = .79 > .05)) nor the interaction of method and language (Chi-S = 2.94 with P = .09 > .05) was significant. The result of the insignificant language effects indicated that the effects of language, either Arabic as a first language (AFL) or English as a second language (ESL), on meaning revision was similar across both pen-and-paper and word-processed essays. This result can be interpreted on the basis of the assumption that writers tend to use similar writing/revision

strategies in both first and second languages (Lay, 1982; Zamel, 1983; Hall, 1990, Raimes, 1985; Raimes, 1987).

The lack of interaction between method and language of writing (Chi-S = 2.94, p = .09 > .05) might be caused by the small sample size. Using a larger sample may produce a significant interaction between the method and language of writing.

As in surface revision examination, the use of Graeco-Latin Square and procedures of random assignment of subjects to treatments to reduce the variability due to three nuisance variables, as desired, resulted in insignificant topic effect (Chi-S = 2.37 with P = 0.50 > 0.05) and treatment order effect (Chi-S = 1.64 with P = .65 > .05). However, the result showed that the subjects' effect was statistically significant (Chi-S = 31. 53 with p = .007 < .05).

There were some possible explanations for the unexpected significance of subject's effect (Chi-S = 31.53 with p = .007 < 0.05):

First, meaning revision is a higher-level-cognitive activity (Piolat, 1991) in which a writer needs to manage several cognitive activities in the same time. Those subjects who made meaning revisions in their essays may have used some cognitive strategies to handle the cognitive demand of meaning revision, An example of cognitive strategies is the activation of metacognitive strategies, such as self-monitoring, knowledge of revision process, internalizing certain audience and attending to the purpose or goal of revision to perform a revision (Daiute, 1985,1989; Hayes et al., 1987; Raphael et al, 1989; Piolat, 1991).

Second, cognitive activities occur in the heads of the writers, since word processing environments mostly facilitate mechanical or so-called surface revisions more

than meaning changes (Glynn et al., 1989; Phinney, 1989; Haas, 1996). Since the subjects seemed substantially different with regard to their writing and word processing experiences and skills, all these factors together may have led to a significant ($p = 0.007 > 0.05$) subject effect in meaning revision.

As expected, the topic (Chi-S = 2.37 with $p = .50 > .05$) and treatment order effects (Chi-S = 1.64 with $p = .65 > .05$) effects were not significant. These results indicated that the selection of topics and the use of the Graeco-Latin Square as randomization procedures to reduce the effect of treatment orders were working as intended.

In meaning revision, the insignificance of the interaction between language and method might have resulted from the lack of language effects.

The results of this Log-linear model confirmed that there were significant differences between word processed and pen-and-paper essays in meaning revision for both Arabic as a first language (AFL) and English as a second language (ESL).

On the average (-1.37), the subjects performed fewer meaning revisions in Arabic than in English with the word processing environment. This may be attributed to the subjects' slow typing speeds in Arabic in contrast to their typing skills ESL, which will be discussed later in detail.

The statistical models used to examining the effects of writing methods on both surface and meaning revision in both Arabic as first language and English as a second language showed the superiority of the word processing factor in contrast to the language factor in both surface and meaning revisions.

Although the subjects' typing skills were weak, especially in Arabic, as revealed in their interviews, their experiences with computers and word processing were substantial. Their experiences ranged between two and seventeen years for computers and two and ten years for word processing. Subjects' long experiences with both computers and word processing may play a role in the significant result with regard to method of writing effect on surface and meaning. According to Phinney and Khouri (1993) and (Phinney, 1996), who studied computer experience and proficiency of language of ESL writers, ". . . computer experience affected the amount and type of revision more than language proficiency did" (Phinney, 1996, p.140).

Moreover, the argumentative issues used as writing topics in this study may have played a role in obtaining significant results. According to Andrews (1995), "Pupils revise less in narrative writing, and tend to make surface changes. In argument writing they are more likely to make substantial changes" (p. 122).

Assessing fit of the model. The examination of how well the Log-Linear Model fits the data (see Table 8) showed that the model fitted the data well because the values of deviance and the Pearson Chi-Square divided by their degrees of freedom (DF) yielded values (0.77) and (0.66) respectably, which were close to (1.00).

Table 8. Assessing fit of Log-Linear Model for meaning revision

Criteria for assessing goodness of fit

Criterion	DF	Value	Value/DF
Deviance	39	30.15	0.77
Scaled Deviance	39	30.15	0.77
Pearson Chi-Square	39	26.04	0.67
Scaled Pearson X2	39	26.04	0.67
Log Likelihood	.	-20.88	.

Summary of the Results of the Two Models

In sum, in both Analysis of Variance (ANOVA) and Log-Linear statistical models, the strongest results were the highly significant effects of word processing ($p = 0.001$) on both surface and meaning revision changes when compared to pen-and-paper across the two languages: Arabic as a first language (AFL) and English as a second language (ESL). The results of the two models with regard to method of writing effects answered the first general question of the study that, depending on the method used to compose the essays (word processing versus pen-and-paper), there are significant differences in both surface and meaning revision processes for both Arabic as a first language (AFL) and English as a second language (ESL).

In addition, visual inspection of the raw data of surface and meaning revisions in Appendix F showed that although there were significant results with regard to the meaning revision with word processing as method of writing/revision, there was a notable decline in the frequency of meaning revision changes in both languages. This

reduction may be attributed to overlapped factors. First, meaning revision is a higher order cognitive activity that may have overloaded the subjects' short-term memories. Second, lack of subjects' metacognitive awareness and knowledge of revision strategies to reduce the cognitive load may have occurred. Third, lack of subjects' keyboarding skills may have caused them to concentrate their attention on typing rather than making substantial changes in their essays.

In addition, until now, the word processing environment has not been basically associated with meaning changes in contrast to its association with surface changes in writing (Piolat. 1991; Montague, 1990; Haas, 1996). Consequently, the subjects benefited from the word processing environment for surface changes in their essays more than for meaning changes.

The Effects of Typing Proficiency on Computer Writing

Many researchers of the word processing relationship to writing/revision hypothesized that keyboarding skills in general and typing in particular may interfere with the writing processes (McAllister & Louth, 1988; Montague, 1990; Piolat, 1991; Pennington, 1996) that may affect the revision and writing quality. A lack of typing proficiency may lead student writers to feel frustrated and interfere with their motivation (MacArthur, 1988) and lure them to focus on surface revisions (Phinney, 1989; Joram et al., 1990).

Because the literature placed a strong emphasis on the effect of typing proficiency on writing and revision quality, the typing speeds of the subjects were measured for both Arabic as a first language (AFL) and English as a second (ESL).

The typing speed measurement of the subjects was guided by the standard widely used in schools' textbooks. This standard states that the typing speed of a subject per minute in term of words is the sum of subjects' strokes per minute divided by five (Ben'Ary, 1989). This standard was established on the assumption that every five strokes, including spaces, were counted as one word. To measure the subjects' typing speeds, a one-minute slice of time from each subject's word-processed essay was recorded on videotapes. Two methods were used to measure subjects' typing speeds. First, a timer was used to measure the time, and the typing strokes were counted. Second, to measure a continuos segment of typing for each subject, ten-second strokes were counted and multiplied by six to form the total strokes per a minute, then divided by five to form the typing speed of each subject per minute. The results of the two methods of typing speed were equal or very close so that fractions were rounded to integral numbers to represent the subjects' actual typing speeds in both languages separately. The accuracy of the measurement of subjects' typing speed was not the aim in this study. Rather, the purpose was to find out whether there were big differences between the subjects' typing speeds in Arabic as a first language (AFL) in contrast to their typing speeds in English as a second language (ESL) and how that typing proficiency may have affected their revisions. The data that emerged from the subjects' typing-speed measurements represented the actual but not the optimal typing speeds of the subjects.

The outcomes of the subjects' typing speeds in both in Arabic as a first language (AFL) and English as a second language (ESL) are shown below in Table 9.

Table 9. Subjects' typing speeds

Sub	TSA	Average WPM	TSE	Average WPM
1	21	13.312	27	22.875
2	16		22	
3	14		22	
4	12		29	
5	18		24	
6	14		18	
7	12		22	
8	17		20	
9	8		27	
10	14		24	
11	11		22	
12	7		25	
13	12		25	
14	15		20	
15	12		22	
16	10		17	

Keys:

Subjects	Sub
Typing Speed in Arabic	TSA
Typing Speed in English	TSE
Word Per Minute	WPM

A quick glance at the raw data presented in Table 9 showed that subjects' typing speeds ranged from 7 to 21 words per minute (WPM) with an average of 13. WPM in Arabic essays and between 17 and 29 WPM with an average 22.875 WPM in English essays. Schade (1999) stated that the level of automaticity in keyboarding skills begins around 60 word per minute. From Table 9 it can be inferred that the typing speeds of the

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subjects were notably below the level of automaticity in both languages; especially the subjects' typing speeds for Arabic as a first language.

The lack of typing proficiency among the subjects in both languages is more likely due to the absence of formal instruction on the use of word processing including typing skills and little exposure to Arabic keyboarding. However, although the averages of subjects' typing speeds in both languages were below the average automaticity level of typing, the data collected from the interviews showed that their computer and word processing experiences were quite notable.

The interview data revealed that none of the subjects of this study except one received any kind of formal instruction on word processing programs. Researchers pointed out that direct instruction on keyboarding and revision strategies are imperative to enable the students to use a word processing environment effectively for major revision (Phinney, 1989; Joram et al., 1990; Toppe, 1991).

To test statistically the difference between the means of subjects' typing speeds in both languages, a paired t-test was used.

Before carrying out the paired t-test, the assumption of normality of mean differences between the subjects' typing speeds in Arabic as a first language (AFL) and English as a second Language (ESL) was checked.

A normal probability plot is presented in Figure 3.

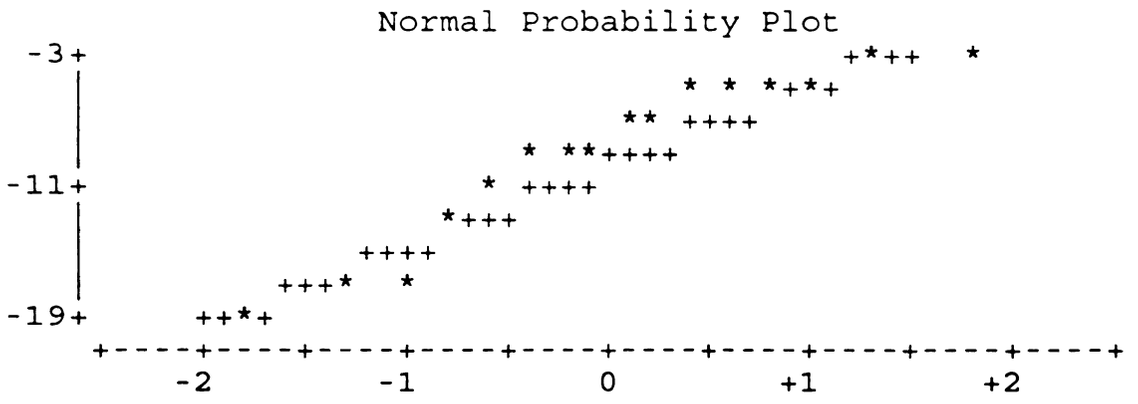

Figure 3. Normal probability plot

As displayed in Figure 3 the normal probability plot of the differences between the subjects' typing speeds in the two languages, Arabic as a first language (AFL) and English as a second language (ESL), showed that the differences were approximately normally distributed. That means the requirement of paired t-test for normality assumption was satisfied.

The result of the paired t-test with respect to the difference between the means of subjects' typing speeds in both languages was reported in Table 10.

Table 10. Paired t-test result of subjects' typing speed means difference in the two languages

T : Mean = 0	-7.68	Pr > | T |	0.0001

The result of paired t-test indicated that the subjects differed significantly in their typing speeds across the two languages with a mean difference = -7.68, at

p value = .001 < .05 level of significance for the advantage of typing speed of English as a second language (ESL). Thus, on average the mean difference is -7.68 word per minute (WPM) between the subjects' typing speeds in Arabic and in English.

Hence, there is evidence that the subjects typed much faster in English than in Arabic. This significant difference is due to the difference in the subjects' past experiences with the word processing environment in English in comparison to their experiences with word processing in Arabic and to their writing experience, since the subjects ranged from the college entry to the doctoral level of education as their demographic information showed. Although there was a significant mean difference between the subjects' typing speeds across the two languages, the subjects typing speeds were far below the minimum speed required for job entry. According to Loveday (1994), the minimum required is 50 words WPM for job entry, but the average typing speed required ranged between 60 and 66 word per minute (wpm). The average of subjects' typing speeds in Arabic essays was 13.31 word per minute (WPM) and in English essays was 22.875 word per minute (WPM).

Keyboarding Proficiency

The qualitative data obtained from the interview survey, videos of the word processing screen, thinking-aloud protocols and observational notes related to keyboarding skills, including typing skill, revealed interesting findings. The interview data showed that the subjects possessed sensible experience with word processing. The

students' word processing experience ranged between two and ten years and with computer between two and seventeen years. In addition, a number of subjects have experience in building computers. However, the data collected from the interview amazingly indicted that no subject received any form of formal instruction in the use of word processing or typing, except one subject who was trained on the typewriter prior to using a computer. According to Pennington (1996) and Phinney and Khouri (1993), unless students of English as a second language (ESL) receive direct instruction and practice for sufficient time on the use of word processing in writing, using a computer for even many years is not enough to enable writers to fully exploit the computer's capabilities for substantial revision. In like manner, Joram et al. (1990) found that with native speakers of English "even graduate students, who are sophisticated writes, fail to take full advantage of computers with word processing programs after several years of experience with them" (p. 68). They stressed the importance of teaching revision and typing with word processing to benefit effectively from it.

While working on their essays with word processing, especially in Arabic, some of the students displayed some degree of frustration and disappointment because of their slow typing.

Almost all subjects of the current study showed lack of automaticity in using the keyboard. The overwhelming majority of the students demonstrated the hunt and peck method of typing, especially in Arabic essays. They continuously looked at the keyboard while entering their essays. According to Bloom (1986) and Wronkovich (1988), lack of automaticity in keyboarding skills may hinder a writer from devoting full attention to the writing task by drawing his/her attention to what the fingers are doing. Bloom (1986)

maintained that automaticity increases level of speed and accuracy of performance of skills. In similar way, Flower and Hayes (1980b) stated, "One way to reduce cognitive stain is to depend on procedures that are so automated or routine that they don't require conscious processing in short-term memory. For example, experienced writers usually devote very little conscious attention to tasks such as typing, producing grammatical sentences, or even meeting the demands of a particular genre, whereas these tasks can overwhelm inexperienced writers." (p. 42).

This observation of lack of keyboarding skills among most of the students of this study was consistent with their responses in the survey. For example, subject number four rated himself as weak in keyboarding skills in Arabic and excellent in English. He saw his slow typing in Arabic as a major problem he faced in the study. He said in responding to question number 10 of part B in the survey's Arabic section, "Yes, I was very slow in typing in Arabic." Another subject stated, "Yes, I am slow in typing." One more subject apologized for his slow typing said, "for four years I have not typed in Arabic." In responding to the survey question number B/9 which asked the subjects what they like about pen-and-paper in both languages, one subject said, "I am very slow in typing, so I like it since I can finish it more faster than typing it"

Along with Daiute (1985), MacArthur (1988) observed that "the slowness of typing can be frustrating for students and interfere with motivation" (p. 538). Daiute stressed that "writers can use a computer most efficiently by touch- typing" (p. 31). She described the touch-typing method as "positioning the hands over the center row of keys--the home row--and striking each key with a specific finger" (p. 31) without looking at the keyboard.

Joram et al. (1990, 1992) suggested that "word processors may increase the attentional demands placed on students when text-editing and typing are not fully automatic" (p. 190). According to Joram et al. (1990) lack of proficiency in keyboarding skills may limit students ability to take advantage of word processing capabilities while writing or revising their texts. Joram et al. (1990), Montague, (1990), Phinney and Khouri, 1993, and Pennington, (1996) recommended that in order to foster native or non-native students to take advantages of word processing capabilities for meaning revision, a combination of intensive instruction and practice for sufficient time on word processing and writing/revision strategies was needed, with emphasis on advanced functions of word processing and higher-level of revisions.

In this study, the results of the statistical methods part suggested that the subjects' long experiences with computers and word processing environments might play an important role in their writing quality and in the amount and types of revision in both languages' (Arabic as a first language and English as a second language) word processing essays in comparison to pen-and-paper revision changes. However, long experience with computers and word processing are not enough to enable writers to benefit effectively from word processing unless it is based on sufficient time for direct instruction on effectively how to use word processing capabilities for substantial revisions. Joram et al. (1992) reported that "Simply because writers use a word processing system for a long time does not ensure that they will become skilled at text-editing." (p. 190).

Taken together, the result of a paired t-test provided statistical evidence that the subjects' lack of typing skills especially in Arabic may have played a major role in leading the subjects overwhelmingly to focus on surface revisions.

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As indicated earlier, the subjects did very few meaning changes in their entire essays. Lack of typing skills may have contributed to this result.

Making a major change is a higher order cognitive activity that involves rewriting or retyping demands. As a result, the interference of cognitive and rewriting or retyping demands more likely led the subjects to pay little attention to meaning revisions.

Qualitative Findings

In this study, there was a variety of qualitative methods used in order to provide rich information about the subjects' revision strategies as they composed in a word processing environment. The results of qualitative questions are addressed in the following sections.

The Survey of Subjects

The subjects' responses to the survey questions (see Appendix F) revealed important information and insights that may reflect some light on the study's findings that resulted from other research methods. The completion rate of the survey by the subjects was 100%.

The first question was concerned with the subjects' rating of their keyboarding skills including typing ability in both Arabic as a first language (AFL) and English as a second language (ESL). The subjects provided unique answers. It should be noted that a number of survey questions discussed in this section and the rest of the questions were discussed in appropriate parts of this thesis.

When the subjects were asked to rate their keyboarding skills. including typing skills) in Arabic as a first language (AFL), nine subjects reported that they were "weak," five "good," one "excellent" and one "very weak.." Figure 4 displays the subjects' rating of their Arabic keyboarding skills.

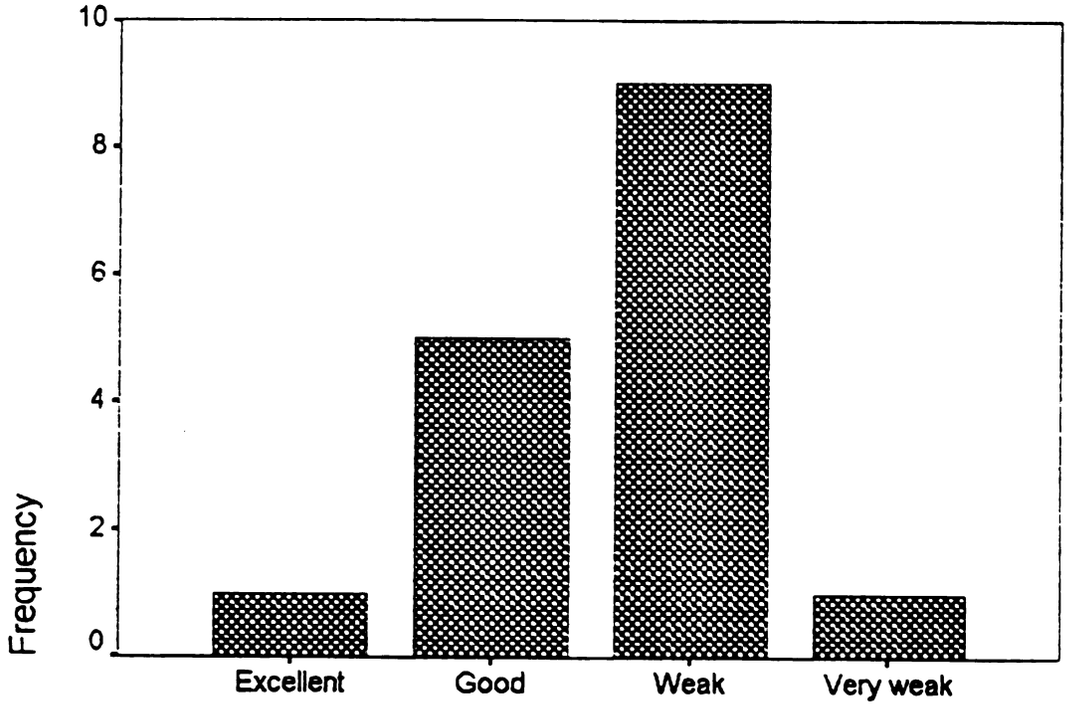

Figure 4. Rating the subjects' keyboarding skills in Arabic.

The same question was posed for their keyboarding skills for English as a second language (ESL). Eleven subjects responded "good," four "very good" and one "excellent." Figure 5 summarizes the subjects' ratings of English keyboarding skills:

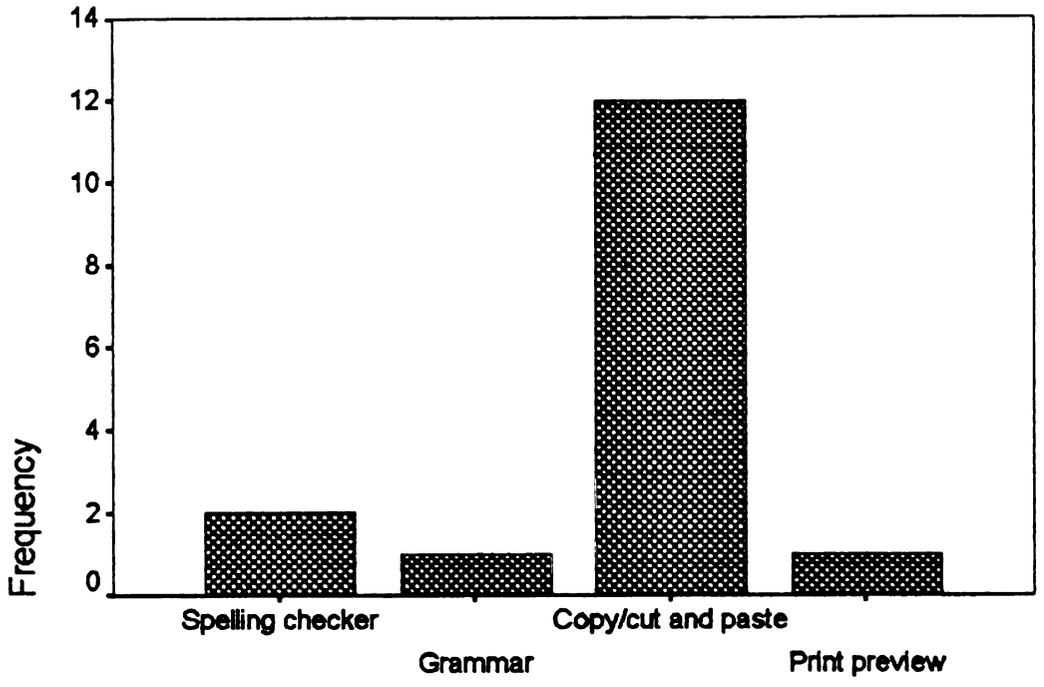

Figure 5. Rating the subjects' English keyboarding skills.

Both Figures 4 and 5 showed the subjects lacked both Arabic and English keyboarding abilities and were clearly lacking in Arabic keyboarding skills. This might be caused by the lack of education systems in the subjects' home countries, suggesting that there is a serious need for those educational systems to put more focus on keyboarding instruction in their general curricula. According to Lewis (1994), instruction in keyboarding and typing in general education is "highly cost effective" (p.31). She elaborated that keyboarding instruction in secondary schools is both academically and vocationally beneficial, stating "It should become an integral part of required general education for all students in the public schools" (p. 32).

When the subjects were asked to rate how many hours per week they use word processing for both Arabic and English. their responses indicated that, for Arabic, 14

subjects (87.5%) used word processing for less than one hour per week; one subject (6.3%) from one to two hours per week; and another (6.3%) from three to five hours per week. Hence, the overwhelming majority of the subjects used word processing for Arabic less than one hour per week.

For English as a second language (ESL), seven subjects (43.8%) used word processing from three to five hour per week; four subjects (25%) for less than one hour per week; three subjects (18.8%) nine or more hour per week; one subject (6.3%) from one to two hours per week; and another (6.3%) from six to eight hours per week. This revealed that that the subjects used word processing for English as a second language more than for Arabic. This may be attributed to two reasons: first, they did not use or rarely used word processing in Arabic; and, second, English is the language used in their academic studies.

The results of keyboarding skills, the amount of hours that the subjects spent word processing per week and the subjects' typing speeds are consistent in concluding that the subjects were exposed to word processing in English as a second language (ESL) more than in Arabic as first language (AFL). This led to better keyboarding skills or faster typing speeds in English as a second language than in Arabic as a first language.

In the survey, furthermore, the subjects were asked to rate their satisfaction with regard to their experience in this study for both Arabic as a first language (AFL) and English as a second language (ESL). The satisfactions for both languages were high. For Arabic, five subjects (31.3%) were very satisfied, seven subjects (43.8%) were fairly satisfied, and four subjects (25%) were slightly satisfied. Figure 6 shows subjects' satisfaction with the experiment in Arabic:

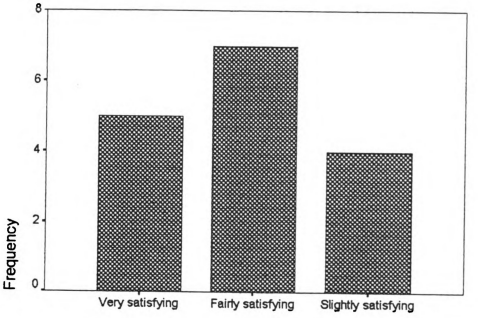

Figure 6. Subjects' satisfaction with the experiment in Arabic.

Examination of subjects' responses with regard to satisfaction with the experiment in English as a second language (ESL) showed that six subjects (37.5%) were very satisfied, eight subjects (50%) were fairly satisfied, and two subjects (12.5%) were slightly satisfied. Figure 7 illustrated the subjects' satisfaction with experiment in English as a second language (ESL):

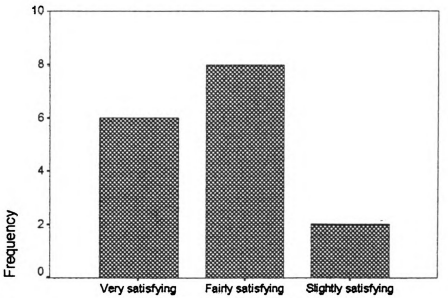

Figure 7. Subjects' satisfaction with experiment in English as a second language (ESL)

Inspection of the percentages of subjects' responses for experiment satisfaction for both languages revealed that the subjects were more satisfied with the English than with the Arabic experience in the experiment. This slight difference in the favor of English may due to the subjects' lack of keyboarding skills in Arabic, especially their Arabic typing speeds.

Two questions addressed the issue of what subjects liked about pen-and-paper and word processing in revision in both Arabic and English.

In the survey, the subjects' revision frequency was explored. They were asked, "Do you often revise your essays?" All of the subjects responded that they frequently revise their essays. This may imply that the subjects more likely aware of the importance of revision for improving their essays.

With regard to word processing, the subjects were asked, "Briefly, what do you like about using word processing to revise in Arabic and in English as a second language

(ESL)? The subjects' responses showed that nine subjects (56.3%) like the functions of word processing for editing. Four subjects (25%) like the speed feature of computer to make revisions. Six subjects (37.5%) like the ease of making revisions with word processing. One subject (6.3%) likes the capabilities of word processing for moving text. Three subjects (18.3%) like the capabilities of word processing for formatting a text.

With respect to pen-and-paper as a writing/revising tool in both languages, the subjects were asked, "Briefly, what do like about using pen-and-paper to revise in Arabic and in English as a second language (ESL)?" The subjects' responses clustered around six merits of pen-and-paper. Six subjects (37.5%) reported that they liked pen-and-paper as a faster revising tool than a computer. Three subjects (18.8%) liked pen-and-paper's allowing a writer to see the whole page in a document. Two subjects (12.6%) liked pen-and-paper in contrast to word processing because actual changes that might be used for revision can be seen on the paper. Four subjects (25%) like pen-and-paper because it is easier to use than a computer. Three subjects (18.8%) liked the availability of pen-and-paper in contrast to a computer. Finally, one subject (6.3%) perceived that pen-and-paper helps a writer to focus on revising an essay more than typing does. (It should be noted that some subjects provided more than one merit each either pen-and-paper or word processing as a revising tool).

When the subjects were asked, "From your experience with the experiment, did you face major problems while writing and revising your essays with word processing in Arabic or in English as a second language? If yes, please explain in the space provided below," their responses revealed that twelve subjects said "no." Three subjects reported

slow typing skills, and one subject pointed to the sequence of topics in writing as being a problem.

The final question in the survey asked the subjects to provide their comments and suggestions with regard to their experience with this experiment. The subjects' responses can be categorized into the following points:

The experiment provided the subjects good experience in various ways.

The writing topics were interesting.

The researcher provided clear instructions and training.

The study seems to be useful for the researcher and writers.

The number of meetings for the study should be reduced.

For example, one subject said, "I think the idea of training topics is very clever, it helps me to be prepared for writing the essays."

Another subject said, "I think that saying things aloud was very interesting and I like it. It was very helpful in revising the papers and structuring the sentences. I also got some good experience or practice with typing in Arabic."

Cut-and-paste Function

With recent advances in computer technologies for writing, many capabilities of the word processing environment become very easy to use. At the heart of these capacities for revision are copy or cut-and-paste. Cut-and-paste explicitly lends itself to meaning revision and, more specificity, for organizing text (Pennington, 1993b). Hill et al. (1991) maintained that "the ability to rearrange chunks of text using the cut and paste features, which are now integral features of nearly all word processing programs, may

also make global text changes easier" (p. 95). Joram et al. (1992) hold that word processing environments not only provide a variety of functions for making surface revision changes, but also are furnished with functions that are proper for meaning-revision changes. Williamson and Pence (1989) described cut-and-paste functions in word processing as superior capabilities in comparison to cut-and-paste in pen and paper. However, Phinney and Khouri (1993) who study ESL student writers concluded that inexperienced writers and computer users did not take full advantage of word processing to make meaning-revision changes.

In this study, the totals of copy/cut and paste functions performed by the subjects with the word processing environment were 37 in Arabic and 21 in English essays, respectively. Observational notes and video analysis revealed that most of the subjects who used copy/cut and paste tended to use them for simple revision changes. For example, the subjects who were slow typists copy/cut-and-paste to move repeated phrases and sometimes words to avoid retyping these phrases. One of the subjects stated, "I am using cut and paste to speed up the typing." This practice was mostly associated with Arabic essays more than those in English. Other subjects used copy/cut and paste to reorder or move words, phrases, sentences, or parts of paragraph. One subject used cut as delete function.

It may be hypothesized that slow typing ability and the absence of instruction on how to benefit from copy/cut and paste for substantial revision prompted these subjects to use the word processing capabilities mainly for simple revision changes. Since the cut-and-paste function became easy to use, the issue was not how to use it, but rather how to take full advantage of this function to make meaning revision changes. According to

Joram et al. (1990), effective exploiting of the cut-and-paste function may be accomplished without direct and sufficient instruction on how to use the function for substantial revision.

Revision-process Sequence (Direction)--Bottom-up

The nature of the revision sequence in word processing has drawn the researchers' attention. As discussed previously, Pennington (1996) claimed that word processing supports the bottom-up process of revision sequence in writing with the more top-down hierarchical structured process. Pennington (1996) shared the opinions of Bernhardt (1989) and Williamson and Pence (1989) that fluency in keyboarding might allow student writers to put their thoughts rapidly in written form and then free them to concentrate on revision and development of what was already written.

In this study, the overwhelming majority of the subjects used the top-down approach to make changes in both their pen-and-paper and word-processed essays in both languages. However, two subjects tended to use bottom-up strategies in their revision activities, benefiting from the insetting and the copy/cut and paste features of the word processing program. The first subject mostly followed the top-down process, but while he created his English essay, he developed the following statement: "The bottom line is to be in a good health, one should exercise, otherwise one has to watch his/her diet." Then he said, "I will make this in my conclusion." He moved that part to the end of his essay with the cut-and-pasted features of the word processing environment.

The other subject completed the first draft of his English essay and started revising the conclusion and then kept adding content and revising his essay.

In the survey, the subjects were asked, "When you revise your essays, do you start from the beginning or from the end of your pen-and-paper and word processed essays?" Their answers revealed that 15 subjects (93.8%) responded that they revise from the beginning of their essays, and one subject for both pen-and-paper and word processed essays (6.3%) responded that he started from the end his essays. This result is consistent with the results that emerged from the examinations of the subjects' essay videos.

Although most of the subjects revised their essays with word processing recursively in both languages, they generally tended to move from top to bottom when they revised their essays. The predominance of this top-down practice among the subjects may be due to the following reasons.

First, the absence of instruction on the use of word processing and the lack of keyboarding skills, especially slow typing, may have played a paramount role in the subjects' avoidance to use the bottom-up strategy (Pennington, 1996; Bernhardt, 1989; Williamson & Pence, 1989).

Second, like most students, these subjects had used top-down strategies in revision for a long time when they used pen-and-paper or word processing.

In the survey, the subjects were asked, "When you write your essays, do you make major changes first and then simple changes or do you do the opposite?" Their responses indicted that 10 subjects (62.5%) reported that they make major revisions first and then simple revisions, five subjects (31.3%) responded that they make simple revision first and then major revision, and one subject (6.3%) responded both simple and

major as he develops his essays. According to the subjects' responses in the survey, two-thirds of the subjects make major changes first and then simple changes in their essays.

Recursive Revision Process

The subjects of this study revised recursively in different quantities in their essays with a word processing environment in both Arabic as a first language (AFL) and English as a second language (ESL), as compared to their revision with pen-and-paper essays. This can be supported by comparing the number of revision changes in their essays with pen-and-paper and with the word processing environment as shown in Table 6. As they created their essays with the word processing environment, the subjects tended to reread frequently the part they had already generated, to make sense of it and accordingly to either revise it or to continue creating more text. In their thinking-aloud protocols, several subjects revealed similar statements, such as "I want to see what I wrote," "I have to go back to check my first paragraph."

Most of the subjects reread their whole essays once or more for revision in both languages with either pen-and-paper or word processor.

In sum, the subjects of this study revised recursively in their essays with the word processing environment more than with the pen-and-paper medium of writing in both languages. These findings are consistent with the findings of Williamson and Pence (1989) and Chadwick and Bruce (1989) that word processing facilitates the recursive revision process more than pen-and-paper. Researchers stressed that pen-and-paper are linear in nature because they associated with recopying or crossing.

Types of revision subjects made. In both languages, the subjects demonstrated similar types of revisions, but they differed in the quantity of revisions. As Table 6 illustrates, surface revisions were the predominant type of revision made by the subjects in both pen-and-paper and word processing essays. However, the subjects performed sizable amounts of surface revisions in word processed essays in both Arabic as first language (AFL) and English as a second language (ESL) in contrast to their surface revisions in pen-and-paper essays. The most frequent type of surface revision students made with word processing was spelling correction. For example, two essays selected randomly from the word processed essays in each language showed that in Arabic as a first language (AFL), the first selected subject made 12 spelling corrections out of total 28 surface changes. Similarly, in English as a second language (ESL), the first subject performed 23 spelling correction out of total 50 surface changes. The second subject made 25 spelling correction out of total 56 surface changes.

The subjects also made more meaning revision changes in the word processing essays in both Arabic as first language and English as a second language as compared to their revision meaning changes in pen-and-paper in the same languages. However, the subjects did very few meaning changes with pen-and-paper in both Arabic as a first language and English as second language essays. Moreover, the subjects did more meaning revision changes in word-processed essays in English than in Arabic. This occurred because meaning revision usually demands more time and more of a cognitive and physical (rewriting or retyping) burden than surface revision does.

Initially, it seems surprising that the subjects did more surface and meaning changes in a word processing environment in English as a second language than in

Arabic as a first language, although the latter is their mother tongue. Upon further reflection, it appears that these differences may be attributed to the following reasons:

1) All of the subjects completed programs in English as a second language (ESL) where they received writing courses.

2) All of the subjects enrolled at an academic level for at least two years. Both the above reasons may have enriched the subjects' experience with regard to revision skills in English as a second language (ESL).

3) As shown in the paired t-test, the subjects' typing was much faster on English than on Arabic essays. Research on word processing in writing indicated that a slow typing speed may intervene with the writing processes, pushing student writers to focus on surface revisions (Piolat, 1991; Pennington, 1993a). Consequently, the combination of cognitive and slow typing is more likely to lead subjects to avoid making meaning changes in their essays with either pen-and-paper or word processing in both languages.

In the survey, the subjects were asked if they used word processing for simple, major revisions or for both when they revised. Their responses revealed that 15 subjects (93.8%) used both simple and major revision; one subject did only simple revisions, and one responded that he did so only for major revisions.

Where Revision Occurred

In general, revision may have occurred before the subjects wrote or typed any word. Most of subjects in pen-and-paper spent seconds thinking about the topic before they started writing, and a few subjects wrote outlines for their essays. For example, one of the subjects revealed in his verbalized protocol that before he started typing, "I am trying to put my thoughts together." Other subject said, "I am thinking about the topic sentence."

On the whole, surface revisions were scattered randomly in all subjects' essays, whether with pen-and-paper or word processing in both languages (see Appendix F).

However, some subjects tended to postpone the correction of their spelling mistakes by spelling checker until they finished a paragraph or section they worked on it.

Broadly speaking, the majority of the surface changes in pen and paper and word processing essays in both languages occurred as the subjects proceeded the first drafts of their essays. Although it is very difficult to decide where is the beginning and the end of first draft is in writing, in this study the second draft was determined to be when a subject finished creating an essay and began reading it as whole for revision purpose.

As shown in Appendix F, the majority of microstructure-meaning revisions with word processing in both languages occurred at the first draft of the subjects' essays. For example, in English as a second language (ESL) essays, the subjects made 27 and 16 microstructure-meaning changes with word processing environment in the first and second drafts, respectively.

In another example, in Arabic as first language (AFL), the subjects preformed 22 and 8 microstructure-meaning changes when composing in a word processing environment in the first and second drafts, respectively. However, in English as a second language (ESL) essays written with pen-and-paper, the subjects made two and nine microstructure-meaning changes in the first and second drafts.

Unlike in pen-and-paper essays in English as a second language (ESL), the subjects made 11 microstructure-meaning changes in the first draft and six in the second draft in Arabic essays written with pen-and-paper. The subjects made overwhelmingly more macrostructure-meaning changes in the first draft in English essays. More specifically, subjects made four out of five macrostructure-meaning changes in the first draft.

When the survey subjects were asked how they revised their essays with pen-and-paper and with word processing in both Arabic and English, for both languages their responses indicted that the majority of the subjects (75%) with either pen-and-paper or word processing environment revised both as they were developing and after they had completed the first draft. Two subjects (12.5%) reported that they revised with pen-and-paper as they developed the first draft, and two subjects (12.5%) did so after completing the first draft. Likewise, three subjects (18,8%) indicted that they revised as they developed the first draft, and one subject (6,3%) did so after completing the first draft with word processing environment.

In summary, in Arabic as a first language (AFL) and English as a second language (ESL), the subjects performed the majority of their surface changes in both pen-and-paper and word-processed essays in the first draft. Furthermore, the subjects made more meaning revisions in their word-processed essays in both languages in the first draft of their essays. The reason for the high occurrence of both surface and meaning changes in the first draft in word processed essays in both languages was the flexibility of making changes in the word processing environment, which attracted the subjects to clean up what they wrote before they finished creating their essays and before they forgot what they wanted to change.

With regard to revision occurrence, the result of this study is partially consistent with research findings reported in Peterson's (1993) study. She reported that student writers preformed more structure, punctuation, grammar and spelling changes while they composed the original essays in a word processing environment. Likewise, Faigley and Witte (1981) indicated that with pen and paper, experienced adult "students made more

revisions of all kinds during the composing of the first draft than did the experienced students." (p. 407).

Audience Awareness

The majority of research on audience analysis in writing emphasized the importance of audience awareness by writers for effective communication (Ede & Lunsford, 1984; Odell, 1980; Black, 1989; Bereiter, 1980; Park, 1982). Revising for the audience is a notable characteristic of experienced writers (Black, 1989; Rubin & O'Looney, 1990).

Based on the subjects' responses in the survey and on their essays and thinking-aloud protocols, the subjects' revisions for awareness of audience (readers) was analyzed by looking for explicit and/or implicit indications of audience awareness in the subjects' products. These indications, which characterize experienced writers, included revising for the audience's ages, beliefs, attitudes, goals, needs, and expectations. Revising with audience in mind also includes attending to clarity and/or legibility, wording, and tone (voice) of their essays (Black, 1989; Ede & Lunsford, 1984; Flower & Hayes, 1980a)

Close inspection of the subjects' essays and thinking-aloud protocols provided many implicit and a few explicit indications of revision for audience awareness. Several subjects revised explicitly for their audience in their thinking-aloud protocols and essays in either Arabic or English essays, but with different levels of audience awareness. For example, four subjects attended to the readers' expectations while they revised their essays. They used expressions such as, "The other group opinions..." "On the other

hand, some people believe that... there are some parents who not agree with the ..." and "These two arguments are important for parents or guardians to consider ..."

Other subjects talked to the audience (e.g., parents) explicitly with voice. For example, one subject said, "I advise the parents to specify a limited time for the kids to spend with computer and more time with human being to learn from the real experience not from the virtual reality world." Some subjects referred explicitly to the audience in general terms such as reader and people. For example, one subject stated, "Personally, I think, it is very important for people to exercise if they want to maintain a happy and healthy life."

A subject in his pen-and-paper Arabic essay showed an explicit awareness of the reader, but in general terms. He said, "The reader of this article may realize that there is a clear contradiction in the answer of the last question."

The majority of the subjects wrote implicitly with the audience in mind by paying attention to clarity and/or legibility, wording, and tone (voice), and by indicating a general sense of their readers while revising their essays. For example, a subject revised implicitly for clarity. He said (translated from Arabic) "I know this sentence is not clear; I will try to make it clear now." Another subject said, "Let's clear that." A third subject said "This a long sentence; I would like to break to two parts to be easier for readers to read." Fourth subject said, "... rephrase that clearly." Hence, in this study, clarity represented the most frequent cause of revision for audience awareness.

Various subjects shared their experiences with readers in order to convince them to adopt their points of views, but without an indication to the type of audience or their characteristics.

The subjects' revisions for awareness tended to randomly appear in their pen-and-paper, word-processed essays or thinking verbalizations in both Arabic as a first language (AFL) and English as a second language (ESL). The effect of the word processing environment on audience awareness was not supported by evidence. This may have resulted from the assumption that audience awareness is a higher cognitive ability, and the word-processing environment so far still does not lend itself to audience awareness.

In the survey, the subjects were asked, "When you revise your essays, do you revise according to for whom you write?" Fourteen subjects responded "yes" which represents 87.5% of the entire subjects, whereas one subject said "No" and another said "sometimes" which each represents 6.3% of the 16 total subjects. According to the results of the survey, the majority of the subjects wrote and revised with audience in mind. This is consistent with the results based on audience awareness analysis in the subjects' essays and thinking-aloud protocols.

In sum, the analysis of a writer's audience awareness is a complicated matter (Long, 1990). The subjects' verbalized protocols were used to trace audience awareness. Most of the subjects had an audience in mind to a varied extent while writing their essays. Some subjects referred to their audiences explicitly, and the majority made some efforts to make their essays clear to the audience without explicit indication to what types or characteristics of audience they were writing to. This inexplicit audience awareness among some of the subjects may be due to the overwhelming demand of the writing technology, especially keyboarding skills, lack of metacognitive control strategies and the limitation of time for each essay. Integrated instruction or training on effective use of a

computer and metacognitive skills for writing/revision may improve the students' awareness of their audiences.

In this analysis of audience awareness, an important question can be raised with regard to the numerous indications of implicit revisions according to audience. Were the implicit indications of revisions for audience awareness that occurred in the subjects' written or verbalized forms intended by the subjects, or did they stem from the nature of the persuasive-argumentative mode of writing? This question can not be answered from the subjects' verbal or written products and is beyond the scope of this study.

The results of this study with regard to audience awareness are consistent with the findings of related studies. Arndt (1987) reported that six Chinese postgraduate students of English as a second language (ESL) had some difficulties to "re-view the emerging text with the eyes of potential readers" (p. 262). Rubin and Looney (1990) cued their subjects to a college basic writer to revise for audience. In a post-writing survey of their basic writers, they found that all the student writers except one had readers in mind; however, only three students indicted that they devoted thoughts to their audiences. This suggested that students in the programs of English as a second language (ESL) should be taught and practice writing and revising for a variety of real-life audiences.

Why Students Made More Revision Changes in English as a Second Language (ESL) than in Arabic?

There were various possible explanations for why the subjects made more surface and meaning revisions in English as a second language (ESL) than in Arabic as a first language (AFL). First, the subjects of this study clearly performed more surface and meaning revision changes in word processed essays in English as a second language

(ESL) than in Arabic as a first language (AFL) pen-and-paper and word processed essays. This occurred because the subjects were more likely to be more proficient in their first language than in their second language.

Second, lack of keyboarding skills, especially in typing skills among the subjects as the survey responses and typing speed measurements showed, consume subjects' time and lead them to perform a lesser amount of surface and meaning revision changes in Arabic than in English essays.

Third, it is undeniable that the students acquired acceptable levels of knowledge and skills of writing/revising during their preparations for academic studies in English programs and during their current academic programs. These prior experiences may have played major role in the subjects' revision-change differences and writing quality in Arabic and English essays. Since English is the only language used for their academic studies in the USA, the students may have improved their writing and revision strategies and writing quality during their programs for English as a second language and academic study. The question that can be raised is, did the students transfer their writing skills from the second language to the first language? Answering this question is beyond the scope of this study.

Fourth, the subjects' prior long-term experiences with computers and word processing environments and their levels of English proficiency interacted. This interaction may play an important role in the number and quality of their revision changes. According to Pennington (1993b), the interaction among language, writing, and computer experience naturally led to an increase in the development from surface to deep and from separated to integrated levels of performance.

Finally, based on the accumulated results from this study, one can hypothesize that the reduction in subjects' revisions in Arabic comparing to English stemmed to some extent from a lack of keyboarding skills, especially typing skills in Arabic, which may, in turn, result in hindering the subjects from effective exploitation of word processing capabilities for writing /revision and may lead to overwhelmingly increase subjects' cognitive loads by causing them to focus on keyboard operation.

Metacognition and Revision

Research on metacognition has highlighted the importance of direct instruction to students about writing strategies, such as planning, translating and reviewing metacognitive strategies, such as self-regulation, self-questioning, self-evaluation in order to improve the quality of their writing (Hayes et al., 1987; Englert & Raphael, 1988; Daiute & Kruidenier, 1992).

Research found that training metacognitive strategies such as self-monitoring, self-reflection and self-evaluation resulted in improving in writing quality and effective revision strategies (Daiute, 1985; Ferrari et al., 1998)

Students should be taught to manage their thoughts as they write/revise their essays in order to reduce the cognitive load resulting from attending to many points at the same times. According to Flower and Hayes (1980b), Sommers, (1980) and Hayes et al. (1987), because human attention capacity is limited and because writing /revision is a cognitively demanding process, student writers may regulate their revision activities by dividing the revision task in parts or problems and treating each revision problem

separately. Flower and Hayes (1980b) called this strategy "juggling constrains." That is, the writer can focus only on correcting the essay organization, then switch to correcting grammatical mistakes, then concentrate only on fixing spelling errors, and so on. In Hayes and Flower's (1983) model of writing processes, one should monitor functions as an executive controller by monitoring attention capacity and regulating the switch of attention focus from process to process or sub-process of writing (Hayes et al., 1987).

Word Processing Functions and Types of Revision

In both Arabic as first language (AFL) and English as a second language (ESL), there was a great tendency among the subjects to use the simple functions of word processing, predominantly the spelling checker and insert-by-cursor functions. For example, a subject used the spelling check for 16 words out of 33 surface revision changes and he used insert-by-cursor to add or delete words or sentences nine times.

Most of subjects did not use the grammar checker and thesaurus support programs in English as a second language. Only a couple of subjects used grammar checker in an attempt to correct their grammatical mistakes. A few others used the thesaurus support program to find alternative words to avoid word repetition. For example, a subject used thesaurus support program to find alternative transition for "however" and another to find a synonym of the "responsible."

Complex functions such as macro were not used by the subjects, although in many situations, they might have been able to used the macro function to avoid retyping expressions or phrases that occurred in their essays in both languages.

The most frequent function associated with meaning revision was cut-and-paste. The subjects mostly used this to move or reorganize words, sentences or parts of paragraphs. Although cut and paste can be used with meaning revision such as changing or reorganizing the structure of a text, the subjects did fully exploit this type of word processing capability to make major changes in their essays in both languages. For example, one of subjects used cut and paste 11 times at word and sentence levels.

Several subjects used print preview or printed functions in either Arabic or English essays to see how their essays looked like or were organized as a whole. However, they did not made major changes accordingly.

In the survey, two questions explored the functions or capabilities the subjects used with simple and major revisions. The first question was, "Which functions or capabilities of word processing do you use to make simple changes in your essays in Arabic and English as a second language (ESL)?" The subjects' responses indicated that the most common function they used for simple changes in both languages was spelling checker. Fifteen and 13 out of 16 subjects reported that they used spelling checker for simple changes in English as a second language (ESL) and Arabic as a first language (AFL), respectively. The second most common word processing function or capability for simple changes the subjects reported using was cut/copy-and-paste in both languages. Eight subjects in Arabic and seven subjects in English as a second language indicated that they used cut-and-paste capability for simple changes in their essays.

The second question was, "Which functions or capabilities of word processing do you use to make major changes in your essays in Arabic and English as a second language (ESL)?" The subjects' responses indicated that cut/copy-and-paste was the most

common function of word processing used by the subjects. Twelve subjects in both Arabic and English reported that they used cut/copy-and-paste for major changes in their essays. The results of the survey with regard to the functions of word processing reported by the subjects were consistent with the findings of the analysis of their essays obtained during the experiment.

The Benefits and Constraints to Revision

In the survey the subject were asked, "Does a word processor facilitate or hinder your revision in both Arabic and English? And how?" According to the subjects' responses in the survey, the majority of them tended to see a word processing environment as a facilitator for making revision. Fourteen subjects (81.3%) of the subjects responded to the question that a word processing environment facilitated revision. One subject said, "It facilities my revision in both Arabic and English by using the functions that simplify the revision." Another subject stated, "It facilitates my revision in the way I do not have to restart every time I want to make change. It also supports my spelling and word meaning." A third subject said, "Of course, a word processor facilitates my writing by making revision faster and easier."

However, one subject (6.3%) saw the word processor as a hindrance for his revision. He said, "It hinders my revision, especially in English because the word processor in English is more advanced than in Arabic."

Two subjects (12.5%) saw that the word processor facilitates revision but somewhat hinders revision. He stated, "The word processor facilitates my revision by providing powerful tools, such as spelling checker, cut and paste, etc.... But it also

hinders the revision -somewhat- by not showing the full page. The screen only shows a paragraph or lines."

Another subject said, "It facilitates sometimes. But in overall it does not effect my revision neither in Arabic nor in English."

In sum, most of the subjects believed that the word processing environment functions as facilitator for revision in both Arabic as a first language (AFL) and English as a second language (ESL). Very few subjects saw the word processing environment as hindrance for revision. This last view may stem from their shallow experience with a word processing environment in writing.

The Reliability of the Revision Classification

To determine the reliability of the classification of subjects' revisions, the researcher and a doctoral student who speaks Arabic as a first language and taught composition for English as a second language classified two 10-minute portions from two randomly selected videotapes of subjects' revisions. Before the classification process, the two classifiers read and discussed Faigley and Witte's (1981, 1984) taxonomy of revision changes. Discrepancies between the two were resolve through discussion until they reached an acceptable level of agreement.

A Pearson's correlation coefficient was used to determine inter-classifier reliability. The Pearson correlation coefficient's average (r) for both videotapes was .94, indicating that there was a strong positive correlation (agreement) between the two classifiers for the revision classification.

The Writing Quality of Subjects' Essays

In order to provide a complete picture of the subjects' writing, the writing quality of subjects' essays with both pen-and-paper and word-processing was evaluated. Two experienced raters carried out the evaluation. The results of the subjects' essays evaluation is presented in Table 11 below. The writing quality scores are not official or represent Test of Written English (TWE) by any means.

Table 11. The subjects' essays writing quality in both Arabic as first language (AFL) and English as a second language (ESL)

Subjects	AP	AW	EP	EW
1	4.75	5.5	4.25	4.5
2	5.5	5.5	5.5	4.25
3	5	5.5	4.5	4
4	5.5	5.5	5.33	5.5
5	5.5	5.5	4.75	4.75
6	5	5.5	4.25	4
7	4.5	4.5	5	5.166
8	5.5	5	3.75	4.5
9	4.5	4.75	4.166	4.75
10	4	5	3.5	4.5
11	5	4.5	4	4
12	4.5	5	5.5	4.5
13	4.5	4.5	4.5	5.5
14	4.75	5	4.75	4
15	5	5	3.75	5.33
16	4.5	4.5	4	3.75
Mean	4.9	5.1	4.4	4.4

Keys:

AP	Arabic pen-and-paper essays
EP	English pen-and-paper essays
AW	Arabic word-processed essays
EW	English word-processed essays

A factorial design Analysis of Variance (ANOVA) for repeated measures was used to examine the effects of the word processing environment on the writing quality of the subjects' pen-and-paper and word processed essays in both Arabic as a first language (AFL) and English as a second language (ESL). This section of the study addressed the question that asked if were there significant differences between word processed and pen-and-paper essays with regard to writing quality in both languages, Arabic as a first language (AFL) and English as a second language (ESL). The results were shown in Table 12 below:

Table 12. ANOVA summary of the results of the word processing effects on writing quality of the subjects' essays across the two languages: Arabic as a first language (AFL) and English as a second language (ESL).

Source	DF	Sum of Square	Mean Square	F Value	Pr > F
Model	24	11.71	0.49	2.33	0.009
Error	39	8.15	0.21		
Corrected Total	63	19.86			

R-Square	Coeff.Var.	Root MSE	Y Mean
0.59	9.65	0.46	4.74

Source	DF	Sum/Square	Mean Square	F Value	Pr > F
Subject	15	6.49	0.43	2.07	0.03
Tre.Order	3	0.28	0.09	0.45	0.72
Topic	3	1.47	0.48	2.32	0.09
Language	1	3.18	3.18	15.19	0.0004
Method	1	0.28	0.28	1.35	0.25
Lan*method	1	0.02	0.02	0.12	0.73

The results of the factorial design Analysis of Variance (ANOVA) for repeated measures revealed that there were no significant ($F = 1.35$; $p = 0.25 > .05$) differences between the subjects' pen-and-paper and word processed essays in both languages. Arabic as a first language (AFL) and English as a second language (ESL) with regard to writing quality. This result indicated that the subjects' essays were similar with regard to writing quality in Arabic as a first language and English as a second language. This result may have attributed to the absence of direct instruction on the use of a word processing environment in writing among the subjects in both languages.

This speculation is consistent with the mainstream of literature. According to Bangert-Drwons (1993) "A full 66% of the 28 studies that measured writing quality reported" (p. 87) noted the effect of absence of instruction. However, the language effect was significant ($F = 15$, $p = .0004 < .05$). That means the subjects did better with regard to writing quality in Arabic as a first language (AFL) than in English as a second language (ESL).

A Tukey post hoc test indicated on the average there was a significant difference between Arabic as a first language (Mean = 4.96) and English as a second language (Mean = 4.51) with level of significant ($p. = .0004 < .05$) with regard to writing quality. That means on the average the subjects did better in Arabic as first language (AFL) than in English as a second language (ESL) with regard to their essays writing quality.

The subject effect was significant ($F = 2.07$, $p = .035 < .05$), but not extremely strong. This may due to the subjects' difference in writing experience and educational level. The interaction between the language and method of writing was insignificant ($F = 0.12$, $p = .73 > .05$).

As expected, both topic (F = 2.32, P. = .09 > .05) and treatment (F = .45, p = .72 > .05) order were insignificant. That means, the choice of writing topics and the Graeco-Latin Square randomization procedures worked as intended.

The results of this study are with in agreement with the findings of Gaskill, (1986), Hall (1987), and Al-Semari (1993) in that the subjects made more revision in their second language than in their first language, especially in terns of surface revisions; and the subjects made a few meaning revisions in their pen-and-paper essays. Chadwick and Bruce (1989) reported that in ESL, subjects tended to make more meaning revisions with a word processing environment.

Furthermore, the results of this study are consistent in part with McAllister and Louth (1988) who found a significant effect of word processing on the quality of revision of native basic writers of English in the spring semester. Although the results of this study were contradictory with those of a number of previous studies that found no statistically significant difference between revision with word processing and revision with pen and paper in English as a first language (Hawisher, 1987; Bridwell et al., 1987) and in English as a second language (Rahman (1991; Smith, 1993), this study is consistent with Bernhardt et al. (1989) who studied the effects of using computers on introductory college composition. They found that the students who chose computers to revise their essays did significantly better than those who chose pen and paper, with regard to revision and writing quality.

In addition, this study is partially consistent with the McAllister and Louth (1988) study of the effects of a word processing environment on the revision quality of basic college writers. The authors of this study found that there was no significant difference

between their control group that used pen and paper and the experimental group that used word processing. However, they found a "significant difference in the quality of revisions between the experimental group and the control group in the spring" (p. 417). They concluded that in a laboratory context, word processing significantly affects the revision quality of basic writers.

The results of this study with the respect to the effect of a word processing environment on subjects' writing quality are consistent with findings of Joram et al.'s (1992) study on English native students and with Chadwick and Bruce's (1989) study of English as a second language students. Both studies found no significant difference between their subjects' word processed and pan-and-paper essays with respect to writing quality.

In this study, the quantitative and qualitative results were consistent. The vast majority of the subjects possessed sizable experience on the use of a word processing environment and computers which resulted in significant effects of word processing on both surface and meaning revisions in the two languages, Arabic as a first language (AFL) and English as a second language (ESL). However, in both quantitative and qualitative methods, the cumulative analysis of subjects' works showed that the subjects did not effectively take advantage of word processing capabilities for revising their essays, especially for meaning revisions in both Arabic as a first language (AFL) and English as a second language (ESL). As in the mainstream research speculations (Phinney, 1989; Daiute, 1986; Markel, 1994), this may have resulted from the absence of effective instruction for sufficient time on the use of word processing environment in writing and revising context.

CHAPTER V

SUMMARY, IMPLEMTNTATIONS, AND RECOMMENDATIONS

Summary

The general purpose of this study was to investigate the effects of a word processing environment on revision processes in writing across two languages: Arabic as a first language and English as a second language (ESL). This study was designed to integrate multiple research methods from both quantitative and qualitative approaches to provide general and detailed information about the subjects' revision processes as they composed with pen-and-paper and with word processing.

The data were collected from experiment products (students' essays and thinking-aloud protocols on video and audiotapes), interview, survey, and observational notes over one semester. Fagley and Witte's (1981, 1984) taxonomy of revision changes was used to classify the subjects' revision changes made with word processing and pen and paper in both Arabic as a first language (AFL) and English as second language (ESL) essays. Before the collection of data, a Graeco-Latin Square was used as a randomization procedure to minimize the effects of nuisance variables, the effects of subject, topic, and treatment orders. To capture rich information that may not appear on paper, a scan converter was used to record the subjects' activities on a word processing monitor and video camcorder to document the subjects' writing activities in pen-and-paper essays.

Two types of factorial designs for repeated measures were used in this study. Analysis of Variance (ANOVA) and Log-Linear Model were used across the two

languages to examine the effects of a word processing environment on surface and meaning revisions, respectively.

The results of both statistical models indicated that there were significant word processing effects on surface and meaning revisions in both languages, Arabic as a first language (AFL) and English as a second language (ESL) essays. The subjects made more surface and meaning revisions to their essays in both languages with the word processing environment than with pen-and-paper.

However, the subjects made few meaning revisions in their word processing and pen-and paper essays. Phinney (1989) pointed out that although teachers stressed the importance of word processing capabilities for making major revisions, students tended to use word processing for "microrevision rather than macrorevision" (p. 84). According to Fitzgerald (1992) advanced college students made one meaning change for every four surface changes. However, inexperienced college students made one meaning change for every seven surface changes.

In general, the subjects made similar revision types in both pen-and-paper and word-processed essays in both Arabic as a first language (AFL) and English as a second language (ESL), but with different quantities.

The qualitative analysis of data revealed that the subjects revised more recursively in the word processing environment in both surface and meaning revisions in the two language essays. This may have due to the assumption that a word processing environment lends itself to revision as a recursive process.

The subjects used a variety of word processing capabilities for surface revision. However, they did not effectively benefit from word processing capabilities for meaning

revisions. For example cut/copy and paste were mostly used to change, move, reorganize, or avoid retyping words, phrases, and sentences.

The subjects tended to have general pictures of audiences in their minds while writing/revising their essays in both Arabic as a first language (AFL) and English as a second language (ESL) in both surface and meaning revisions. However, there were a few subjects who referred to their audiences explicitly while revising their essays.

Typing speed measurements, observational notes and the surveys showed that the major problem subjects faced was slow typing skill in both languages, especially in Arabic. The cognitive load of slow typing speed may have interfered with the cognitive burden of subjects' writing/revision processes, causing them to focus on low level revisions.

The results of factorial design repeated Analysis of Variance (ANOVA) for writing quality revealed that the subjects showed similar writing quality in pen-and-paper and word processed essays in both languages; Arabic as a first language (AFL) and English as a second language (ESL). However, the subjects did better with regard to writing quality in Arabic as a first language (AFL) than they did in English as a second language (ESL).

The results of this study suggested that long experience with a word processing environment is useful to take advantage of a word processing environment effectively but is not enough without direct and sufficient integrated instruction on writing and word processing. This instruction should not only embrace the knowledge and practice of keyboarding skills, especially typing skills, but also word processing capabilities, writing processes including planning, translating, and revision strategies, and metacognitive skills

such as self-regulation and self-reflection. The students' performance of these skills should approach the level of automaticity in using the word processing environment, including typing skills, and performing of revision and metacognitive strategies for them to fully benefit from the word processing environment; otherwise, the student writers will be overloaded by the task requirements. This concurs in large part with the conclusion of the majority of the research literature (Daiute, 1986; Hult, 1988; MacArthur et al., 1993; Pennington, 1993, 1996).

Implications

Theoretical Implications

The study of revision is based on theory and models which have been primarily oriented to a pen-and-paper medium of writing/revision. The advent and rapid development of word processing as a writing environment changed the writers' practices to handle a text (Williamson & Pence, 1989; Klem & Moran, 1991). Writers revise more recursively with word processing. Writers are motivated to revise more with a word processing environment.

In this electronic age, the concepts of writing and revision are moving beyond the textual concept to include document orientation meaning as a result of new advances in text manipulation and communication technologies. That is, the document may not be limited only to the textual form of writing, but also it may include pictures, cartoons, videos, sounds and figures (Phinney, 1996) which may widen the nature and complexity of revision processes. In addition to conventional writing/revising skills, revision in writing may become more complex by involving other skills such as computing,

communication and instructional design skills. With electronic writing, revision becomes a continuous process as long as the document is alive. The authors can revise their sites easily and continuously with minimum effort. Consequently, the theory of writing and revision in general should include the medium of writing as an integral element that may affect the other components of writing or revising models. The current models of writing or revision include the component of the writing/revising tool as a general component that fits any type of writing or revising medium.

As discussed earlier, most of the researchers agree that meaning revision is complex and difficult because it involves higher-order-thinking activities (Chadwick & Bruce, 1989; Piolat, 1991) that are not easy to train subjects on. Consequently, student writers tend to focus on surface revision rather than meaning revision. Although meaning revision is difficult, the subjects of this study performed a few meaning revisions in both languages with both pen-and-paper and word-processed essays. This was a consistent amount of meaning revisions with either only pen-and-paper (e.g., Alsemari, 1993; Gaskill, 1986) or with both pen-and-paper and word processing studies of revision (Walker, 1997) for pen-and-paper or word-processed essays in both Arabic as a first language and English as a second language.

Methodological Implications

Various studies combined surface and meaning revision while studying the effects of a word processing environment on revision. This combination may have introduced ambiguity to the interpretations of the results (Herrmann, 1990; Bangert-Drowns,1993) Furthermore, Bangert-Drowns (1993) argued that using count methods of revision

changes is not a reliable method of revision changes measurement because a lot of the revision changes on paper do not appear in the final draft of an essay.

In order to avoid such problems, this study examined surface and meaning revisions separately and used a scan converter device and camcorder to facilitate capturing writing/revision activities writers made on their essays on videotapes. The use of a scan converter and camcorder provided researchers with detailed data that may not appear in the final printed product as well as comprehensive information about the subjects' revision activities in compression to the use of pen and paper products. To take advantage of the richness of collected data, the classification of revisions and the analysis of data were relied on not only for subject' essays on paper and their thinking-aloud protocols, but also for their videotapes.

In addition to the complexity of studying revision as a writing process (Faigley & Witte, 1981; Faigley et al., 1985), rapid advances in word processing technologies have added new dimensions of complexity to investigating the relationship between word processing and the revision process. Investigating the relationship of a word processing environment to the revision processes in writing is complex in nature. As matter of fact, a word processing environment is not used in a vacuum. Rather, it effects and is effected by the nature of context surrounding it. This context is more likely to involve varied forces in addition to their interactions. The forces may include humans, language systems, writing conventions, social, technological, and ecological contexts. To examine the word processing relationship to writing/revision processes, multiple methods of research

should be integrated in order to provide a more complete picture about the nature of this relationship.

In this study, although the word processing environment helped the subjects to make significant surface and meaning revisions in both languages, Arabic as a first language (AFL) and English as a second language (ESL), the subjects benefited from the word processing environment for surface revisions more than for meaning revisions. This occurred because meaning revisions usually are cognitively and physically demanding, and student writers tend to avoid such writing activities.

This study suggested that the researchers of writing/revision processes should benefit from technological advances to capture in detail the writers' activities that may not appear on paper and to reduce the burden of tracing writers' thinking processes as they compose and revise texts.

Choosing and integrating quantitative and qualitative methods of research to investigate a research problem are complex and demanding processes. Graduate students should be instructed in practice and trained on how to choose and combine quantitative and qualitative methods in a study.

A guideline for evaluating Arabic essays should be developed and validated to be available for the instructors and research community.

Practical Implications

In this information and technological age, skills of effective written communication have become vital for all students to succeed in academic and real-life

contexts (Dever & Pennington, 1989; Montague, 1990; Williams, 1991). Revision in writing is intending to improve the quality of text (Sommers, 1985; Hillocks, 1995; Hayes & Flower,1986).

The suggestions of this study were consistent with several studies' suggestions for both native and non-native writers (Phinney, 1989; Phinney & Khouri, 1993, Joram et al., 1990; Piolat, 1991; Markel, 1994; Pennington, 1996): that to use word processing effectively for writing/revision student, writers should be taught or trained directly for sufficient time to practice a variety of writing and revising with computer skills in authentic writing context. The students should be trained effectively on keyboarding skills, knowledge of writing processes and revision strategies, metacognitive awareness and management of their writing and revision processes.

Although the subjects of this study showed long experience with computers or word processing, and fair competence in the use of computers, they did not fully take advantage of word processing capabilities for revision. This mainly was due to the fact that they hadn't been trained to use a word processing environment. Although long experience in the use of a computer in general and word processing in particular may have made a major contribution to the significant effects of word processing on surface and meaning revisions in this study, long experience in the use of a computer in writing was not enough to take full advantage of word processing capabilities for revision unless it was based on direct instruction for sufficient time. (Phinney, 1989; Joram et al., 1990; Phinney & Khouri, 1993; Markel, 1994).

As mentioned previously, making major revisions is complex and cognitively demanding. To reduce the cognitive load while revising/writing, student writers should

be trained effectively on the use of a word processing environment, to manage their thinking processes, and to acquire revising and writing strategies.

A word processing environment provides a wide range of capabilities that can facilitate revision process in writing. Phinney and Khouri (1993) hypothesized that incorporating the teaching of word-processing into writing processes instruction for a sufficient amount of time will help students to take full advantage of the word processing environment for revising their writing. Likewise, Joram et al. (1990) recommended the design of strategies and skills to teach students revision strategies and keyboarding skills (typing and functions) with certain level of competence.

Since this study relied on subjects' experience with computers in writing, direct instruction on revision and on word processing skills, including keyboarding skills, with special emphasis on meaning revision strategies, may improve the subjects' writing/revision strategies. Pennington (1996) stated, "A considerable opportunity to expand non-native students' horizons as writers is therefore lost if their introduction to word processing is not supported by intensive instruction and in-class practice in the writing strategies that can be applied in the computer environment" (p.142).

Programs for teaching English as a second language (ESL) should incorporate the teaching of word processing skills, including typing skills, in writing classes with more emphasis on teaching advanced functions of word processing (cut and paste, macro, etc.) for making meaning changes.

Curriculum planners in the Saudi educational system should integrate the instruction of keyboarding proficiency, especially at early levels of education in writing pedagogy. Daiute (1985) noted that children at early stages of elementary schools could develop keyboarding skills to write a story. She stressed that the idea that children at early stages of education should be taught both handwriting and typing skills simultaneously.

Although "keyboards are going to be around for along of time" (Wentling, 1992, p. 30), recent advances in voice recognition technology have captured the attention of researchers and educators (O'Hare & McTear, 1999). As a result, curriculum planners should keep an eye on this new technology as a text input device.

Designers of word processing environments may change or redesign the user interfaces of word processing environments and computer monitors to facilitate meaning changes in texts, such as software that allows writers to retrieve the original text and monitors that display the full readable text.

Software designers should incorporate a variety of programs in word-processing environments to support meaning changes in a text, such support programs for planning, data-base knowledge for adding content, support programs for text coherence and organization.

Moreover, the designers of word processing environments should add more supporting programs that meet the needs of Arabic-speaking writers when they compose in Arabic as first language (AFL) or in English as a second language (ESL). In general, Arabic speakers may lack idioms and prepositions. Including support programs to facilitate such problems may contribute to some degree in the improvement of Arabic speakers' writing quality in English as a second language (ESL).

Recommendations for Further Research

Based on the findings that emerged from the study, several suggestions might be proposed for further research.

As mentioned earlier, the current study combined quantitative and qualitative research methods; however, there is a need to use qualitative methods such as a longitudinal case or ethnography study on similar students in order to provide a close-up picture of the interaction among contextual, social, technological forces, because the subjects, in a limited time and artificial situation, may not have performed as in an authentic situation. A longitudinal qualitative study may be carried out to trace the development of similar students' keyboarding competence in integrated instruction on word processing and revision skills.

Since the subjects of this study were male graduate and undergraduate students, replication of this study on female students at graduate and undergraduate level is recommended. According to Fitzgerald's (1992) review of literature on revision, "females tend to revise more than males" (p. 58).

The subjects of this study were students who spoke Arabic as a first language (AFL) and English as a second language (ESL). Similar studies can be conducted on bilingual students of Arabic and English.

Replication of this study can be done on similar subjects using a larger sample and a longer time for writing and revision.

Supporting programs (e.g., thesaurus, spelling and grammar checkers) in a word processing environment are usually used by students for revising their essays. A study

may examine how student writers use supporting programs for revising their essays in comparison to the use of those same programs by expert writers.

With emphasis on automaticity of keyboarding skills, a study should explore the relationship between keyboarding proficiency, in term of speed and accuracy, and amount and types of revisions.

Since the word processing environment is very flexible in terms of organizing text with a cut-and-paste function, a study may explore how inexperienced and experienced writers use this word processing capability in revision.

In the current study, typing competence of the subjects across the two languages was statistically treated separately. In the future research, subjects' typing speeds might be included and controlled as a covariate variable.

Reflection

This study had multi-dimensions in terms of research methodologies, the languages studied, methods and topics of writing and treatments which all together resulted in complex and laborious work.

In this study, both the technology and combination of qualitative and quantitative methods worked together to provide rich and comprehensive data that would not be collected by traditional tools and analyzed with a single research method. The classification of revision types and tracing subjects' trains of thoughts on videotapes offered a variety of thick and detailed information; however, they were extremely difficult and time consuming to collect and to analyze.

The richness of data also came as a result of the close relationship between the researcher and the subjects. The subjects' commitment and cooperation would not occurred if the individuals and the norms of their culture were not well known to the researcher.

This work in this study provided the researcher the opportunity to practice what he learned during his doctoral program. He applied the technology, learning and cognition and research methods learned during his coursework.

The use of multiple methods in one study would not be meaningfully learned unless it were experienced in an authentic situation. This study provided the researcher with a rich experience that is impossible to learn practically from textbooks: how to combine quantitative and qualitative methods.

The use of technology was an important component in the body of this study. The researcher learned and practiced how to benefit from technologies to collect rich and precise data that is very difficult to collect by conventional tools.

The relationship between the researcher and the subjects is a very important factor for the success of a study. The researcher learned how much important it is to deal with the subjects with honesty and good manners in order to obtain their trust and their full cooperation and commitment, especially when the study requires multiple treatments for each subject.

Conclusion

Based on the results of this study, several conclusions can be drawn.

First, the subjects benefited from the word processing environment for making surface revisions in their essays in both first and second language situations at the surface level. This might be due to the low cognitive level involved in both surface revision changes and word processing capabilities associated with them.

Second, however, the subjects of the study exploited the word processing environment for their second language more than for their first language. This might be attributed to two reasons: first, the lack of subjects' typing skills in the first language in contrast to their typing abilities in the second language; and, second, generally speaking, non-native speakers were characterized as having limited language proficiency in comparison to native speakers of language (Pennington, 1993a). Consequently, "non-native writers may revise extensively in [a] computer environment" (p. 155).

The effect of a word processing environment on surface revision was statistically significant. This, also, appears from the number of surface revision changes subjects made with word processing in comparison to their surface revision changes in both languages, Arabic as a first language and English as second language (ESL).

This result is consistent with contentions of other researchers that a word processing environment is more associated with surface revisions than with meaning revision (Phinney, 1989; Montague, 1990; Haas, 1996). Although slow typing may have hindered the subjects from taking full advantage of word processing for revision in general and for meaning revision in particular, the subjects' long experience with computers and word processing may have played a major role in their revision changes, especially in English as a second language.

Third, the subjects' experience and proficiency in English throughout their language preparation and academic studies may have contributed to the nature and number of their revision changes.

Although the effects of word processing environments in both Arabic as a first language (AFL) and English as a second language (ESL) were significant, the results of qualitative research in this study revealed that the subjects in general did not exploit word processing capabilities effectively for meaningful revision.

APPENDICES

APPENDIX A

THE INTERVIEW

The Interview

Subject' name_____ Subject's number_____

What is your age?

What is your major?

What is your current educational level?

Did you complete an English program?

Have you taken the TOEFL Test of Written English? If yes, what was your score?

How long have you been using a computer?

How long have you been using word processing?

Were you taught to use word processing? If yes, was it in Arabic, English or in both?

If no, did you learn to use word processing by yourself?

APPENDIX B

SUBJECTS' SURVEY

Subjects' Survey

Please take a few minutes of your time to complete this survey. The survey will ask you some questions about your revision habits with pen and paper and with word processing in both Arabic and English as a Second Language (ESL) and others about your experience with this experiment. Your name and your responses will be anonymous.

A) Please mark the appropriate response that best describes your writing or revision experiences or feelings for each of the following questions.

1) How would you describe your keyboarding skills?

In Arabic:	In English as a second language (ESL):
Excellent	Excellent
Very good	Very good
Good	Good
Weak	Weak
Very weak	Very weak

2) How many hours per week do you use word processing?

In Arabic:	In English as a second language (ESL):
Less than 1 hour	Less than 1 hour
From 1 to 2 hours	From 1 to 2 hours
From 3 to 5 hours	From 3 to 5 hours
From 6 to 8 hours	From 6 to 8 hours
9 hours or more.	9 hours or more

3) How do you revise your essays with pen and paper?

As you develop your first draft

After you complete the first draft

All of the above

4) How do you revise your essays with word processing?

As you develop your first draft

After you complete the first draft

All of the above

5) When you revise your essays, do you use word processing for:

Simple revisions?

Major revisions?

For both?

6) How would you describe your satisfaction with your experience with this experiment in both Arabic and English as a second language?

In Arabic:	In English as a second language (ESL):
Very satisfying	Very satisfying
Fairly satisfying	Fairly satisfying
Slightly satisfying	Slightly satisfying
Not satisfying	Not satisfying

2nd) Please answer the following questions in the spaces provided below to the best of your ability:

1) Do you often revise your essays?

---

2) Does the word processor facilitate or hinder your revision in both Arabic and English? And how?

3) When you write your essays, do you make major changes first and then simple changes or do you do the opposite?

4) Which functions or capabilities of word processing do you use to make <u>simple</u> changes in your essays in Arabic and in English as a second language (ESL)?

<u>Arabic:</u>

<u>English as a second language (ESL):</u>

5) Which functions or capabilities of word processing do you use to make major changes in your essays in Arabic and in English as a second language (ESL)?

Arabic:

English as a second language (ESL):

6) When you revise your essays, do you start from the beginning or from the end of your pen-and-paper and word-processed essays?

7) When you write or revise your essays, do you revise according to whom you write?

8) Briefly, what do you like about using word processing to revise in Arabic and in English as a second language (ESL)?

Arabic:

English as a second language (ESL):

9) Briefly, what do you like about using pen and paper to revise in Arabic and in English as a second language (ESL)?

Arabic:

English as a second language (ESL):

10) From your experience with this experiment, did you face major problems while writing and revising your essays with word processing in Arabic and In English as a second language? If yes, please explain in the space provided below.

Arabic:

English as a second language (ESL):

11) Do you have any suggestions or comments from your experience with this experiment?

Thank you for your cooperation.

APPENDIX C

INSTRUCTIONS FOR SUBJECTS' THOUGHTS/VERBALIZATIONS

Instructions for Subjects' Thoughts/Verbalization

Instructions of thinking-aloud protocols:

Please say aloud what you are writing and revising.

Please say aloud what you are thinking while writing and revising your essays.

Please do not explain or analyze. Just say aloud what you are thinking.

Every five seconds you stop, I will remind you to say aloud what you are thinking about.

You will have approximately one hour to complete each essay and submit the final draft.

APPENDIX D

THE TOPICS IN ARABIC

The topics in Arabic

الترجمة العربية للمواضيع

الموضوع آلا ول

بعض الناس يرون أنه من الضروري لطلاب المرحلة الابتدائية أن يرتدوا لباسا موحدا، بينما آخرون يرون أنه حاجة غير ملحة لأولئك الطلاب أن يلبسوا ملابس موحدة. ما هو موقفك من هذا الموضوع. أكتب ونقح مقالة إنشائية عن هذا الموضوع في حدود 300 كلمة. فضلا زود مقالتك بأمثلة وأدلة لإقناع الآباء بتبني وجهة نظرك.

الموضوع الثاني

خبراء الصحة يؤكدون على أهمية ممارسة التمارين البدنية والحمية لإنزال الوزن والمحافظة على الصحة الجيدة. ولكن بعض الناس يقولون أنهم مشغولون جدا لذلك لا يستطيعون الاستمرار على ممارسة تمارين بدنية أو التقيد بحمية معينة. هل أنت موافق مع هؤلاء الناس أم لا. أكتب ونقح مقالة إنشائية عن هذا الموضوع في حدود 300 كلمة. فضلا زود مقالتك بأمثلة وأدلة لإقناع هؤلاء الناس بتبني وجهة نظرك.

الموضوع الثالث

العاب الفيديو أصبحت تلعب بشكل واسع بين الأطفال. مؤيدو تلك الألعاب يرون أنها مفيدة تربويا بينما المعارضون لها يصرون على أن الأطفال يضيعون أوقاتهم بلعب تلك الألعاب بدلا من الدراسة. أكتب ونقح مقالة إنشائية عن هذا الموضوع في حدود 300 كلمة متخذا موقفا من هذين الرأيين. فضلا زود مقالتك بأمثلة وأدلة لإقناع هؤلاء الناس بتبني وجهة نظرك.

الموضوع الرابع

بعض الناس يقولون أنه من الأفضل لكبار السن أن يوضعوا في دور الرعاية الاجتماعية ولكن آخرون يرون أنه من الأحسن لكبار السن أن يعيشوا مع عائلاتهم. أكتب ونقح مقالة إنشائية عن هذا

للموضوع في حدود 300 كلمة. فضلا زود مقالتك بأمثلة وأدلة لإقناع هؤلاء الناس بتبني وجهة نظرك.

APPENDIX E

TOPICS OF WRITING IN ENGLISH

Topics of Writing in English

Topic One

Some people believe that it is good for elementary school students to wear uniforms. Others tell there is little need for elementary school students to wear uniforms. Write and revise a 300-word essay about the topic. Take a position in your essay that will convince parents to adopt your point of view.

Topic Two

Health experts emphasize that physical exercises and diet are imperative to lose weight and maintain good health. Some people say that they are too busy to do physical exercises and so hard for them to stick to a particular diet. Do you agree or disagree with those people. Write and revise 300-word essay to convince people to adopt your opinion. Give examples and evidence.

Topic Three

Video games become widely played by children. Defenders of video games believe that they have educational aspects. Video game opponents insist that students waste their time playing these games instead of studying. Write and revise a 300-word essay expressing your position with regard to these two arguments. Give examples and evidence to support your ideas.

Topic Four

Some people say that elderly people should be sent to nursing homes to be care for. Others say that elderly people should live with their families to take care of them. Write and revise a 300-word essay to convince such families to adopt you opinion. Give examples and evidence.

APPENDIX F

REVISION CHANGES

Revision Changes

SUBJECTS	Surface Changes								Meaning Changes							
	Formal				Meaning-preserving				Microstructure				Macrostructure			
	AP	AW	EP	EW	AP	AW	EP	EW	AP	AW	EP	EW	AP	AW	EP	EW
1	4	49	5	48	1	6	4	12	0	0	0	1	0	0	0	0
2	3	17	9	22	19	11	13	11	2	2	1	2	0	0	0	0
3	7	39	8	36	12	19	6	14	0	0	0	2	0	0	0	0
4	5	37	9	63	8	16	14	41	2	2	0	2	0	0	0	1
5	3	38	10	41	2	2	11	27	1	2	3	5	0	0	0	0
6	4	31	5	72	24	26	13	56	1	1	0	6	0	0	0	1
7	4	36	5	23	16	14	17	30	0	1	0	1	0	0	0	0
8	5	73	15	51	9	24	7	16	1	1	0	3	0	0	0	0
9	2	50	18	43	12	26	21	39	1	4	1	5	0	0	0	1
10	9	21	4	32	10	28	14	24	2	2	0	2	0	0	0	0
11	6	13	9	25	6	13	6	22	0	3	0	1	0	0	0	1
12	1	51	14	34	32	15	32	24	1	1	1	2	0	0	0	0
13	4	18	13	40	9	6	23	17	1	1	1	2	0	0	0	0
14	4	56	5	28	6	26	1	20	1	2	0	2	0	0	0	0
15	2	11	8	40	9	20	15	25	1	4	2	3	0	0	0	1
16	6	49	8	25	26	22	24	27	3	4	2	4	0	0	0	0
Tot	69	589	145	623	201	274	221	405	17	30	11	43	0	0	0	5

Table # 13. Detailed classification of subjects' revisions by types

Keys of the table

AP	Arabic with pen-and-paper
AW	Arabic with word processing
EP	English with pen-and-paper
EW	English with word processing

As displayed in Table 13, following Faigley and Witte (1981, 1984) taxonomy of revision, the classification of this study subjects' revision changes were categorized into major parts:

First, surface changes which, further, classified into two types of revision, formal and meaning-preserving revisions and secondly, meaning changes which, as well as broke down into two types of revision, microstructure and macrostructure.

Table 13 contains the subjects' frequency of revisions by types with either pen-and-paper or word processing in both Arabic as first language (AFL) and English as a second language (ESL). The table reveals that the subjects made more surface revisions in word processed essays when compared to their similar revisions in pen-and-paper essays in both Arabic as a first language (AFL) and English as a second language (ESL). For example, in Arabic, the total number of subjects' Format-surface changes with pen-and-paper was 69 changes, while the total number of Format-surface changes was 589 changes. Another example, in English as a second language (ESL) the total number of subjects' Meaning-preserving changes was 221 changes, with pen-and-paper versus 405 Meaning-preserving changes with word processing environment.

The table also showed that the total number of subjects' Microstructure changes was 11 changes, whereas the entire number of subjects' changes were 43 changes.

Similarly, in English as a second language (ESL), the percentage of subjects' surface changes with pen-and-paper to their surface revision with word processing is 35.60 percent. Hence, 64.40 percent represents the surface changes in English essays with word processing environment.

In Arabic, the percentage of subjects' meaning changes with pen-and-paper to their meaning changes with word processing is 56.6 percent. The subjects made about 43.4 percent more as meaning change with word processing than meaning changes with pen-and-paper in their Arabic essays.

Further, in English as second language (ESL), the percentage of subjects' meaning change with pen-and-paper to their meaning changes with word processing is 25.58 percent. This means that the subjects made about 74.42 percent more as meaning change with word processing than their meaning changes with pen-and-paper in their English essays. The relatively high percentages (43.4 and 74.42) of meaning revisions carried by the subjects with word processing in both Arabic as a first language (AFL) and English as a second language (ESL) may result from the subjects' avoidance to make meaning revisions in pen-and-paper essays, because meaning revision more likely changes essays neatness and may require rewriting the whole essay.

APPENDIX G

EXAMPLES OF SUBJECTS' ESSAYS

Examples of Subjects' Essays

Subject # 5

Video Games and Our Children

Now a day with expanding of the technology and different ways of entertainment video games came to the picture as one way of utilizing the technology and having fun. Children and most adolescent play video games a lot. Many parent do not find a problem in this issue. Why? Because children stay at home a way from the troubles out side, and it is save from the strangers. Also many parents use these form of technology as a baby sitter which I do not agree in this totally. Moreover parents some time feel proud that there children know about the modern technology.

First of all video games are a tool if we mess use it, it will go against us. I am personally against the use of the video games in many times because the parents do not know what the child is doing and they do not know the effect of these games on the child mentality. Many times the parents do not know how to use this technology, so the child is the expert in this field. The nature of most of the video games is violent which could increase the bad behaviors in the child. Moreover the video games ratings are not accurate, so you can not just trust what is writing in the label. The video games are designed in a way that attract the child even the adults and they can waste many hours playing without moving there eyes from the screen, which effect the eyes.

Many people are not aware of the effect of the video games in the social skills of the children and how they can find the video game as their mates, so they do not worry if they have bad relations with other children in their ages or totally if they do not have friends. So the video games will be there friend.
It is important that to teach the children the difference about the real world and what they are dealing with in the video games are just a game. Because most of the video games are oriented in how you can defeat the other person without trying to teach the child the skills that he or she needs to help him/her in solving the problem.

Now in the computers there are some computer games which can build good skills and not violent as in the video games. These computer games could have educational values that help the children to learn in more fun and creative way. These things you can not find it in the video games. Schools now use many of these educational tools to increase the children level of learning and excitement without getting bored. I tried these educational games and I found it very exciting and effective. But still that does not mean parents leave the children without company or without trying to infesise the educational aspects that the game could have.
Finally I advice the parents to specify a limited time for the kids to spend with the computer and more time with the human being to learn from the real experience not the virtual reality world.

Subject # 15

Health and the Value of Exercising

Exercising and dieting are very important aspects in people 's life to watch and do. Exercising lead to a very happy and enjoyable life. It also makes one's dieting program very enjoyable. Busy people think that they should have preplaned time to do exercising, and that's how they lose the joy of exercising. Because they did not think that exercising is part of their daily routine.

The idea of being busy not to exercise is based on many reasons: laziness, lack of the importance of exercising, lack of the joy of exercising. People who don't exercise have the idea that they are busy to exercise, they don't have time to exercise etc. This idea is not correct for many factors. These factors can be categorized into: health factor, timing factor, dieting factor.

Good health is an aim for everybody. Exercising is very big asset to maintain a good and healthy life. This so because most of the illnesses which people suffer from those days is due to the lack of exercising. For example, for a middle age person if he/she does not walk at least ten minutes a day he/she might suffer from joints or knees pain, as they said "USE IT OR LOOS IT" meaning joints and knees.

The timing factor is a crucial issue in people mind who don't exercise. They are too busy to find at least twenty minutes, three times a week. On the other hand, they easily find twenty hours a week watching TV. Time for exercising is so easy to find. For example, instead of driving your car to work you can sometimes walk to work or take a bus until a reasonable distance left to walk to work if you live far from work.

The dieting factor which motivate people to exercise is that persons who exercise can eat whatever they like if they maintain a reasonable amount of time for exercising. They can eat food which is high in fat or high in cholesterol without the fear from eating this type of food. So the deal, if you want to eat delicious food you have to pay two prices; the price to buy it and the price to burn it in exercising.

Personally I think, it is very important for people to exercise if they want to maintain a happy and healthy life. The bottom line is to be in a good health, one should exercise, otherwise one has to watch his/her diet

Subject # 9

Nursing Homes

Nowadays, old people are being dealt with differently than couple of years ago when the family is the only responsible for dealing with them. Today, family is no longer obligated for their elder people if they are not willing to take the responsibility. Nursing homes in some societies become the alternative way of dealing with them. Nursing homes are special places for elderly people who do not have a welling family to take care of. The nursing homes might be a necessity in some cases when it becomes impossible to handle the them at home as in case of bad sickness. However, it is better keep them at home and treat them as nicely as they deserve.

Regardless of how convenient the nursing homes are, I don't think there are going to be better than home. Emotionally, a person would feel much better at home even if he/she doesn't get the same attention as in the nursing home. He/she would feel much safer and good known he/she is being handled by a care relative than by a stranger who's motivation is mainly money. Money is not only the motivation for people to open up and work at nursing homes but it is also the driving force behind families to send their elderly people to nursing homes.

Today, in this society, money becomes the first priority in everyone's life. Everyone is trying to maximize his or hers saving by doing whatever makes more money. As a concessions of this attitude a lot of moral values are being lost in the process. Elderly people are not the only victim of this attitude, but they are the most effected.

In conclusion, nursing homes are not an equal alternative to homes. Regardless of how much services they provide, they cannot provide the needed feeling of trust and happiness. We as a whole should think one more time about our priorities in life knowing that one day we would be the elderly people. Whatever we do to others, one day someone will do it to us. So why don't we ask ourselves at this point do we want to end up in these homes? If not, what can we do about it?

Subject # 8

العاب الفيديو بين المؤيدين والمعارضين

أخذت العاب الفيديو تنتشر انتشارا واسعا هذه الأيام بين الكثير من الطلاب والطالبات لتوفر أجهزة العرض وتوفرها بشكل يمكن للكثير امتلاكها واستخدامها في المنزل وحتى خارج المنزل يمكن حملها والانتقال بها الى أي مكان . والمشكلة تكمن في ما يتبع هذه الألعاب من آثار أخرى تكون سلبية نحو الأطفال . فالألعاب في ذاتها لها جوانب إيجابية إذا حسن استخدامها وكانت مضبوطة بضوابط تمنع أن تتقلب تلك الإيجابيات إلى جوانب سلبية تؤثر على تربية وسلوك الأطفال .

هناك من الناس من يعتقد أن هذه الألعاب مفيدة جدا في حياة الأطفال حيث أنها تنمي عقلية الطفل وتجعله يتعامل بشكل فعال مع المشكلات والعوائق بطريقة مسلية وممتعة . فالأطفال يحبون بطبعهم التحدي والتنافس فيما بينهم . وهولا الناس يعتقدون أن هذه الألعاب تحل الكثير من مشاكل الأطفال مثل مل الوقت بما يسلي ويفيد ويشغل الأطفال عن أمور أخرى قد تضر بالطفل وتسبب مشاكل للأسرة من هذه المشاكل اللعب بعيدا عن نظر الوالدين او مشاكل قد تقع بين الأطفال أنفسهم من الشجار والعنف الى غير ذلك .

وهناك من الناس من يعتقد أن هذه الألعاب هي سلبية للغاية في حياة الأطفال فأضرارها وخيمه وآثارها سيئة من الناحية الدراسية والتربوية والصحية والنفسية . من الناحية الدراسية فهي تضيع أوقات كثيرة على حساب الدراسة وعمل الواجبات المنزلية وكذلك لها جوانب تربوية في تعويد الطفل على إضاعة الوقت وصرفه بما لا ينفع وتعويده الكسل وعدم الجدية في اخذ أمور الحياة وتغليب الجوانب الترفيهية على حساب الواجبات الأخرى . أما من الجوانب الصحية فالطفل يمضي ساعات أمام شاشة العاب الفيديو مما يؤثر على صحته خصوصا النظر والأعصاب أحيانا السمع إذا صاحب هذه الألعاب أصواتا عالية مزعجة . وأيضا لها آثارها النفسية من حيث القلق والغضب وخلق نفسيه مضطربة قد تتحول إلى نفسيه عدوانية تتأثر بما يعرض من العاب العنف والتنافس المستمر الذي يولد نفسية مضطربة لا تتحملها نفسية وتركيبة الطفل في مرحلة نموه الطفولي .

بالنظر الى هولا الناس بين مؤيد ومعارض نقول أن مثل هذا الأمر يحتاج إلى مراقبة الأبوين ودورهم الحقيقي في متابعة الأطفال وتربيتهم لكي يتعاملون مع هذه الألعاب بطريقة تجعلهم يحصلون على الجوانب الإيجابية منه وتفادي الجوانب السلبية ولا يتأتى ذلك الا ببرمجة منطقية متوازنة يتفق عليها الوالدين والأطفال لتحقق الغاية من الاستفادة من هذه المعطيات الحديثة وتسخيرها بشكل إيجابي

يسلي الأطفال وينفعهم في نفس الوقت مع التأكيد على المتابع الجادة للحصول على افضل النتائج ومن ثم نخرج من الخلاف بين مؤيد ومعارض.

Subject # 6

لا شك أن موضوع الصحة من المواضيع الهامة والملحة في كل الأزمان وعند كل المجتمعات على وجه الخليقة. ومع ذلك فقد تباينت وجهات النظر في فهم المعنى الصحيح للصحة من حيث كيفية المحافظة عليها ومن ثم تطبيقها بصورة سليمة. فهناك فريق من الناس من يرى في ممارسة التمارين البدنية الشاقة التي ينخللها ممارسة الحمية بدرجات متفاوتة كوسيلة أساسية في محاولة المحافظة السليمة على الصحة. وفي مقابل ذلك هناك بعض من الناس من يشارك الفريق الأول في أهمية الصحة ولكن يصعب على هؤلاء ممارسة التمارين البدنية أو بعضها بالإضافة إلى صعوبة تطبيق الحمية كوسيلة من وسائل المحافظة على الصحة عن طريق تخفيف الوزن. ولدى كل من الطرفين من وجهات النظر المتفقة والمختلفة فيما بينهما.

فالصحة بلا أدنى شك هي من الأهمية بمكان لدى الإنسان على وجه الخليقة على عبر العصور والأزمان. فقد أثبتت التجارب العلمية والأحداث التاريخية على النتائج الإيجابية في تأثير التمارين الرياضية وممارسة برامج الحمية التغذوية على الصحة البدنية والنفسية لدى الإنسان. فعند ممارسة التمارين الرياضية بشتى أنواعها يجب الأخذ بالأعتبار بعض الأمور المهمة واللازمة. كمثال لذلك نوعية هذه التمارين من حيث نوعها وقسوتها وكذلك يراعى فيها عمر الإنسان وطول فترة التمارين الزمنية. فكلما قست وكثرت وطالت مدتها مع عدم ملائمة السن كلما ثقلت في تطبيقها ومن ثم لتعدمت أو تلاشت في الجملة عند من يرى صعوبة في التطبيق من الناس. ويسهل على هؤلاء التعذر بأعذار شتى القصد منها تحاشي الممارسة السليمة لبرامج الصحة. فلذلك يجب إعطاء حد أدنى لهؤلاء الفئة من الناس بعض البرامج الصحية اللازمة وتشجيعهم وتبصيرهم وتوعيتهم بالنتائج الإيجابية والسلبية من جراء تطبيق البرامج الصحية. كمثال لذلك يمكن إعطاء بعض التسهيلات للفريق الذين يصعب عليهم ممارسة التمارين البدنية وبرامج الحمية كأن يقترح عليهم المشي لقضاء بعض الحاجيات اليومية مثل الذهاب إلى المحلات القريبة مشيا على الأقدام بدلا من استعمال السيارة أو إيقاف السيارة مسافة ليست بالبعيدة عن موقع العمل أو تناول وجبات غذائية متزنة وخفيفة مما يسهل هضمها ولا يثقل الممارسة الرياضية. من جهة أخرى على من يرى في تطبيق الحمية القاسية والممارسة الرياضية أن يراعى فيها عامل مهم جدا ألا وهو أن العبرة في الاستمرار في البرامج الرياضية والتغذوية وليست في درجة قسوة تلك البرامج.

نتيجة لذلك فالتوازن هو المطلب الملح والجوهري في الحصول على أفضل النتائج الإيجابية الصحية. فالتغذية المفرطة غير المنتظمة والتمارين البدنية الشبه منعدمة هي ليست المطلب السليم للصحة السليمة. في المقابل ليست ممارسة الحمية الشديدة والتمارين البدنية الشاقة الطريق السليم للصحة السليمة.

Subject # 2

كبار السن في مجتمعنا

يمثل كبار السن في مجتمعنا شريحة كبيرة مما يؤدي إلى إثارة الكثير من النقاش والجدل حول كيفية معاملتهم عند الكبر. الوالدين و الأجداد في كل عائلة هم المعنيون في هذا الموضوع. من نتائج النقاشات المستمرة حول هذا الموضوع هو انقسام الناس إلى قسمين. أحدهما يرى أنه من الأفضل أن نترك رعاية كبار السن في عائلاتنا للمختصين في دور الرعاية. أما الطرف الآخر فيرى إن رعاية كبار السن من ذويهم هي أحد مسؤولياتهم التي يجب عليهم القيام بها كجزء من واجبهم. في هذه المقالة القصيرة، سنحاول التطرق إلى هذا الموضوع و محاولة تحليل وجهة نظر كلا الطرفين، بالإضافة إلى إيضاح وجهة نظري الشخصية.

أصبحت دور الرعاية في الوقت الحاضر من أهم الإمكانيات التي تحرص أي حكومة على توفيرها في المجتمع كغيرها من الإمكانيات الأخرى. توفر في هذه الدور الرعاية الكاملة والمستمرة لكبار السن في المجتمع. ولربما كانت هذه الحقيقة هي من أهم الدوافع التي أدت إلى إقناع بعض العائلات بإناطة مهمة رعاية كبار السن إلى المختصين في هذه الدور. تزعم هذه الفئة من الناس أن مسؤولية الاهتمام بكبار السن تصعب مع مرور الوقت، وأن المختصين في دور الرعاية هم الحل الأمثل لهذه المشكلة.

أما بالنسبة للفئة الأخرى فترى أن رعاية كبار السن من قبل عائلاتهم هي أفضل طريقة لمعاملتهم لعدة أسباب. من أهم هذه الأسباب هي مراعاة مشاعر كبير السن حيث أنه قد يتعرض للكثير من المواقف المحرجة في دور الرعاية بحكم أنه غريب عمن يقوم برعايته. السبب الآخر والأهم هو إيمان هذه الفئة بأن رعايتهم لكبار السن هي أقل ما يمكن تقديمه لهم كعرفان بالجهودات التي قدموها في شبابهم.

في النهاية، أرى أن حقوق كبار السن علينا واجبة، وتضحياتهم السابقة لابد لها من مكافئة. لذلك–ومع احترامي لرأي الفئة الأخرى–أرى أنه من الأفضل أن نهتم بكبار السن بأنفسنا، وتوليهم، ولو بجزء بسيط، من الرعاية التي قدموها لنا سابقا. هذا لا يلغي أهمية دور الرعاية لبعض كبار السن اللذين فقدوا عائلاتهم، فأصبحت دور الرعاية هي ملجأهم الأخير.

Sf=9
Mp=13
Mic=1
Mac=0

Analysis Sheet

Sub # 2 EH.t3 **Topic Order** 2

Revision Type Code | Where it occurred | W.P Function

First draft

M.p added word 11 "way"
M.p changed adj → noun 11 educational → education
M.p substituted word 13 "developed" contributed"
S.f verb agreement 02 "is → are"
S.f deleted modality 02 "might"
S.f changed verb tense 02 raise → raising
M.p deleted transition 12 "Moreover"
M.p deleted word 12 "keep"
M.p added word "positively"
M.p substituted phrase "educational system → ways of educating"
M.p deleted word 12 "some"
M.p deleted word 12 "their"

Follow (direction) of revision processes:
Used top_down strategy

Audience awareness:
Used the words "we" and "our children" as references to audience

Revised recursively:
Revised recursively at levels of words and sentences.

Analysis Sheet

Sub # 2 EH.t3 Topic Order 2

Revision Type	Code		Where it occurred	W.P Function
M.p	substituted phrase	13	"the video games that" "would be using video games"	
S.f	changed single → plural		"game → games"	02
M.p	added word	11	"game"	
S.f	changed single → plural		"problem → problems"	02
S.f	=	=	=	= 02
S.f	Co.spelling	01	"in"	
S.f	Co.spelling	01	"two"	
S.f	changed	plural — ~~signal~~ single	"children → child"	02
M.p	deleted clause	12	"sine our children are"	

Second draft

M.p added word 11 other

mic added title 21

Follow (direction) of revision processes:

Audience awareness:

Revised recursively:

Analysis Sheet

Sub # 4 Awit Topic Order 2

Revision Type	Code	Where it occurred	W.P Function
		first draft	
S.f Co.spelling	01	"الوحد"	without spelling checker
S.f Co.spelling	01		= =
M.p substituted word	13	"إلى → الباص"	
M.p = =	word → phrase	13 الموضوع → بعض لنقاط	
S.f Co.spelling	01		without sp. checker
M.p added word		"الحرية"	
~~S.f~~ Co.spelling	01		without sp. checker
M.p deleted word	12	"ب ←"	
M.p substituted word	13	"ع → ط"	
S.f Co.spelling	01	"الوحد"	
S.f Co. spelling		"الخصوصية"	without sp. checker
M.p substituted word	13	"الولد → الطالب"	= =
M.p deleted word	12	"المدرسة"	backspace

Follow (direction) of revision processes:

Audience awareness:

Revised recursively:

Analysis Sheet

Sub # 4 Awfi Topic Order 2

Revision Type	Code	Where it occurred	W.P Function
S.F. Co, grammar	06	حين → حينما	without gram. checker
S.F Co. spelling	01	"يعطين"	without spelling checker
S.F Co. spelling	01	"إلنصاب"	=
S.f Co. spelling	01	"إلى"	=
M.P substituted word	13	إلى بيه → حاسن	
S.f Co. spelling	01		without spelling checker
S.F deleted period (.)	01		backspace
S.f Co. spelling	01		without sp. checker
S.f Co. spelling	01		without backspace
M.P deleted word	12		
S.f Co. grammar	02	"إلحين" → "إلين"	
M.P substituted word	13	وكيب → كين	
M.P added word	11	"يبقى"	

Follow (direction) of revision processes:
used top-down strategy

Audience awareness:
Used general terms to refere to his audience (الناس) people.
He might have implied parents and educators as implicit audience.

Revised recursively:
Revised his essay at levels of words, sentences and pagragraphs
Re

Analysis Sheet

Sub # 4 Awt1 Topic Order 2

Revision Type Code	Where it occurred	W.P Function
M·p added phrase	11	"على والديه أن إختيار"
M·p added prep.	11	"في"
M·p added word	11	"كيف"
M·c added sentence	21	"وبذلك لا يسلب حرية الطفل في إختيار ملابسه على الإطلاق"
M·c added paragraph	21	من ذلك ما إيجابيات إلباس الموحد للطلاب أنه نوع من أنواع التفريق بين الطالب وعدده بحيث يعرف المدرس والعامل في المدرسة أو سائق الحافلة الطالب فتسهل عملية التعامل مع الطالب تحت إشراف ومراقبة المدرسة وأيضاً تحت مسئوليتهم إلى أن يعود لبيته.
M·p deleted phrase	12	"الى الحافلة على الساعة" - backspace
M·p substituted word	13	"يعرف" → "يرى"

Follow (direction) of revision processes:

Audience awareness:

Revised recursively:

Analysis Sheet

Sub # 4 — Awft — Topic Order 2

Revision Type Code	Where it occurred W.P Function	
	second draft	
S.f Co.spelling 01		with spelling checker
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =
S.f = = 01		= =

Follow (direction) of revision processes:

Audience awareness:

Revised recursively:

Analysis Sheet p.5

Sub # 4 Awt1 **Topic Order** 2

Revision Type	Code	Where it occurred	W.P Function
S.f. Co. spelling	01		with sp.checker
S.f	= 01	=	=
S.f	= 01	=	=
S.f	= 01	=	=
S.F	= 01	=	=
S.f	= 01	=	=
SF	= 01	=	=

Follow (direction) of revision processes:

Audience awareness:

Revised recursively:

APPENDIX H

EXAMPLES OF REVISION ANALYSIS

Sab #2 EH.f3

Video game - advantages and disadvantages

Children are the most valuable part of any family. Educating them and ~~rais~~ raising them the right way is a very sensitive subject. A lot of educational experts have been studying and searching for best ways to educate children. Modern technology has ~~developed~~ contributed to the searching process by developing a lot of inventions that are used by children. The most recognizable invention ~~nowa~~ that is used by children are video games.

- Some people think that video games are a waste of time. They claim that their children should spend ~~their~~ their time studying. From my point of view,

I think that children have a lot of free time that they could use wisely— under parents observation. ~~It~~ Video games could be an option for parent to ~~to~~ fill the free time that their children have. However, not all video games are suitable. They have to pick the ones that add more to children's ability to think and positively affect their mentality.

In the last few years, technology has added a lot to the ~~educational~~ ways of educating children. ~~Some~~ for example, some of the video games are ~~now~~ meant to develop ~~the~~ children's ability to do math problems. It's basically challenging the child

in a very nice way that he or she would accept through easy math problems. In this way, they accomplish two goals, entertaining the child and increasing his mathematical skills.

Another example would be using video games to teach children how to type. I think that this is a perfect way to get a child to learn skills of typing. Because we all know that children love video games. So taking advantage of this fact and teaching them how to type through a video game is a very clever, effective technique.

On the other hand, we should keep in mind that there are some bad video games that children should not play. And parents should be responsible for choosing the righ video games for their children.

In conclusion, video games issue is just like other issues in our lives. It has advantages and disadvantages involved in it. So, it's all up to the user of video games to decide how to use them. We can use them and educate our children - which is an advantage that should be used by everyone. Or we can misuse them

and waste our children's time — which is the disadvantage that everyone should be aware of.

بسم الله الرحمن الرحيم

Subject #15
AH.tL

١

الزي المدرسي للطلاب

هذا الموضوع يناقش قضية توحيد الزي المدرسي لدى الطلاب بالمدارس بجميع مراحلها سواء الابتدائي أو المتوسط أو الثانوي. هذه القضية يجب ضبطها لأن البنات يمثلن أهمية في العملية التعليمية لدى طلاب المدارس.

بعض الناس يرى أن توحيد الزي المدرسي للطلاب والطالبات لعدة أسباب منها أسباب اجتماعية وأسباب مادية وأسباب أمنية. فمثلاً الناس يعتقدون أن توحيد الزي يؤدي الى تحسين عدم التفرقة بين الطلاب حيث لا يوجد المباهاة في اللباس لأن اللباس موحد. وفي الغالب أن اللباس إذا كان موحد فإن الفئة المادية لهذا اللباس تكاد تكون معقوله، حيث يستطيع أن يوفرها معظم أولياء أمور الطلاب،

٢

وأيضاً فالطالب أو الطالبة إذا رُؤي خارج المدرسة في وقت الدوام الرسمي للمدرسة

وهو في اللباس المدرسي فإنه يعرف أن هذا الشخص ينتمي إلى المدرسة الفلانية، بحيث أن هروبه من هذا الوقت يؤدي إلى التساؤل والشك وبعد ثم فإنه تؤخذ الإجراءات اللازمة بهذا الطالب والطالبة.

وبالجملة فإن الطائفة من الناس تعتقد أهمية ترشيد الزي المدرسي لأنه يهم ويقدم في العام التعليمي.

وطائفة أخرى من الناس يرون عدم أهمية هذه القضية - وهي ترشيد الزي المدرسي - في مسيرة العملية التعليمية. حيث أن الطالب أو الطالبة يأتي إلى المدرسة من أجل التعلم سواء كان يلبس زي موحد أو يأتي بزي آخر، وأما ما يترتب من أسباب مادية أو اجتماعية فيرون عدم أهميتها لأن معظم الناس مثلاً لم يرسل

أولاده إلى المدرسة إلا وصعوبة تقدر على تحمل أعباء الدراسة
سواء المادية أو الاجتماعية أو الأمنية.

أنا أعتقد أن توحيد الزي المدرسي لدى الطلاب (الذكور)
غير مرحب لأنه ينظم اللباس للأولاد تقريبا متشابه
في بلدنا على الأقل، أما بالنسبة للطالبات فإني أرى
أنه من الممكن تحديد لون الزي أو اللباس، لأنه كما نعلم
البنسة العنصر الأنثوي متعدده ومختلفة الأشكال
والألوان، وتتبع المادية كذلك متفاوتة وفي الغالب
أنها تكون باهضة الأسعار حيث لا يستطيع توفير
فيهم المتوسط من هذه الملبسة - عامة الناس.

والخلاصة أن بعض الناس يرى أهمية توحيد اللباس
للطلاب والطالبات ~~لجميع~~ لأسباب متعددة. وبعض الناس
يرى عدم أهمية توحيد الزي المدرسي لعدم أهمية أسباب
التي توحيد الزي التي ذكرها أصحاب الرأي الأول

٤

وأنا كمكاتب وعلى المثال فإني أميل إلى رأي آخر وهو
أن توحيد لباس سرهم من العنصر لبشائي سنة
الطلبة فقط.

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