ABANT IZZET BAYSAL UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES

FOSTERING HIGHER-ORDER COGNITIVE SKILLS OF STUDENTS THROUGH STIMULATED RECALL METHODOLOGY IN ENGLISH AS A FOREIGN LANGUAGE WRITING CLASSROOM

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ABANT IZZET BAYSAL UNIVERSITY
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FOSTERING HIGHER-ORDER COGNITIVE SKILLS OF STUDENTS THROUGH STIMULATED RECALL METHODOLOGY IN ENGLISH AS A FOREIGN LANGUAGE WRITING CLASSROOM

In Partial Fulfilment of the Requirements for the Degree of
MASTER OF ARTS IN ENGLISH LANGUAGE TEACHING

by
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APPROVAL

TO THE INSTITUTES OF SOCIAL SCIENCES

This thesis titled as "**Fostering Higher-Order Thinking Skills of Students Through Stimulated Recall Methodology in English as a Foreign Language Writing Classroom**" and presented by Kenan BARUT has been approved as a thesis of Master of Arts in English Language Teaching. 19.10.2007

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ABSTRACT

FOSTERING HIGHER-ORDER COGNITIVE SKILLS OF STUDENTS
THROUGH STIMULATED RECALL METHODOLOGY
IN ENGLISH AS A FOREIGN LANGUAGE WRITING CLASSROOM

by

Barut, Kenan

This study is an innovative research in the field of English as a Foreign Language (EFL) Writing done with the combination of keystroke logging software, Inputlog, and stimulated recall methodology. Two research questions were determined for this study: (1) "What do students think during their pause behaviour doing writing tasks; do they use their higher or lower level thinking skills?" and (2) "Is it possible to foster higher-order cognitive skills in EFL writing with the help of stimulated recall methodology combined with keystroke logging data files?". Thirty-six ninth grade students at Ankara University Development Foundation Schools participated in this study.

Each student wrote two stories in view of the standard requirements of Cambridge ESOL Preliminary English Test (PET). The experimental group students of each level (A2 and B2) were guided to make more text-based revisions during stimulated recall session while the control group students were given the classic written feedback by the instructor.

Inputlog, a keystroke logging tool was used to collect data and replay function of this software was used so as to make the students remember their cognitive processes clearer.

At the end of this study, it was found that both levels of students use their lower level thinking skills more than higher level thinking skills. There is no exact difference between genders considering the use of cognitive skills. However, it was analysed that lack of language competence inhibits higher level thinking skills. Another finding of the study which was based on revision analysis of the students is that higher-order cognitive skills can be fostered through stimulated recall sessions by leading the students make more text-based revisions rather than surface-based ones. These results were parallel with the literature.

The findings of this study give insights to researchers, educators and teachers of the English Language in terms of pause and revision analyses of students in EFL classroom. Researchers and educators might benefit from the results of this study while designing writing courses and teachers might have an idea of the factors affecting thinking skills of learners.

Key Words: Keystroke logging, stimulated recall, higher-order cognitive skills, lower-order cognitive skills, text-based revisions, surface-based revisions.

ÖZ

YABANCI DİL OLARAK İNGİLİZCE YAZIMINDA
ÇAĞRIŞIM TEKNİĞİNE DAYALI GÖRÜŞME YOLUYLA
ÜST DÜZEY BİLİŞSEL BECERİLERİ GELİŞTİRME

Barut, Kenan

Bu çalışma, kayıt tutma yazılımı olan Inputlog ile çağrışım tekniğine dayalı görüşme metodunun birleşmesiyle gerçekleştirilmiş Yabancı Dil olarak İngilizce Yazı alanında yenilikçi bir araştırmadır. Bu çalışma için iki tane araştırma sorusu tespit edilmiştir: (1) "Öğrenciler yazı çalışmalarındaki duraklamalarda ne düşünürler; üst seviyedeki düşünce becerilerini mi yoksa alt seviyedeki düşünce becerilerini mi kullanırlar?' ve (2) "Kayıt tutma yazılımı ile çağrışım tekniğine dayalı görüşme metodu birleştirildiğinde üst düzey bilişsel becerileri desteklemek mümkün müdür?' Ankara Üniversitesi Geliştirme Vakfı Okullarındaki otuz altı dokuzuncu sınıf (Lise 1) öğrencisi bu çalışmada yer almıştır.

Her bir öğrenci Cambridge ESOL PET sınavının standart gereksinimleri doğrultusunda iki tane hikâye yazmıştır. Her seviyedeki (A2 ve B2) kontrol grubu öğrencileri öğretmen tarafından verilen klasik geribildirimi alırken, deney grubu öğrencileri çağrışım tekniğine dayalı görüşme seanslarında daha fazla konu odaklı değişiklikler yapmaları doğrultusunda yönlendirilmişlerdir.

Veri toplamak için kayıt tutma cihazı olan Inputlog kullanılmıştır ve öğrencilerin bilişsel işlemlerini daha net hatırlayabilmeleri için bu yazılımın yeniden oynatma işlevi kullanılmıştır.

Bu çalışmanın sonunda, her iki gruptaki öğrencilerin de alt seviyedeki düşünme becerilerini, üst seviyedeki becerilerine göre daha fazla kullandıkları belirlenmiştir. Bilişsel düzeylerini kullanmaları göz önüne alındığında cinsiyetler arasında net bir fark bulunamamıştır. Bununla beraber, dil düzeyindeki eksikliğin üst düzey düşünme becerilerini engellediği çözümlenmiştir. Öğrencilerin tekrar çözümlenmelerine dayanan başka bir bulgu ise öğrencilerin yüzeysel değişiklikler yerine konu odaklı değişiklikler yapmaya yönlendirilerek çağrışım tekniğine dayalı görüşme metodunun üst düzey bilişsel becerileri desteklediğidir. Bu sonuçlar daha önceki araştırmalardaki bulgularla eşgüdümlüdür.

Bu çalışmadaki bulgular, Yabancı Dil olarak İngilizce Yazma derslerindeki duraklama ve tekrar çözümlemeleri bakımından araştırmacılara, eğitimcilere ve İngilizce öğretmenlerine ışık tutacak niteliktedir. Araştırmacılar ve eğitimciler yazma derslerini planlarken bu araştırmanın sonuçlarından faydalanabilirler ve öğretmenler, öğrencilerin düşünme düzeylerini etkileyen etkenlerle ilgili fikir sahibi olabilirler.

Anahtar Kelimeler: Kayıt tutma, çağrışım tekniğine dayalı görüşme, üst düzey bilişsel beceriler, alt düzey bilişsel beceriler, konu odaklı tekrar, yüzeysel tekrar.

To My Family

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My heartfelt appreciation goes to my family for their emotional support and for they believe in whatever I do. I will always try to do my best to deserve their unconditioned love.

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CHAPTER I

INTRODUCTION

1.1. Introduction

The purpose of this study is to analyse pause and revision behaviours of the 9th grade students from Ankara University Development Foundation Schools at English as a Foreign Language (EFL) writing courses, using a keystroke logging programme. A result of this analysis is aimed at uncovering cognitive processes of students while writing in a foreign language. These processes are thought to provide deep insights about what learners think during composing, planning and organising a text.

This study also aims to foster learners' higher-order cognitive skills like coherence and relevance in EFL writing with the help of stimulated recall methodology.

1.2. Background of the study

Writing has a central role in development of relationships among people, communities and countries. However, it has been the neglected part of learning process in spite of increasing views supporting that students need to write frequently in a set up where writing activities are given priority as being one of the most essential and integral part of foreign language learning, because writing instruction not only helps to consolidate learning in other skill areas but also allows conscious

development of the target language as learners progress in the language. Writing practices should be instrumental to the acquisition of awareness and competence in the learning process, and clearly one of the main challenges to all teachers should be the considerations of devoting more student time, more learning time to actually doing writing activities in classroom. This period provides learners with a sense of discovery in learning to write, by integrating skills that contribute to self-learning, self-correcting and self-editing which is an interactive communicative process essentially.

The composing process seems to be an extremely complex undertaking. It involves much more than studying a particular structure, analysing and imitating rhetorical forms or outlining one's composition. This process involves not only the act of writing itself but prewriting and rewriting and all of which are interdependent and improvement in student writing is related to these.

If viewed from the perspective of new paradigms, writing can be considered as the process of exploring one's thoughts and learning from the act of writing itself. Rather than being the development of preconceived ideas, writing is the 'record' of an idea developing.

Consequently, it is not wrong to say that good writing involves a process which is a constant interplay of thinking, writing and rewriting. Nevertheless, research on composition had traditionally been focused on written product mainly before the seventies. Studies (e.g. Braddock, Lloyd-Jones, & Schoer, 1963, cited in Williams, 2005; Slaughnessy, 1977) reflect this truth since researchers have looked into the effects of certain methodologies on writing. In many cases these studies sought to prove the efficacy of one grammar to another, thus, perpetuating the belief that a better pedagogical approach, particularly one that focused on usage, structure or correct form would improve writing skills of students. Little attention was paid to other, more important elements such as purpose, the process of composing itself and the audience for whom the composition is being written. The whole notion of how

writers compose, where ideas come from, how they are generated or developed, what the various stages of composing involve was not taken into account in these studies.

However, as pointed out by Nunan (1988), the focus of emphasis on composition shifted. Rather than investigating what students write, teachers and researchers began to study the process of writing itself (e.g. Kuhn, 1970; Hairston, 1982; Crowley, 1998). They started working with the assumption that teachers or researchers must first understand how people write rather than discover how to teach writing.

Different research studies have been done so far to explain the writing process cognitively: The continuous interaction of planning, text-production, reviewing and revision (Flower & Hayes, 1981), the connection between these features and the writer's memory (Hayes, 1996), whether the writing medium should be computer or pen and paper (Haas, 1989; van Waes, 1992), the construction of negotiated meaning (Flower, 1994), cognitive studies and resources of adult writers (Fayol, 1999), the writing task and its genre (Severinson Eklundh & Kollberg, 1999; Spelman Miller, 2000) whether the writer is composing in their first or second language (Zimmerman, 2000) and the process pedagogy and its applications (Tobin, 2001).

Researchers, some of whom are mentioned above, analysing the writing process have always wanted to uncover the cognitive processes of the writers; however, until recently, they have been restricted to written protocols for the analysis of these EFL writing sessions. Most of them (e.g. Matsuhashi, 1987; Smagorinsky, 1994; DiPardo, 1994; Levy and Ransdell, 1996; Zimmermann, 2000; Perrin, 2001) used outcomes of introspective protocols like think-aloud methodology so as to express cognitive processes. These introspective protocols were also established in cognitive psychology and began to be used in various studies in EFL writing. However, some researchers (e.g. Russo, Johnson, & Stephens, 1989) always

commented on the incompleteness and partiality of the data collected through these protocols. It has been a common criticism that due to the interference, or disruption, during the writing process, learners cannot focus on their task at all and the data obtained in this way should be reviewed by means of validity.

Researchers trying to explore the visible indices of cognitive processes of learners used the method of tracking the activity of writing, observation. They mainly used video, which has been regarded as an intrusive element and criticised for this reason, to record the writing process. The first and best-known research in this field by Matsuhashi (1981, 1987) employed direct observation and video recordings of writing sessions to identify the two temporal features of writing, revision and pause behaviours. Following Matsuhashi's impressive research, studies on pause behaviours (e.g. Chanquoy, Foulin, & Fayol, 1996; Janssen, van Waes, & van den Bergh, 1996; and Bosher, 1998) tried to refine various aspects of observational analysis in EFL writing. They mostly combined their observational studies with a variety of other data collection techniques, such as interview (Bosher, 1998) and questionnaire (New, 1999).

Van Waes (2001) states that the coding of the extensive amount of data collected are extremely difficult and are open to researcher subjectivity during the coding process. In spite of its benefits, it is very difficult to say that these researchers were able to catch the entire mental representation of the process with the help of observational studies as they couldn't achieve cognitive levels of students, which was their prior objective.

Researchers (e.g. Kent, 1999; Silva & Matsuda, 2001; Kroll, 2003) tried to analyse the evolving nature of foreign language writing studies, which draw attention to the shifting trends and influences in this field lately. These studies show the interdisciplinary nature of writing studies clearly, which range from cognitive psychology to discourse analysis.

The use of computers as writing instruments has not only had a profound effect on the writing practice and the attitudes towards writing, it has also created new possibilities for writing research (Spelman Miller, 2005; Lindgren, 2006). Computer-based observation can be defined as an alternative means of recording data without the intrusive presence of a video camera. In the field of cognitive writing research, keystroke logging programmes have become very popular during the last decade. In order to avoid the potential pitfalls mentioned above, researchers make frequent use of keystroke logging tools which help researchers to register and reconstruct the whole writing processes of writers composing their texts at the computer (Wengelin, 2000; Spelman Miller, 2003; Lindgren, 2006). Keystroke logging can be seen as overcoming some of the data collection and data analysis problems of the other data collection methodologies like interview and questionnaire.

Keystroke logging has been widely used in different studies in order to develop a better understanding of learners' behaviours while writing in a foreign language. New keystroke logging tools have been developed year by year to provide deeper analysis. Holmqvist, Johansson, Stromqvist, & Wengelin (2002) did quantitative research with students with reading and writing disabilities; Lindgren and Sullivan (2003) used this data collection tool with first and second language writers; Dimitrova (2006) studied with the students completing their translation studies using a keystroke logging tool.

The most widespread use of keystroke logging is in pause and revision analysis of second language writers. Thorson (2000) used keystroke logging software to compare the online revisions made by undergraduate writers writing in their first and second language; and some researchers (Spelman Miller, 1996; Warren, 1996; and Lindgren & Sullivan, 2006) tried to analyse learners' thought processes during their pause behaviours.

Revisions in foreign language writing generally occur as a result of lack of language proficiency. It is widely accepted that encouraging writers to focus on higher level textual concerns is a must since lower level linguistic concerns are always a priority for learners. Revisions in writing sessions are predominantly on low level, convention- and rule-governed changes to their texts (Flower, Hayes, Carey, Schriver & Stratman, 1986), and these revisions tend to focus more on word level revisions rather than revisions of larger chunks of text (Fitzgerald, 1987). When writing in a foreign language, lack of linguistic competence is likely to have an important effect on revision behaviours of EFL writers, and these effects can be observed in revision strategies learners use during their composing and organisation period.

It is clear in previous studies that writers revise more when writing in a foreign language or a second language than in their first language (Zimmerman, 2000; Chenoweth & Hayes, 2001). Another aspect is that foreign language writers make many changes to linguistic surface features (New, 1999). Using the information resulting from the studies above, it can easily be deduced that there is a strong attention to surface-based aspects like spelling or word choice in EFL writing. This tendency hinders higher level thinking skills, which is called inhibition hypothesis that is of theoretical value for capacity accounts of writing (Kellogg, 1996; McCutchen, 1996).

The most recent pause and revision analytical studies using keystroke logging are compiled in Sullivan and Lindgren's last study (2006). Considering all these modern studies, the major limitation that remains is that using computer-based keystroke logging on its own is not a solution to analyse and find answers to the problems in EFL writing. Actually, while interpreting the data collected through keystroke logging it has at all times to be kept in mind that pause and revision analysis can be classified only based on their form; as the files achieved contains no exact information about the writer's underlying intention in his/ her decisions during the whole process.

In order to use keystroke logging more effectively, as it is a wonderful way of eliciting data in EFL writing, studies should be combined with methods like stimulated recall undermining the cognitive layers active in creating the text. In a stimulated recall session, writers reflect upon their decisions and behaviours; why they made changes, what they were thinking, what they paused etc., and provided that the sessions occur immediately after the writing session, the writers may remember almost all about a text's composition (Gass & Mackey, 2000). Students' reflections and definitions may be prompted by replaying the writing session logged on the computer. These students are encouraged to tell all their thoughts during the writing session looking at their specific statistics and seeing their entire writing process as an observer. Therefore, they can reveal what different options they were thinking over at various stages in a text's production period, why a certain revision was made or considered to be made etc., which will facilitate researchers to analyse almost all the specific cognitive procedures in EFL writing.

Stimulating from the invaluable studies mentioned above, the present study aiming to explain the cognitive processes of students, to find traces reflecting their mental operations and to foster their higher-order cognitive skills was designed with the combination of keystroke logging and stimulated recall methodology. Actually, this study is a continuance of the research done in the last phase of process writing, developed over the last decade.

1.3. Statement of Purpose

Insight into the process of writing as a whole and the various components of that process, along with the positing of frameworks for the understanding of cognition and effect in writing, is of pedagogical importance (Lindgren & Sullivan, 2002). For this reason, researchers have always tried to find what is going on in the minds of EFL students and sought answers to the questions like: "How often and why do EFL writers pause while writing?", "Are there any difference between

thinking skills of writers with lower English competence and higher English competence?" These kinds of questions have puzzled researchers' minds for a long time and some clues are beginning to occur with the help of new analysis devices and tools.

Furthermore, it has frequently been claimed that, in foreign language writing, attention to linguistic processes inhibits attention available for higher level conceptual processing (Whalen & Menard, 1995; Chenoweth & Hayes, 2001). For this reason, researchers have been trying to find effective ways to pose higher-order cognitive skills of learners in EFL writing courses using different kinds of research methods.

Present study combines the use of keystroke logging and stimulated recall methodology as data collection techniques in order to achieve cognitive processes of learners and produce solutions to the problems mentioned above. It is aimed to find clues about thinking procedures of EFL writers and lead them to use their higher-order cognitive skills while writing in a foreign language.

1.4. Research Questions

The following research questions are sought in this study:

1. What do students think during their pause behaviour doing their writing tasks; do they use their higher or lower level thinking skills?

   a. Are there any differences between thinking skills of students with different English competences?

   b. Are there any differences between thinking skills of students with different genders?

2. Is it possible to foster higher-order cognitive skills in EFL writing with the help of stimulated recall methodology combined with keystroke logging data files?

1.5. Significance of the Study

Today, sentences are not parsed or divided into pieces as much as it was done before, even though grammar still holds a central place in most curricula; having students recite memorised poems or chunks of literature is not mentioned very often; much time is not spent on having them copy over passages from books in order to promote writing skills. As each of these unproductive practices is dropped, and as more functional growth-producing methods prove themselves, a gradual progress toward a better understanding of how human beings actually learn and acquire new uses of language is noticed.

New paradigms or approaches with communicative considerations seem to cycle in and out of the educational field reminding us of the commonly used metaphor of a swinging back and forth. Even though it may seem to be symbolising some random variation, it is not probably a pointless swinging. It seems to be a deeper and deeper investigation into the process of learning.

The main purpose of this study is to express insights and concerns related to this issue and to discuss the ways how process writing can be realised in the English language class where the emphasis has to shift from how to teach writing to understanding how writing occurs.

Moreover, there is a need for uncovering the cognitive processes and eliciting data providing us with a better understanding of thinking skills used during writing process. Therefore, this study is significant in that it provides detailed information about cognitive processes and shows ways to foster higher-order thinking skills.

1.6. Delimitations and Limitations

1.6.1. Delimitations

One of the delimitations is that the study focuses on two levels of students, A2 and B2. For this reason, it is possible to compare the results of students with different levels.

An additional delimitation is that different data analysis ways, key-stroke logging, stimulated recall methodology and t-test were used altogether to make the data as comprehensive and clear as possible.

1.6.2. Limitations

One of the limitations of the study is its being partially dependent on the honesty and sincerity of the English language learners who took place in the study. They were interviewed to tell their all thinking procedures realized during their writing tasks.

Another limitation is that only one age group, grade, was considered in this research. All the students taking place in this study aged about 14 - 15, and they are all ninth graders. Hence, no comparison with other age groups or grades is possible with the present study.

The last limitation of this research is that the students were interviewed in the stimulated recall sessions one by one instead of group sessions. Thus, no interaction among the students was observed in the study.

1.7. Definitions of Terms

Computer Keystroke Logging: Lindgren & Sullivan (2006) defines computer keystroke logging as an exciting development in writing research methodology that allows a document's evolution to be logged and then replayed as if the document were being written for the first time.

Keystroke logging programmes record the whole writing session and store accurate and detailed information about time and occurrence of every keystroke and movements of mouse in a log file, which can be converted to different output files afterwards.

Stimulated Recall Methodology: Stimulated Recall is one of the introspective methods which can be used to prompt participants to recall thoughts they had while performing a task or participating in an event (Gass & Mackey, 2000).

It is possible to investigate cognitive processes through stimulated recall sessions by inviting subjects to recall, when prompted by replaying of the events through various tools.

Higher/ Lower Level Thinking Skills: In Bloom's Taxonomy, higher level thinking is defined as application, analysis, synthesis, and evaluation (Bloom, 1956 cited in Gass & Mackey, 2000). As thinking at these levels is an essential skill to be taught in the education process and in life-long learning, providing students with opportunities to foster higher level thinking is a priority in EFL classroom. Below is Bloom's categorisation and associated thinking skills determined by Tsun Lai (2002):

Table 1: Thinking Skills associated with Bloom's Taxonomy

Bloom's categorisation	Associated thinking skills
Evaluation	Relevancy, ordering, prioritising, judgement
Synthesis	Collating, creating
Analysis	Categorising, characterisation, comparison, contrast
Application	Abstraction and transfer
Comprehension	Question, discuss, explanation, doing a task
Knowledge acquisition	Memorisation

Pause: It is mostly described as a lack of activity, not pressing a key on the keyboard or moving the mouse, for two or more seconds. Even though some researchers such as Warren (1996) have set the limit for a pause lower, the standard pause in this study is determined as two seconds owing to the potential lack of computer literacy of the students.

Pauses less than two seconds are regarded as motor activities and they are not taken into consideration in this study.

Revision: Making any changes at any point in the writing process (Fitzgerald, 1987). There are two main kinds of revisions analysed in this study: Text-based revision and surface-based revision. Faigley and Witte (1981 cited in Lindgren & Sullivan, 2006) define a surface-based revision as one which does not bring new information to a text, or remove old information from a text. A revision which adds information to, or removes information from, a text is called a text-based revision.

1.8. Conclusion

The background of the study, the statement of purpose, research questions, significance of the study and definition of terms have been described briefly in this chapter.

The literature related to this study will be reviewed in the next chapter. In the third chapter, detailed information about the research design, participants, instruments and the data collection procedure will be described. In the fourth chapter the results of the research will be presented, and the fifth chapter will conclude the study.

CHAPTER II

LITERATURE REVIEW

2.1. Introduction

In this chapter, first of all, the theoretical framework of this study, process writing, is introduced and its development in EFL writing will be discussed with its applications. Secondly, the place of introspection in EFL writing research will be introduced. Studies using think-aloud protocols and stimulated recall methodology will be analysed in a chronological order in this part. Thirdly, the role of computers in EFL writing research will be discussed in view of the development of keystroke logging tools. After that, pause and revision analysis studies with keystroke logging will be analysed and, finally, related studies made with the combination of keystroke logging and stimulated recall methodology will be synthesised with their implications.

2.2. Theoretical Framework: Process Writing

Until the beginning of 1970s, students had learned linguistic structures and applied them to write their texts on specific topics assigned by the teacher, which was a process without any revision or feedback. Then, with the pioneer studies of Murray (1968, 1972, cited in Matsuda, 2003); Macrorie (1970, cited in Raines & Shadiow, 1995); Emig (1971); Elbow (1973, cited in Vinall-Cox, 2005) and Britton, Burgess, Martin, McLeod, & Rosen (1975, cited in Bernstein, N. & Johnson, P.,

2004) process movement in EFL writing began to be emphasised against the old views defending the importance of product. This new trend not only helped students to discover their own capabilities, but also allowed them to choose their subjects to write and their styles as well as writing strategies with the help of their peers and teachers by means of feedback. The rise of process movement led a process-oriented and student-centred pedagogy to arise in English language teaching studies rather than the old product-oriented and teacher-centred pedagogy. Suser (1994) identified two essential features of this pedagogy: awareness and intervention. If the process movement is divided into three phases, this study using stimulated recall methodology is the last stage of process movement, which pays great attention to awareness and intervention.

This change in perspective has been prompted mare by the development of communicative language teaching than anything else and it aims at developing the 'communicative' as opposed to 'linguistic' competence of learners. Communicative competence consists of four major elements: grammatical competence, sociolinguistic competence, discourse competence, strategic competence (Canale and Swain, 1980) and, evidently, writing skills are correlated with all. Discourse competence, for instance, has a great significance since it concerns the ability to combine meanings with unified and acceptable spoken or written texts in different genres, concentrating and use and appropriateness rather than simply a language form; which also means an awareness of variation in language use rather than simply attention to language.

Process approach emphasises discourse and cognitive aspects of writing so that the students can understand how to generate ideas, how to organise these ideas and how to develop them in a written structure. With this innovative approach, students need to be made aware of three kinds of competencies they are required to reflect to their compositions: content competency, organisational competency, and linguistic competency; and learning to achieve these competencies is a longitudinal process.

In the area of research on composing process, Emig's classic study with schoolchildren, including verbal protocols of children thinking aloud as they wrote, is one of the first attempts to investigate what writers do when they compose. Emig (1971) defines process writing in a certain way by identifying key points of contrast between the old and new paradigms. As opposed to the old views on writing, new views emphasize writing as being a process to be 'experienced' rather than a product to 'evaluated'. According to Emig, writing is predominantly 'learned' rather than 'taught'. It is an unconscious process rather than being largely conscious. Writing processes varied and recursive rather than being essentially linear. Writers learn best from attempting whole texts rather than mastering parts and sub skills. The rhythm and the pace of writing can be quite slow since the writer's actual task is to create meaning; so, it cannot be done swiftly and on order. Last of all, writing is essentially social and collaborative, not at all a silent and solitary activity.

Perl (l980) using the case-study approach of current research paradigm, found that even unskilled and inexperienced writers employ consistent and stable composing strategies in order to discover meaning. Through the act of seeing their ideas on paper, students enabled to reflect upon and develop them further. A learner educated in the use of language aware of language as a 'cultural artefact' and is a student analyst of the language as a user. Such awareness can be stimulated at all stages in the language development process and courses should make greater provision for developing such awareness from the earliest stages to the most advanced levels.

Since learning is characterised as a process of developing the ability to do things with language as opposed to learning about language, any classroom activities which engage the learner in any sort of communicative language use will provide the necessary and sufficient conditions for learning (Krashen & Terrel, 1983). In addition, there is known to be research which suggests that learners need the opportunity for both comprehensible input and output (Long, 1980; Nicholas, 1985)

and writing practices allow learners to experience and realise these kinds of conditions.

It is believed that we need methodologies which are psychologically and psycholinguistically motivating and encouraging, and Krashen's Monitor Model suggests that there are two discrete psycholinguistic processes operating in second language development: conscious learning and subconscious acquisition. According to this model, long-term language development occurs only through subconscious acquisition. Writing practices in general, or process writing more specifically, allows for this type of acquisition due to its recurring and recursive character. What is more, there is great emphasis on development of meaning and the importance of the negotiation of meaning as a stimulus to language development. All in all, comprehensible-output hypothesis which stresses the importance of giving learners the opportunity of practicing the target language (Swain, 1985) is need to be considered, and the writing instruction is definitely the most effective vehicle to this end.

However, to be realistic, students' self-confidence is not always boosted in the writing class. Quite the contrary, as indicated by Perl (1980), less skilled writers who view composing as more mechanical and formulaic are inhibited by their concerns with correctness and for that they cannot get beyond the surface, in order to anticipate the needs and expectations of their readers.

Britton et al. (1975, cited in Bernstein et al., 2004) developed a model which emphasised functional features of writing process and their data were formalised by Hayes and Flower (1980). In their study, Hayes and Flower regarded writing as a process of problem-solving which is full of communicative tasks. They underlined various cognitive skills like planning, translating and reviewing and determined teacher's role as a monitor rather than a director. Hayes and Flower's goal oriented model focuses on communicative sides of writing skill and this model was applied in different studies (e. g. Bereiter & Scardamalia, 1987; Hayes & Flower, 1986).

Bereiter and Scardamalia (1987) used Hayes and Flower's model in two aspects. They developed "knowledge-telling" strategy for children and novice writers and a "knowledge-transforming" strategy for adults and experienced writers. "Knowledge-telling" is a "think-say" method of composing, and ideas are directly written in a text. The produced text lacks higher-order cognitive skills like organisation, relevance and coherence, and revision process is limited to surface-based changes after final text. "Knowledge-transforming", in contrast to "knowledge-telling", takes the reader into consideration and it involves organisation of the ideas. Ideas are actively constructed and evaluated considering communicative targets. Revision process is more extensive and involves text-based changes as well as surface-based changes. Bereiter and Scardamalia's study has an important role in writing research as they emphasise the improvement of more intentional cognition, which enables learners to fulfil communicative goals of writing process.

One example of such cognition-oriented studies is the research (Bereiter, Scardamalia, & Steinbach, 1984) in which they compared two groups of children; a group given a course of instruction designed according to the principles of process writing and a group continuing with their everyday classroom activities. The first group were provided with a set of cards prepared to stimulate more goal-directed planning, leading to fulfil communicative purposes. Examples of these cues were demonstrated first by the instructor and the students were given different planning strategies. The results showed that the essays produced by experimental group students shifted towards a more reflective style of composition, showing more proof of reflective and complex thought than the ones in the control group. It is also concluded that within the framework of a specific theme, poor writers tend to just jot down topics irrelevantly as these come to their minds. Good writers, on the contrary, carefully examine both the content and the rhetoric of their composition. The same results, proving the development of higher-order cognitive skills through process writing with stimulated interventions can be seen in different research (e.g. Beal, Garrod & Bonitatibus, 1990; Graham & Harris, 1989) done after this study.

Based on this observation above, the same researchers (Bereiter, Scardamalia and Steinbach) used cue cards to teach poor writers a strategy for re-examining the content of their writing in terms of rhetoric. After the instruction given by the researchers, unskilful writers' compositions showed some improvement, but far less than the skilful writers.

After nineties, the process writing studies began to focus more on the coordination of processes like the ones mentioned above like planning or revision with the other processes of writing rather than being concerned with the nature of these processes in themselves. The basic hypothesis before is that the cognitive system is limited in capacity, and that one of the central problems for writers is cognitive overload (Flower & Hayes, 1980). Contrary to this belief, the studies after nineties suggest that effective writing depends on writer's capability to coordinate all the different processes involved in writing. Thus, planning at a specific stage or revision of the final product is not necessary to reach higher-order cognitive processes and need to realise different actions simultaneously is essential in foreign language writing studies.

The new trend can be observed in various studies carried out during nineties. Breetvelt, van den Bergh and Rijlaarsdam (1994), for instance, used research material consisted of 40 compositions on two themes, written by 20 ninth grade students who had think-aloud protocols; and Rijlaarsdam and van den Bergh (1996) used think-aloud data obtained during argumentative essay task of ninth grade students. They all found that the quality of a text increases if different activities can be carried out at the same time during the writing process. These researches are important in that they state the ways to improve the writing quality, which is a concrete example of benefits of using higher-order cognitive processes during writing tasks.

As for the level of cognitive processes, Bourdin, Fayol and Darciaux (1996) found that adults retrieve more material than children when they write their responses as opposed to producing them orally. They attributed this relationship to the fact that children deal with lower level issues in writing, which inhibits their attention from higher level concepts whereas adults do lower level activities automatically.

Additionally, Torrance, Thomas and Robinson (1994) suggested that the basic advantage of outlining over rough drafting strategies is taking the attention of students to higher-order cognitive processes in writing. They identified similar groups in a questionnaire study of social science research students. In their study, 'Planners' tended to produce detailed outlines in advance of producing one or at most two drafts. 'Revisers', on the other hand, were less likely to plan, but tended to produce more drafts of their text. In accordance with the same results, Galbraith (1996) concluded that process writing activities like brainstorming, outlining and journal keeping are designed to focus on generating ideas; free-writing and deferred revision are designed to promote fluent translation; peer revision and collaboration are designed to focus on revision.

Considering the studies done after nineties, it is not wrong to say that the main philosophy of process writing have become improving learners' higher-order cognitive skills. Modern researchers in writing haven't given up digging the underlining pedagogies of process writing yet and they still continue "discovering" process writing (Schafer, 2001). Accordingly, the main focus in the studies of the last debate is the collaborative and cooperative nature of writing, which takes its roots from Vygotsky's social constructivism. Different researchers (e.g. Storch, 2002; Ferris, 2003 and Aldana, 2005) deal with the effects of group and peer activities in writing.

Storch's classroom based study (2002) has a great importance as her research has a pioneer role in post-process movements. There were 23 adult ESL students completing degree courses in this study. They were given an option to write in pairs or individually. All pair work, which was the majority, was audiotaped and all completed texts collected. The pairs were also interviewed after they complete their writing sessions. The main objective of this study was to determine the reflections on collaborative writing and to compare texts produce individually with the written by pairs. Most of the learners were positive against the pair work and it is found that pars wrote shorter but better texts by means of task fulfilment and complexity, which require higher order cognitive skills.

In this aspect, the intervention study by Hidi, Berndorff and Ainley (2002) also have an important role as it investigated both collaborative writing and intervention. They used an intervention programme to improve students' cognitive skills as well as a pre-test and post-test. They tried to determine the advantages of collaborative writing activities and the study found that intervention programs including collaborative activities improved the quality of children's writing. The collaborative writing sessions were mainly useful for the male. The study also indicated that "children's genre-specific liking and self-efficacy of writing are closely associated and that both of these factors are also associated with their general interest in writing" (Hidi et al., 2002, p. 1).

All in all, the apparent shift in emphasis from product to process has had a profound effect on the way writing is taught. A huge variety of activities have been designed to give students experience of the process of writing and its separate components, including such activities as: journal writing; peer conferencing; collaboration in small groups; brainstorming; outlining; free writing; multiple drafting; peer revision; writing for different audiences; class publication. Matsuda (2002) stated that within this variety of activities we think one can distinguish three complementary approaches to teaching writing:

> "(i) developing the ability to direct writing towards communicative goals; (ii) developing the ability to coordinate and manage the different processes which make up writing; (iii) developing an understanding of the social context within which the writing process is embedded and of the social process of writing." (p. 197)

Matsuda (2004) suggested that "There is no doubt that the process movement helped to call attention to aspects of writing that had been neglected in many writing classrooms; it also contributed to the professionalisation of composition studies." (p. 2). She thinks that process movement is the most successful pedagogical reform on the teaching of writing.

2.3. Introspective Studies in EFL Writing

Introspection may be defined as "examining one's mental processes" (Spielmann, 2003, p. 112). The first applications of introspection are traced to Aristotle. The longitudinal rise of behaviourism in scientific research areas lead introspection to be reconsidered as an unreliable method as it is not a qualitative way of analysis. However, since behaviourism began to be criticised severely because of its weakness in reaching cognitive processes, introspective methods reappeared and became one of the main methodology of scientific research, mostly in linguistic studies.

Gass and Mackey (2000) who advocate introspection simply because through introspection "one can often gain access to processes that are unavailable by other means ..." (p. 16–17) list seventy-one second language research projects in which introspective methods have been used (Table 2). Forty one of these projects including thesis and articles were realised after nineties, which is an evidence of the drastic increase in the usage of introspective methods.

Table 2: Second Language Studies Using Introspection (na = not available)

Author	Year	Type of Data	Method	# participants
Abraham & Vann	1996	L2 test-taking	Think-aloud	9
Alanen	1995	Reading	Rule presentation Think-aloud	36
Anderson	1989	L2 test-taking	Retrospective think-aloud	28
Anderson	1991	L2 test-taking	Think-aloud Self-revelation / observation	
Bartelt	1997	Production	Introspection (written)	105
Block	1986	Reading	Think-aloud	12
Bosher	1998	Writing	Stimulated recall	3
Brice	1995	Writing	Think-aloud	3
Brown	1993	Oral proficiency testing	Stimulated recall reports (written)	53
Buck	1991	Listening	Retrospection	6
Cavalcanti	1987	Reading	Restrospection Think-aloud	na
Chern	1993	Vocabulary	Think-aloud	20
Cohen	1993	L2 test-taking	Think-aloud Self revelation	5
Cohen & Aphek	1979	Vocabulary	Restrospective reflection	17
Cohen & Aphek	1981	Vocabulary	Restrospective reflection	19
Cohen & Cavalcanti	1987	Writing	Think-aloud	8
Cohen & Cavalcanti	1990	Writing	Think-aloud	12
Cohen & Olshtain	1993	Speaking	Stimulated recall	15
Cohen Weaver & Li	1995	Strategy use	Think-aloud	21
Cumming	1989	Writing	Compose-aloud	23
Davies & Kaplan	1998	Grammaticality	Think-aloud (not	26

		judgements	all provided a verbal protocol)	
Davies & Kaplan	1998	Grammaticality judgements	Think-aloud (not all provided a verbal protocol)	26
Dörnyei & Kormos	1998	Oral language production	Stimulated recall	44
Enkvist	1995	Translation	Think-aloud	47
Færch & Kasper	1986	Translation	Think-aloud Retrospection	1
Feldman & Stemmer	1987	L2 test-taking	Think-aloud Retrospection	20
Fraser	1999	Vocabulary	Retrospective think-aloud	8
Gass	1994	Acceptability judgements	Stimulated recall	Small subset
Gatbonton	1999	Pedagogical knowledge	Stimulated recall Verbal report	7
Gerloff	1987	Translation	Think-aloud	5
Glahn	1980	Gender Communication strategies	Stimulated recall	26
Gordon	1987	L2 test-taking	Self-revelation / observation	na
Gosden	1996	Writing	Self-reflection / self report	16
Goss, Zhang, & Lantolf	1994	Grammaticality judgements	Think-aloud	15
Gu	1994	Vocabulary	Think-aloud	2
Haastrup	1987	Vocabulary	Think-aloud Think-aloud with retrospection	104
Hill	1994	L2 test-taking	Self-revelation / observation	na
Hölscher & Möhle	1987	Translation	Think-aloud	7

Hosenfeld	1976	Grammar	Think-aloud	25
Hosenfeld	1977	Reading	Think-aloud	40
Hosenfeld	1979	Reading	Think-aloud	1
Hosenfeld	1984	Reading	Think-aloud	2
Huckin & Bloch	1993	Vocabulary	Think-aloud	3
Jones	1985	Writing	Stimulated recall	9
Jones & Tetroe	1987	Writing	Think-aloud	6
Jourdenais, Ota, Stauffer, Boyson, & Doughty	1995	Linguistic knowledge	Think-aloud	10
Kern	1994	Reading	Think-aloud	51
Krings	1987	Translation	Think-aloud	8
Laviosa	1991	Listening	Self-observation (immediate retrospection)	5
Lay	1982	Writing	Think-aloud	4
Lennon	1989	Acquisition strategies	Self-report	4
Mackey, Gass, & McDonough	In press	Oral language	Stimulated recall	17
Murphy	1989	Listening strategies	Talk-aloud	12
Neubach & Cohen	1988	Dictionary use	Think-aloud	6
Nevo	1989	L2 test-taking (Reading)	Immediate introspective and retrospective reports (written)	42
Paribakht & Wesche	1999	Vocabulary	Think-aloud Retrospective interviews	20
Poulisse	1990	Communication strategies	Stimulated recall	45
Poulisse, Bongaerts, & Kellerman	1987	Communication strategies	Stimulated recall	45

Raimes	1985	Writing	Think-aloud	8
Robinson	1991	Pragmatics / Speech Acts	Think-aloud Retrospective interviews	12
Skibniewski	1990	Writing	Think-aloud	3
Stemmer	1991	L2 test-taking	Think-aloud and immediate retrospection	30
Swain & Lapkin	1995	Writing	Think-aloud	18
Swain & Lapkin	1998	Oral interaction	Think-aloud	35
Tomitch	1999	Reading	Think-aloud and retrospective interview	12
Tyler	1995	Discourse	Stimulated recall	2
Vignola	1995	Writing	Think-aloud	17
Villamil & Guerrero	1998	Writing	Think-aloud	17
Warren	1996	L2 test-taking	Self-revelation / observation	20
Zamel	1983	Writing	Retrospective interviews	6

As seen in this table, introspective studies cover a wide range of topics including writing, listening, translation, oral interaction and reading.

2.3.1 Stimulated Recall Methodology in EFL Writing Research

Stimulated recall is one of the most used introspective methods in which "participants are prompted (via some visual or oral stimulus such as a video/audio taped event, or any other tangible reminder such as different drafts of a composition, etc) to recall thoughts they entertained while carrying out certain tasks or participating in certain events" (Lindgren, 2005, p. 12). This method has a great

advantage over thinking-aloud protocols or interviews since it needs no comprehensive training and it doesn't only rely on the memories of participants without prompts.

Stimulated recall methodology is widely used after the behaviourist movement's fall in nineties because "it can shed light on some dark corners of the learner's mind, whose activities are assumed to be partly available to her consciousness though NOT accessible via behaviour-oriented empirical methods" (Lindgren & Sullivan, 2003, p. 13). Faerch and Kasper (1987) showed the potential of Stimulated recall in second language research (Table 3).

Table 3: The Potential of Stimulated Recall Methodology in Second Language Research

Research Area	Author(s)	Overview of Study	Additional Issues / Questions Raised Where Supplementary Data May Be Helpful	Stimulated Recall Suggestions
L2 perception	Munro	Perception of foreign-accepted speech with noise	Individual listeners were affected by the presence of noise when interpreting L2 production. Why? Did vocal pitch, prosody or speech rhythm have an effect?	Prompting listeners to introspect about why they made certain judgments (using their ratings for stimuli)
L2 perception	Riney and Flege	Change over time in global foreign accent and liquids	Questions raised about perception of listeners who were trained researchers in L2 phonetics / phonology	Prompting listeners to introspect about why they made certain judgments (rating as stimuli)
Classroom interaction	Lyster	Recasts, repetition and ambiguity	Questions raised about intentions of teachers in providing recasts and perception of learners about corrective function of recasts versus noncorrective repetition.	Prompting learners and teachers to introspect about intentions and perceptions using videotaped classroom interaction as stimulus

Oral production / planning	Mehnert	Different amounts of planning time on task performance	Questions raised about whether planning time is used to prepare cognitively or linguistically and about how learners approach planning	Prompting learners to introspect about how planning time was used utilizing videotapes and written plans as the stimulus: questions focusing on how planning time was used
Pragmatics	Bardovi-Harlig and Dörnyei	Differences between ESL and EFL learners in pragmatic and grammatical awareness	Questions raised about the variables that intervene between stages of noticing and targetlike production	Obtaining retrospective comments from learners about intervening variables, using judgment data obtained while watching the video scenarios as stimulus
L2 comprehension	Kempe and Mac Whinney	Comprehension of overt morphological case marking	Questions raised about whether differences between learners of Russian and of German differed because of metalinguistic awareness of case marking	Prompting learners to introspect about metalinguistic awareness, using the task responses as the stimuli
Input and input processing	Lee	Reading comprehension and input processing	Questions raised about whether learners detect forms in input. Even when they read for meaning, some learners' rhetorical organization skills were higher	Carrying out on-line think-aloud protocols with some learners and stimulated recalls with others, using videotapes and the task responses as the stimuli
Input and input processing	Leow	Effects of amount and type of input exposure on L2 develop.	Questions raised about the teacher-centred group, who did not complete the think-aloud tasks of the learner-centred groups (it would have interfered	Carrying out stimulated recall protocols with some of the learners using videotapes and transcripts as the stimuli

			with the lesson)	
L2 comprehension	Barry and Lazarte	Inference generation: domain-knowledge, complexity, and topic effects	Questions raised about the potential of a resource allocation model, where resources are redirected at certain points; also questions about what sort of resources learners needed in order to carry out the experimental task	Carrying out on-line think aloud protocols with some learners and stimulated recalls with others, using videotapes, reading passage, and written recall as the stimuli
Oral interaction	Swain and Lapkin	Learner dialogue can be seen as a means of communication and a cognitive tool	Questions raised about combining analyses of students' collaborative dialogues with follow-up interviews to achieve a better understanding of mental processes	Prompting the two learners to introspect about their thoughts during the interaction (After the post-tests) using videotapes of the collaborative dialogues as the stimuli
Negotiation	Foster	Investigation of meaning negotiation in the classroom	Questions remain as to why predictions and replication of prior research findings of negotiation and resulting modifications are not borne out	Posing questions to probe learners' thoughts during the time of the original interaction using audiotapes as stimulus
Syntactic processing	Hoover and Dwivedi	Processing of converginf (L1 and L2) and nonconverging grammatical structures and reading proficiency	Were the results partly affected by word recognition?	Asking questions in which participants are asked to recall what they were thinking about when there were particularly fast or slow responses. Use video as stimulus
Incidental vocabulary learning	Joe	Conditions that promote incidental	Is there really a lack of focus when incidental learning takes place?	Probing differences on gain scores for different words using an audio or

		vocabulary learning		video stimulus
Vocabulary	Lotto and de Groot	The effect of learning method, word frequency, and cognate status on the acquisition of new words	Questions remain concerning conflicting results between this study and others	Prompting learners with questions relating to reaction time. Use task performance as a stimulus

According to van Waes (2007), through stimulated recall, it is possible to answer questions about the psychological processes which allow us to transform complex ideas into words, cognitive processes affecting EFL writing and memory retrieval.

Within the context of second language research, Gass and Mackey (2000) review the literature (Matsumoto, 1993 and Cohen 1996, 1998) with regard to advantages and disadvantages of the stimulated recall methodology. Some of the advantages they listed are:

- it reflects a theoretical framework,
- it reflects cognitive events,
- it is a reliable method as data collected correlates with behaviour,
- it is useful in determining what prior knowledge is used in processing texts.

DiPardo's research on writing programmes for non-Anglo students is a pioneer study in the field of writing research with stimulated recall methodology. She studied with a large population of non Anglo Saxon students within a university context. Participants were enrolled in three-hour collaborative tutorial groups as well as their regular writing courses. DiPardo (1994) dealt with the dynamics of the programme. In particular, she wanted to

> 'assess the webbing of social, affective, and linguistic issues in students' and tutors' talk about writing (Dyson and Freedman, 1991) – that is, how the small group conversations related to students' struggles to adjust to life at this predominantly Anglo, middle- class campus, and how tutors' efforts to provide meaningful support related to larger patterns of institutional uncertainty.' (p. 169)

DiPardo compiled three audio taped segments per participants which last 15 minutes. Before each playback session, Di Pardo refreshed learners' minds giving them information about the writing process and written transcripts were also provided. She stopped the tape after each segment. During the sessions she asked open- ended questions such as "What are your comments?" and "What do you have to say on this?"

Bosher (1998) used stimulated recall methodology in order to compare composing processes of the students graduating from high schools in the United States with those graduated from different countries from the United States. She was mainly interested in the composing stages of Southeast Asian students. The task of the students was to write their own opinions on the articles which were about discrimination in schools. While they were writing their texts, video cameras were focused on the paper so that all pen and paper movements were visible. During this process, they were observed on a monitor situated in another room. Following the end of the writing session, the students were interviewed and their comments were audio-taped.

Cribb (2000) used stimulated recall methodology in order to increase awareness of SL among his students. He collected data through video and audio recordings of his students who were running their writing tasks. Cribb paused the recorder when he wanted to tell something to his students, which is an intervention technique. However, the students were not active in this process since there was one side pausing the recorder and asked the questions, which made the teacher the only decision-maker in the classroom.

As mentioned before, stimulated recall method can only be effective with the combination of comprehensive data collection methods. In the studies above, video cameras or audio recordings, which are potential attention-distracting devices for students, were used so as to collect the data to be used in stimulated recall sessions. One of the objectives of the present study in using keystroke logging data along with stimulated recall methodology is preventing from these potential pitfalls in the research design.

2.4. Computer Mediated Writing

The last teaching methods, the current physical design of the classroom, and the impact of the new technology effect process writing analysis as well as other dynamics in EFL practices. Sloane (1999) argued that if researchers do want to comprehend the dynamics of composing process, they must analyse how encounters with today's writing modes, especially computers. He also indicated that modern researchers must "…explore how writers compose at the computer." (Sloane, 1999, p. 51)

Although language teachers do not feel comfortable using technology in the classroom, computers will become a normal part of EFL practices in coming years (Dudeney & Hockly, 2007). In this aspect, computers are becoming a more and more important tool in EFL writing courses in today's age of technological literacy. Our ability to communicate in digital environments is seen as an essential aspect of literacy (Hawisher & Selfe, 2000) and this is the focus of many current researches both qualitative and quantitative.

In the late 80's and early 90's, various studies were conducted to express writing processes in the new writing medium. There were different studies comparing this new mode with pen and paper (e.g. van Waes, 1991; Goldberg, Russell, & Cook, 2003; van Waes & Schellens, 2003). They all concluded that

computer-based writing courses are much closer than the recursive nature of process writing methodology. In addition, some of the researchers above believe that it is more convenient to reach higher level cognitive processes with the use of computers in EFL writing.

As the computers are taking their part as a medium against pen and paper in EFL writing, studies comparing their roles and effects are increasing:

> 'In comparison with writers using pen & paper, those using a word processor (i) spent more time on a first draft and less on finalizing a text, (ii) pursued a more fragmentary writing process, (iii) tended to revise more extensively at the beginning of the writing process, (iv) attended more to lower linguistic levels (letter, word) and formal properties of the text, and (v) did not normally undertake any systematic revision of their work before finishing.' (van Waes, 2004, p. 12)

Different researchers compared the nature of writing through computers and the one with pen and paper mode. The behaviour of writers using computer can be characterised by less initial planning, shorter pauses and more frequent revision (Severinson Eklundh, 1993). Hadenius (1997) claimed that the writer is encouraged to produce text in front of the computer. He supported his views with a few examples such as: the cursor is constantly twinkling, urging the writer to continue; if the writer stops for a longer period the screen turns black or shows an exiting pattern to save energy.

By means of the effects of writing modes on composing process, van Waes and Schelens' study (2003) on the effect of the writing mode on pausing and revision has an important part in the literature. They compared writing produced in two primary modes, the pen and paper mode and the computer mode. Two experiments were set up in the research design in which participants were asked to write two different texts, both were reports, each in a different mode. The participants of the research were 27 male and 13 female university students, all of

whom used the computer for word processing (WordPerfect) regularly and had had at least 2 years' experience in doing this process.

In the first step, the participants were asked to write a text on a computer with a 25-line screen and the other on a computer with a 66-line screen. In the second step, the other 20 participants wrote one text in the pen and paper mode and another on a computer with a 25-line screen. As a result, eighty separate writing processes were observed in duration of two hundred hours.

The results showed that the computer mode and the pen and paper mode did not differ significantly with respect to the duration of the writing process. Pauses longer than three seconds revealed a clear difference between the modes. Computer writers paused approximately 70 percent more often than pen and paper writers and revision pauses made up 45–50 percent of all these pauses. In the computer mode, revisions at the higher thinking levels constituted 42.8 percent of the total, whereas in the pen and paper mode, this rate is 50.6 percent.

Today's professional writing environments are changing rapidly. The most specific change seen in this aspect is the newest TOEFL format which has turned into an internet based exam. With regards to life long learning criteria, it seems to be a must to teach EFL writing in the computer mode. Therefore, previous studies comparing the writing modes are only a data base for EFL researchers to design their new courses in a computer based atmosphere.

2.4.1. Keystroke Logging as a Research Tool

The place of keystroke logging should be set within the cognitivist movement which was developed within the process methodology in writing research. From the beginning of the process approach, hidden processes in writer's mind has been a question tried to be answered. These studies trying to uncover the inner processes were not limited to seventies and eighties (Kroll, 1990, 2003; Grabe

& Kaplan, 1996). Hence, in current writing research the description of cognitive processes is still one of the most important issues. As most writers nowadays produce almost all of their texts on a word processor, the computer has not only become the major writing instrument, its use as a research tool has also increased. Spelman Miller and Sullivan (2005) stated these facts in the introduction of their anthology on keystroke logging:

> "As an observational tool, keystroke logging offers the opportunity to capture details of the activity of writing, not only for the purposes of the linguistic, textual and cognitive study of writing, but also for the broader applications concerning the development of language learning, literacy, and language pedagogy." (p. 1).

Computer keystroke logging programmes were designed to focus on logging all the movements of the writer which are reflections of his / her thoughts. The keystroke logging software is activated before the writing session begins, and therefore does not interfere with the activity of writing, which was a handicap of video cameras or audio recording tools.

Keystroke logging software record writing sessions and they store detailed information about time and occurrence of every keystroke. In other words, it registers traces of cognitive activity during writing process. Planning and revision of writing can be reflected as pauses, changes and movements in the text during this process. Keystroke logging programmes also include a replay function, which allows retrospective analysis afterwards. Lindgren and Sullivan (2003) reported on an experimental use of JEdit's replay facility as a technique for stimulating recall of the writing event.

The first software developed for the purposes above are JEdit (Severinson Eklundh & Kollberg, 1996) and Scriptlog (Stromqvist & Ahlsen, 1998). In the case of JEdit, the data elicited may be converted using another software- S-notation- (Severinson Eklundh & Kollberg, 1996) to reveal the effect of revisions on the emerging text.

Spelman Miller (2000) was one of the first users of keystroke logging in EFL writing studies and her aim was to explore temporal aspects of text production between two groups of first and second language student writers working on academic tasks in the context of a British University. The results revealed differences in pausing and formulating behaviour according to writers' language background, in line with the findings of a number of researchers.

Different researchers like Jones & Tetroe (1987), Hall (1990), Silva (1993) and de Larios, Marin and Murphy (2001) realised these kinds of research on the same topic; however Spelman Miller stated that beyond these observations, keystroke data contained a wealth of detailed information about the individual writers' performances.

Sullivan and Lindgren (2006) considered keystroke logging's potential application areas in the second language learning and teaching context with different sample researches (e.g. Severinson Eklundh & Kollberg, 1996; Strömqvist & Malmsten, 1998; Leijten & van Waes, 2004).

2.4.1.1. Pause Analysis Studies through Keystroke Logging Tools

"Pause" in writing may be defined as the time when the writer is not actually using her pencil to write on her paper, or pressing a key on the keyboard or using the mouse when using the computer. Although this definition is regarded as the common way of telling pauses, the main problem here is the "length" of pauses. The most commonly used length is two seconds period since it is believed that pauses less than two seconds in foreign language writing studies are mainly a result of motor activity and not of conscious planning. Hence, the standard usage in this study is two seconds.

Warren (1996) investigated pauses at the ends of sentences and clauses and she defined these pauses as "...pausing between the typing of the last word of the previous clause and the first word of the next clause." (Warren, 1996, p. 14) Spelman Miller (1996) categorised all the pauses as word-internal, word-final or clause-final. Hadenius (1992) looked at word-internal pauses, pauses before and after words, before and after full stop or comma, before and after paragraph and before move or delete.

In her study with adult first and foreign language writers, Warren (1996) found that foreign language writers pause more frequently than first language writers. She found no significant differences between the two groups concerning pausing for spelling or organisational purposes; however, lexical and structural pauses occurred more frequently among the foreign language writers compared to the first language writers, which is regarded as the lack of linguistics competence of students.

Palson's study (1998) in which she investigated the pausing patterns of nine Swedish 14-year old writers who wrote in English is a very comprehensive study as she compared her results with the other researchers, like Hadenius, Warren, Miller, carrying similar studies.

The participants in Palson's study have three forty-minute English lessons per week. Some of the pupils have their own computers at home and have a little bit greater experience of the medium. They wrote their essays, which were about a typical day at school, one at the time on a Macintosh IIsi with an A4 screen in two hours. They were allowed to use pen and paper to take down notes but they weren't allowed to ask any questions. JEdit log file was used to analyse the pupils' pause behaviours:

3551.7 18 <2.5> d_easy _cooperating <4.2> 4 <12.2> 1 19 1 <2.3> <2.5> 9 4
3605.7 <2.4> one_thing_very_inportant <18.5> 7 1 m <3.4> 21 1 1 1 1 1
3655.2 A <3.9> 1 1 2 13 1 25 1 34 , <6.1> t_stays _between _you_ <5.8>
3698.1 _and_this _person. <5.1> 5 <5.1> this person. ¶¶ <2.9> is_. ¶¶ <2.9>
3728.4 rson_inportant,keep..you and this. ¶¶ <12.5> 3 1 1 54

Figure 1: JEdit Log File for the Analysis of Pupils' Pause Behaviours 1

" **d easy cooperating** students and teachers also.
You can always be shore that you wont be alone long after you get here, and if you need someone to talk with about your troubles and personal things ,there is always someone who is ready to listen to you.And **one thing very important,it stays between you and this person.** "

Figure 2: JEdit Log File for the Analysis of Pupils' Pause Behaviours 2

At the end of the analysis, Palson found that, the writers use their time very differently; they wrote between 55 and 95 minutes and spent between 43 and 68 percent of that time for pausing.

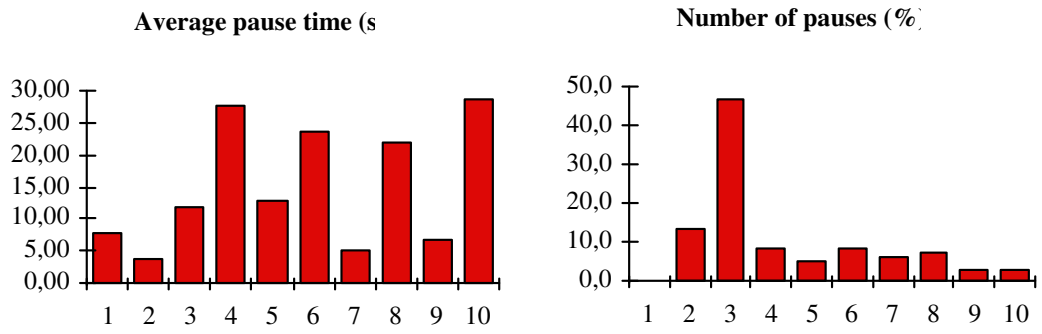

Figure 3: The Results of Palson's Study

1.Initial, 2. Word-internal, 3. Between words, 4. Between sentences, 5. Between paragraphs, 6. Before delete, 7. After delete, 8. Before move, 9. After move, 10. Before move + delete.

This research showed that there is a strong connection between pause location and pause duration. The larger syntactic unit involved, the longer are the pauses and this was the same finding in Spelman Miller's study claiming that "Clause final pauses are longer than word-internal pauses…" (Spelman Miller, 1996, p. 14)

As shown in the previous studies, the main focus in the research on pause analysis behaviours was the difference between first language writers and second language writers. Some researchers also concentrated on the relationship between the locations of the pauses and their types. However, in most studies the English levels of the students were ignored although it is an important variable in EFL writing activities.

2.4.1.2 Revision Analysis Studies through Keystroke Logging Tools

Matsuhashi defines revisions as;

> "A revision is an episode in which the writer stops the pen's forward movement and makes a change in the previously written text. The writer may then either resume the pen's forward movement or make another change at another location." (Matsuhashi, 1987, p. 208)

The revision process has been regarded as a major component of the overall writing process (Borner, 1987 cited in Zimmerman, 2000; Chenoweth & Hayes, 2001). The Chenoweth and Hayes' (2001) model of written language production has four internal processing components: the Proposer, the Translator, the Transcriber, and the Reviser. The Proposer is associated with generating and organising writing content. The Translator is associated with linguistic processes. The Transcriber turns the language produced by the Translator into written form. On the other hand, the Reviser assesses and evaluates both proposed language that has not yet been

transcribed and transcribed language determines problems and inadequacies; and if necessary, makes changes.

Revising has been regarded as an effortful process in writing studies and much more effortful than, for instance, translating (Levy & Ransdell, 1995). In EFL writing, lack of proficiency in the foreign language is likely to mean that the amount of attention devoted to lower level processing will be too much, and this may inhibit the amount of attention devoted to higher level processes, such as generating content and organising this content (Chenoweth & Hayes, 2001; Schoonen, 2003). That is, greater attention to revising at lower levels could be expected to have an inhibitory effect on revising at higher levels (Broekkamp & van den Bergh, 1996). This inhibition will be observed in this study comparing students with different English levels.

Different effects take place in the revision process; so, there are lots of variables in the studies considering revision. Severinson Eklundh and Kollberg (1999) found that the nature of the writing task systematically influenced the location of revisions made by university level students. Phinney and Khouri (1993) found that writers who were not experienced at using a computer made more surface revisions than writers who were more experienced with computers. It is possible that computer illiteracy of these young writers to focus on the surface features of the text. They found that the use of a computer to write the texts certainly resulted in a large number of typographic errors and typographic revisions represented nearly 60% of all revisions made. However, it needs to be clarified that such a high percentage of typographic revisions is usual; for instance, a study by Kim (2001) on typographic revisions made by adult writers found that most of the total number of revisions was typographic revisions.

Therefore, the use of a computer may influence students' revision processes. Researchers investigating writing processes, like Allal (2001), have examined the improvement of revision skills and how different pedagogical techniques affect the

development of revision activity. Most of these technical studies have compared the different drafts of a writing task and not studied and analysed the writing session as a whole.

Perrin (1998) who used JEdit and S-notation to generate revision analysis of text produced by journalists in their natural professional settings is one of the first users of keystroke logging in revision analysis of EFL texts. In this study, Perrin considers the production of newspaper text by different contributors over time and distance.

Several studies have compared the kinds of revisions made in first language and EFL writing studies. Van den Bergh (1996) examined the revisions which Dutch students made in a task in which they were required to improve English texts containing different types of problems. The study found that peer comments may well complement the role that teacher comments play in revision.

Lindgren and Sullivan (2003) examined the types of revisions in her study in which nine 13-year-old native Swedish writers wrote descriptive and argumentative texts in Swedish and in English. The results of this study indicated a writing language effect on pre-contextual revision. The writers undertook more pre-contextual revision of both “form” and “concepts” in English texts.

The last comprehensive study in this field is the one carried out by Stevenson, Schoonen and Gropper (2006). This study examined the inhibition hypothesis for foreign language revision processes by comparing online revisions made by 22 Dutch junior high school writers when producing computer-written texts in Dutch and English (FL). This comparison is made using a multi-dimensional revision taxonomy. The relationship between different types of revisions and text quality is also considered in the study. The researchers compared online revising processes in first language (English) and foreign language (French) in terms of the proportions of revisions involving linguistic, textual, or pragmatic processing. The proportion of linguistic processes was much higher in foreign language. On the contrary, textual

revisions were higher in first language. Another finding is that writers carried out more revisions within a lower linguistic domain like morpheme and orthography in foreign language and more within a higher linguistic domain like punctuation, and sentence levels in first language.

In this study, revision analysis will be made in view of the previous literature; however the main focus will be on the general English levels of the students and the relationship between their levels and types of revisions will be synthesised. The first simple revision typography, surface-based and text-based, is used as there are too many variables in the study.

2.4.2 Research with the Combination of Keystroke Logging and Introspection

In recent studies, keystroke logging has been combined with introspective protocols to provide complementary data about cognitive processes of learners in EFL writing classroom. The application of keystroke logging and introspective protocols in the classroom is presented as a means of promoting self-assessment, metacognitive awareness, and learner autonomy among EFL writers (Spelman Miller, 2002).

Stevenson (2003) used this combination in first language and foreign language writing studies, and Sleurs, Jacobs and van Waes (2003) used this for journalistic writing research. The validity of introspective protocols has been always criticised for being incomplete and they can, together with the log files elicited from keystroke logging tools, give valuable insights into cognitive processes. Just after a writing session, the replay function in the keystroke logging software is used to stimulate writers to recall and verbalise their thought processes during writing. The method is not intrusive and distracting. This process lowers the range of criticisms in that it follows directly upon the writing session (Greene & Higgins, 1994); it recreates the original writing session by replaying the text (Levy, 1996) and it

includes carefully chosen prompts when necessary (Greene & Higgins, 1994; Gass & Mackey, 2002).

Sleurs et al. (2003) used this combination in a case study of journalistic writing. He examines a whole process of writing from the beginning to the end and stated that this method provided researchers with a deeper understanding of cognitive processes during writing. Keystroke logging gave an accurate picture of the writing session which was also in a detailed form and introspection using the data from keystroke logging tool gave insights into events that were not verbalised during writing since they were "automated (long-term memory), too obvious to be mentioned or too complicated to reflect upon while working" (Sleurs et al., 2003, p. 210).

Vygotsky (1986) regard collaboration and social interaction as central elements in the process of learning, and as Fortune and Thorp (2001) write "dialogue triggers developmental processes, such as language development" (p. 143). Student discussion was also an important part of the study carried out by Sullivan and Lindgren and Sullivan (2002) concluding that collaborative reflective sessions using computer keystroke logging techniques raised the linguistic and writing strategy awareness of a group of adult EFL students. Computer keystroke logging permitted the writers in this study to record all the keystrokes they made during the composition of their texts and then replay all the recorded keystrokes in real time. Thus, the students were able to observe and discuss a text's evolution and see all changes made to the text clearly during its composing process. The adult learners in the study first wrote an essay using the keystroke logging tool, JEdit, then replayed their essays in pairs and reflected together upon each other's texts. It is also found that the writers taking part in the research felt they soon forgot that they were being logged and worked in their usual manner with their texts, which fosters reliability of this research.

Actually, this combination has been mainly used in revision analysis studies. Van Waes (2004) analysed this inhibition hypothesis for foreign language revision processes by comparing online revisions made by 22 Dutch junior high school writers when producing computer-written texts in both Dutch and English. 13- 14-year old students participating in this study were selected from 8 classes, totalling 253 students, from 6 urban schools in the Netherlands. At the time of this study, the students had received approximately 3.5 years of EFL classroom instruction: 1.5 years at secondary level of approximately 2–3 hours a week, and 2 years at primary level of approximately 1 hour a week that concentrated solely on basic oral communication skills. The texts were written using a laptop computer in the presence of an instructor. The four texts were written in four different writing sessions that were held within a two-week period. The students were required to think aloud while writing the texts, and their verbalisations were recorded using a cassette recorder. The results show that, although revisions made to linguistic elements were more frequent in foreign language, there was little evidence that students' higher level revision processes were inhibited in foreign language writing. Furthermore, little relationship was found between revision frequencies and text quality.

In a case study of two female junior high school students of EFL in Sweden, the use of stimulated recall sessions following a writing session is evaluated in terms of the impact on revision behaviour (Lindgren & Sullivan, 2003). At first, students were prompted to reflect on their thinking and composing and to identify and discuss aspects of form they felt needed elaboration. The following day students were invited to improve their texts. Changes to the text produced on the second day were analysed using a framework for revision analysis and compared to changes made when texts were written without stimulated recall. After the detailed analysis of the number of words written and revisions undertaken in each text's composition progression, it was found that using keystroke logging as a prime for a stimulated recall peer discussion session can trigger an increase in noticing and language awareness that leads to more text revision.

In another study using keystroke logging and stimulated recall methodology, Lindgren and Sullivan (2006) compared the frequency of revisions made by high school age writers in first language (Swedish) and foreign language (English) in terms of whether they were form revisions or conceptual revisions. Nine 13 year-old native Swedish writers, who wrote descriptive and argumentative texts in Swedish and English, participated in this study. The researchers used a developed taxonomy using Faigley and Witte's (1981) notion of 'surface-based' and 'text-based' changes (Figure 4).

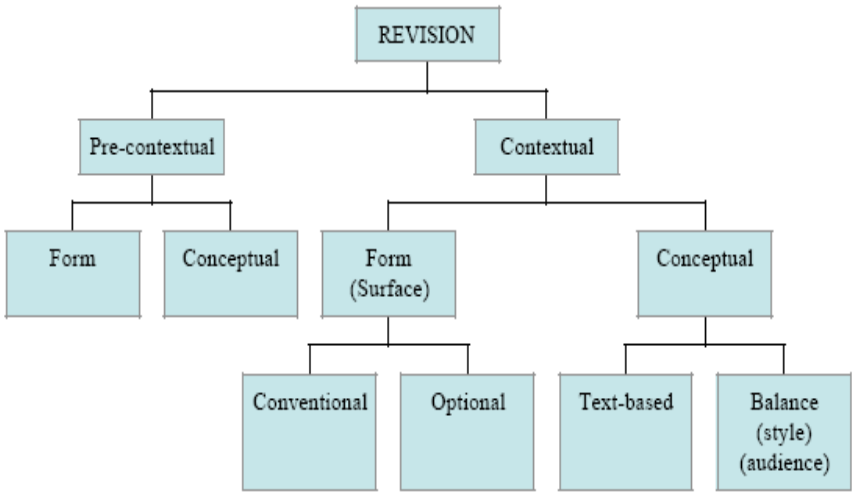

Figure 4: Revision Taxonomy used by Lindgren and Sullivan (2006).

It was found that the writers in the study made both significantly more form (surface) revisions and conceptual revisions in foreign language than in their first language.

2.5. Conclusion

In this chapter, the theoretical framework of the study is described in view of the chronological developments. Then, related studies to the present research are described in detail. Research are given within the framework of the methods which are also used in the present study. Recent studies using keystroke logging tools along with stimulated recall methodology are explained and their results are identified in this chapter.

In the next chapter, methodology, the setting, the tools, the participants, data collection procedures and the data analysis of this study will be explained.

CHAPTER III

METHODOLOGY

3.1. Introduction

In the first chapter, an introduction to the present study is provided and the aims and significance of this study as well as research questions are stated. In the second chapter, previous studies related to this research are reviewed and some terms are described in detail.

This chapter will provide detailed information about the research design, study participants, instruments to obtain the data, the data collection procedures, and the data analysis strategies.

3.2. Research Design

Stimulated recall method, one of the introspective methods, was used with the combination of keystroke logging in this qualitative and quantitative study. As Gass and Mackey (2000) explained, it is used primarily in an attempt to explore learners' thought processes and strategies by asking learners to reflect on their thoughts after they have carried out a predetermined activity.

Different factors were taken into consideration as while designing a stimulated recall session great attention is needed in order to access objective data as Jensen (2002) argued:

> "Stimulated recall provided far more detail on the cognitive processes of the participants, but necessitated great investment of time and energy from both researchers and candidates." (p. 17)

The writing texts of the participants in this study were logged through the keystroke logging tool, Inputlog and then the participants were interviewed while the researcher was using the replay function so as to stimulate the learners to remember the writing process as clearly as possible. The printout versions of their texts were also given to the participants as "the stimulus should be as strong as possible." (Gass & Mackey, 2000, p. 55)

The participants were taken to the stimulated recall sessions just after the writing process lest they should forget the short-term memory aspects in their writing process. As the session becomes more distant in time and memory, the chance for the participants to say what the researcher wants them to say or create a plausible explanation gets greater (Gass & Mackey, 2000). The sessions were conducted in the classroom atmosphere which was familiar to the participants so as to create an environment in which the students and the researcher can speak within an indirect means of introspection, which enhanced the value of the sessions (Lyle, 2003).

Open-ended questions like "Comments?" were used to prevent teacher from directly guiding the participant and there was another instructor who is also an English Teacher except for the researcher in the room to provide interrater reliability as an objective observer in the research.

The experimental group students in both groups had an extra stimulated recall session in which they had the opportunity to analyse their revision behaviours in detail and the control group students were provided with written feedbacks after stimulated recall sessions.

All the students attended the second writing session after stimulated recall sessions. All the values regarding the revision behaviours of the students were applied in the t-test to see the significance of the results.

3.3. Participants

The participants of this study are composed of thirty six ninth grade students at Ankara University Development Foundation Schools. There is a streaming system in this grade and there are two levels separated at the beginning of the term. At the beginning of each academic year, the students attending ninth grade take a placement exam which is designed in parallel to PET - Preliminary English Test (see Appendix 1), "an intermediate level exam, testing your ability to cope with everyday written and spoken communications" (http://www.cambridgeesol.org/exams/index.htm), which is one of Cambridge ESOL standard exams. However, in general, most of the students attending the higher level have graduated from the same school's primary school or another private school whereas the lower level students have graduated from state schools.

Both levels have same hours of English per week – 12 – throughout the academic year and there is a two- hour "Process Writing" course inside this programme from the first week on. The content of this course include activities in view of the steps asserted by White and Arndt (1991) in "Process Writing" during the first term:

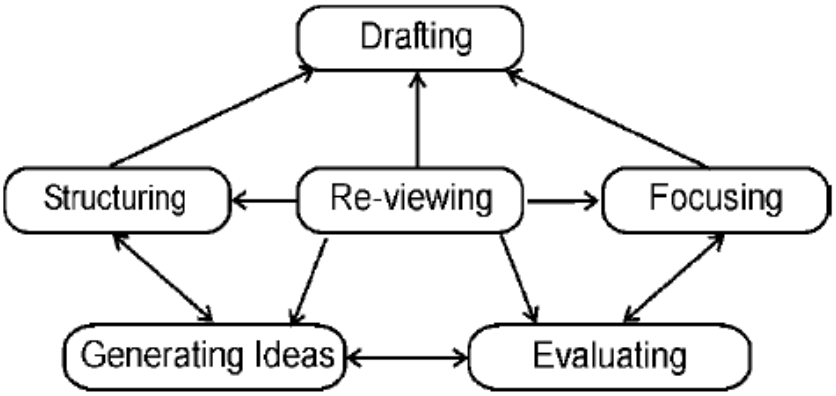

Figure 5: The Writing Process (White and Arndt, 1991)

During the second term, did both levels have the same course in which they have studied on two types of writing required in PET exam: Letter Writing and Story Writing.

Both classes also have two- hour computer lessons per week in which the students attending this study have gained essential skills to use the keystroke logging tool, Inputlog effectively and they were also informed about the different features of Inputlog in these lessons

3.3.1. Students with Higher English Competence – B2 (Intermediate - Upper Intermediate) Level

There are ten females and eight males in this classroom. Seventeen of these students have graduated from a private primary school and fifteen of them are from Ankara University Development Foundation Private Primary School. As a result of this, their English level is above standards and they have been learning English for about eight years.

As for their socio-cultural background, it is not wrong to say that they were brought up in an environment in which they have frequently had opportunities to come across authentic materials or native speakers.

3.3.2. Students with Lower English Competence – A2 (Elementary – Pre-Intermediate) Level

There are eleven males and seven females in this classroom. Sixteen of these students have graduated from a state primary school. As a result of this, their English level is below standards and they have been learning English for about four years; however, most of the time, these courses haven't been carried out regularly.

Considering their socio-cultural background, they have had fewer opportunities to see authentic materials or native speakers.

3.4. Instruments

In the data collection procedure, the writing task from a sample PET exam (http://www.cambridgeesol.org/support/dloads/pet/PET_HB_sampleRW.pdf) and the keystroke logging software, Inputlog were used.

3.4.1. Writing Tasks

The writing tasks of the students are separated from the questions asked in PET exam. In the third part of PET writing exam, the participant has the choice of writing either an informal letter or a story. The participant is to "write approximately 100 words, demonstrating both ambition and control of structure, vocabulary, spelling and punctuation" (http://www.cambridgeesol.org/exams/pet.htm).

The task is to write a story beginning with this sentence:

"I felt nervous when the phone rang."

The same task is used for both groups and forty minutes were given to the students to finish their first draft. During this period, they have to generate their ideas, organise them and write them on the keystroke logging software, Inputlog.

Their second writing task was very similar to the first format. They wrote a story again on Inputlog but now the beginning was a little bit different:

"It was a wonderful morning when I saw her."

They had forty minutes again and completed this story considering the warnings of the teachers during the stimulated recall session and through their written feedback.

3.4.2. Keystroke logging programme, Inputlog

Inputlog is "a research tool for observing and analysing multimodal writing processes in a Windows environment" (Lejiten & van Waes, 2006, p. 1). The program consists of three different modules: a data collection module that registers online writing processes on a very detailed level; a data analysis module that offers basic and more advanced statistical analyses like pause analysis; a play module that enables researchers to review the whole writing session at different speeds. The software allows researchers to;

> "- record (keyboard, mouse and speech) data of a writing session in Microsoft Word, I-pad and other Windows based programs (See Figure 6);
>
> - generate data files for statistical, text, pause and mode analyses (see Figure 7);
>
> - integrate various types of data from other programs (See Figure 8)." (Lejiten & van Waes, 2006, p.12)

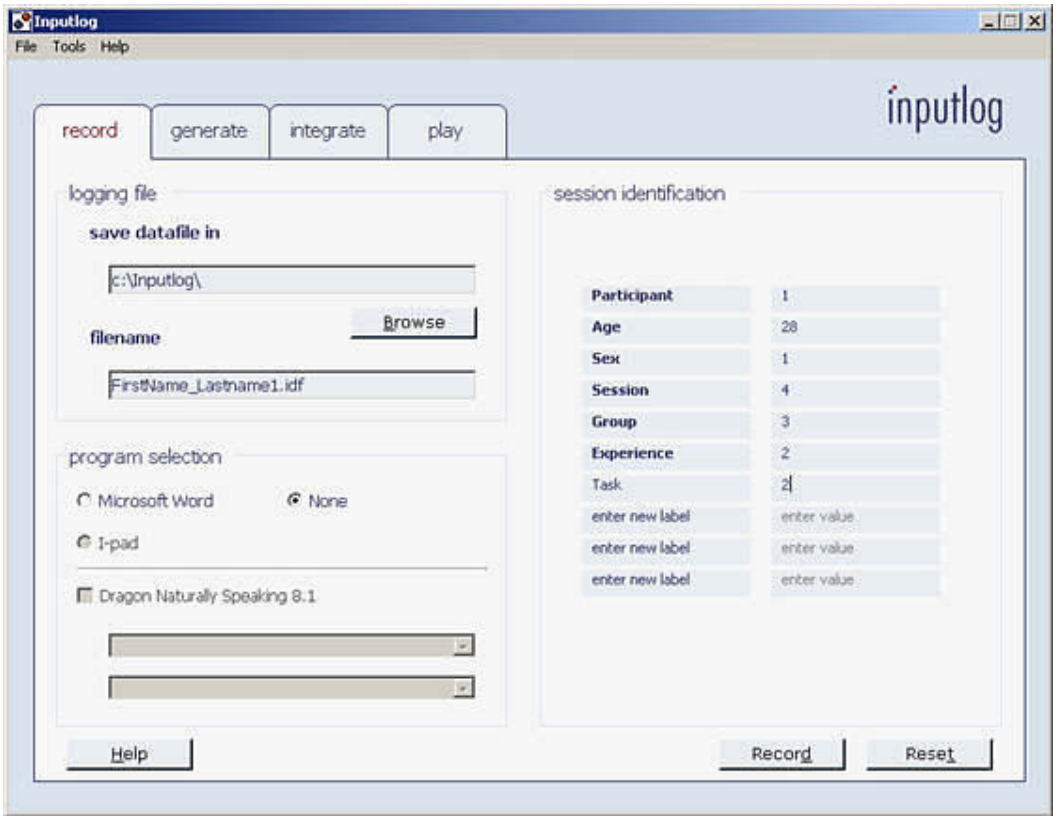

Figure 6: The Interface of Inputlog Software

inputlog

General Logging File

WritingMode	Output	StartClock	StartTime	EndClock	EndTime	ActionTime	PauseTime	X	Y
2	Movement	0:00:00	0	0:00:16	16532	16532	0	252	55
2	Left Button	0:00:16	16672	0:00:16	16797	125	16672	252	55
2	Movement	0:00:16	16891	0:00:17	17891	1000	219	219	260
2	Left Button	0:00:17	17907	0:00:17	17969	62	1016	219	260
3 - dict	context in	0:04:39	279051	0:04:40	280577	1526	1673		
1	ENTER	0:04:42	282250	0:04:42	282328	78	3199		
1	ENTER	0:04:42	282578	0:04:42	282641	63	328		
3 - dict	de algemene verplichtingen van de werkgever met betrekking tot de bescherming van gezondheid en veiligheid van werknemers op de werkplaats	0:04:43	283502	0:04:51	291922	8420	924		
3 - dict	.\punt	0:04:55	295051	0:04:55	295928	877	3129		
1	BS	0:05:01	301594	0:05:01	301688	94	5666		
1	SPACE	0:05:02	302297	0:05:02	302375	78	703		
3 - dict	kaderen in de ontwikkeling ervan een preventiebeleid .\punt	0:05:02	302687	0:05:06	306248	3561	390		

Figure 7: Example of a writing session with keyboard, mouse and speech recognition

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,949	32,992	32,992	4,949	32,992	32,992	4,201	28,007	28,007
2	3,018	20,120	53,112	3,018	20,120	53,112	3,018	20,121	48,128
3	1,727	11,510	64,622	1,727	11,510	64,622	2,430	16,200	64,328
4	1,136	7,576	72,198	1,136	7,576	72,198	1,181	7,871	72,198
5	,977	6,515	78,713						
6	,854	5,693	84,406						
7	,605	4,033	88,438						
8	,514	3,427	91,866						
9	,426	2,838	94,704						
10	,371	2,474	97,178						
11	,185	1,232	98,410						
12	,093	,619	99,029						
13	,080	,533	99,562						
14	,038	,250	99,812						
15	,028	,188	100,000						

Figure 8: Example of an SPSS output showing the Total Variance Explained in a factor analysis

The main differences of Inputlog from Scriptlog and JEdit is that it "registers every keystroke and mouse movement independently of the word processor used" (Lejiten & Waes, 2005, p. 4) and it is designed to log and analyse the data in Microsoft Word which is becoming the main instrument in writing research due to the reason explained by Dudeney and Hockly :

> "Although not everyone uses Microsoft Word, it is currently the most ubiquitous of word processing packages, with an estimated 300 million users worldwide at the time of writing. " (p. 15)

3.5. Data Collection Procedures

It was planned to involve both classes in this study. Therefore, first of all, all of the participants were invited to attend the writing lessons in the computer lab in order to do their writing tasks. As to the A2 level students, the writing sessions were realised in the morning and the sessions were carried out in the afternoon for B2 level students.

The A2 level students were given their writing task and they began writing using the keystroke logging tool, Inputlog (See Appendix 2). There is a sample recording session below:

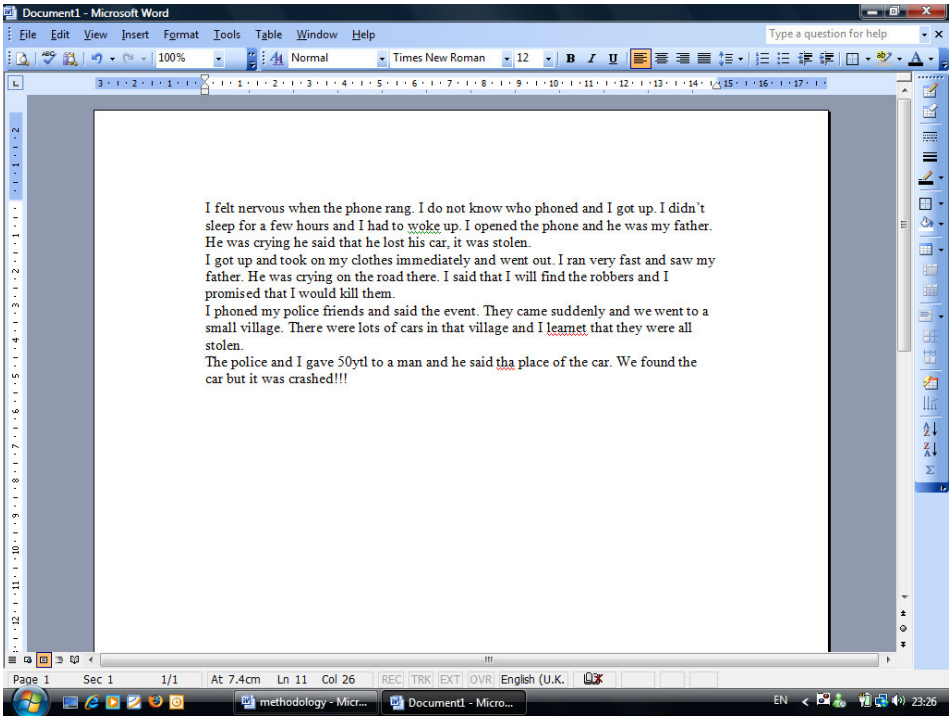

Figure 9: Sample Recording Session

After they had finished writing these materials, their text analyses were gathered through keystroke logging software. After, they were taken in a classroom for the stimulated recall session, which was also recorded. In the stimulated recall session, the texts are replayed and during this process, the teacher asked the students questions like "What they were thinking?" when they paused in the writing process. The questions had been determined using their possible capabilities stated in the Common European Framework (see Appendix 3). The printouts of their stories were also given to the students at the beginning of this section.

The students wrote their second stories (see Appendix 4) in view of the warnings that the teachers made during stimulated recall process. After having finished their second story, the students saved their files and logged out of the programme, which has registered all the writing processes of both groups.

3.6. Data Analysis

Through Inputlog, it is possible to have data XML (Extensible Markup Language) files (see Appendix 5). Using these files it is possible to make inferences and deductions.

After the first writing session of the students, the average pause lengths were determined and they were divided into two: one spent for higher thinking levels and the other for lower thinking levels. Furthermore, the revision movements of the students were analysed and categorised as surface-based revisions and text-based revisions.

After the second writing session, the revision movements of the students were determined by using the replay function and linear analysis data of Inputlog, and all these revisions were compared with the ones determined after the first session.

The t-test was applied to compare the revision behavours of the students in the first session and the second session and the significance of the results were determined in view of this test.

3.7. Conclusion

In this chapter, the characteristics of the participants and instruments were presented. Then, research design, data collection procedures and data analysis were described in detail.

In the following chapter, the findings as a result of analysis of the data will be presented in parallel with the research questions

CHAPTER IV

FINDINGS

4.1. Introduction

The first research question of this study is to identify the thinking skills the students use during writing tasks in EFL writing and to find the differences between thinking skills of the two groups taking part in the study in view of their English competencies and gender. The other question is to analyse if stimulated recall sessions have a positive effect in fostering students' higher level thinking skills or not.

The findings of the study will be presented in this chapter in detail, considering the research questions.

4.2. Pause Analysis of the Students

The first research question of this study is about thinking skills of the students. The pause behaviours of the students were analysed to find if they used higher or lower level thinking skills while they were writing. This section includes two parts. In the first section, the differences between thinking skills of the students with different English levels were determined and the second part deals with the differences of thinking skills between genders.

In the first part of the study, A2 level students and B2 level students did their first writing task respectively. They wrote their stories using Inputlog and the data obtained from Inputlog were used to synthesise their pause behaviours. They were asked about their cognitive processes during stimulated recall sessions (see Appendix 6).

The Inputlog data shows that 58.86 percent of B2 students' time in writing was spent for pauses (Table 4) whereas this value is 67.34 percent for A2 students (Table 5).

Table 4: Pause Analysis of B2 level Students

	PARTICIPANTS	***TOTAL TIME***	***TOTAL PAUSE TIME***	***NUMBER of PAUSES***	***PAUSE TIME / TOTAL TIME %***
B2 LEVEL STUDENTS	**P1 – F**	38. 40	23. 23	145	60.47
	P2 – F	35. 34	24. 45	154	69.58
	P3 – F	32. 46	20. 09	132	61.49
	P4 – F	30. 45	13. 32	78	44.01
	P5 – F	25. 05	12. 30	79	49.83
	P6 – F	24. 56	10. 45	69	43.11
	P7 – F	34. 55	20. 03	145	57.42
	P8 – F	36. 08	23. 03	170	63.79
	P9 – F	35. 54	20. 21	143	70.61
	P10 – F	37. 43	19. 50	135	52.58
	P11 – M	35. 40	21. 52	144	61.30
	P12 – M	23. 35	9. 56	65	42.12
	P13 – M	39. 55	26. 56	180	67.47
	P14 – M	39. 48	25. 04	176	62.98
	P15 – M	31. 09	16. 32	134	53.07
	P16 – M	30. 01	17. 54	132	59.63
	P17 – M	25. 06	15. 31	126	61.81
	P18 – M	20 .11	13. 02	120	64.57
	AVERAGE	*32.06*	*18.53*	*129.27*	*58.86*

Table 5: Pause Analysis of B2 level Students

	PARTICIPANTS	*TOTAL TIME*	*TOTAL PAUSE TIME*	*NUMBER of PAUSES*	*PAUSE TIME / TOTAL TIME %*
A2 LEVEL STUDENTS	**P19 – F**	35. 44	23. 04	149	64.55
	P20 – F	36. 50	23. 54	160	64.88
	P21 – F	39. 56	30. 01	212	75.16
	P22 – F	39. 25	25. 43	165	65.24
	P23 – F	38. 45	24. 40	145	63.65
	P24 – F	34. 00	21. 10	120	62.25
	P25 – F	36. 34	19. 43	121	53.91
	P26 – M	30. 09	21. 21	145	70.81
	P27 – M	33. 32	20. 04	132	59.84
	P28 – M	38. 56	28. 32	201	73.28
	P29 – M	32. 45	24. 43	145	75.97
	P30 – M	36. 24	23. 09	167	63.59
	P31 – M	30. 34	21. 12	132	69.35
	P32 – M	38. 35	25. 59	132	67.34
	P33 – M	30. 24	21. 03	123	69.24
	P34 – M	37. 34	25. 48	154	68.67
	P35 – M	32. 21	23. 43	139	73.31
	P36 – M	34. 46	24. 08	146	69.41
	AVERAGE	*35.24*	*23.46*	*149.33*	*67.34*

A2 students' average pause time is 23.46 minutes and this period is 18.53 for B2 level students. Considering these values, it is determined that A2 level students pause more than B2 level students in their writing process and the difference is 8.48 percent.

As to the number of pauses, the average pause number for A2 level students is 149.33 and the average number of pause number for B2 level students is 129.27, which is again a lower value compared with A2 level students' average pause number.

4.2.1. Higher Level and Lower Level Thinking Skills of Students with Different Levels

Stimulated recall sessions were applied to the students just after the writing sessions and they were asked to tell about their thinking processes while they were pausing. The dialogues were recorded and used to distinguish higher and lower level thinking skills.

After the analysis which is based on thinking skills table of Tsun Lai (2002) along with the thinking levels chart (see Appendix 7), it was observed that B2 level students used 30.24 percent of their pause time with higher level thinking skills (Table 6).

Table 6: B2 level Students' Use of Thinking Skills

	PARTICIPANTS	*TOTAL PAUSE TIME*	*USE OF LOWER LEVEL THINKING SKILLS*	*USE OF HIGHER LEVEL THINKING SKILLS (H.L.T.S.)*	*USE OF H.L.T.S. / TOTAL PAUSE TIME %*
B2 LEVEL STUDENTS	**P1 – F**	23. 23	16. 34	6.49	29.15
	P2 – F	24. 45	16. 56	7.49	31.58
	P3 – F	20. 09	15. 35	4.34	22.66
	P4 – F	13. 32	10. 43	2.49	20.81
	P5 – F	12. 30	8. 45	3.45	30
	P6 – F	10. 45	7. 44	3.01	28.06
	P7 – F	20. 03	16. 43	3.20	16.62
	P8 – F	23. 03	14. 23	8.40	37.59
	P9 – F	20. 21	12. 21	8	39.31
	P10 – F	19. 50	11. 12	8.38	43.52
	P11 – M	21. 52	13. 35	8.17	37.88
	P12 – M	9. 56	5. 35	4.21	43.79
	P13 – M	26. 56	21. 27	5.29	20.35
	P14 – M	25. 04	15. 39	9.25	37.56
	P15 – M	16. 32	11. 53	4.39	28.12
	P16 – M	17. 54	15. 50	2.04	11.54
	P17 – M	15. 31	11. 52	3.39	23.52
	P18 – M	13. 02	7. 31	5.31	42.32
	AVERAGE	*18.37*	*13.01*	*5.36*	*30.24*

As for A2 level students, this value is 19.96 and none of the students used half of his or her pause time with using higher level thinking skills (Table 7). Furthermore, there is no student using half of his or her pause time for higher level thinking skills in B2 group, either.

Table 7: A2 level Students' Use of Thinking Skills

	PARTICIPANTS	*TOTAL PAUSE TIME*	*USE OF LOWER LEVEL THINKING SKILLS*	*USE OF HIGHER LEVEL THINKING SKILLS (H.L.T.S.)*	*USE OF H.L.T.S. / TOTAL PAUSE TIME %*
A2 LEVEL STUDENTS	**P19 – F**	23. 04	21. 42	1.22	5.92
	P20 – F	23. 54	17. 42	6.12	25.94
	P21 – F	30. 01	27. 48	2.13	7.38
	P22 – F	25. 43	22. 12	3.31	13.67
	P23 – F	24. 40	17. 48	6.52	27.83
	P24 – F	21. 10	13. 21	7.49	36.92
	P25 – F	19. 43	17. 38	2.05	10.56
	P26 – M	21. 21	17. 39	3.42	17.33
	P27 – M	20. 04	18. 26	1.38	8.13
	P28 – M	28. 32	27. 23	1.09	4.03
	P29 – M	24. 43	16. 24	8.19	33.64
	P30 – M	23. 09	14. 27	8.42	37.58
	P31 – M	21. 12	18. 01	3.11	15.01
	P32 – M	25. 59	17. 18	8.41	33.41
	P33 – M	21. 03	18. 31	2.32	12.03
	P34 – M	25. 48	16. 00	9.48	37.98
	P35 – M	23. 43	18. 27	5.16	22.20
	P36 – M	24. 08	21. 45	2.23	9.87
	AVERAGE	*23.46*	*19.01*	*4.44*	*19.96*

Lower level thinking processes cover 19.01 minutes of the total time of 23.46 minutes of A2 level students and B2 level students spent 13.01 minutes of their 18.37 minutes of total writing time for lower level thinking processes.

4.2.2. Higher Level and Lower Level Thinking Skills of Students with Different Genders

The males in B2 students use 60.93 percent of their time for pauses (Table 8) while the females in this group spent 57.22 percent of their writing time for pauses (Table 9).

Table 8: Pause Analysis of B2 level Students – Males

	PARTICIPANTS	*TOTAL TIME*	*TOTAL PAUSE TIME*	*PAUSE NUMBER*	*PAUSE TIME / TOTAL TIME %*
B2 LEVEL STUDENTS MALE	**P11 – M**	35. 40	21. 52	144	61.30
	P12 – M	23. 35	9. 56	65	42.12
	P13 – M	39. 55	26. 56	180	67.47
	P14 – M	39. 48	25. 04	176	62.98
	P15 – M	31. 09	16. 32	134	53.07
	P16 – M	30. 01	17. 54	132	59.63
	P17 – M	25. 06	15. 31	126	61.81
	P18 – M	20 .11	13. 02	120	64.57
	AVERAGE	*31.54*	*19.06*	*137.5*	*60.93*

Table 9: Pause Analysis of B2 level Students – Females

	PARTICIPANTS	*TOTAL TIME*	*TOTAL PAUSE TIME*	*PAUSE NUMBER*	*PAUSE TIME / TOTAL TIME %*
B2 LEVEL STUDENTS FEMALE	**P1 – F**	32. 46	20. 09	132	61.49
	P2 – F	30. 45	13. 32	78	44.01
	P3 – F	25. 05	12. 30	79	49.83
	P4 – F	24. 56	10. 45	69	43.11
	P5 – F	34. 55	20. 03	145	57.42
	P6 – F	35. 54	20. 21	143	70.61
	P7 – F	37. 43	19. 50	135	52.58
	P8 – F	35. 40	21. 52	144	61.30
	P9 – F	39. 48	25. 04	176	62.98
	P10 – F	25. 06	15. 31	126	61.81
	AVERAGE	*32.15*	*18.27*	*122.7*	*57.22*

The difference between genders by means of their rate of pause time to total time is just 3.71 percent, which is not a high value.

As for A2 level students, the males spent 66.44 percent of their time for pause behaviours (Table 10) and this value is 68.16 percent for females (Table 11).

Table 10: Pause Analysis of A2 level Students – Males

	PARTICIPANTS	*TOTAL TIME*	*TOTAL PAUSE TIME*	*PAUSE NUMBER*	*PAUSE TIME / TOTAL TIME %*
A2 LEVEL STUDENTS MALE	**P26 – M**	35. 44	23. 04	149	64.55
	P27 – M	36. 50	23. 54	160	64.88
	P28 – M	36. 34	19. 43	121	53.91
	P29 – M	30. 09	21. 21	145	70.81
	P30 – M	33. 32	20. 04	132	59.84
	P31 – M	32. 45	24. 43	145	75.97
	P32 – M	36. 24	23. 09	167	63.59
	P33 – M	30. 34	21. 12	132	69.35
	P34 – M	30. 24	21. 03	123	69.24
	P35 – M	37. 34	25. 48	154	68.67
	P36 – M	32. 21	23. 43	139	73.31
	AVERAGE	*33.53*	*22.31*	*142.45*	*66.44*

Table 11: Pause Analysis of A2 level Students - Females

	PARTICIPANTS	*TOTAL TIME*	*TOTAL PAUSE TIME*	*PAUSE NUMBER*	*PAUSE TIME / TOTAL TIME %*
A2 LEVEL STUDENTS FEMALE	**P19 – F**	39. 56	30. 01	212	75.16
	P20 – F	39. 25	25. 43	165	65.24
	P21 – F	38. 45	24. 40	145	63.65
	P22 – F	34. 00	21. 10	120	62.25
	P23 – F	38. 56	28. 32	201	73.28
	P24 – F	38. 35	25. 59	132	67.34
	P25 – F	34. 46	24. 08	146	69.41
	AVERAGE	*37.46*	*25.44*	*160.14*	*68.16*

As to A2 level students, the difference between males and females regarding the rate of pause time to total writing time is 1.72 percent which is also a very low rate and it is even a smaller ratio than the one in B2 level students.

Considering the time spent for higher and lower thinking skills during writing, the differences between males and females in both groups are very small numbers: it is 0.70 percent for B2 students and 1.70 percent for A2 students (see tables 12, 13, 14 and 15). No group has used more than one third of their total pause time for higher level thinking skills in their writing process and the maximum ratio of higher level thinking skills to total pause time is the males in B2 level students' value: 30.63 percent whereas the minimum ratio is the one of the females in A2 level students: 18.31.

Table 12: B2 level Students' Use of Thinking Skills - Males

	PARTICIPANTS	***TOTAL PAUSE TIME***	***USE OF LOWER LEVEL THINKING SKILLS***	***USE OF HIGHER LEVEL THINKING SKILLS (H.L.T.S.)***	***USE OF H.L.T.S. / TOTAL PAUSE TIME %***
B2 LEVEL STUDENTS MALE	**P11 – M**	21. 52	13. 35	8.17	37.88
	P12 – M	9. 56	5. 35	4.21	43.79
	P13 – M	26. 56	21. 27	5.29	20.35
	P14 – M	25. 04	15. 39	9.25	37.56
	P15 – M	16. 32	11. 53	4.39	28.12
	P16 – M	17. 54	15. 50	2.04	11.54
	P17 – M	15. 31	11. 52	3.39	23.52
	P18 – M	13. 02	7. 31	5.31	42.32
	AVERAGE	*19.06*	*12.55*	*5.25*	*30.63*

Table 13: A2 level Students' Use of Thinking Skills – Males

	PARTICIPANTS	*TOTAL PAUSE TIME*	*USE OF LOWER LEVEL THINKING SKILLS*	*USE OF HIGHER LEVEL THINKING SKILLS (H.L.T.S.)*	*USE OF H.L.T.S. / TOTAL PAUSE TIME %*
A2 LEVEL STUDENTS MALE	**P26 – M**	23. 04	17. 39	3.42	17.33
	P27 – M	23. 54	18. 26	1.38	8.13
	P28 – M	19. 43	27. 23	1.09	4.03
	P29 – M	21. 21	16. 24	8.19	33.64
	P30 – M	20. 04	14. 27	8.42	37.58
	P31 – M	24. 43	18. 01	3.11	15.01
	P32 – M	23. 09	17. 18	8.41	33.41
	P33 – M	21. 12	18. 31	2.32	12.03
	P34 – M	21. 03	16. 00	9.48	37.98
	P35 – M	25. 48	18. 27	5.16	22.20
	P36 – M	23. 43	21. 45	2.23	9.87
	AVERAGE	*22.31*	*18.34*	*5,01*	*21,01*

Table 14: B2 level Students' Use of Thinking Skills – Females

	PARTICIPANTS	*TOTAL PAUSE TIME*	*USE OF LOWER LEVEL THINKING SKILLS*	*USE OF HIGHER LEVEL THINKING SKILLS (H.L.T.S.)*	*USE OF H.L.T.S. / TOTAL PAUSE TIME %*
B2 LEVEL STUDENTS FEMALE	**P1 – F**	20. 09	16. 34	6.49	29.15
	P2 – F	13. 32	16. 56	7.49	31.58
	P3 – F	12. 30	15. 35	4.34	22.66
	P4 – F	10. 45	10. 43	2.49	20.81
	P5 – F	20. 03	8. 45	3.45	30
	P6 – F	20. 21	7. 44	3.01	28.06
	P7 – F	19. 50	16. 43	3.20	16.62
	P8 – F	21. 52	14. 23	8.40	37.59
	P9 – F	25. 04	12. 21	8	39.31
	P10 – F	15. 31	11. 12	8.38	43.52
	AVERAGE	*18.27*	*13.05*	*5.44*	*29,93*

Table 15: A2 level Students' Use of Thinking Skills - Females

	PARTICIPANTS	*TOTAL PAUSE TIME*	*USE OF LOWER LEVEL THINKING SKILLS*	*USE OF HIGHER LEVEL THINKING SKILLS (H.L.T.S.)*	*USE OF H.L.T.S. / TOTAL PAUSE TIME %*
A2 LEVEL STUDENTS FEMALE	**P19 – F**	30. 01	21. 42	1.22	5.92
	P20 – F	25. 43	17. 42	6.12	25.94
	P21 – F	24. 40	27. 48	2.13	7.38
	P22 – F	21. 10	22. 12	3.31	13.67
	P23 – F	28. 32	17. 48	6.52	27.83
	P24 – F	25. 59	13. 21	7.49	36.92
	P25 – F	24. 08	17. 38	2.05	10.56
	AVERAGE	*25.44*	*19.44*	*4.17*	*18.31*

4.3. Revision Behaviours of the Students

For the revision analysis of this study, the revisions were divided into two categories: surface-based revisions and text-based revisions. The multi dimensional revision taxonomy (see Appendix 8) developed by Stevenson et al. (2006) was used first and then the data was transformed into two categories mentioned above. The content revisions which changed the meaning of the text were transferred to text-based revisions and the linguistic revisions along with the typographic ones were transferred to surface-based ones.

After their first writing task, the students' texts were analysed using the data collected from keystroke logging linear analysis. The revisions were separated as surface-based revisions and text-based revisions in parallel to multi dimensional revision taxonomy. The t-test was also applied in order to analyse the significance of the relation. It was determined that 36.62 percent of B2 level students' revisions were text-based ones whereas this value is 17.43 percent in A2 level students' stories (Table 16).

Table 16: Revision Types of B2 – A2 Level Students

	PARTICIPANTS	*TOTAL REVISIONS*	*SURFACE-BASED REVISIONS*	*TEXT-BASED REVISIONS*	*TEXT-BASED REVISIONS / TOTAL REVISIONS %*
B2 LEVEL STUDENTS	**P1 – F**	34	19	15	44.11
	P2 – F	32	22	10	31.25
	P3 – F	25	16	9	36
	P4 – F	27	17	10	37.03
	P5 – F	26	14	12	46.15
	P6 – F	18	12	6	33.33
	P7 – F	25	19	6	24
	P8 – F	30	20	10	33.33
	P9 – F	38	21	17	44.73
	P10 – F	43	31	12	27.90
	P11 – M	36	28	8	22.22
	P12 – M	13	5	8	61.53
	P13 – M	25	13	12	48
	P14 – M	36	23	13	36.11
	P15 – M	20	12	8	40
	P16 – M	14	10	4	28.57
	P17 – M	18	12	6	33.33
	P18 – M	19	13	6	31.57
	AVERAGE	*26.61*	*17.05*	*9.55*	*36.62*
A2 LEVEL STUDENTS	**P19 – F**	37	32	5	13.51
	P20 – F	26	23	3	11.53
	P21 – F	34	31	3	8.82
	P22 – F	36	31	5	13.88
	P23 – F	43	39	4	9.30
	P24 – F	33	23	10	30.30
	P25 – F	25	20	5	20
	P26 – M	26	21	5	19.23
	P27 – M	10	8	2	20
	P28 – M	34	25	9	26.47
	P29 – M	19	18	1	5.26
	P30 – M	37	26	11	29.72
	P31 – M	32	26	6	18.75
	P32 – M	43	32	11	25.58
	P33 – M	28	27	1	3.57
	P34 – M	30	24	6	20
	P35 – M	25	21	4	16
	P36 – M	32	25	7	21.87
	AVERAGE	*30.55*	*25.11*	*5.44*	*17.43*

Then, both levels were divided into two groups randomly: experimental group and control group. The only criterion in distinguishing these two groups is controlling the number of males and females equal (Tables 17, 18, 19 and 20).

Table 17: Revision Types of B2 Level Students / Experimental Group – First Session

	PARTICIPANTS	*TOTAL REVISIONS*	*SURFACE-BASED REVISIONS*	*TEXT-BASED REVISIONS*	*TEXT-BASED REVISIONS / TOTAL REVISIONS %*
EXPERIMENTAL GROUP B2	**P1 – F**	34	19	15	44.11
	P2 – F	32	22	10	31.25
	P3 – F	25	16	9	36
	P4 – F	27	17	10	37.03
	P5 – F	26	14	12	46.15
	P11 – M	36	28	8	22.22
	P12 – M	13	5	8	61.53
	P13 – M	25	13	12	48
	P14 – M	36	23	13	36.11
	AVERAGE	*28.22*	*17.44*	*10.77*	*40.27*

Table 18: Revision Types of B2 Level Students / Control Group – First Session

	PARTICIPANTS	*TOTAL REVISIONS*	*SURFACE-BASED REVISIONS*	*TEXT-BASED REVISIONS*	*TEXT-BASED REVISIONS / TOTAL REVISIONS %*
CONTROL GROUP B2	**P6 – F**	18	12	6	33.33
	P7 – F	25	19	6	24
	P8 – F	30	20	10	33.33
	P9 – F	38	21	17	44.73
	P10 – F	43	31	12	27.90
	P15 – M	20	12	8	40
	P16 – M	14	10	4	28.57
	P17 – M	18	12	6	33.33
	P18 – M	19	13	6	31.57
	AVERAGE	*25*	*16.66*	*8.33*	*32.97*

Table 19: Revision Types of A2 Level Students / Experimental Group – First Session

	PARTICIPANTS	*TOTAL REVISIONS*	*SURFACE-BASED REVISIONS*	*TEXT-BASED REVISIONS*	*TEXT-BASED REVISIONS / TOTAL REVISIONS %*
EXPERIMENTAL GROUP A2	**P19 – F**	37	32	5	13.51
	P20 – F	26	23	3	11.53
	P21 – F	34	31	3	8.82
	P26 – M	26	21	5	19.23
	P27 – M	10	8	2	20
	P28 – M	34	25	9	26.47
	P29 – M	19	18	1	5.26
	P30 – M	37	26	11	29.72
	P31 – M	32	26	6	18.75
	AVERAGE	*28.33*	*46.66*	*5*	*17.03*

Table 20: Revision Types of A2 Level Students / Control Group – First Session

	PARTICIPANTS	*TOTAL REVISIONS*	*SURFACE-BASED REVISIONS*	*TEXT-BASED REVISIONS*	*TEXT-BASED REVISIONS / TOTAL REVISIONS %*
CONTROL GROUP A2	**P22 – F**	36	31	5	13.88
	P23 – F	43	39	4	9.30
	P24 – F	33	23	10	30.30
	P25 – F	25	20	5	20
	P32 – M	43	32	11	25.58
	P33 – M	28	27	1	3.57
	P34 – M	30	24	6	20
	P35 – M	25	21	4	16
	P36 – M	32	25	7	21.87
	AVERAGE	*32.77*	*26.88*	*5.88*	*17.83*

As seen in the table below (Table 21 and 22), there is no significant difference between the results of control group students and experimental group students in B2 level as well as A2 level in the first session.

Table 21: Comparison between B2 level Control Group First Session & Experimental Group First Session

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
B2Con1B2Exp1	1.00	9	32.9733	6.28085	2.09362
	2.00	9	40.2667	11.25977	3.75326

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
B2Con1B2Exp1	Equal variances assumed	2.593	.127	-1.697	16	.109	-7.29333	4.29769	-16.40404	1.81737
	Equal variances not assumed			-1.697	12.539	.114	-7.29333	4.29769	-16.61275	2.02609

Table 22: Comparison between A2 level Control Group First Session & Experimental Group First Session

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
A2Con1A2Exp1	1.00	9	17.8333	8.18812	2.72937
	2.00	9	17.0322	8.02610	2.67537

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
A2Con1A2Exp1	Equal variances assumed	.002	.964	.210	16	.837	.80111	3.82192	-7.30100	8.90322
	Equal variances not assumed			.210	15.994	.837	.80111	3.82192	-7.30126	8.90348

After the stimulated recall sessions, the control group students were given a written feedback quite different from the one they used to receive (see Appendix 9). The main significant change in the new feedback is marking the place of the errors or mistakes with terms (e.g. organisation, relevance) relating to higher-order cognitive skills.

The experimental group students had an extra stimulated recall session during which they were guided to focus more on higher-order cognitive skills and text-based revisions accordingly. In this session, they were leaded to discuss over their revisions while the replay function of Inputlog was on again, and the questions mainly focused on contextual and global issues, as well as the comments of the researcher.

After these sessions all the students began writing their second story beginning with "It was a wonderful morning when I saw her." They all did their tasks in keystroke logging programme, Inputlog, again and the results were collected in the same way as the first writing task. The same taxonomy was used to separate the revision types and new scores were determined before they were compared with the first session's values.

There was a significant increase of text-based revisions in the second sessions, mainly in B2 level students (The *p* value for this group is .001), after the stimulated recall sessions.

Table 23: Comparison between B2 Control Group Second Session & Experimental Group Second Session

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
B2Con2B2Exp2	1.00	9	44.3733	7.44705	2.48235
	2.00	9	58.3333	7.22083	2.40694

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
B2Con2B2Exp2	Equal variances assumed	.190	.669	-4.037	16	.001	-13.96000	3.45766	21.28992	-6.63008
	Equal variances not assumed			-4.037	15.985	.001	-13.96000	3.45766	21.29049	-6.62951

Table 24: Comparison between A2 Control Group Second Session & Experimental Group Second Session

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
A2Con2A2Exp2	1.00	9	25.1378	7.16997	2.38999
	2.00	9	36.0222	11.39484	3.79828

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
A2Con2A2Exp2	Equal variances assumed	.620	.442	-2.425	16	.027	-10.88444	4.48765	20.39783	-1.37106
	Equal variances not assumed			-2.425	13.476	.030	-10.88444	4.48765	20.54469	-1.22420

All in all, all the students raised the number of text-based revisions in different values. There is an increase of 18.06 percent, the maximum value of 58.33 percent of text-based revisions in the total time, in B2 level experimental group students whereas this increase is 11.40 percent in control group students of the same level (Tables 25 and 27).

Table 25: Revision Types of B2 Level Students / Experimental Group – Second Session

	PARTICIPANTS	***TOTAL REVISIONS***	***SURFACE-BASED REVISIONS***	***TEXT-BASED REVISIONS***	***TEXT-BASED REVISIONS / TOTAL REVISIONS %***
EXPERIMENTAL GROUP B2	**P1 – F**	44	20	24	54.54
	P2 – F	33	14	19	57.57
	P3 – F	32	15	17	53.12
	P4 – F	37	16	21	56.75
	P5 – F	29	10	19	65.51
	P11 – M	37	20	17	45.94
	P12 – M	17	5	12	70.58
	P13 – M	32	12	20	62.50
	P14 – M	53	22	31	58.49
	AVERAGE	*34.88*	14.88	20	58.33

The most significant raise can be observed in t-test results for B2 level experimental group students.

Table 26: Between B2 Experimental Group First Session & Experimental Group Second Session

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
B2Exp1B2Exp2	1.00	9	40.2667	11.25977	3.75326
	2.00	9	58.3333	7.22083	2.40694

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
B2Exp1B2Exp2	Equal variances assumed	1.551	.231	-4.052	16	.001	-18.06667	4.45874	-27.51876	-8.61457
	Equal variances not assumed			-4.052	13.628	.001	-18.06667	4.45874	-27.65424	-8.47910

Table 27: Revision Types of B2 Level Students / Control Group – Second Session

	PARTICIPANTS	*TOTAL REVISIONS*	*SURFACE-BASED REVISIONS*	*TEXT-BASED REVISIONS*	*TEXT-BASED REVISIONS / TOTAL REVISIONS %*
CONTROL GROUP B2	**P6 – F**	24	12	12	50
	P7 – F	32	16	16	50
	P8 – F	32	21	11	34.37
	P9 – F	34	18	16	47.05
	P10 – F	44	30	14	31.81
	P15 – M	21	10	11	52.38
	P16 – M	16	9	7	43.75
	P17 – M	24	12	12	50
	P18 – M	25	15	10	40
	AVERAGE	*28*	*15.88*	*12.11*	*44.37*

The t-test results also show that there is a significant increase of text-based revisions in B2 level control group students; however, it is not as significant as the experimental group as the *p* value is .003 here while this value is .001 for experimental group students.

Table 28: Between B2 Control Group First Session & Control Group Second Session

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
B2Con1B2Cont2	1.00	9	32.9733	6.28085	2.09362
	2.00	9	44.3733	7.44705	2.48235

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
B2Con1B2Cont2	Equal variances assumed	.858	.368	-3.511	16	.003	-11.40000	3.24735	-18.28408	-4.51592
	Equal variances not assumed			-3.511	15.557	.003	-11.40000	3.24735	-18.30003	-4.49997

Regarding A2 level students, the numbers of text-based revisions were also higher than the first session for both groups. This increase is 18.99 percent, the maximum increase in all groups, in the experimental group and it is 7.30 percent in the control group of this level. The most important number here is the raise observed in A2 level experimental group, which is twice as much as the first session: from 17.03 percent to 36.02 percent (Tables 29 and 31). One of the participants in this group (P27 – M) has more text-based revisions than surface-based revisions in the second writing session.

Table 29: Revision Types of A2 Level Students / Experimental Group – Second Session

	PARTICIPANTS	*TOTAL REVISIONS*	*SURFACE-BASED REVISIONS*	*TEXT-BASED REVISIONS*	*TEXT-BASED REVISIONS / TOTAL REVISIONS %*
EXPERIMENTAL GROUP A2	**P19 – F**	37	23	14	37.83
	P20 – F	41	25	16	39.02
	P21 – F	35	30	5	14.28
	P26 – M	26	16	10	38.46
	P27 – M	14	6	8	57.14
	P28 – M	35	22	13	37.14
	P29 – M	25	18	7	28
	P30 – M	47	28	19	40.42
	P31 – M	47	32	15	31.91
	AVERAGE	*34.11*	*22.22*	*11.88*	*36.02*

The difference between the first session and the second session in A2 level experimental group students is also significant with the value of .001 in the t-test.

Table 30: Between A2 Experimental Group First Session & Experimental Group Second Session

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
A2Exp1A2Exp2	1.00	9	17.0322	8.02610	2.67537
	2.00	9	36.0222	11.39484	3.79828

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
A2Exp1A2Exp	Equal variances assumed	.126	.728	-4.087	16	.001	-18.99000	4.64591	-28.83890	-9.14110
	Equal variances not assumed			-4.087	14.370	.001	-18.99000	4.64591	-28.93047	-9.04953

Table 31: Revision Types of B2 Level Students / Control Group – Second Session

	PARTICIPANTS	*TOTAL REVISIONS*	*SURFACE-BASED REVISIONS*	*TEXT-BASED REVISIONS*	*TEXT-BASED REVISIONS / TOTAL REVISIONS %*
CONTROL GROUP A2	**P22 – F**	35	24	11	31.42
	P23 – F	46	37	11	23.91
	P24 – F	36	28	8	22.22
	P25 – F	25	18	7	28
	P32 – M	36	26	10	27.77
	P33 – M	29	26	3	10.34
	P34 – M	47	26	11	23.40
	P35 – M	26	20	6	23.07
	P36 – M	36	23	13	36.11
	AVERAGE	*35.11*	*25.33*	*8,88*	*25.13*

The difference between the first session and the second session in A2 level control group students is not significant as the value is above .005 in the t-test (the *p* value is .061).

Table 32: Between A2 Control Group First Session & Control Group Second Session

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
A2Con1A2Con2	1.00	9	17.8333	8.18812	2.72937
	2.00	9	25.1378	7.16997	2.38999

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
A2Con1A2Con2	Equal variances assumed	.341	.567	-2.013	16	.061	-7.30444	3.62788	-14.99521	.38632
	Equal variances not assumed			-2.013	15.726	.062	-7.30444	3.62788	-15.00612	.39723

4.4. Conclusion

In this chapter the findings of the data analysis were presented in the order of the research questions of this study and the findings were converted into tables. As the findings of this study, it can be summarised that B2 level students spent more time for higher-order cognitive skills than A2 level students but there is no difference between the order of thinking skills of males and females.

Considering the revision behaviours of the students, it is clear that stimulated recall sessions have a positive effect in leading the students make more text-based revisions than surface-based revisions.

In the next chapter, Conclusion, the discussion and implications of the study will be presented in the light of what the findings revealed. The next chapter also includes a conclusion of the study and suggestions for further studies.

CHAPTER V

CONCLUSION

5.1. Overview of the Study

This study aimed at determining thinking skills of students through identifying their cognitive processes in EFL writing. In addition to this, the differences between students with different English competences and genders were analysed by means of their thinking skills. Moreover, the role of stimulated recall methodology as a trigger to foster higher-order thinking skills was synthesised in this research.

Firstly, the tool chosen for data collection was Inputlog, which is a keystroke logging tool. The reasons for choosing Inputlog as a data collection tool were its facilities providing researchers with various data and the replay function which give the opportunity to realise the writing process for the researcher, the teacher and the student. As the participants were familiar with this software, no instruction was required for both groups of students; B2 level students and the A2 level ones.

Secondly, the writing task chosen from a PET writing question was given to the students and they completed their task using Inputlog. The reason for choosing this task was that the ninth grade's curriculum is very similar to PET syllabus and the students had been studying for this kind of tasks for a long time.

Thirdly, stimulated recall sessions were designed by the researcher and an English Language Instructor which aimed at uncovering the cognitive processes of the students. The reason for a third person's presence in these sessions is to provide reliability. Then the students of each level were divided into two groups; the experimental group and the control group. After, the experimental group students had an extra session during which they were leaded to make more text-based questions, watching their writing process through the replay function of Inputlog whereas the control group of students were given a different form of writing feedback they used to receive.

Lastly, the revision behaviours of the students were identified and compared with the ones in the first session. The results were categorised using the multi dimensional revision taxonomy. The findings were collected in the form of surface-based revisions and text-based revisions. These findings were also analysed in the t-test so as to determine the significance of the relations.

In this chapter, the findings of the present study will be discussed in the order of research questions of the study. The results will be associated with the literature and the parallel and conflicted points will be presented in the discussion section. Then, suggestions for further research will be given and the major findings of the study will be summarised in the conclusion.

5.2. Discussion of the Findings

The findings of the research questions were discussed in this section respectively. The results will be analysed with the comparison of the results of the previous research.

5.2.1 Thinking Skills

The first research question was about what students were thinking when they paused during their writing tasks and this question had two sub questions. The first one was the difference between thinking skills of the students with different English levels and the second one was related to the difference of cognitive skills between genders.

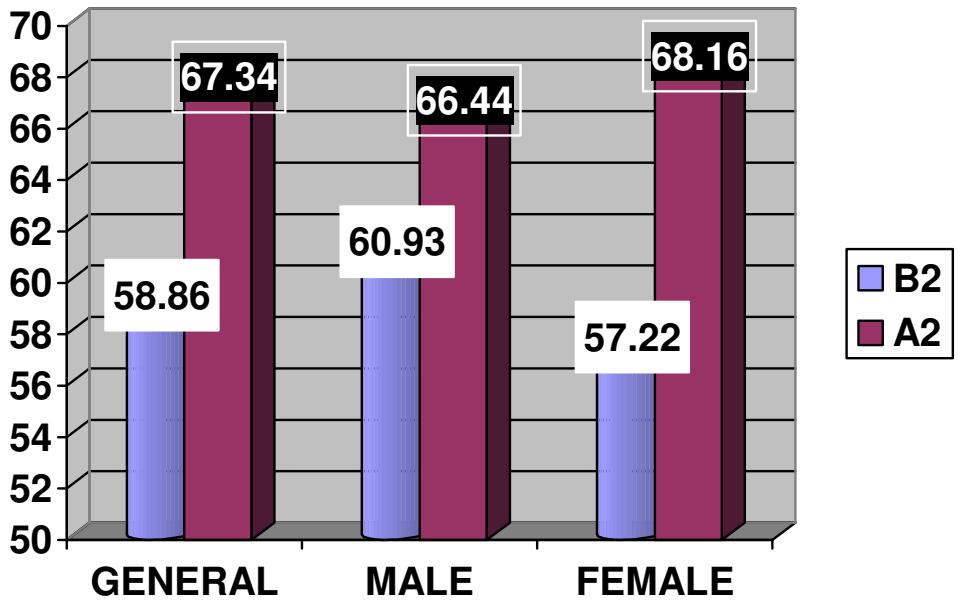

Figure 10: Pause Analysis of B2 and A2 Level Students

The pause analysis shows that A2 level students spent 67.34 percent of their writing time for pauses while B2 level students used 58.86 percent of their time pausing. As seen in the figure above there is no significant difference between males and females in both groups considering the time they spent for pausing.

The time spent for pausing seems much when compared to Sullivan & Lindgren's study (2002) but the fact that the participants in that study were adults should be considered. There were four participants in that study and their pause times were 42, 47, 58 and 30 percent of the total writing time. They were more computer literate than the participants in this research and their typographic changes weren't as much as these learners.

5.2.1.1 Higher Level and Lower Level Thinking Skills in Different Levels

As a result of this study, pause behaviours of the students involving the research were determined and it was seen that students with higher English competences used their higher level thinking skills much more than the other students (Figure 11).

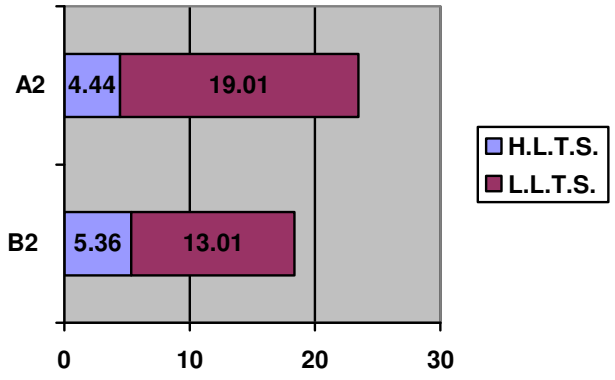

Figure 11: Thinking Skills of A2 and B2 Students (H.L.T.S. = Higher Level Thinking Skills, L.L.T.S. = Lower Level Thinking Skills)

As seen in the figure above, the use of higher level thinking skills is too low in A2 students even the pause time during the writing task is longer than B2 level students.

Warren (1996) found that lexical and structural pauses occurred more frequently among the foreign language writers in her research comparing first language and foreign language writers' pausing behaviours.

In another research in the same field as Warren's study, Broekkamp & Van den Bergh (1996) argued that because the density of linguistic problems in their text is higher than first language writers, foreign language writers are more tempted to restrict their attention to linguistic demands.

In addition to these studies, Chenoweth and Hayes (2001) and Stevenson et al. (2003) had the same results supporting the inhibition hypothesis claiming lower linguistic competence hinders higher level thinking skills. A strong focus on linguistic demands during writing occupy a large amount of a writer's working memory resources; as a result, less cognitive capacity is available for higher level processing of, for example, content, audience and style (Whalen & Ménard, 1995; Schoonen et al., 2003).

To sum up, in terms of the first research question, there are some similar types of results in the research in this field. Even if the previous studies are mainly focused on the comparison of first and foreign or second language writers, the common claim is that there is a relationship between language competency and the level of thinking skill used.

5.2.1.2. Higher Level and Lower Level Thinking Skills in Different Gender

The second sub-problem of the first research question was related to the differences of thinking skills between males and females. At the end of the analysis of the data, it was found that there is no exact difference of thinking skills between genders (Figure 11 and 12)

Figure 12: The rate of Higher Level Thinking Skills to Total Pause Time – A2 Level Students

Figure 13: The rate of Higher Level Thinking Skills to Total Pause Time – B2 Level Students

The figures above clearly shows that the use of higher-order cognitive skills is very low for both levels and the difference between genders in A2 is 2.70 percent and this rate is 0.70 for B2 level students.

In literature, this kind of research questions weren't studied at all so there is no opportunity to compare these results with previous studies, but it is not wrong to claim that it is almost impossible to make a categorisation as males and females considering their thinking skills.

5.2.2 The Role of Stimulated Recall Methodology in Revision Behaviours

Stimulated recall methodology was used along with keystroke logging data to foster higher-order cognitive skills, leading the students make more text-based revisions during they wrote their texts.

In the first session, the rate of text-based changes to the total changes was only 17.43 percent in A2 level students (Figure 13) while this value is 36.62 percent in B2 level students (Figure 14).

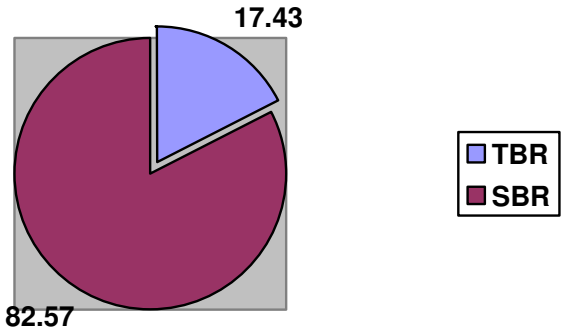

Figure 14: The rate of Text-Based Revisions (TBR) and Surface-Based Revisions (SBR) in A2 Level Students

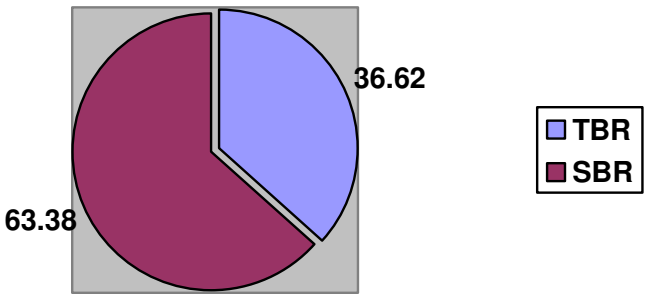

Figure 15: The rate of Text-Based Revisions (TBR) and Surface-Based Revisions (SBR) in B2 Level Students

It was also found that most of these surface-based revisions are typographic revisions, which might also be a result of lack of computer literacy. Typographic revisions represented nearly 60% of all revisions made in the research done by Stevenson et al. (2006). Nonetheless, it needs to be clarified that such a high percentage of typographic revisions is not an unusual feature for writers doing their tasks on word processors. For instance, results of the study made by Kim (2001) on typographic revisions showed that 64% of the total number of revisions in a writing task was typographic revisions. Some studies have also excluded this kind of revisions on the assumption that they are purely a reflection of typing skills of the students.

All in all, these rates for text-based revisions are really low as they show the students' attention, which focus on structural aspects. Nevertheless, it is believed that, in process writing, "treating any piece of writing primarily as a source of language…" (White & Arndt, 1991, p. 2) creates an important problem and this prevents learners to concentrate on higher- order cognitive skills. For this reason, all the students were given a different feedback leading them to put emphasis on global problems in their texts. The control groups received different criteria in their usual form, written feedback, and the experimental groups had an extra stimulated recall session focusing on text-based revisions.

The results are much closer to the philosophy of process writing since all the groups' average rates of making text-based revisions increased in their second story (Figure 16).

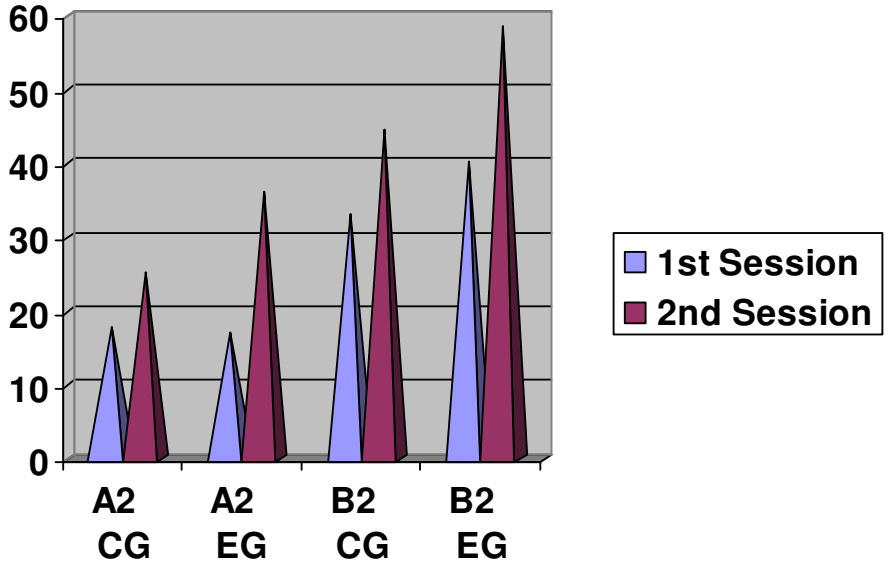

Figure 16: The rates of Text-Based Revisions (TBR) in Control Groups (CG) and Experimental Groups (ER).

In this figure, it is clear that all the groups raised the amount of text-based revision rates. These rates seem satisfying considering the literature; for example, the number of text-based revisions is five in 100 words in Sullivan & Lindgren's study (2002).

The role of stimulated recall as a positive factor affecting quality of texts is parallel to the research done by Lindgren & Sullivan (2003). Their study "provides strong evidence that using keystroke logging as a prime for a stimulated recall peer discussion session can trigger an increase in noticing and language awareness that leads to more text revision."(p. 159). They also found that there were more non-surface level revisions after stimulated recall sessions, which makes this clear that it is quite possible to shift the attention of the students from linguistic features to more conceptual ones through the use of stimulated recall methodology.

5.3. Implications for Findings

This study aimed at uncovering cognitive processes of students and identifying their mental operations through stimulated recall session along with keystroke logging data. Ninth grade students at Ankara University Development Foundation Schools participated in this research during their two-hour weekly Process Writing course in 2006 – 2007 academic year.

It was found that lower level processes are more common in EFL writing although students with higher English competences performed more higher level mental processes. No relationship between gender and thinking skills was observed in this study.

The role of stimulated recall methodology as a trigger posing higher-order cognitive skills was found in this study and its effect for leading writers make more text-based revisions was determined.

The necessity of this study is its conveying ways to uncover cognitive processes of students and it shows different alternatives to find traces from mental processes of learners.

The results of this study will provide researchers with new insights on this topic and this study will be useful for them for further research. Moreover, this research will provide teachers with information about features of keystroke logging tools and characteristics of stimulated recall methodology as well as their practical usages in EFL classroom.

5.4. Suggestions

This section includes practical suggestions for researchers, teachers, and further research. In this section, how researchers and teachers can benefit from the results of this research will be briefly mentioned.

5.4.1. Suggestions for Researchers

Pause and revision analysis studies are not so common in EFL writing research. Moreover, keystroke logging tools do not have a long history, which means that there is a lot to develop in these software. Van Waes and Lejiten, the developers of Inputlog have still been working on revision analysis data feature of this programme (van Waes & Lejiten, 2006). Therefore, potential studies, especially in revision analysis, should be determined in order to benefit from this outstanding data collection tool in the future.

This study also provides information about the possible areas to combine keystroke logging software with stimulated recall methodology. By this way, it is also possible to provide more reliable and valid data to be used in stimulated recall sessions.

Researchers can design new studies based upon the results of this study and they can implement their research using these modern tool and methodology in order to find traces from cognitive processes of learners.

5.4.2. Suggestions for Teachers

Teachers may lead their students to use computers for their development in EFL writing in view of this study. Before directing them to these environments, they should be aware of the characteristics of this new medium in EFL writing. Therefore,

the findings of this study will provide detailed information about the basic patterns of computer-mediated writing. They will know that a student who is advised to use a keystroke logging programme will be able to identify his or her own writing process and this process can be easily assessed by teachers, which will lead them to find unknown traces from their students' mental processes.

In their courses, teachers should then place importance on using these tools more and more so as to discover their students' unidentified mental features. Furthermore, they may have great opportunities to make the students get more independent and autonomous learners with the help of stimulated recall sessions.

5.4.3. Suggestions for Further Research

This study was mostly about the cognitive skills of EFL writers and the role of stimulated recall methodology to foster higher-order cognitive skills. This will provide information about the kinds of thinking skills EFL writers use and assert different ways to observe them. As for further research, there are still many points to be studied and discovered.

First of all, Inputlog was used for collecting data. This software is still being developed and a revision analysis part will be included soon. Revision analysis research can be done more easily and in a more comprehensive way with this feature of the programme.

As for the participants of this study, ninth grade students, all of whom are 15 years old participated in this study. They were two levels considering their English competence. For further research, the same level students with different age groups can participate the writing sessions. In the end, the results can be compared and the effect of age may be discussed.

The other point which can be studied is on which topic the participants use higher level thinking skills and on which topic they tend to use lower level thinking skills. The impact of text types or genres on thinking skills can be observed in the same study. In this study, this was not determined and it was beyond the scope of the study.

Finally, the last research to suggest is using peers or groups in stimulated recall sessions to increase the cooperation and collaboration issues in the research. This kind of research will be more convenient than the present one in terms of post-process approach which is becoming a dominant trend in EFL writing.

5.5. Conclusion

The results of this study revealed that more than half of pause time in writing sessions was spent for lower level thinking skills in both A2 and B2 level students. Nonetheless, this time is much longer in A2 level students than B2 level students, which clarifies that lack of linguistic input hinders the use of higher level thinking skills in EFL writing. On the other hand, there is no significant difference between males and females in both levels.

Another result was that stimulated recall sessions had a positive effect fostering the students to use higher-order cognitive skills, which is observed through the increase in text-based changes in both levels. This result was also consistent with the results of previous studies in literature.

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APPENDICES

APPENDIX 1: PET Exam applied to the participants at the beginning of the Academic Year

A – Cover of the "Reading and Writing" Paper

UNIVERSITY OF CAMBRIDGE ESOL EXAMINATIONS
English for Speakers of Other Languages
PRELIMINARY ENGLISH TEST
PAPER 1 Reading and Writing
SAMPLE PAPER 1

Additional materials:

Answer sheets
Soft clean eraser
Soft pencil (type B or HB is recommended)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Write these details on your answer sheets **if they are not already printed**.
Answer **all** questions.
Write your answers clearly **on the separate answer sheets**. Use a pencil.

You may use the question paper for any rough work, but you must write your answers in pencil on the answer sheets. You will have no extra time for this, so you must finish in one and a half hours.

At the end of the examination, you should hand in both the question paper and the answer sheets.

INFORMATION FOR CANDIDATES

READING
Questions 1-35 carry one mark.

WRITING
Questions 1-5 carry one mark.
Part 2 (Question 6) carries five marks.
Part 3 (Question 7 or 8) carries fifteen marks.

This question paper consists of 14 printed pages and 2 blank pages

B – Cover of the "Listening" Paper

UNIVERSITY OF CAMBRIDGE ESOL EXAMINATIONS
English for Speakers of Other Languages
PRELIMINARY ENGLISH TEST
PAPER 2 Listening
SAMPLE PAPER 1

Additional materials:
Answer sheets
Soft clean eraser
Soft pencil (type B or HB is recommended)

TIME Approx. 35 minutes (including 6 minutes transfer time)

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page. Write these details on your answer sheet **if these are not already printed**.

Answer **all** questions.

Write your answers on the question paper.

You will have six minutes at the end of the test to copy your answers, in pencil, onto the separate answer sheet.

At the end of the examination, hand in both the question paper and the answer sheet.

INFORMATION FOR CANDIDATES

There are four parts to the test.
Each question in this paper carries one mark.
You will hear each part **twice**.
For each part of the test there will be time for you to look through the questions and time for you to check your answers.

This question paper consists of 7 printed pages and 1 blank page.

C – Information about the "Speaking" Part

Paper 3: Speaking

Paper Format

This paper contains four parts.

The standard format is two candidates and two examiners.

One examiner acts as both assessor and interlocutor and manages the interaction by asking questions and setting up the tasks. The other acts as assessor and does not join in the conversation.

Task Types

Short exchanges with the examiner; a collaborative task involving both candidates; a one-minute long turn and a follow up discussion.

Timing

10–12 minutes per pair of candidates.

Marks

Candidates are assessed on their performance throughout the test.

There are a total of 25 marks in Paper 3, making 25% of the total score for the whole examination.

APPENDIX 2: Sample Papers

I AM SO SORRY!!!

I felt nervous when the phone rang. I was at home and I was sleeping. I opened telephone and speak. My friend called me. He was frightened. He wanted help because his father had debt and he must gave the money. He said he had a plan and we will steal money from a bank. I said:

- No!

But he said

- He will go without me

I say;

- then I will go.

We went to a bank and we had got toy guns. We said hands up and everyone frightened. We went to the manager abd wanted the money. We put the money in my friend's school bag. We ran quickly but then eveyhwhere was in black and grey. Because police put a fog bomb in front of bank.

My friend ran away but I couldn't. Now I am in prison and my friend outside. I do not know where is he???

THE END

HAPPINESS!

I felt nervous when the telephone rang. I was really angry as I had just felt asleep. And the weather was really very hot which made me too tense. I turned on the phone and it was my father. I realised that he had been crying.

He said that his car had been stolen. Furthermore, his belongings like his wallet were in the car. I immediately got into my car and went to my father's house. I saw him crying and then I phoned to one of my friends, Bob who is a police.

Bob picked me up and we went to a small town full of cars. Bob and I spoke to a man and I gave 50 YTL to the man. Then, the guy showed us the place of our car. I was very happy until I saw my father's car which was totally crashed!!

APPENDIX 3 – Global Scale
(www.coe.int/T/DG4/Portfolio/documents/globalscale.doc)

B2	Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.
A2	Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.

APPENDIX 4: Sample Paper

CHANCE AND CHANGE

It was a wonderful morning when I saw her. She was a lovely little girl begging money on the edge of the pavement I was walking along. I had an urge to speak with her immediately the moment I realised her. After, I showed her 50 YTL and told her that she had to have lunch with me if she wanted to have the money. She accepted this generous offer without any hesitation. We had a wonderful meal together, at the last minute of which she decided to talk about herself and her life.

Damla is now my research assistant at university and one of the most promising students we ever had. I wish I had seen her before and she hadn't had those days with sorrow. Furthermore, I have always kept in mind that one chance may result in big changes.

APPENDIX 5 – A: Sample "Statistical Analysis"

Statistical Analysis (C:\Program Files\inputlog\aycanStatisticalAnalysis.xls)

Session Information	
Participant	aycan
Sex	f
Session	2
Group	b2
Experience	10
Age	15

Product	
total number of characters	719
total number of words	188
average length of words	3.825
sd of words	2.231
total number of sentences	4
average length of sentences	179.75
sd of sentences	0
total number of paragraphs	4
average length of paragraphs	179.75
sd of paragraphs	89.673

writing mode	
number of switches	30
total time in keyboard	00:11.16,267
mean time in keyboard	45.08446667
sd of mean time in keyboard	94.312
total time in mouse	00:05.20,732
mean time in mouse	20.0458125
sd of mean time in mouse	16.108

Pauses	
session time	00:16.37,000
production time_2	00:07.55,160
pause time_2	00:08.41,840
# of pauses_2	78
mean pause time_2	6.691
sd of mean pause time_2	9.186

APPENDIX 5 – B: Sample "Pause Analysis"

Pause analysis (minimum pause length >= 2 seconds)

Session Information	
Participant	aycan
Sex	f
Session	2
Group	b2
Experience	10
Age	15

Statistics	
total number of pauses	78
total pause time in seconds	521.84
total pause time	00:08.41,839
mean pause time	6.691
sd pause time	9.186
number of pauses per interval	
interval 1/10	6
interval 2/10	9
interval 3/10	7
interval 4/10	6
interval 5/10	9
interval 6/10	9
interval 7/10	14
interval 8/10	9
interval 9/10	6
interval 10/10	3
mean pause time per interval	
interval 1/10	8.555
interval 2/10	6.152
interval 3/10	6.215
interval 4/10	3.191
interval 5/10	5.158
interval 6/10	3.785
interval 7/10	3.411
interval 8/10	8.283
interval 9/10	10.474
interval 10/10	28.964
sd pause time per interval	
interval 1/10	9.428
interval 2/10	5.539
interval 3/10	8.104
interval 4/10	0.877
interval 5/10	3.931
interval 6/10	1.883
interval 7/10	1.13
interval 8/10	6.546
interval 9/10	14.049
interval 10/10	23.136

pause location	
total number of pauses within words	0
mean length of pauses within words	0
sd of length of pauses within words	0
total number of pauses between words	70
mean length of pauses between words	6.651
sd of length of pauses between words	9.512
total number of pauses between sentences	0
mean length of pauses between sentences	0
sd of length of pauses between senteces	0
total number of pauses between paragraphs	8
mean length of pauses between paragraphs	7.041
sd of length of pauses between paragraphs	5.559

...

APPENDIX 5 – C: Sample "General Analysis"

Output	input in	Input in_sec	input out	input out_sec	action time	action time_sec	pause time	Pause time
Movement	00:00.00,015	0.015	00:00.04,625	4.625	00:00.04,610	4.610	00:00.05,766	5.766
I	00:00.05,781	5.781	00:00.05,890	5.890	00:00.00,109	0.109	00:00.00,281	0.281
SPACE	00:00.06,062	6.062	00:00.06,172	6.172	00:00.00,110	0.110	00:00.00,610	0.610
F	00:00.06,672	6.672	00:00.06,828	6.828	00:00.00,156	0.156	00:00.00,093	0.093
E	00:00.06,765	6.765	00:00.06,890	6.890	00:00.00,125	0.125	00:00.00,157	0.157
L	00:00.06,922	6.922	00:00.07,047	7.047	00:00.00,125	0.125	00:00.00,156	0.156
T	00:00.07,078	7.078	00:00.07,203	7.203	00:00.00,125	0.125	00:00.00,156	0.156
SPACE	00:00.07,234	7.234	00:00.07,328	7.328	00:00.00,094	0.094	00:00.01,297	1.297
N	00:00.08,531	8.531	00:00.08,625	8.625	00:00.00,094	0.094	00:00.00,109	0.109
E	00:00.08,640	8.640	00:00.08,734	8.734	00:00.00,094	0.094	00:00.00,219	0.219
R	00:00.08,859	8.859	00:00.08,953	8.953	00:00.00,094	0.094	00:00.00,328	0.328
V	00:00.09,187	9.187	00:00.09,297	9.297	00:00.00,110	0.110	00:00.00,156	0.156
O	00:00.09,343	9.343	00:00.09,437	9.437	00:00.00,094	0.094	00:00.00,219	0.219
U	00:00.09,562	9.562	00:00.09,656	9.656	00:00.00,094	0.094	00:00.00,156	0.156
S	00:00.09,718	9.718	00:00.09,843	9.843	00:00.00,125	0.125	00:00.00,157	0.157
SPACE	00:00.09,875	9.875	00:00.09,984	9.984	00:00.00,109	0.109	00:00.00,547	0.547
W	00:00.10,422	10.422	00:00.10,515	10.515	00:00.00,093	0.093	00:00.00,203	0.203
H	00:00.10,625	10.625	00:00.10,703	10.703	00:00.00,078	0.078	00:00.00,062	0.062
E	00:00.10,687	10.687	00:00.10,781	10.781	00:00.00,094	0.094	00:00.00,453	0.453
N	00:00.11,140	11.140	00:00.11,234	11.234	00:00.00,094	0.094	00:00.00,203	0.203
SPACE	00:00.11,343	11.343	00:00.11,468	11.468	00:00.00,125	0.125	00:00.01,032	1.032
T	00:00.12,375	12.375	00:00.12,484	12.484	00:00.00,109	0.109	00:00.00,172	0.172
H	00:00.12,547	12.547	00:00.12,672	12.672	00:00.00,125	0.125	00:00.00,062	0.062
E	00:00.12,609	12.609	00:00.12,734	12.734	00:00.00,125	0.125	00:00.00,203	0.203
SPACE	00:00.12,812	12.812	00:00.12,906	12.906	00:00.00,094	0.094	00:00.00,828	0.828
P	00:00.13,640	13.640	00:00.13,765	13.765	00:00.00,125	0.125	00:00.00,516	0.516
H	00:00.14,156	14.156	00:00.14,297	14.297	00:00.00,141	0.141	00:00.00,109	0.109
O	00:00.14,265	14.265	00:00.14,359	14.359	00:00.00,094	0.094	00:00.00,219	0.219
N	00:00.14,484	14.484	00:00.14,578	14.578	00:00.00,094	0.094	00:00.00,094	0.094
E	00:00.14,578	14.578	00:00.14,656	14.656	00:00.00,078	0.078	00:00.00,125	0.125
SPACE	00:00.14,703	14.703	00:00.14,797	14.797	00:00.00,094	0.094	00:00.00,984	0.984

APPENDIX 5 – D: Sample "Linear Analysis"

Linear Text Analysis 1

[MwC.889,688-622,445]
IFELTNERVOUSWHENTHEPHONERSA[BS 1]
NG>[LEFT 35]
[LEFT 1]
[TAB 1]
[END]
IWASATHOMEANDIWASSLEEPING>IOPENEDTH[BS 1]
ELEPHONEANDSPEAK>MFFRIEND[LEFT 7]
[LEFT 1]
[BS 1]
Y[END]
[LEFT 1]
CALLEDMEHEWSS[BS 1]
[BS 1]
ASFRIGHTN[BS 1]
ENED>HEWANTEDHELPBECAUSEHISFATHEER[BS 1]
[BS 1]
[BS 1]
RWAS[BS 1]
[BS 1]
[BS 1]
[BS 1]
HADDEPT[BS 1]
[BS 1]
BTANDHEMUSTGAVETHEMONEY>SDFM[BS 4]
[BS 1]
[BS 1]
[LEFT 13]
[BS 1]
[END]
[BS 1]
HESAIDHEA[BS 1]
HADAPLANANDWEWILL[BS 1]
[BS 1]
[BS 1]
ILLSTEL[BS 1]
A[BS 1]
[BS 1]
ALMONEYFROMABANK>ISAIDNOBUTHESAIDHEWILLGOWITHOUTME>ISAYT

HENIWILLGO>WEWENTTOABANKANDWEHADGOTTOYGUNS>[MwC.622,438
-233,239]
[Mselect]
[MwC.551,402-300,67]
[Mselect]
[MwC.300,68-356,152]
[McLeft]
[MwC.356,152-583,453]
[McLeft]
[MwC.583,453-480,462]
[RIGHT 1]
[LEFT 1]
[RIGHT 1]
WESAIDHANDS[INS]
[BS 1]
[BS 1]
SUPANDEVERYONEFRI[BS 1]
IGHTENED>WEWENTTOTHEMANAGERABDWANTEDTHEMONEY>WEPUTTHE
MONEYI[BS 1]
INTHEBAG>WEHADASCHOOLBAG>WERANQUICKLYBUTTHENEVEYHWE[BS
1]
HW[BS 1]
EREWASINBLACKANDGREY[BS 1]
>BECAUSEO[BS 1]
POLIEC[BS 1]
[BS 1]
CEPUTAFOGBOMB>MYFRIENDRANAA[BS 1]
WATBUTI[BS 1]
ICOULDN@t. now IAMINHO[UP 1]
[UP 1]
[RIGHT 11]
[LEFT 1]
[RIGHT 1]
[BS 1]
[BS 1]
[BS 1]
MYFER[BS 1]
R[BS 1]
[BS 1]
IEND@s [RIGHT 1]
[DOWN 1]
[DOWN 1]
[UP 1]
[UP 1]
[LEFT 4]

[LEFT 1]
[LEFT 1]
[LEFT 1]
[LEFT 1]
[INS STOP]
r[DOWN 1]
[DOWN 1]
[BS 1]
[BS 1]
prison and my friend outside [BS 1]
. I[BS 1]
[BS 1]
DONOTKNOWWHEREISHJE[BS 1]
[BS 1]
E[SHIFT + UP 6]
[SHIFT + UP 1]
[SHIFT + UP 1]
[MwC.480,460-346,63]
[Mselect]
[MwC.346,61-327,152]
[Mselect]
[MwC.326,149-696,414]
[Mselect]
[MwC.694,414-288,386]
[McLeft]
[MwC.287,386-295,390]
[Mselect]
[MwC.294,391-596,453]
[Mselect]
[MwC.596,452-708,304]
[Mselect]
[MwC.709,303-791,766]
[RIGHT 1]
[SHIFT + ENTER 1]
[ENTER 1]
[TAB 1]
[BS 1]
[BS 1]
[TAB 1]
[MwC.791,764-790,764]
[DOWN 1]
[DOWN 1]
[END]
[RIGHT 48]
[LEFT 36]

[LEFT 1]
[LEFT 1]
[ENTER 1]
[ENTER 1]
[MwC.790,764-790,763]
[RIGHT 18]
[BS 1]
uy[MwC.790,762-997,546]
[MwC.998,571-1005,735]
[BS 1]
[MwC.1005,737-1005,741]
[BS 1]
[MwC.1006,741-1022,767]
y[MwC.1023,767-129,761]
[Mselect]
[MwC.129,761-959,96]
[Mselect]
[MwC.959,96-467,176]
[Mselect]
[MwC.466,176-257,739]
[Mselect]
[MwC.257,738-263,760]
[McLeft]
[MwC.263,761-614,473]
[McLeft]
[MwC.614,473-708,429]
kenanbarut[CTRL + ALT + Q]
hotmail.com[TAB 1]
proffessor[ENTER 1]
[MwC.703,423-264,750]
[Mselect]
[MwC.263,751-698,451]
[McLeft]
[MwC.698,452-693,454]
pt[BS 1]
roffessorkb[ENTER 1]
[MwC.693,455-254,767]
[Mselect]
[MwC.254,764-708,246]
[Mselect]
[MwC.640,296-291,294]
[McLeft]
[MwC.291,294-478,268]
[McLeft]
[MwC.478,268-484,324]

.[RIGHT 1]
[RIGHT 1]
[BS 1]
H[MwC.484,324-450,757]
[Mselect]
[MwC.450,756-207,366]
[Mselect]
[MwC.207,366-209,380]
[McLeft]
[MwC.209,379-234,748]
[McLeft]
[MwC.234,748-274,399]
[Mselect]
[MwC.275,399-354,468]
INFRONTOFBAN[MwC.353,468-373,764]

…

Linear Text Analysis 2

[MwC.882,688-529,455]
[TAB 1]
ITWASAWONDERFULMORNINGWHENISAWHER>SHEWASALITTLECHILDBEG
GINGONTHEEDGEOFTHEPAVEMENT>[UP 1]
[END]
[LEFT 29]
[LEFT 1]
[LEFT 1]
[LEFT 1]
[LEFT 1]
LOVELY[DOWN 1]
[UP 1]
[END]
[LEFT 12]
[RIGHT 1]
[LEFT 1]
_[BS 1]
[BS 1]
[BS 1]
[BS 1]
[BS 1]
[BS 1]
GIRL[DOWN 1]
[UP 1]
[PD 1]
[PU 1]
[RIGHT 8]
[RIGHT 1]
MONEY[LEFT 1]
[LEFT 1]
[LEFT 1]
[LEFT 1]
[LEFT 1]
[BS 1]
M[PD 1]
[PU 1]
[END]
IHADAFEELINGTOSPAEKWITHHERASSOONASPOSSIBLE[LEFT 45]
[LEFT 1]
[LEFT 1]
[END]
THEMOMENTIREALISEDHER>AFTER<IGAVEHER%)YTLANDREM[BS 1]
[BS 1]

[BS 1]
TOLDHERTHATSHEHADTOSPEA[BS 1]
[BS 1]
[BS 1]
[BS 1]
HAVELUNCHWITHMEIFSHEWANTEDTOHAVETHEMONEY>[BS 7]
MONEY>[BS 1]
[BS 1]
>SHEACCEPTEDWITHOUTANYHESITATION>[ENTER 1]
[TAB 1]
SHEISNOWMYASSISTANTATMYDEPARTMENT>[LEFT 24]
[LEFT 1]
[LEFT 1]
[LEFT 1]
[LEFT 1]
RESEARCH[END]
[BS 1]
[BS 1]
ANDONEOFTHEMOSTPRON[BS 1]
I[BS 1]
MISINGSTUDENTSWEEVERHAD>IWISHIHADSEENHERBEFOREANDSHEHADN
@t have[BS 8]
[BS 1]
[BS 1]
[BS 1]
didn@t have these da[BS 5]
[BS 1]
s[BS 1]
ose dayds [BS 1]
[BS 1]
s[BS 1]
with sorrow.[UP 1]
[UP 1]
[LEFT 1]
[RIGHT 1]
we has [BS 1]
[BS 1]
d a wondrful meal, at the last minute i[BS 1]
of wg[BS 1]
hich she decided to talk about herself and her life.[MwC.533,446-838,365]
[Mselect]
[MwC.226,241-293,63]
[Mselect]
[MwC.293,64-340,147]
[McLeft]

[MwC.340,147-583,456]
[McLeft]
[MwC.583,456-255,241]
[McLeft]
[MwC.255,241-446,288]
[ENTER 1]
[ENTER 1]
[TAB 1]
[UP 1]
[UP 1]
[TAB 1]
[TAB 1]
[TAB 1]
[TAB 1]
[TAB 1]
CHANCEANDCHANGE[MwC.445,288-827,405]

…

APPENDIX 5 – E: Sample "Linear Analysis" with Intervals

Text Analysis in linear intervals of 5 seconds/interval

Interval n°	Actions
1 (0 - 4,999 sec.)	[MwC.889,688-622,445]
2 (5 - 9,999 sec.)	IFELTNERVOUS
3 (10 - 14,999 sec.)	WHENTHEPHONE
4 (15 - 19,999 sec.)	RSA[BS 1] NG>
5 (20 - 24,999 sec.)	
6 (25 - 29,999 sec.)	[LEFT 35]
7 (30 - 34,999 sec.)	[LEFT 1] [TAB 1] [END]
8 (35 - 39,999 sec.)	
9 (40 - 44,999 sec.)	
10 (45 - 49,999 sec.)	IWA
11 (50 - 54,999 sec.)	SATHOME
12 (55 - 59,999 sec.)	ANDIWAS
13 (60 - 64,999 sec.)	SLEEPING>
14 (65 - 69,999 sec.)	
15 (70 - 74,999 sec.)	
16 (75 - 79,999 sec.)	
17 (80 - 84,999 sec.)	
18 (85 - 89,999 sec.)	IOPE
19 (90 - 94,999 sec.)	NEDTH[BS 1] ELE
20 (95 - 99,999 sec.)	PHONEANDSPEAK
21 (100 - 104,999 sec.)	>
22 (105 - 109,999 sec.)	
23 (110 - 114,999 sec.)	

24 (115 - 119,999 sec.)	
25 (120 - 124,999 sec.)	MF
26 (125 - 129,999 sec.)	FRIEND[LEFT 7] [LEFT 1]
27 (130 - 134,999 sec.)	[BS 1] Y[END] [LEFT 1] CALLED
28 (135 - 139,999 sec.)	MEHE
29 (140 - 144,999 sec.)	WSS[BS 1] [BS 1] ASFRIGH
30 (145 - 149,999 sec.)	TN[BS 1] ENED>
31 (150 - 154,999 sec.)	
32 (155 - 159,999 sec.)	
33 (160 - 164,999 sec.)	
34 (165 - 169,999 sec.)	
35 (170 - 174,999 sec.)	H
36 (175 - 179,999 sec.)	EWANTEDHELP
37 (180 - 184,999 sec.)	BECAUSEHISF
38 (185 - 189,999 sec.)	ATHEER[BS 1] [BS 1] [BS 1] R
39 (190 - 194,999 sec.)	WAS[BS 1] [BS 1] [BS 1] [BS 1] HADDEP
40 (195 - 199,999 sec.)	T[BS 1] [BS 1] BTANDHE
41 (200 - 204,999 sec.)	MUST
42 (205 - 209,999 sec.)	GAVETHEMONEY
43 (210 - 214,999 sec.)	

APPENDIX 6: Extract from a Stimulated Recall Session

…

Instructor 1 : What were you thinking here?

Students : umm… I was thinking … about … the meaning of "yon (direction)" in English.

Instructor 2 : Do you know the meaning of "way"?

Students : Yeah!

Instructor 2 : So, why didn't you use it here?

Students : I do not remember it… I think ...

Instructor 1 : Any comments about this pause…

Students : umm… yes… I was thinking to start a new paragraph… then I changed my mind because I need to add something more… and I was thinking over this "more"!

Instructor 2 : Then, you change your adverb here; you deleted "fast" and changed it as "quick".

Students : Yeah, I remember the teacher told us to use quick for movements… by the way, is it wrong?

Instructor 1 : No, you are right!

…

APPENDIX 7: Description of Revision Taxonomy

1. Orientation

1.1. Typing revisions

A typing revision occurs when a writer changes a typing error. Typographic errors occur when a writer accidentally presses the wrong key when he/she knows how a word should be spelt (Kollberg, 1998). Typing errors include errors in characterization and spacing. A typing error is a slip, whereas a spelling error is a mistake. However, in practice, distinguishing between typing revisions and spelling revisions is sometimes problematic. Consequently, a set of criteria has been developed that aids in making this distinction. A revision has been identified as a typing revision, if one or more of the following applies:

a. The pre-revision form does not conform to the orthographic rules of the language (e.g., ‘‘mooore’’ instead of ‘‘more’’).

b. The pre-revision form involves a letter string which does not conform to a likely pronunciation of the word (e.g., ‘‘improant’’ instead of ‘‘important’’).

c. The semantic context indicates that the pre-revision form could not have been intended (e.g., ‘‘I got a present form my mother’’ instead of ‘‘I got a present from my mother’’).

d. The same word is written correctly at an earlier point in the text.

e. A letter is replaced by an adjacent letter on the keyboard.

In uncertain cases, if the pause between the revision and the preceding keystroke is less than one second, the revision is classified as a typing revision. Otherwise, the revision is categorized as a spelling revision. The reasoning is that correcting a keystroke slip is likely to involve less thinking time than correcting a spelling error.

1.2. Language revisions

A language revision is a revision made to the linguistic expression of an utterance. For example, the writer corrects a grammatical error. Language revisions do not effect meaning significantly.

Language revisions are sub-classified according to the kind of element that is revised.

1.3. Spelling

Spelling include any graphemic change which cannot be classified as a typing error.

1.4. Grammar

Grammar include changes to elements such as tense, agreement, verb forms, word order, prepositions, and inflections.

1.5. Vocabulary

Vocabulary revisions include L1/FL translations, replacement of non-existent word forms with existing forms (e.g., ‘‘washfull’’ becomes ‘‘washable’’), and synonyms.

1.6. Punctuation

Punctuation include changes to elements such as hyphens, apostrophes, (de)capitalization, commas, semi-colons, full stop, question marks, exclamation marks, and paragraphing.

1.7. Phrasing

A phrasing revision is a revision in which the writer changes the wording of part of the text without changing the meaning significantly (e.g., a sentence paraphrase which stays close to the original meaning).

1.8. Error-triggered

Language revisions are also sub-classified according to whether they are error-triggered or non error-triggered.

Error-triggered revisions are triggered by a linguistic error or an error in convention/format.

Error-triggered revisions have also been coded in terms of whether the resulting revision is successful or unsuccessful (i.e., correct or incorrect).

1.9. Non-error-triggered

A non-error-triggered revision is prompted by considerations such as style, tone, and cohesion. For example, a non-error triggered revision could involve a change from active to passive tense, the replacement of a word with a synonym, or the substitution of a pronominal reference for a nominal reference.

1.10. Content revisions

Content revisions affect the informational content of the text. They include both locutionary and illocutionary revisions. A locutionary revision results in a change in the informational content of part of the written message. For example, ‘‘I like cats’’ becomes ‘‘I don’t like cats’’ or

‘‘She has two cats’’ becomes ‘‘She has three cats.’’

An illocutionary revision results in a change to the communicative function that a proposition performs (e.g., statement, request, explanation, promise, opinion). An example of an illocutionary revision would be changing a request such as ‘‘Could you open the window?’’ into an offer such as ‘‘I’ll open the window.’’

2. Linguistic domain

This refers to the linguistic domain within which a revision is made. The following domains are distinguished:

Below-Word: one or more characters, less than a whole word.

Below-Clause: one word or more and less than a clause.

Clause and above: one or more clauses.

3. Location

This refers to the point in the composition process at which the revision takes place. The following categories are distinguished:

Pre-text: The revision is made without being transcribed.

Point of inscription: The revision takes place at the Point of inscription (i.e., the last word of the current text).

Previous text: The revision takes place prior to the Point of inscription.

4. Action

This refers to the kind of mechanical operation that the writer carries out in order to make the revision. The following categories are distinguished:

Addition: the addition of at least a word.

Deletion: the deletion of at least a word.

Substitution: the substitution of at least a word.

Other: a change in the order of words or clauses, or a change in the segmentation of clauses

(e.g., two clauses become one, one clause becomes two).

Note: Typing revisions have not been coded in terms of Action, as the mechanical operations for this kind of revision involve letters rather than words.

APPENDIX 8: Feedback

A - PREVIOUS CRITERIA

S	**Spelling**
P	**Punctuation**
G	**Grammar**
WW	**Wrong Word**
WO	**Word Order**
MW	**Missing Word**

B - NEW CRITERIA

C	**Cohesion**
R	**Relevance**
O	**Organisation**
M	**Meaning**

APPENDIX 9 – Thinking Levels
(http://fic.engr.utexas.edu/files/HigherOrderThinkingSkills(FIC).pdf)

LEVEL	PROCESS VERBS	STUDENT ACTIVITIES	INSTRUCTOR ACTIVITIES	STUDENT ASSESSMENT
Knowledge - remembering previously learned materials.	cite, define, identify, label, list, match, name, quote, recite, reproduce, state	reads materials, listens to lectures, watches videos, takes notes	directs, tells, shows	name, list, define, answer Yes or No questions
Comprehension- ability to grasp the meaning of material.	alter, change, convert, depict, describe, discover, explain, give main idea, illustrate, interpret, manage, paraphrase, relate, rephrase, compare, restate, locate	explains idea in written or oral form, translate information into their own words, make an example, interprets what is said	demonstrates, listens, questions, compares, contrasts, and examines information	give an example, compare, contrast, justify why they say something, give an idea in their own words, respond to ”What caused this?” or “Why did you say that?”
Application- ability to use abstractions in new and concrete situations	apply, classify, compute, demonstrate, direct, discover, employ, solve, evidence, manage, manifest, predict, prepare, present, relate, show	takes knowledge learned at above levels and applies to a new situation, solves problems, recognizes problems and develops tools to solve them	shows, facilitates, observes, and criticizes	solve, “How can I find an answer to…?”, apply the generalization to …

Analysis- ability to break down material into its component parts so that its organizational structure may be understood.	analyze, ascertain, associate, conclude, designate, determine, diagnose, diagram, differentiate, discriminate, dissect, distinguish, divide, examine, find, infer	analyzes and take apart, explains each of the parts, discusses, uncovers, lists and dissects.	probes, guides, observes, and acts as a resource	answer questions like "What reason do I give for this conclusion", "Does the evidence support the conclusion?", "What facts support the conclusion?"
Synthesis- ability to put parts together to form a new whole.	combine, compile, compose, conceive, create, design, develop, devise, expand, extend,	puts parts together into a unified whole, creates plans and hypothesis for finding solutions, uses original creative thinking	reflects, extends, analyses, and evaluates	create a plan, develop a model, combine these parts
Evaluation- ability to judge the value of material for a given purpose	assess, compare, conclude, contrast, criticize, critique, deduce, evaluate, judge, weigh	makes a value judgment based on considerations, write editorials, discuss or debate	clarifies, accepts, harmonizes, guides	demonstrate making a judgment, evaluate an idea using some criteria