THE APPROPRIATENESS OF REDRAFTING IN COMPUTER VERSUS HUMAN GENERATED FEEDBACK EFL BUSINESS WRITING ENVIRONMENTS

THE COSTS & BENEFITS ASSOCIATED WITH REDRAFTING IN COMPUTER & HUMAN BASED WRITING INSTRUCTION & CORRECTION CLASSES

AN EMPIRICAL STUDY

CLYDE A. WARDEN

CHAOYANG UNIVERSITY OF TECHNOLOGY

I. Preface

A. Key Terms & Definitions

AI: Artificial Intelligence

API: Application Program Interface; the part of a program that can be accessed and controlled by other programs

Artificial Intelligence: Computer hardware and software combination that performs functions analogous to learning and decision making

Assembly Language: A low-level computer language used in instructing a specific type of computer or operating system

BASIC Language: Beginner's All purpose Symbolic Code; a widely used high-level computer programming language

C Language: A powerful high-level computer programming language widely used because of its speed and ability to create complex programs

CAI: Computer Assisted Instruction

CALL: Computer Assisted Language Learning

CAW: Computer Assisted Writing

Context Sensitive Help: On screen text that assists the user to answer questions related to the action being performed at the time

Customized Software: A computer program that is created or modified for a specific purpose, for which commercial programs are not available

DOS: Disk Operating System; most widely used software for controlling personal computer functions and programs; widely thought of as difficult to use because it is controlled through command line codes

ESP: English for Special Purposes such as business English or academic English

Expert System: A computer program that imitates the actions of a human expert in a specific field

GUI: Graphic User Interface; synonyms with easy-to-use program interfaces that use menus, buttons and mouse movements to control a program rather than command codes

IDE: Integrated Development Environment; used in creating programs

Mouse: A computer input device that controls an on-screen arrow

PC: A Personal Computer, not linked to a network (in this study, PC refers only to IBM compatible machines)

Program Interface: The part of a program that the user sees and responds to in order to accomplish some type of task

QBL Student Version: A program used by students in preparing business letters for input into the QBL TOOLS expert system

QBL TOOLS: A program that finds errors in students' business writing while also allowing detailed analysis of progress

QBL: Quick Business Letters

RAM: Random Access Memory; more of this type of memory is required for more powerful programs

VB: Visual BASIC; the first, and generally accepted as the best, high-level programming language for Windows

VBA: Visual Basic Applications; Microsoft's use of Visual BASIC as a special language to control and modify commercially available Microsoft programs

Visual BASIC: See VB

Windows: A widely used program for controlling a personal computer and other programs; often thought of as easy-to-use because it is based on objects rather than command lines

B. Key Points of This Research

This study covers a wide range of issues in CALL (Computer Assisted Language Learning), any one of which the reader may find interesting and of some practical application in other classroom situations. However, this project is built on the foundation of five years of previous research, which is not the center of examination of this paper. In order to present the findings of this most recent research, but not sacrifice clarity and context, all important elements of this research project have been included here.

1. Using Computers in Business Writing Class

All writing assignments were completed on PCs through custom developed business writing software. This software is floppy disk based and emphasizes ease of use and freedom from the classroom while training students in the standard forms of English business letters.

2. Using Computers for Automated Analysis

After completing assignments, students writing can be automatically corrected through a custom created Windows based program. Up to 45 error types can be found, including grammar, mechanical and style based errors.

3. Feedback Types (Human VS Computer)

Detailed error feedback was supplied to some students, while teacher generated, process based, feedback was supplied to others. The differences in the ways students approached new writing assignments reveals the impact such feedback styles have on students.

4. Effects of Redrafting

After receiving feedback, some students were asked to redraft their writing and turn it in again, while others did not perform any redrafting. The different writing strategies that redrafting encourages are examined in detail.

5. Students' Perceptions & Opinions

Survey instruments were used extensively in this study to measure students' opinions of their own writing skills and changes that took place over the time of this study. Opinions on the computer software, feedback methods and other factors were also sought through the use of open-ended surveys.

II. Introduction

A. Research Motivation

Since the turn of the century, writers have been speculating about the emergence of artificial intelligence. This futuristic vision usually takes the form of a robot that can see, talk and listen, but most importantly think. It was only natural then that when real thinking machines came about, in the form of computers, people assumed they would soon take the form of the traditional human-like robot. While such a future may eventually come, these visions have actually hindered the application of useful machines and software, simply because computers have yet to achieve the perfect robotic vision. The gap between reality and expectation has been especially harmful in the area of education. Teachers often expect a computer in the classroom will be able to substitute for them when the reality is that a computer cannot even begin to perform such a task. This overestimation of the computer has led some to be overly enthusiastic, which eventually leads to disillusionment, or to fear of marginalization, both of which are unfounded.

It appears that as computers and software improve, these machines are not becoming more human-like, but more powerful at the very things they do best (which are some very un-human characteristics). These important computer characteristics include:

1) **calculation: computers excel at exact calculation at very high speeds that very few humans, if any, can match.**

2) **Order execution: Computers always follow the orders given to them. In fact, one of the maxims of the computer age: junk in junk out, reflects this characteristic.**

3) **Perfect and complete memory: Short-term and long-term memory are no problem for the computer.**

Humans, on the other hand, excel in other areas:

1) **Estimation: While humans cannot always get the exact answer to a problem, we are extremely good at quickly getting an answer that is close to correct even when large amounts of the data are missing (something a computer simply cannot deal with).**

2) **Understanding context: Humans look at every problem in reference to its surroundings, past experience and even apparently unrelated data. For a computer, there is no context. It can only follow rules about what data to include in a process.**

Of these very different characteristics, which ones are most important to education? The fact of the matter is that in a modern society and economy, all these skills can be very useful in teaching. Before any realistic assessment of computer usefulness in the language classroom can be undertaken, we must first obtain a complete and objective understanding of just what effects the computer has on our students.

B. Research Objectives

This project strives to show the relationships between error rates, editing activity and redrafting within the context of computer/teacher generated feedback. Since these activities consume large amounts of time in the English writing classroom, a clear picture of how they affect students, as well as how they interact, would be most helpful in determining the right balance of feedback, redraft, computer interaction and teacher interaction. While personalized feedback is clearly advantages to students, there is still the question of what type of feedback is most effective. This study compares feedback generated by a computer to that generated by a teacher. More importantly, fundamental issues are looked at that deal with the question of the suitability of Western feedback techniques in Taiwan classrooms, i.e., the process method. The questions of cultural differences and suitability are also addressed in the context of redrafting.

The reality of English language instruction in Taiwan is such that these issues must be addressed. If we simply assume that the presently accepted ESL (English as a Second Language) methods in the West are suitable in the Taiwan context, then do we not need to make the rest of the classroom resemble Western classrooms? Class size, facilities and opportunity to English exposure must all undergo radical change. If such change is attempted, however, and our Taiwan students do not respond in the expected Western ways, the whole effort would be a waste and possibly even harmful.

If, on the other hand, we can find methods for combining computer based solutions and effective redrafting techniques for application in the existing Taiwan

education framework, we may be able to create English classes that are more suitable for our students' specific needs and situations.

C. Methodology

In order to compare three treatments, three groups were formed.

All students used the same textbook, completed assignments on the same software, followed the same class schedule and generally were exposed the exact same material and methods in class. The teacher for the groups remained the same throughout the experiment duration. The only difference among the three groups was the feedback type and the redrafting requirement.

Four writing assignments were completed throughout the semester, all centering on some aspect of business communication.

D. Research Hypotheses

This research asserts several points which are later tested for validity.

H_{1a}: Students receiving computer feedback on their writing errors will produce fewer objective errors in later assignments.

H_{1b}: Students receiving computer feedback will directly copy less reference material than students receiving process-based feedback.

H_{1c}: Students receiving computer generated feedback will show improvement in more error types than students receiving process-based feedback.

H_{2a}: Students who receive computer generated feedback and then redraft their assignments will have fewer errors on new assignments than students not completing redrafts.

H_{2b}: Students receiving process-based feedback will make fewer alterations during redrafting than students receiving computer-based feedback.

H_{2c}: Students not completing redrafts will spend more time working on their first draft.

H_{3a}: Students receiving no computer feedback, using the generally accepted process approach, including redraft, will not reduce errors in later assignments.

H_{3b}: Students receiving process-based feedback will write more and spend more in their letters.

H_{3c}: Students receiving process-based feedback will navigate their document less than students receiving computer feedback.

H_{4a}: All students will express improvement on a range of English business writing skills.

H_{4b}: Satisfaction with the class will be higher among students receiving computer feedback.

H_{4c}: Students receiving process feedback will express confusion and/or frustration.

III. Literature Review

A. Error Correction In EFL Classes

Teachers of English as a foreign language (EFL) face numerous difficulties that computer technology may be especially well situated to relieve. An apparently intractable problem, especially in Asian language classrooms, is large class size and low skill level. If computer software could assist in the correction of assignments, a huge time savings could be transferred to teaching and more effective teacher/student interaction.

While the present level of technology is nowhere near perfect, automated correction in the EFL/ESL field has met with some success. However, while the software is far from flawless, successful implementation of automated error correction depends more on the role it is expected to play in the classroom than its ability to replicate the teacher's intelligence.

B. Artificial Intelligence (AI)

The key to perfect computer based language error correction is machine intelligence or AI (Artificial Intelligence). There is little doubt that the better AI characteristics software can exhibit, the more useful its application in the language learning and teaching environments can be. Harrington (1996) points out that intelligent computer-assisted language learning software is made up of three parts: the domain knowledge (often the L2 grammar), a student model (tracks what the

student knows) and an instructional component (tasks and activities). It is the domain knowledge that really separates intelligent software from more traditional types of learning software. The ability to understand the underlying meaning and correctness of a student's response is central to creating accurate feedback rather than short, canned comments.

In the attempt to achieve a better domain knowledge base, many language researchers have been writing software, called parsers, that can understand the parts of language. The most accessible approach involves the use of corpora. Corpora are collections of words that may represent commonly used words in certain types of writings. Liou (1992) used this approach in order to build a large knowledge base from which language learning software could be developed.

Once a knowledge base is constructed, software can be written to compare student input with the knowledge base. Such programs are often not a single program but a group of large programs that use huge amounts of memory and take long periods of time to process data (Coniam, 1991). Efforts to create small and fast programs to parse sentences has been documented (Baldry, Piastra & Bolognesi, 1991; Coniam, 1991; Webster, 1991; Xu, 1994), but the search for a completely reliable program that has true understanding of the English language has proven elusive.

While spell checking software successfully focuses on the character level of a sentence (Peng, 1993), the higher structures, such as phrases, escape spell checkers. The ability to break a sentence into its parts, parsing, is the key to successfully reading a sentence.

A special problem faced by ESL teachers is that their students are starting off at a level where they are likely to produce many inaccurate, and often completely wrong, sentence structures. Such errors cause severe problems for parsing software. How can a computer program overcome such fundamental errors while parsing (Bolt, 1991; Tschichold, Bondmer, Cornu, Grosjean, Grosjean, Kubler & Tschumi, 1994)? Parsing a sentence calls for creating a parse tree that matches all the structures with allowable linguistic structures. When a word has been spelled wrong, or verb tense used wrong, how can the parsing continue? While a teacher can usually guess what a student was trying to say, such guessing is not in the nature of computers.

One area of research is the creation of corpus that describe the characteristics of correct writing. With software, teachers can find commonly occurring patterns and then use that information in class (Li & Pemberton, 1994; Ma, 1994; McEnery & Wilson, 1993; Milton & Tsang, 1993; Pickard, 1994; Shillaw, 1994; Tribble, 1991). For example, hundreds of English advertisements could be run through such software and the most common words or phrases located. This information can then be relayed to students as a kind of guideline of words and phrases to keep in mind when creating an advertisement. This genre analysis can be helpful in teaching (Bhatia, 1993; Swales, 1981, 1990).

Programs have also been developed that help students build their vocabulary. These programs also are based are large copra databases that can quickly lookup many lexical meanings of a word or phrase (Clarke, 1992; Goodfellow, 1993).

C. Computers in the Writing Class

Most EFL teachers are fairly optimistic about CALL mostly because the potential economic benefits from using CALL (Donaldson & Morgan, 1994). Computers in the writing class has been shown to have a generally positive impact on students' performance in language acquisition (Daiute, 1983; Fisher, 1983; Gula, 1983; Healey, 1992; Kenning, 1991; Wresch, 1988). EFL students who are struggling with their writing, benefit greatly from the flexibility computer-based editing brings to writing (Bernard, 1993). Rather than concentrate on the problems created with typewriter correction liquid, or erasing blocks of penciled text, students can concentrate more on the process of their writing. Following this line of thought, computers are really technological tools for writing that may have a positive influence on students due to increased efficiency and positive attitudes toward technology (Santiago, Nakata, Einwaechter, Marschmeier & Shimada, 1996). The passive nature of many EFL learners may also be overcome through the computer as writing tool. Sullivan and Pratt (1996) found that students writing on computers showed much more participation in the class, while the traditional class ended up being dominated by the teacher.

Although computer software cannot truly understand what a student writes, it is clear that the examination of a few key phrases or words can lead to a high level of apparent understanding. Jamieson, Campbell, Norfleet and Berbisada (1993), in their study, had students complete open ended writing tasks. The assignments were then scored by computer and next by humans with a resulting score correlation coefficient

of .90, confirming that computers can score open ended tasks. The software checked mainly for key phrases within students' writing to make sure development of the writing structures was correct.

Issues surrounding hardware expense are also important to ESL/EFL teachers who often have limited resources. Researchers have shown the practicality of using low-cost or out dated computers successfully (Lam and Pennington, 1995; Warden, 1996). However, the Internet, and the associated World Wide Web, appear to have costs that far surpass even the most generous budgets (Rothstein & McKnight, 1996).

Adaptation to the special needs of EFL students is another issue and added expense as software developed for ESL computer use needs some change to match EFL needs (Lange, 1993). Advanced networked computer systems, such as Daedalus, may work well for native English speakers, or advanced English majors (Downs-Gamble, 1994), but at the lower EFL levels, we may need to depend more on the fundamental advantages computers and text-manipulation software can bring to our students.

Unrealistic expectations of what CALL can accomplish may lead to a repeat of the language lab audio/linguistic errors of the past (Hyland, 1993). Twenty years after it began and more than ten years past its theoretical downfall, nearly every school in Taiwan has a language lab which few credit with having any appreciable impact on students' ability. Such labs are simply assumed to have a use, even though no one is quite sure what it is. Understanding the underlying strengths of the

computer, can greatly enhance its successful use in the language classroom and help avoid disillusionment.

At its most basic, computers are excellent recording machines. simple use of macro recording software, that records the keyboarding activity of writing students, has been found to yield immense amounts of detailed data on just what students are doing while they write (Bonk, Cavalcante, Liszewski & Reynolds, 1995; Reynolds & Bonk, 1996). A similar approach of data collection is addapted in this research study, with measures including time spent on task as well as revision.

D. Computers in EFL

Early on, research had shown that students have positive attitudes about computer technology in the EFL/ESL classroom and that such technology does have a positive impact (Brady, 1990; Herrmann, 1987; Johnson, 1988; Nash, Hsieh & Chen, 1989). Using computers in generating feedback or advice on students' writing has had less clear results. In the early 1990s, researchers looked into the possibility of applying software, for generating such feedback, in language learning classrooms. Pennington (1991) pointed out the danger of grammar checkers causing teachers to revert to outdated methods of language teaching. She observed that grammar checkers seem to run counter to a more student centered classroom approach of teaching and that such software was often wrong in its error detection and advice, Pennington (1992). Liou (1991), investigated the application of the commercial grammar checking program Grammatik IV and found it mostly checked style errors

and often missed substantive errors. Generally, all commercial grammar checking software packages failed to live up to their stated aims (Bolt, 1992). The initial reaction to computer based grammar checking placed a cloud of doubt over such software that still exists today.

Later examination of such software showed programs with some drawbacks but which could be improved on and serve a purpose. Liou (1992), Holland, Melissa, Maisano, Alderks and Martin (1993), Coniam (1991), Webster (1991), Xu (1994) and other EFL researchers have respectively worked to create their own custom software that can accurately analyze sentences (parsers). The results of such efforts have been positive, yet have not been able to substantially surpass the accuracy and convenience of commercially available software. Meanwhile, commercially available software has continued to improve, and researchers have found more suitable methods for their application in the writing classroom.

A detailed analysis of the different grammar packages was performed by Bolt (1992), revealing that such software falls into differing degrees of programmability (what he calls transparency.). The more open a software package is to be programmed, the more it can be customized to fit specific learners' needs. Levy and Garton (1994) continued the customization of GrammatikV that Brock (1990) had attempted with GrammatikIV. Warden (1995) followed this road and also adapted GrammatikV to be more sensitive to EFL business genre writing errors and showed that in a controlled study, students using such a program did lower their error rates.

Liou conducted a similar study, using the software Complete Writer's Toolkit, in a process oriented class and obtained positive results.

E. Grammar/Style Checkers

Bolt (1992) has described most of the commercially available grammar checking software packages in detail, including: Correct Grammar, Right Writer, Grammatik, CorrecText, Reader, Power Edit and LINGER. Bolt found Grammatik to offer the greatest access to its rule base as well as allowing changes to rules or new rules to be added. Healey (1992, p. 14), when experimenting with using Grammatik, found: ***Though the grammar checker may not find every error, its work in "consciousness raising" can be very helpful for language learner*****s. Brock (1990), teaching in Hong Kong, found that modifying Grammatik was helpful when rules were programmed for some common errors of Cantonese speakers learning English. Garton and Levy (1994) using a later version of Grammatik, version 5, found Grammatik5 to be much improved over earlier versions. Although at first use, Grammatik5 seems to be very inaccurate, after modification, it improves greatly.**

Liou (1991, 1992, 1993a, 1994) has performed a number of experiments using Grammatik as well as custom designed software to examine its impact on EFL students in Taiwan. Although the studies are usually small in number, the results tend to be positive in showing groups using CALL perform somewhat better than those not using CALL. When grammar oriented CALL was applied in a process oriented class setting, Liou (1993b) found that the CALL group was able to rectify

more of their errors during redrafts and made fewer errors than the non-CALL group.

The inability of EFL students to overcome some errors was also been observed by Dalgish (1991) when he wanted to find the common errors of students learning English in Sweden. The same topic was pursued by Brehony and Ryan (1994) with the understanding that an EFL learner's mistakes often reflect the usage or structure of his/her native language. These interlingual errors can be intercepted and corrected by CALL simply because they can be easily identified and then codified in software. Simple matching procedures can be used to flag such common errors.

Another approach to grammar-based error identification is the computerized cloze test. Interactive software is well suited to the cloze test since the parameters are finite and feedback can be given to students immediately. Such a program has been used successfully by Coniam (1997) in Hong Kong.

F. Present Situation

Overall, we can see expressed in the literature, a great disappointment that computers cannot be as intelligent as we would like. However, with modest goals in mind, most researchers are generally positive towards the future of CALL. Of special interest are the findings that simply using computers in the language classroom appears to improve students' abilities as well as their attitudes. Grammar/style checking software can be modified to make a better fit with specific EFL settings and may actually do a good job at consciousness raising as well as addressing errors that

are difficult to treat (mostly carry over from the L1) under normal classroom settings. Caution should always be exhibited, lest we bite off more than we can chew. CALL should answer questions that do not already have easily accessible answers (Pennington, 1992), rather than a complete adoption of every new technology.

G. Process Approach

Writing teachers began to focus more on the actual process of writing in the U.S. about twenty years ago. The aim of this approach was to find the sources of students' writing problems and then aid them to overcome those problems. Murray (1980) was a leading influence with the view that a writer will slowly discover what s/he wants to say through a series of drafts. This unconscious approach to language acquisition has been largely advocated by Krashen (1981) who states that conscious learning does not promote language acquisition. Numerous researchers have objected to this approach and have asserted there is a need for conscious learning (Bialystok, 1981, 1982; Ellis, 1986, 1994; McLaughlin, 1987; Schmidt, 1983, 1990, 1993, 1994; Tarvin and Al-Arishi, 1991; Wenden and Rubin, 1987; Yalden, 1975).

The process approach is not one clear methodology that all teachers uniformly follow. In fact, process writing is much more a general approach and attitude that exist within the context of many teaching tools. While the process movement has certainly affected the attitudes of many teachers in Taiwan, it is not certain how many teachers would label their teaching as *process*. This approach has been most actively

advocated in the native English environment for native speakers and ESL students of English who live in English speaking countries.

Horowitz, 1986, however, has pointed out that such an approach may not fit as well in the EFL context, where there are numerous pressures during education (testing and measurements) and after graduation (single draft tasks in the work place and translation tasks) that do not jibe well with a process approach (Horowitz, 1986). It may be the case that the process approach is more rewarding for students in the long-run, but those same students must produce a solid product in the short run. Students of English in Asia clearly adhear to the traditional teaching ideal of tranmitting knowledge from teacher to student. Such a method leaves little room for process (Pennington, 1995). Traditional approaches to teaching that center on the transmission of objective knowledge may be culturally determined (Barnes and Shemilt, 1974) or even encouraged by required qualifications (Morris, 1985; Grimmett and Crehan, 1992). Numerous researchers have viewed these pressures as pushing teachers away from process writing and even preventing inovation in teaching (Fullan, 1982; Havelock, 1982; Nicholls, 1983; Rogers, 1983).

Few researchers have examined, with a critcal approach, real results and attitutes of students in Asia when a process approach is used. Pennington, Brock and Yue (1996) did perform just such an experiment in Hong Kong with dissapointing results. Eight secondary-level classes, composed of ethnic Chinese students were included in the experiment. Non-process teaching methods were the norm for these students and teachers before the experiment begain. For six months the eight classes

were exposed to process oriented writing methods with the researchers assisting with and monitoring the introduction of the process approach. Pre- and post-survey results revealed that students were equally split between positive and negative reactions.

H. Issues of Feedback

Commentary on student writing has been largly skipped over in L1 and L2 research. While there is no shortage of opinions peices written on exactly how a teacher should comment on student writing (if s/he should comment at all), actual research into the effectiveness has yet to be widely conducted. This should lead us to be extreemly cautious when applying imported teaching theories and practices into our EFL classrooms. While generalizations about L1 language learners my generally work well for the L1 students, EFL students are significantly different from native speakers (Silva, 1993; Goldstein & Conrad, 1990; Zhang, 1995) and even ESL students who live in an English environment.

Most of the existing research is quite critical of teacher feedback to student writing. Sommers (1982) observed teachers' responses to students' writing as *arbitrary and indiosyncratic* (p. 149). This lack of clearity and direction in teacher feedback is also observed by Zamel (1985) in the L2 setting, as well as by Brannon and Knoblauch (1982), and Conners and Lunsford (1993). Some research in this area has exmined the effects of praise and criticism (Cardelle & Corno, 1981) and the

emotional content of the feedback (Sperling, 1994) while others have looked into the goals of comments (Beason, 1993).

Effects of feedback in the ESL setting have been examined by Cardelle and Corno (1981), Fathman and Whalley (1990), Robb, Ross and Shortreed (1991). Results generally show little significant response, on the part of students, to teacher-generated feedback. More positive results have come from research on peer feedback, which is a popular form of feedback among teachers in L2 environments (Carson & Nelson, 1994, 1996; Connor & Asenavage, 1994; Goldstein & Conrad, 1990; Lockhart & Ng, 1995; Mendonca & Johnson, 1994; Nelson & Murphy, 1992; Patthey-Chavez & Ferris, 1997; Villamil & deGuerrero, 1996). The personalized feedback related with peer feedback is less impersonal than whole class grammar instruction (Chaudron, 1988; Cumming, 1990) mainly due to its ability to focus and adjust to the zones requiring attention (Aljaafreh & Lantolf, 1994).

While this track of research has generally shown positive results, EFL settings appear to provide an inhosbitable envrinment for peer feedback (due to the overall low level of all students, as well as the presence of objective standards required to be met). Students' impressions of teacher feedback have been examined, and give an insight into general strategies students use in response (Cohen, 1987; Ferris, 1995a; Hedgcock & Lefkowitz, 1994, 1996; Leki, 1991; Radecki & Swales, 1988). However, such studies generally do not track actual student writing with teacher feedback and then resulting redraft changes.

A recent study by Ferris, Pezone, Tade and Tinti, (1997), looked at a teacher's feedback over two semesters. A total of 1500 comments on 111 essays were analyzied. A model was constructed to help classify comments and analitical analysis. Results showed that over the time of two semesters the teacher did change commentary and that overall amount of commentary decreased as the term progressed. While not a significant finding in itself, this study points the way for quantifiable analysis of feedback. Such structured studies provide more reliable methods for understanding what role feedback is really playing in our EFL classrooms.

I. Importance of Redrafting

Central to the process oriented approaches of writing instruction, advoacated by composition theorists, is a kind of Socratic dialogue between teacher and student on the rhetorical aspects of students' writing (Carnicelli, 1980; Harris, 1992; Simmons, 1984). The reality of student/teacher interaction (and even student/student interaction), however is quite different. Teachers often correct errors in students' texts (Aljaafreh & Lantolf, 1994; Connor & Asenavage, 1994; Cumming, 1995; Fitzgerald, 1987; Goldstein & Conrad, 1990; Jacobs, 1987; Mendonca & Johnson, 1994; Saito, 1992; Stanley, 1992). It appears that error correction, and surface level correction in general, is an important orientation for EFL students. While avoidance of such surface error correction is discouraged by some theorists (Harris, 1992; Krashen, 1981), this approach may be suitable for EFL writing students.

A key concept in EFL writing instruction is that EFL students often are not learning to write for the first time. They have received instruction on English for many years, often beginning in elementary school or junior high. What these students are often seeking is improvement of the linguistic parts of their foreign language (Radecki and Swales, 1988; Cumming & So, 1996) as opposed to improvement in overall rhetorical abilities. The value of surface error attention needs further research with recent research showing there may be benefits to such an approach in both written and spoken language instruction (Aljaafreh & Lantolf, 1994; Carrol & Swain, 1993; Fathman & Whalley, 1990; Ferris, 1995b; Hegcock & Lefkowitz, 1994; Saito, 1994; Spada & Lightbown, 1993).

J. Special Issues in Taiwan

While the process approach has been widely accepted in the EFL teaching environment, there is no one clear methodology that all teachers follow.

The cultural specificity of the process approach has been noted by numerous researchers. In Taiwan, the education system is a fundamental part of the overall Confucian societal value system which places emphasis on unequal social roles. In this context, students are expected to be subordinate to teachers and teachers are expected to clearly lead the students through their formal education.

While one may disagree with the underlying structure and assumptions of traditional Chinese values, vis-a-via education, it is simply not realistic to expect a language class teacher to single-handedly challenge and change such assumptions. If

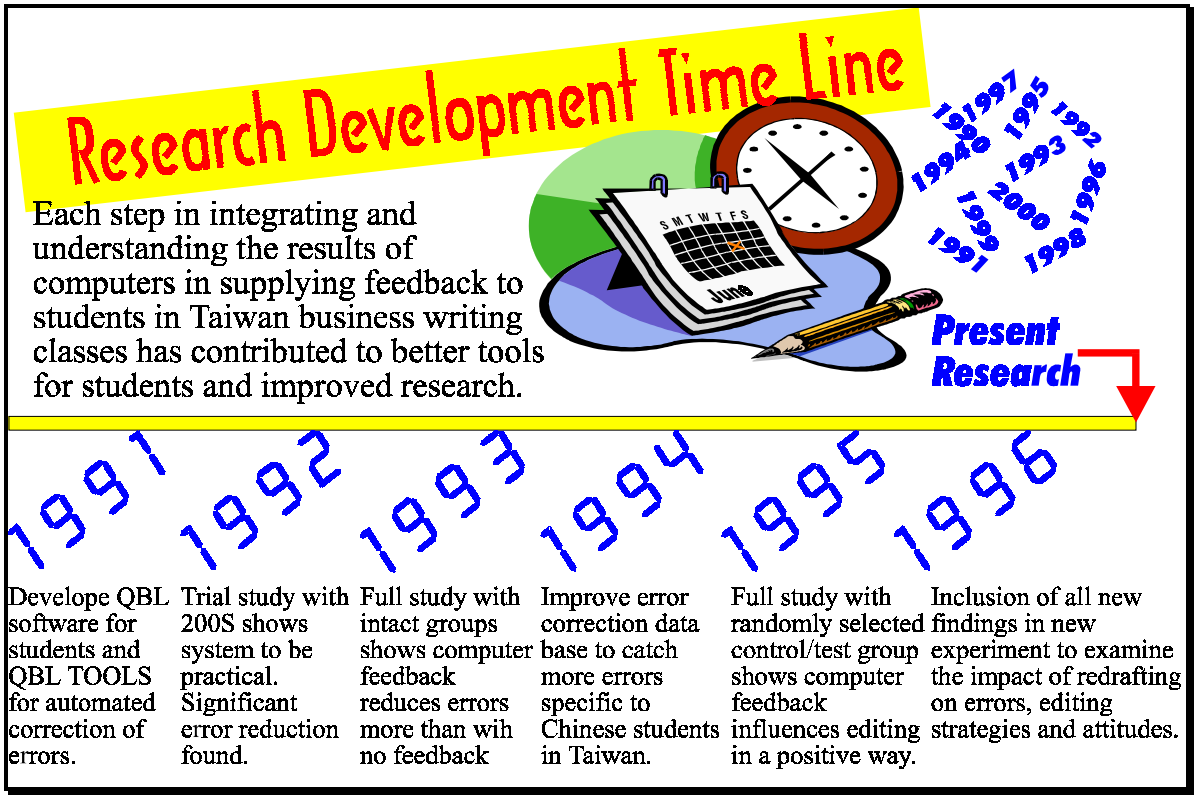
students are open to Western approaches and if such approaches produce the desired effects, then adoption can be recommended.

Finally, the lable of *Western* may not even be suitable because the so called process approach is itself not universally adopted and supported in the United States. The conventional teacher-student interaction, even in the U.S., places the teacher in the position of authority in the just as in the East (Goldstein and Conrad, 1990).

IV. Research Foundations

The study reviewed in this report is based on seven years of continuous experiment and development. Numerous parts of the software creation and computer based feedback's influences on Taiwan students' error rates have been documented in previous publications. It is that previous work, of the author as well as other teachers in Taiwan, that make it possible to follow through on the complex design of the present study. A short review of that previous work follows (see Figure 1).

Figure 1. Background of present research



A. Computer Based Writing Software

Since 1991, the author and other teachers have been working on developing software for Taiwan business writing classes. This process has gone through numerous generations which are briefly reviewed here.

1. Starting With PEII (1990)

Simply using a word processor to complete an assignment has numerous advantages for the student of English writing. With this in mind, I requested students to use PEII to complete all business letter writing assignments. Results were positive in that students thought the method was effective and modern. The results in the quality of their writing was not improved, however, and the same problems came up as when students used typewriters or wrote by hand:

1) **Wrong Basic Formats**
2) **Inconsistent Print Quality**
3) **Numerous Grammar Errors**
4) **Repeated Errors (within the same document and among all students)**

2. Custom Develop QBL (Quick Bussiness Letters) System (1991)

a) System Goals

(1) For Student

After the first testing of the automated system (using PEII), an effort was made to develop all parts of the process into a more functional and useful system. Keeping the students' program at a low cost while including some of the features normally found in professional writing packages was a major objective of the QBL design. Additionally, the opportunity to supply on-line assistance to students could actually expand the classroom experience. To this end, freedom to complete assignments on any PC (Personal Computer) system, not only networks, was viewed as important.

(a) Program Features

The program used by the student would not reveal any part of the expert system that actually found errors. From the student's perspective, the program should be easy to use while simulating the experience of writing a business letter in a work environment.

The actual program structure would guide students through the creation of a business letter in such a way that it reinforced correct letter formats. All the parts of a business letter had to be included as well as the ability to print a correctly formatted business letter. By having QBL supply a letter template, and samples for each entry, students could develop habits that would carry over into the work environment.

(b) Hardware Issues

Many previous attempts at applying computer aided feedback, at the time, had been based on mainframe computers or networks. In the R.O.C., this presented some problems that were difficult to overcome. The obvious problem is that access to such

equipment was often limited to computer department students. In addition, centrally based computer systems experience down-time. An English instructor would have little opportunity to know if a student's excuse for not completing an assignment due to down-time was true or not. Avoidance of such complex issues was desirable with the QBL program. The best situation would be that QBL could be used on any platform capable of running DOS. In this way, each student would have the freedom to decide when and where writing of an assignment could be completed.

Student ownership of personal computers is widespread in Taiwan. It is the case, however, that there is wide variation in the types of PCs students use. The QBL program, used by the students, was designed to function on the lowest common denominator of student computer systems while retaining features that still give a professional appearance on more advanced computer systems. The fundamental requirements included:

1) **Run on an Intel 80286 CPU (Central Processing Unit), using any flavor of DOS.**
2) **Fit into 640K of RAM (Random Access Memory) memory.**
3) **Able to run with no hard disk.**
4) **Good appearance on a monochrome monitor.**
5) **Keyboard access to all program commands.**
6) **Usable on a 360K, 5.25 inch floppy disk drive.**

Program features could surpass the above requirements, but the program had to remain compatible with this most basic student computer configuration.

(2) Software Requirements For Instructors

The correction software is for instructor use only. With this in mind, it is reasonable to expect that a higher level of computer power can be accessible. The key advantage to this assumption is that a GUI (Graphical User Interface), such as Windows, can be used in the teacher's software. GUI interfaces require more powerful computers, yet are key to user-friendly systems.

(a) Program Features

The most important feature for the expert system was ease of use. English teachers have no standard level of computer expertise. The implementation of a GUI interface was the first priority. By supplying a graphic based program, training time could be cut as well as reducing the frustration factor often encountered when non-computer experts attempt to use new software.

Also important, was the ability to do more than simply provide feedback to students. Some instructors expressed interest in being able to view more details and even perform research about students' errors (as is the case with the author's studies). To this end, the instructor's program would need to list and print totals of a class' writing errors, compare multiple homework assignment results, preferably in graph form, and perform some basic statistical measurements and testing.

(b) Hardware Issues

Early on the development of the software, it was common that teachers were not running Windows 3.1 or that their computers were simply too slow or lacked the required RAM memory. By the time of this latest study, however, hardware issues had completely disappeared as the most commonly available hardware far surpassed the requirements of the QBL system.

b) Student Program (QBL Student Version)

The completed students software and manual can be seen in Figure 2. A student user's manual was created with all explanation in Chinese. The manual is fourteen pages long with each page devoted to one aspect of the program. Every page contains a screen shot of the relevant program situation and an explanation. Also included is an explanation of the division of business letters into the four main parts (heading, opening, body and closing) as well as a summary of all program commands (located on the back of the manual for easy reference).

Figure 2. Software used by students

(1) Programming Tools

The student program, QBL Student Version, was developed using Microsoft QuickBASIC 4.5. This version, the last DOS based version produced by Microsoft, offered numerous advantages over other programming languages and software vendors' implementation of the BASIC language.

(2) Program Design

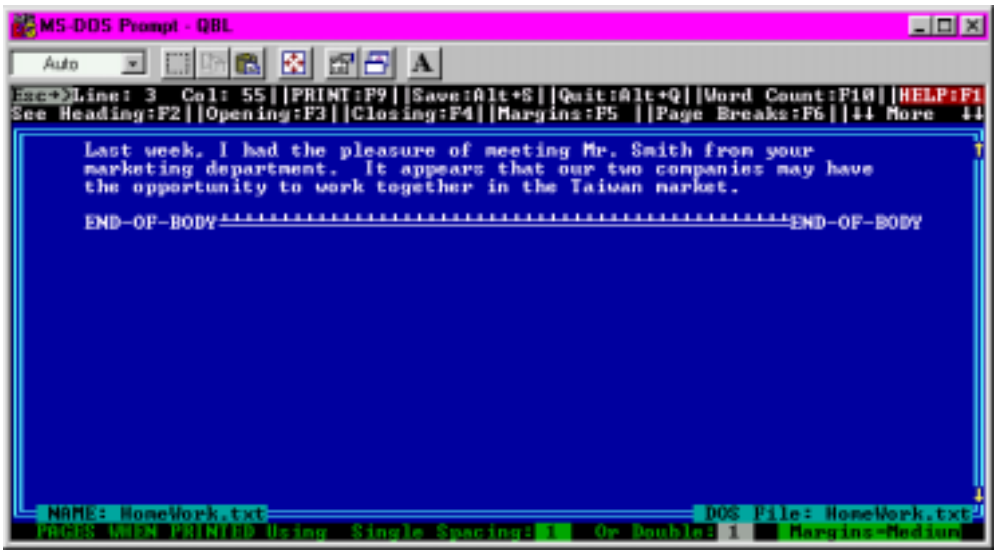
(a) Division of Letter Parts

A business letter is made of four main parts: heading, opening, body, and closing (Warden and Chen, 1993). The DOS screen, however, is only 80 characters wide by 25 characters high. Some method was needed to display the different parts of the letter on the screen while also reinforcing the structure of a business letter. The

approach used for the student program was to use four different windows. The first window is where the user spends most of his/her time. When the program opens, it is this main screen that is displayed.

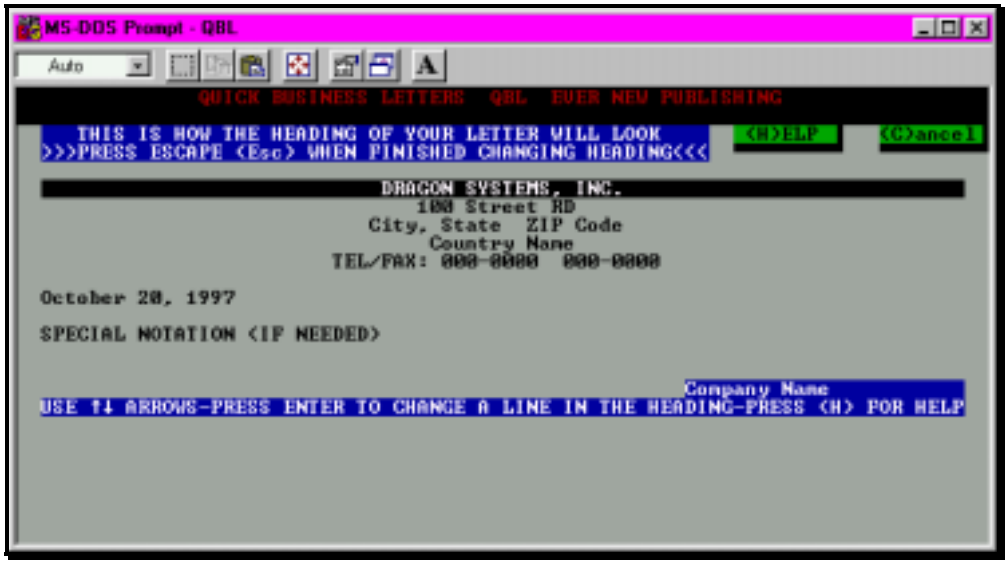
This main screen is where the body of the letter is written (see Figure 3). Commands are accessed in the menu, at the top of the screen. All common commands are in the menu; also included are commands that access the other three parts of a business letter. The three commands, Heading:F2, Opening:F3 and Closing:F4 all open the windows to their respective letter parts.

Figure 3. QBL Student Version main screen



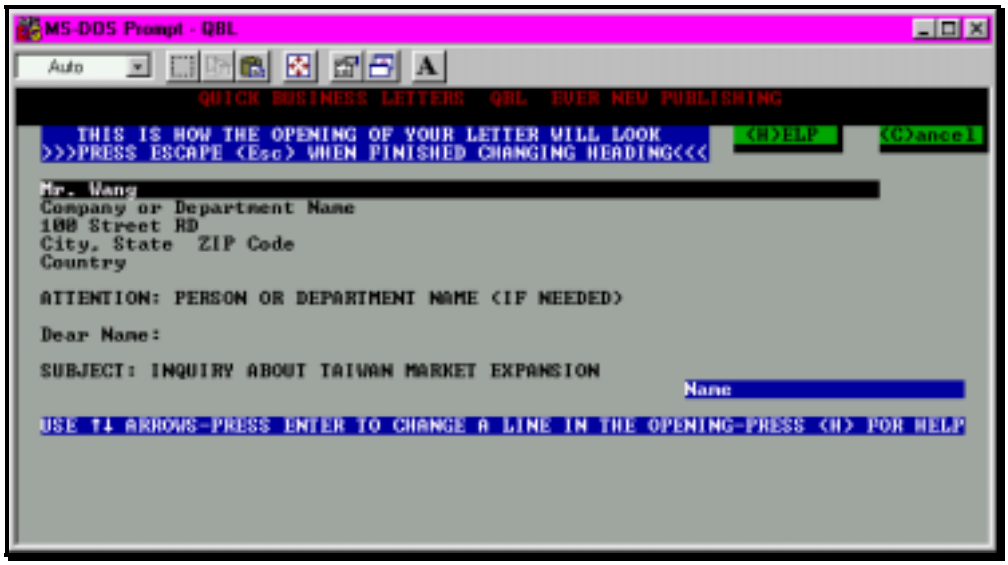
After completing the body of the business letter (or memorandum) the heading section of the letter can be modified. The sender's name and address information are placed in this section (see Figure 4).

Figure 4. QBL Student Version changing the heading section



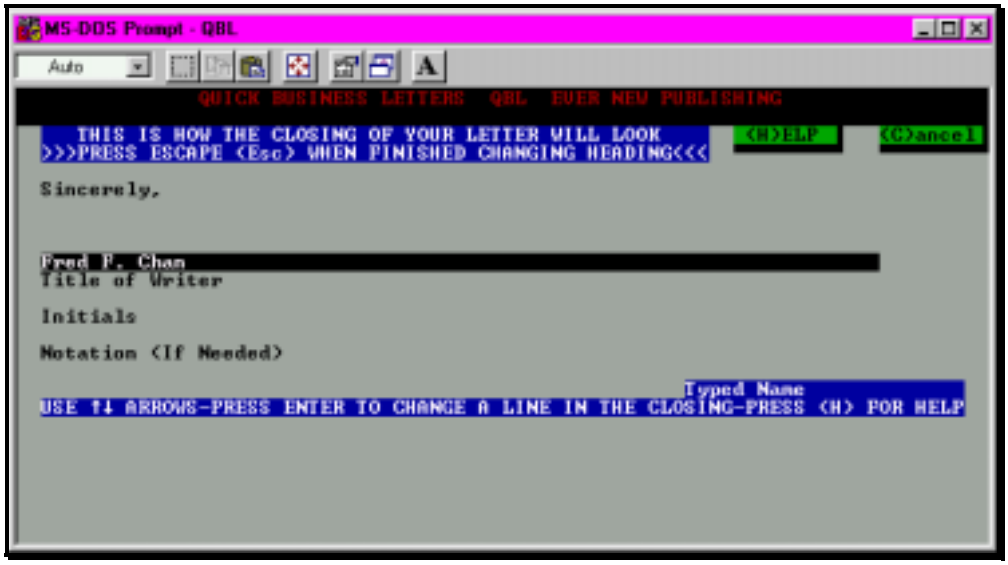
The receiver's name and address are placed in the opening section of a business letter. A student can see the correct formatting that is already present upon opening this part of the program (see Figure 5).

Figure 5. QBL Student Version changing the opening section



The final part of a business letter is the closing, which includes the sender's signature and some special information such as typing reference initials or other notations (see Figure 6).

Figure 6. QBL Student Version changing the closing section



c) Instructor Program (QBL TOOLS)

(1) Error Correction Software

The level of AI required to accurately parse English sentences (in commercially available software) has only been achieved in recent years. Different programs take radically differing approaches to achieve their levels of AI. It was obvious, that for this project, the resources did not exist to custom develop such software.

The ability to make existing grammar-checking programs easier to use, and more applicable to the R.O.C. classroom experience was seen as achievable and necessary. After examining several programs, Grammatik was chosen as the AI

engine for this project. Grammatik would only act as the actual searching engine while all interface, input and output features would be redesigned to better fit academic goals. One of the most important reasons for choosing Grammatik was its ability to be programmed, i.e., new rules could be added and existing rules could be modified. Although the detailed functioning of Grammatik has not been widely circulated by WordPerfect (the current owners of the software), it appears that Grammatik functions in two main stages.

Grammatik's mor-proof parsing engine first parses a sentence into its grammatical parts. This part of the program cannot be modified by the user. Part of this first stage is the determination of fundamental violations of grammar structures, i.e., missing verbs, incorrect forms, etc. After the first stage of checking, Grammatik compares the contents of the sentence to its database or knowledge-base of rules using simple forward chaining (see Hu, 1987, for a good discussion of chaining in expert systems). These rules can be viewed by the user through the use of Grammatik's Rule Editor program, included with Grammatik as a separate execute file. This database contains rules that are at a higher level than those checked during parsing. The rules in this database can be turned on and off through normal adjustment of Grammatik's options, more importantly, these rules can be changed directly through the Rule Editor program.

For development of the QBL system, I included over 300 new rules into the Grammatik database. Any new rules must only contain words that are also contained in Grammatik's dictionary, so I also made extensive additions to the Grammatik

dictionary. In addition to adding rules, I also changed the category settings for numerous rules as well as modifying the advice which is given by the program when a writing error is found. Lastly, after extensive testing, a few problems were found in the first stage of checking by Grammatik, the actual parsing, could flag false errors. Such flagging of a false error could easily be changed if the rule for the error existed in the database, but rules that were used in the actual parsing are not available for modification. In most cases, rules could be programmed into the second stage of checking, the rule database, which countered the false flagging of an error in the parsing stage.

(2) Windows Development

The Windows 3.1 environment, just released at the time development of QBL was begun, offered many advantages over DOS. However, the tools available to develop Windows software were limited at the time. The use of the C programming language and the Microsoft SDK (Software Development Kit) was the only way to proceed. The release of Microsoft Visual BASIC 2, in 1992, provided a way to program in Windows, without learning a new language and even the opportunity to port some already developed code into the Windows' environment.

(3) Programming Tools

(a) Microsoft Visual BASIC

The advantages of using QuickBASIC also apply to Visual BASIC, namely, easy to use syntax. Additionally, Visual BASIC allows the construction of interfaces

without requiring any coding. Since its release in 1992, Visual BASIC has been seen as the easiest method for programming Windows, yet it retains all of the powerful features that are common to the Windows95 interface. More than any environment, Microsoft Visual BASIC is a truly visual development environment.

The most important differences between DOS based BASIC and Visual BASIC are (Sarna and Febish, 1993):

1) **Visual BASIC is not a procedural language but a visual language**

2) **Visual BASIC is event driven**

In Visual BASIC, code is placed inside objects and is activated when the object is acted upon. The process of developing a Visual BASIC program is quite different from DOS based BASIC. Visual BASIC's steps towards application creation include (Sarna and Febish, 1993):

1) **Creating and manipulating objects visually**

2) **Setting properties visually or through BASIC code**

3) **Writing BASIC code for desired event handlers**

4) **Calling pre-written methods supplied by third party vendors (Dynamic Link Libraries, DLLs)**

By avoiding the coding of every window, menu and mouse functions, Visual BASIC allowed the author to avoid reinventing the proverbial wheel. Combined with calls to the Windows' API (Application Program Interface), the author was able to

create a completely professional software package with minimal expenditure of time and money. Windows itself has hundreds of functions available which can be accessed by other applications through the Windows API (Appleman, 1993). Once programming is completed, a standalone .EXE file is compiled that does not require a runtime module. This fact, combined with small .EXE file size, makes programs developed under Visual BASIC appear more professional than applications requiring extra files and large disk space.

(4) Program Structure

QBL TOOLS is constructed from 19 forms and four modules, containing over 20,000 lines of code and object settings. The general structure of the program can be seen in figure 2. All program actions are accessed through menus or icon buttons in the main analysis screen. QBL TOOLS takes advantage of Windows' event driven execution of commands by allowing the user to access any of the more than eight task specific tool modules. Due to this freedom of movement, a Windows program does not follow the same clearly defined execution of code that is the case with DOS programs. There is, however, a general path followed by users of QBL TOOLS.

The .TXT files are copied from students' disks to a central class disk through the use of the Copy Tool module. Errors are then found with the Find Error Tool module which creates a link with the Grammatik5 program. A summary of errors can then be created using the Create Analysis File command and saved as files using an .ANA ending. Feedback on errors can be printed through use of the Print Tool module.

Further detailed analysis, such as charting, creation of a spreadsheet of errors and statistical tests can be performed through the relevant modules.

(5) Interface Design

(a) Overview

When designing the actual interface, a priority was placed on following the standard Microsoft interface designs. Although not even all Microsoft programs follow the standards for Windows GUI programs, most do, including Windows95. Working from the assumption that teachers using QBL TOOLS would be mostly computer novices, the importance of following the conventions of the Windows interface was apparent. Since Windows use is the common experience users would have, to one extent or another, the interface goals were to match the Microsoft standard set out in the book <u>The Windows Interface An Application Design Guide</u> (Microsoft, 1992). When interface parts could not fit exactly to Microsoft recommendations, the next priority was to match the original IBM Common User Access (CUA) guidelines (IBM, 1989). The general advantages of a GUI environment are summarized by Cox and Walker (1993):

> **There are a number of major advantages of the object/action model: it lends itself easily to visual representations of the system, which are conceptually attractive, easy to learn and easy to manipulate, and it leads to relatively simple models of complex systems. . . User control means that it is up to the user, not the computer system, to decide how a particular task is to be performed. Techniques for ensuring user control include: use of windows, modeless dialogues and flexible display facilities (including provision of overviews).**

(i) The QBL TOOLS Package

1) **QBL Student Version master disk and manual (this disk is used by the instructor or computer lab technician to repair students' disks that have problems).**

2) **QBL TOOLS disks (containing the actual program, important files and on-line help files).**

3) **Class disks (one high density floppy disk for each class to participate in the QBL system).**

(ii) System Features

1) **QBL TOOLS' helpful on screen yellow help memo notes guide the user through each action so that the user does not get lost.**

2) **Advanced on-line help (accessed by pressing F1 at any time) that includes complete index and search capabilities—so the user can quickly find the answer to a question—as well as hypertext (by pressing on green words, the user can jump to specific definitions and instructions).**

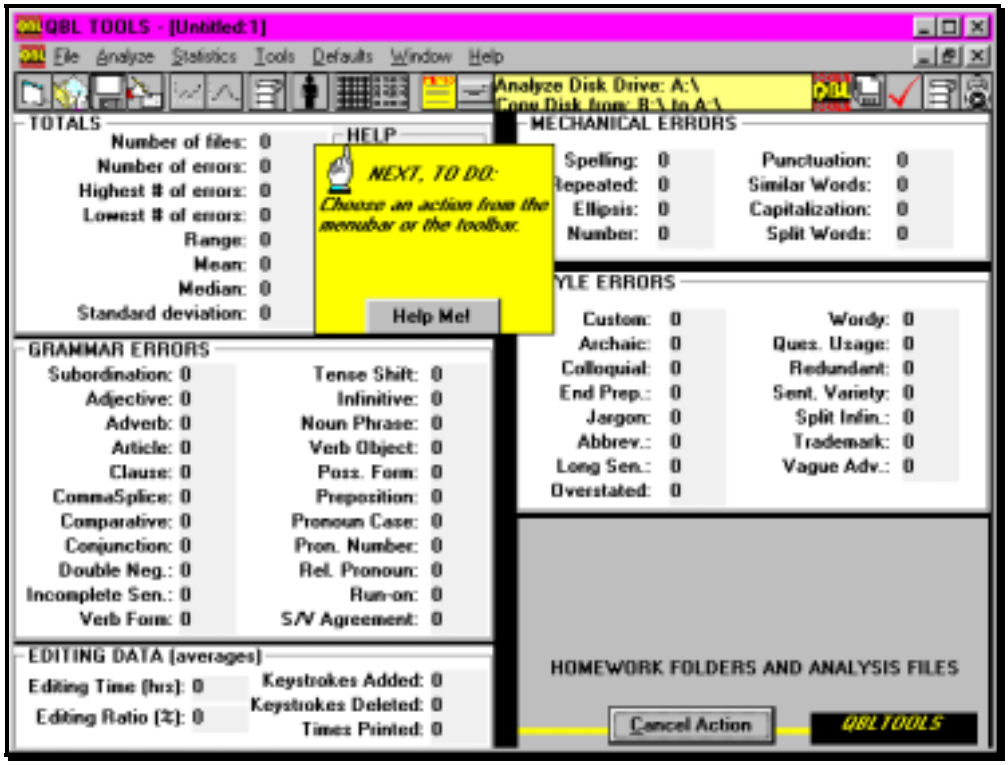
3) **Clicking with the right mouse button on any object opens an explanation box that lets the user see what it does or what its meaning is.**

(b) Getting Started With QBL TOOLS

(i) QBL TOOLS Screen

The main screen for QBL TOOLS opens with an empty analysis file displayed. The different parts of the screen are shown in Exhibit 11.

Figure 7. The Main QBL TOOLS Screen



(ii) Help Memo Notes

When the user opens the main QBL TOOLS screen, he/she can see a yellow square with the words WHAT TO DO. This note is to help guide the less experienced user through the steps of using QBL TOOLS. The help memo notes can be turned on or off by making changes in the Defaults menu.

B. Most Recent Updates & Changes

The fundamental design of the QBL system has not changed for the present experiment although slight modifications have been made. All software has been updated to full compatibility with Windows95. For QBL Student Version, this means the ability to run smoothly in a DOS window under Windows95. In this way, the

program keeps full backward compatibility and the ability to be run on older non-Windows95 machines.

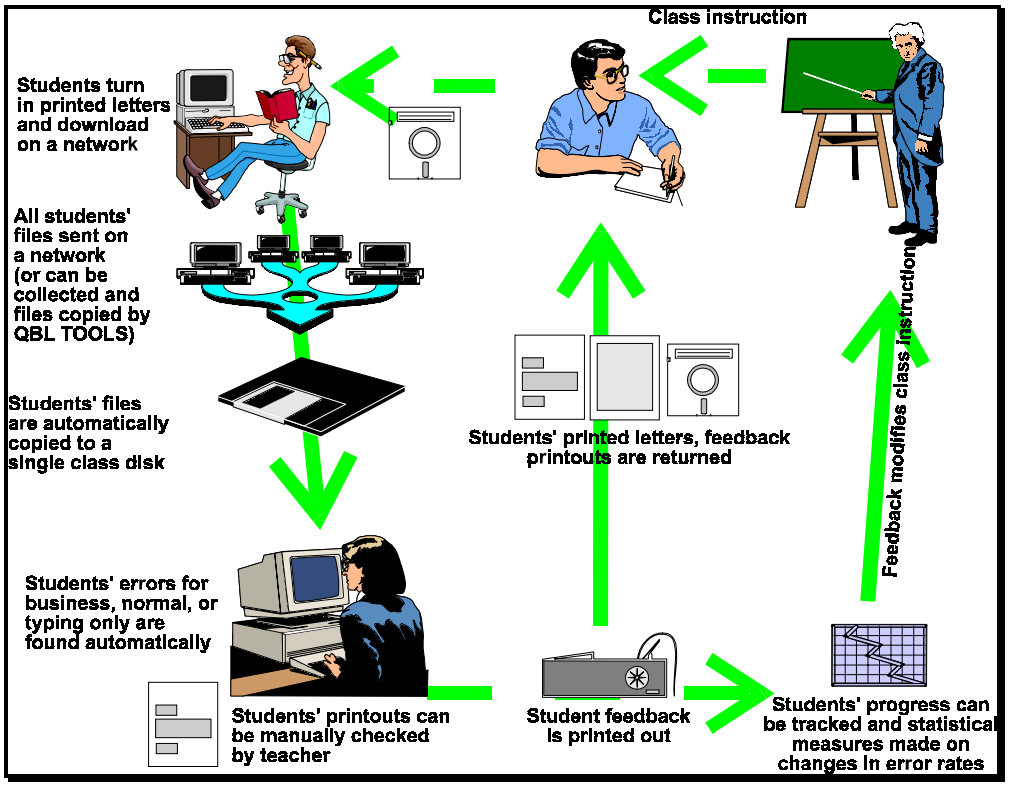
C. Computer Based Correction Software

An overview of the QBL System can be seen in Figure 8. The process actually resembles a normal writing assignment in that a student must complete a letter, print it out and then turn it in to the teacher. Additional steps for the QBL system include:

1) **Assignments be completed on computer using the QBL Student Version software.**

2) **Upon assignment completion, the document is sent via local area network to a predetermined location on a server (the printout can be turned into the teacher as usual).**

Figure 8. Steps to completing assignments (Chen, 1997)



Of course, the benefits of using the QBL system also can bring more steps into the evaluation, feedback and pedagogy evaluation stages if one wishes. As this study will demonstrate, the amount of detailed data that can be gathered on student activity during the completion of their documents is extremely large.

D. Network Homework Submission (Uploading)

Students are free to complete their assignments at any location or at any time that is convenient for them; this is one of the main goals of the QBL system implementation. However, when the document is completed and the student wishes to turn in the assignment, access to the local area network is required. The task of uploading the document is quite simple and should not be confused with e-mail, Internet or World Wide Web. The process is simply based on a local area network which nearly every school has installed when a computer room is set up. With the cooperation of the school's computer center, a specific server is designated as the machine to contain English students' assignments. A unique path is created for each class which ends in an electronic folder where the relevant class' assignments will be stored. The instructions for setting up the network can be seen in Figure 9 on page 47.

Once students know the network path for their class, they may send their documents at any time. When quitting QBL Student Version, a dialog asks the student if s/he wants to send the document over the network to the teacher. If the response is "NO," then the program closes with no further action. If the student

responds by clicking "YES," s/he will be prompted to input the path where the file is to be sent (see Figure 10).

The resulting system has proven easy for students to use, since most students have had computer class and are required to log into the network. An additional benefit is that students can send documents at any time with the knowledge that updated or modified versions can be sent right up to the class time when the assignment is due.

If there is any problem with sending the file, such as typing the wrong letters in the path, the program will jump back to try again. If the document is uploaded successfully, a smile face appears along with a short music clip and then the program closes. Submitting completed documents follow these guidelines:

1) **Files can be sent over the network at any time.**

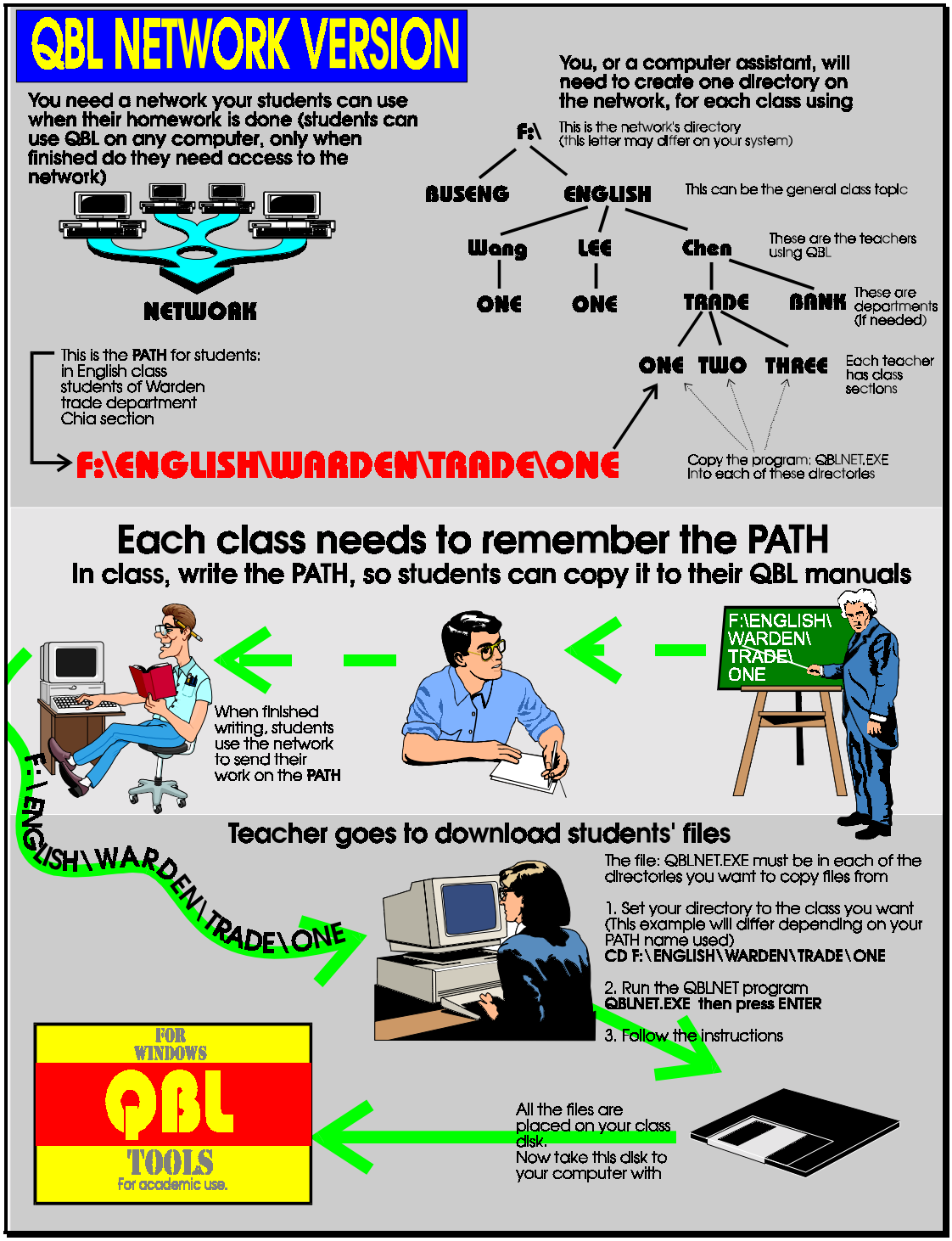
2) **Files take the name of the student's seat number, e.g., 10.txt.**

3) **After a document has been sent, a student may send a corrected version that will simply overwrite the first version.**

4) **Students may view the contents of the network directory to which their documents were sent; however, no erasing or changing of directory structure is supported.**

5) **Once a document has been sent, it cannot be erased by a student although it can be overwritten with a newer version.**

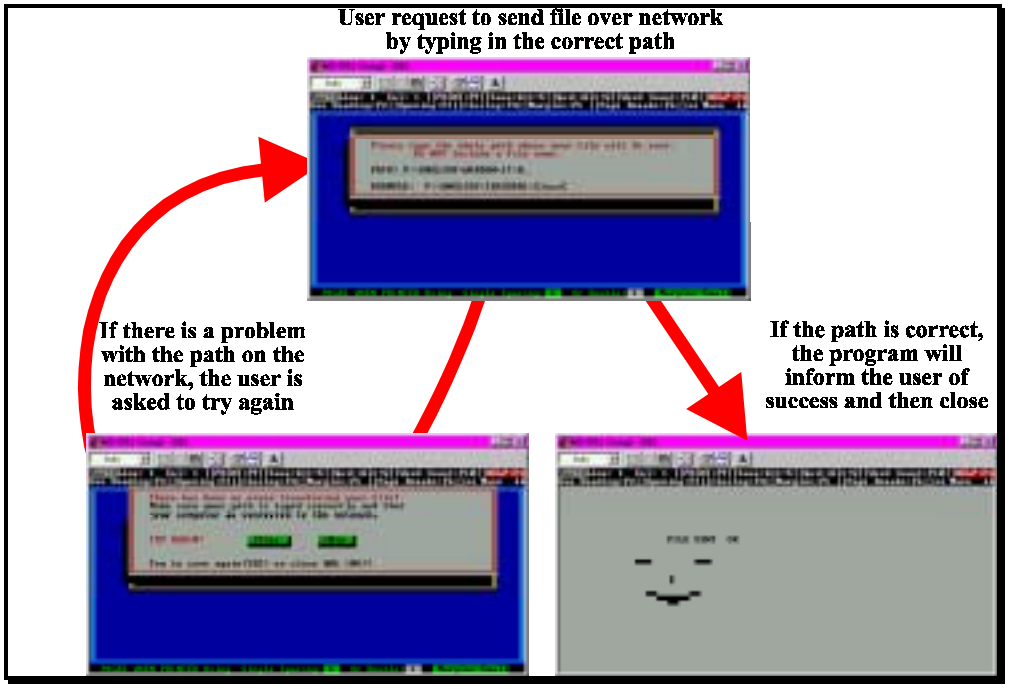
Figure 9. Instructions for setting up a local area network for the QBL system



The resulting system has proven easy for students to use since most students have had computer class and are required to log into the network. An additional

benefit is that students can send documents at any time with the knowledge that updated or modified versions can be sent right up to the class time when the assignment is due.

Figure 10. Sending student files over the network

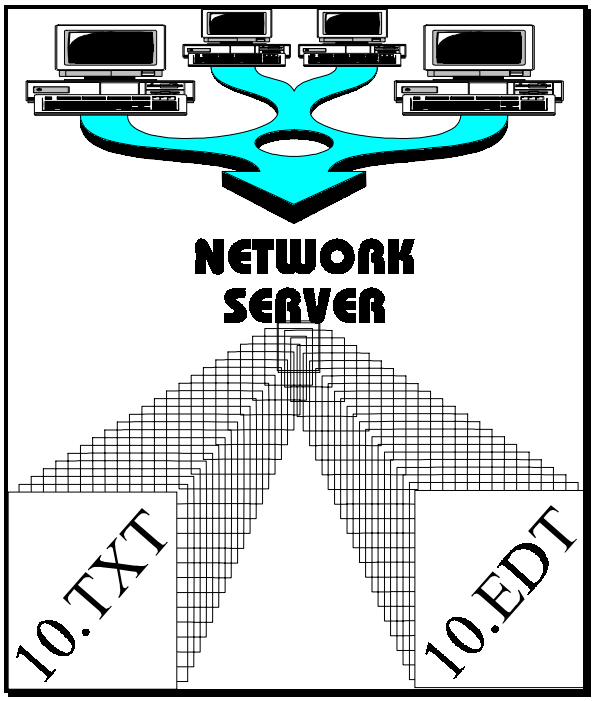


When a document is sent over the network, only the body of the business letter is sent. The heading, opening and closing sections are not included in the uploading since these parts are not conducive to computer correction. Additionally, any special formatting or carriage returns are stripped out of the document in order to ease computer error correction.

While the essential file sent over the network is the body of the business letter, it is not the only file sent. All data gathered on the student's editing activity are removed from the main file and placed in a secondary file that also uses the student's

seat number as the file name but appends the extension of ".edt" to the number (see Figure 11).

Figure 11. File types created over the network



Both files are sent over the network in a unique way in order to minimize the chance of spreading any type of computer virus (always a fear of network administrators). Rather than simply copy files from a student's disk to the network, using a command similar to the DOS COPY command, the QBL system creates a new file over the network for writing to (see Listing 1). Because viruses often act on common commands, such as copy, the *OPEN A NEW FILE FOR WRITING TO* technique is safer.

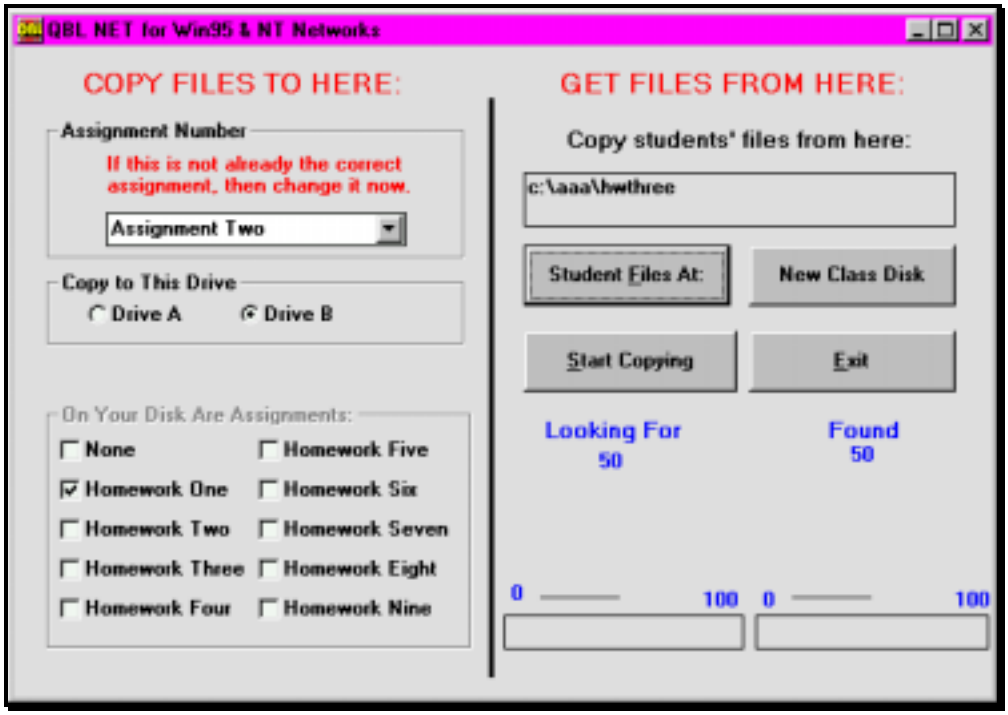
Listing 1. Code for saving across a network

```
'save the string to disk (using a sequential file)
FileNum = FREEFILE
OPEN NetPathTxt$ FOR OUTPUT AS #FileNum
IF NoF% = -1 THEN EXIT SUB 'if net save errors then flag NoF% as -1
IF NoF% = -2 THEN GOTO RETRYNET'if net error and user wants to try again
WRITE #FileNum, A$
CLOSE
'save the editing measures file (using a sequestial file)
FileNum = FREEFILE
OPEN NetPathEdt$ FOR OUTPUT AS #FileNum
WRITE #FileNum, EditTime&, EditAdd&, EditCut&, OnOff%, Prints%, Helps%, Nav&, FirstPrint&
CLOSE
```

E. Network Homework Collection (Downloading)

After all student files had been successfully transmitted over the network, the teacher could then download the files to a floppy disk for correction and analysis. This task was accomplished through another custom made program completed specifically for this research project. In addition to retrieving the text files (.TXT), as was the case in previous QBL research projects, this study required the additional downloading of the edit measures files (.EDT). A further complication was that while the overall sample size was not small, the division of the subjects into three groups resulted in small sample sizes per group. This meant that any confusion or errors in downloading one hundred percent complete sets of files could have detrimental effects on the data analyzing stage of the experiment. The program shown in Figure 12, *QBL NET for Win95 & NT* Networks, is the resulting program. This program was completely visual in nature and performed most tasks automatically, thus avoiding any errors that could occur in the normal DOS accessing of network files.

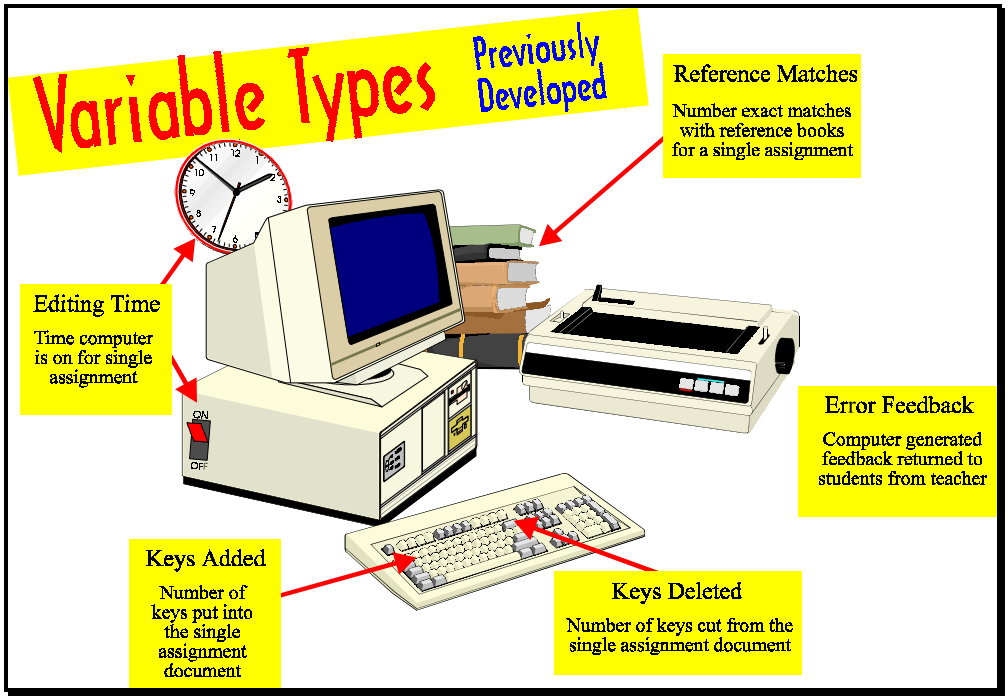
Figure 12. QBL NET program for downloading students' files



F. Computer-Based Monitoring Variables (1992-95)

From previous work (Warden, ???; Chen, ???), numerous variables can be measured through the use of the QBL system, in addition to error numbers and types. Figure 13 reviews the measurement abilities previously developed in QBL that were also used in this experiment (see page 82 for details of variable types).

Figure 13. Computer-based monitoring variables (previously developed)

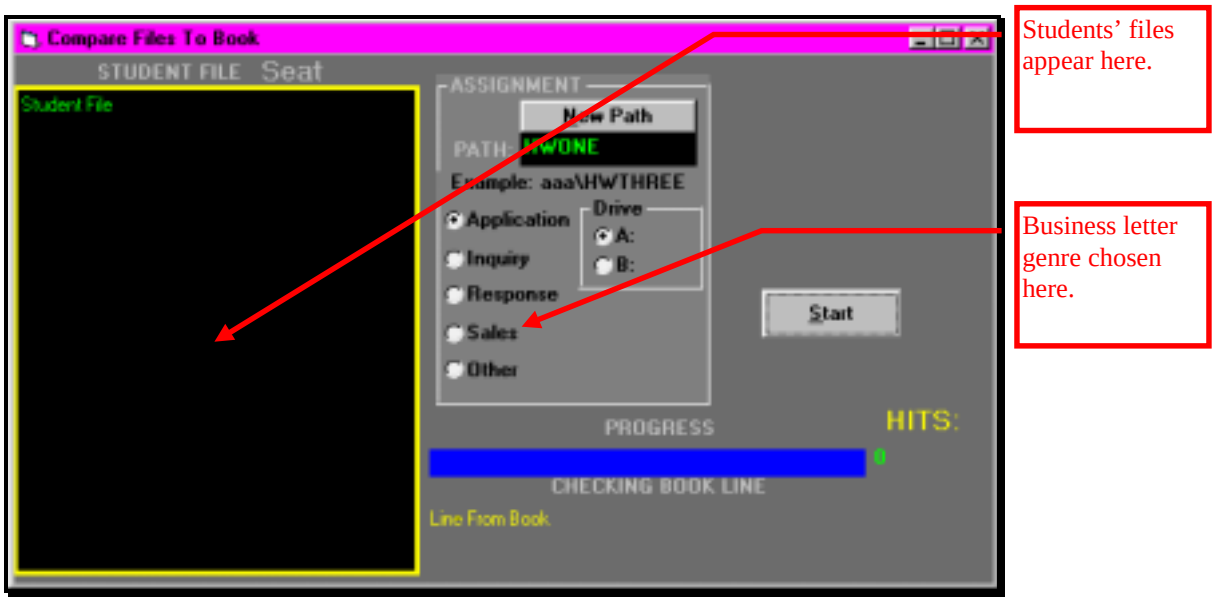


G. Reference Use Monitoring (1995)

The Chen (???) experiment also began a new approach to measuring the amount of reference material students used in their documents. For this experiment the same concept was used while the software was expanded to include the ability to check for matches between all four letter assignments, included in this experiment, and the textbook.

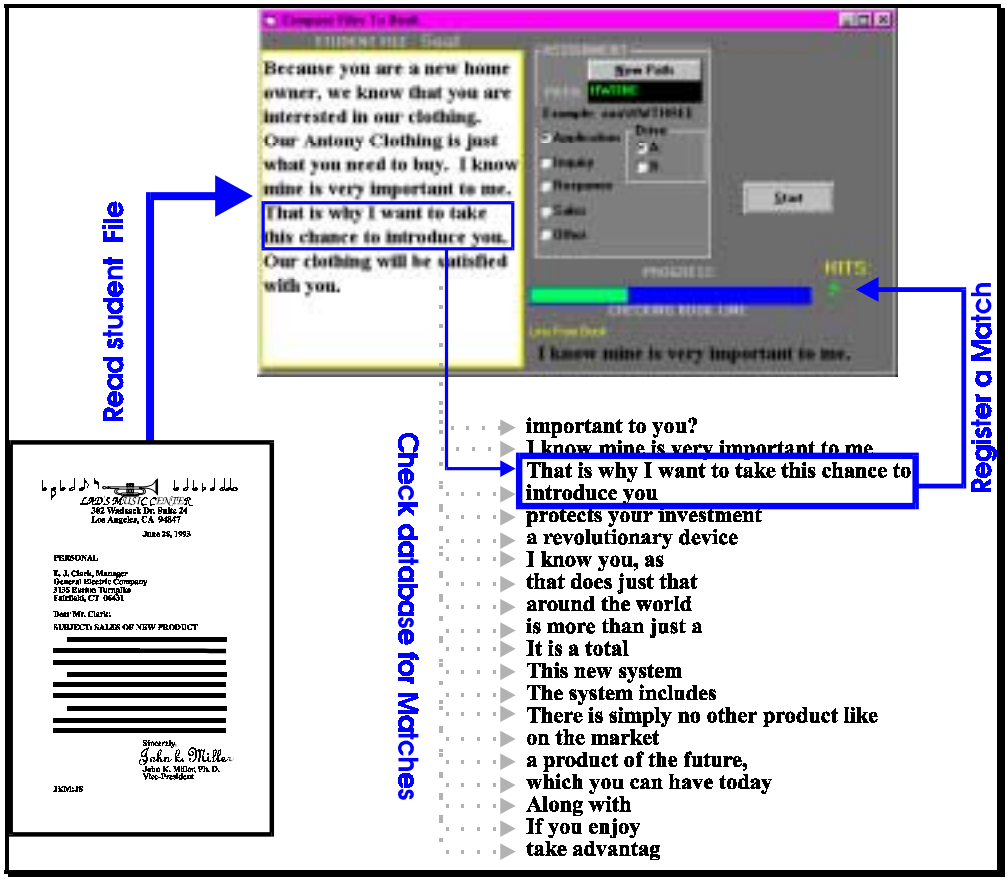
The program shown in Figure 14 is easy to use and can check for matches between fifty students' documents and the relevant book examples in less than three minutes. The resulting data is transferred to a spread sheet where each student number is listed with a corresponding number of reference matches with the textbook.

Figure 14. Software for checking book matches



The reference checking software works by building a database of example phrases from the class textbook and then checking for exact matches between those phrases and occurrences in students' documents (see Figure 15). The database differs depending on the letter genre assigned for student completion.

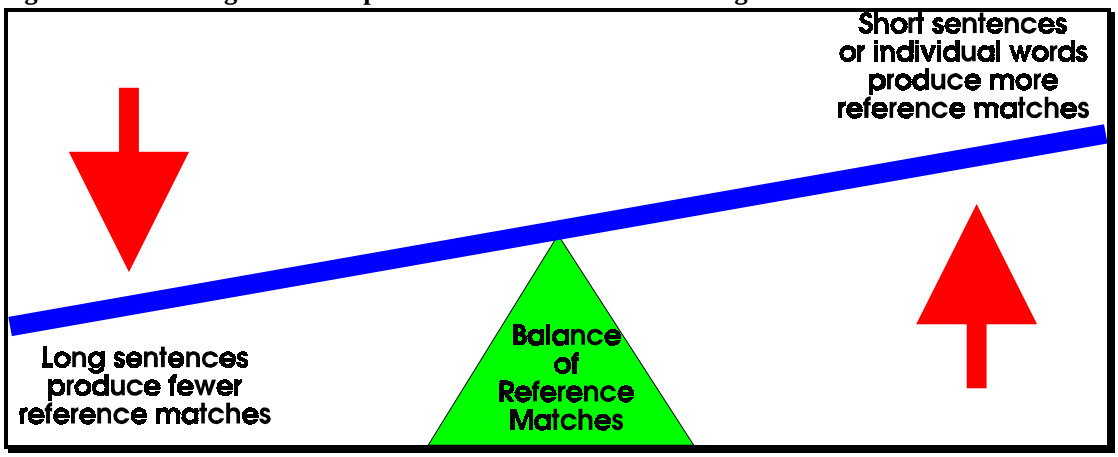
Figure 15. Functionality of reference checking software



Construction of the database was a balance between using whole sentences from the textbook versus individual words (see Figure 16). For example, the textbook sentence: *Order your books today, by simply completing the questions below,* is a typical structure for sales letters. If this whole sentence were placed in the database, only an exact match would be counted as a reference use. However, students may not be writing letters for selling books yet still use the structure found in the example. The sentence, *Order your new shirt today, by simply completing the questions below* would not be counted as a match under such a database structure. Clearly this method would flag too few reference matches.

At the other extreme, the use of words or phrases that are too small could cause too many matches between students' documents and the reference material. From the above example, if we used a smaller part of the textbook sentence, such as: *by simply* the chance that a student wrote such a phrase on his/her own, without referring to the textbook, is high, since this is a commonly used phrase. The possibility of over flagging matches is even higher when placing single words in the database.

Figure 16. Balancing the size of phrases in the reference matching database



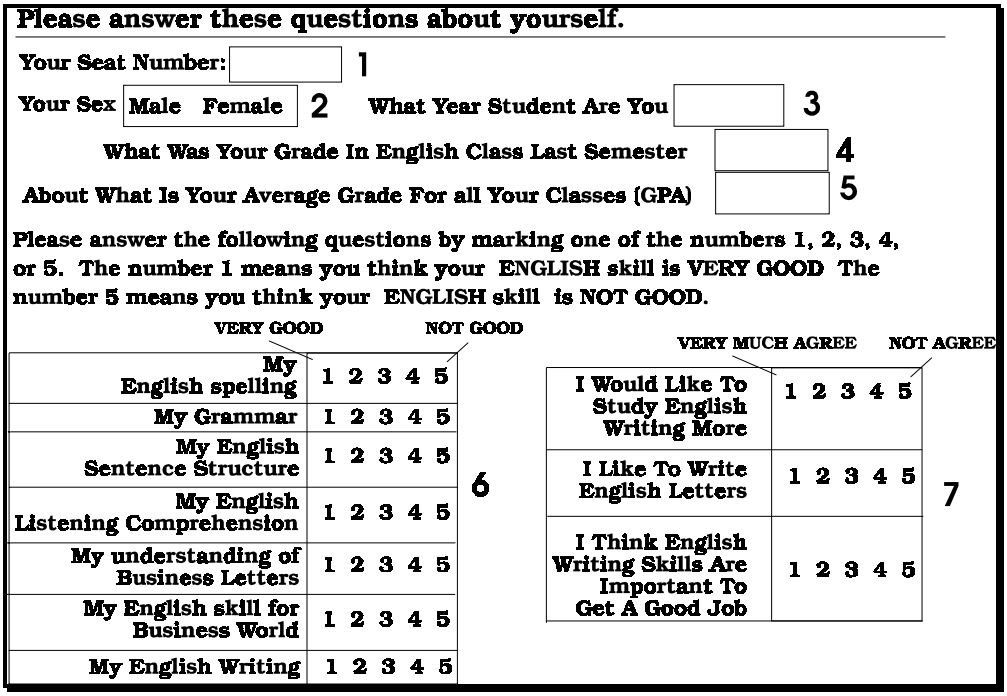
In the end, a database was constructed that included all sample sentences from the relevant textbook chapters, yet broke sentences at places where specific product names or situations were used. Capitalization and ending punctuation were also ignored as students could use examples within different sentence constructs. The resulting database gives an accurate indication of the amount students copied examples directly from the textbook.

H. Previous Survey Use (1994-95)

This study employed the survey instrument used by Chen (???) and Warden (???) in previous studies. The survey instrument used a five point Lickard-like scale for students to rate their own skill levels on a number of English writing and professional writing areas (see page 80 for details on the administering of the survey). No questions were included on computer use or the QBL system since the measure being taken is of students' own perceptions of their skill levels and the change of those skill levels over the treatment period.

The survey instrument also included a question on listening ability, which should not be related to writing class, for the purpose of checking validity of the questionnaire; i.e., this measure should not show change over the treatment since it is not being addressed in the business writing class, or if it does change, all groups should change equally thus having no significant difference between any two groups. Inclusions of this checking mechanism can assist in tracking down any unaccounted for variability in later statistical analysis.

Figure 17. Pre/Post survey instrument (Warden & Chen)



Please answer these questions about yourself.

Your Seat Number: [ ] 1

Your Sex [Male Female] 2 What Year Student Are You [ ] 3

What Was Your Grade In English Class Last Semester [ ] 4

About What Is Your Average Grade For all Your Classes (GPA) [ ] 5

Please answer the following questions by marking one of the numbers 1, 2, 3, 4, or 5. The number 1 means you think your ENGLISH skill is VERY GOOD The number 5 means you think your ENGLISH skill is NOT GOOD.

	VERY GOOD NOT GOOD
My English spelling	1 2 3 4 5
My Grammar	1 2 3 4 5
My English Sentence Structure	1 2 3 4 5
My English Listening Comprehension	1 2 3 4 5
My understanding of Business Letters	1 2 3 4 5
My English skill for Business World	1 2 3 4 5
My English Writing	1 2 3 4 5

6

	VERY MUCH AGREE NOT AGREE
I Would Like To Study English Writing More	1 2 3 4 5
I Like To Write English Letters	1 2 3 4 5
I Think English Writing Skills Are Important To Get A Good Job	1 2 3 4 5

7

V. Newly Designed Instruments (1996-97)

For this experiment, three new tools were developed in order to increase measures of more subjective areas. While the computer-based correction software has the ability to collect massive amounts of detailed data, this experiment required a wider range of measures due to the inclusion of a process-based feedback group. Additionally, feedback to the process group had to be as consistent as possible while retaining the student centered emphasis that is typical of the process writing motivation. For this reason, software was developed that assisted in pinpointing the changes students made in their redrafts. While this application of new software allowed some objective measures to be drawn out of what is usually very subjective material, flexibility was also required in our measurements in order to capture opinions or directions not revealed in the computer measurements and/or not included in the pre-post surveys. To this end, an open-ended survey was designed.

A. New Computer Based Monitoring Variables (1996-97)

Previous research (Chen, ???), began to experiment with measuring details of students' editing activities. During 1995, new code was added to QBL Student Version that tracked keystrokes as well as the total amount of time spent on the computer editing a document. The keystroke measurement was broken into two groups: keystrokes adding to the document and keystrokes deleting from the document. Those measures proved viable and successful in measuring students' editing activity. For that reason, this experiment expanded the number of variables to

be measured (see Figure 18 and Figure 19) while also creating more complete software for downloading and consolidation of the resulting data within the QBL TOOLS environment (see page 82, Table 5, for details of variable types).

Figure 18. Computer-based monitoring variables used in this study

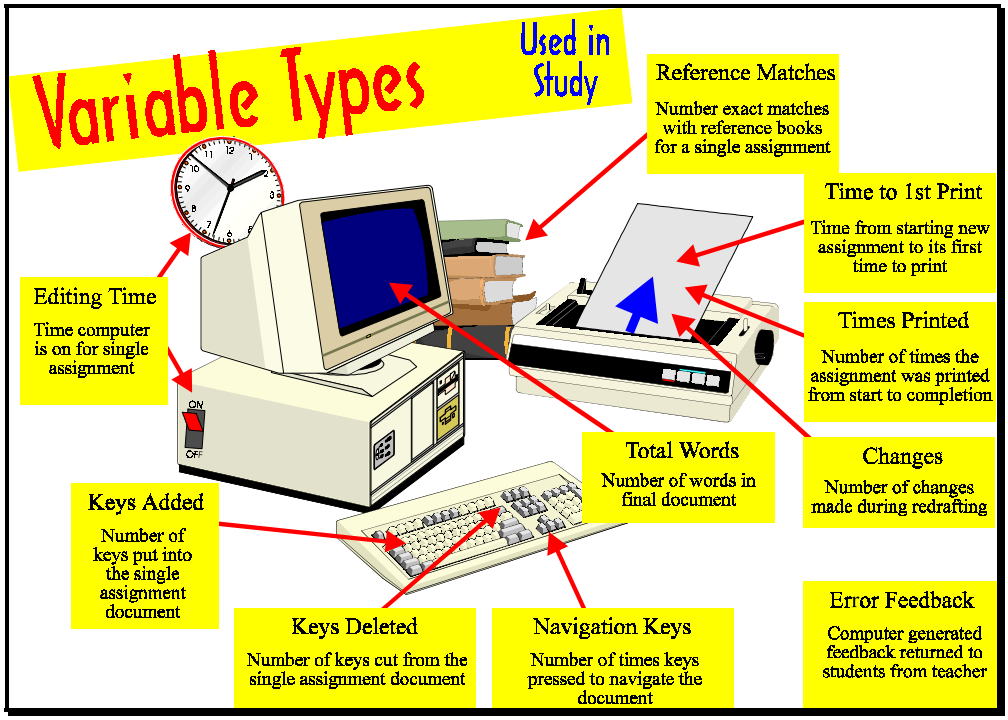
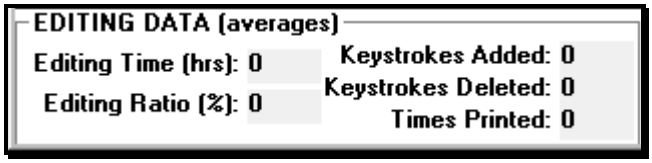


Figure 19. New measures integrated into QBL TOOLS (see full screen shot on page 43)

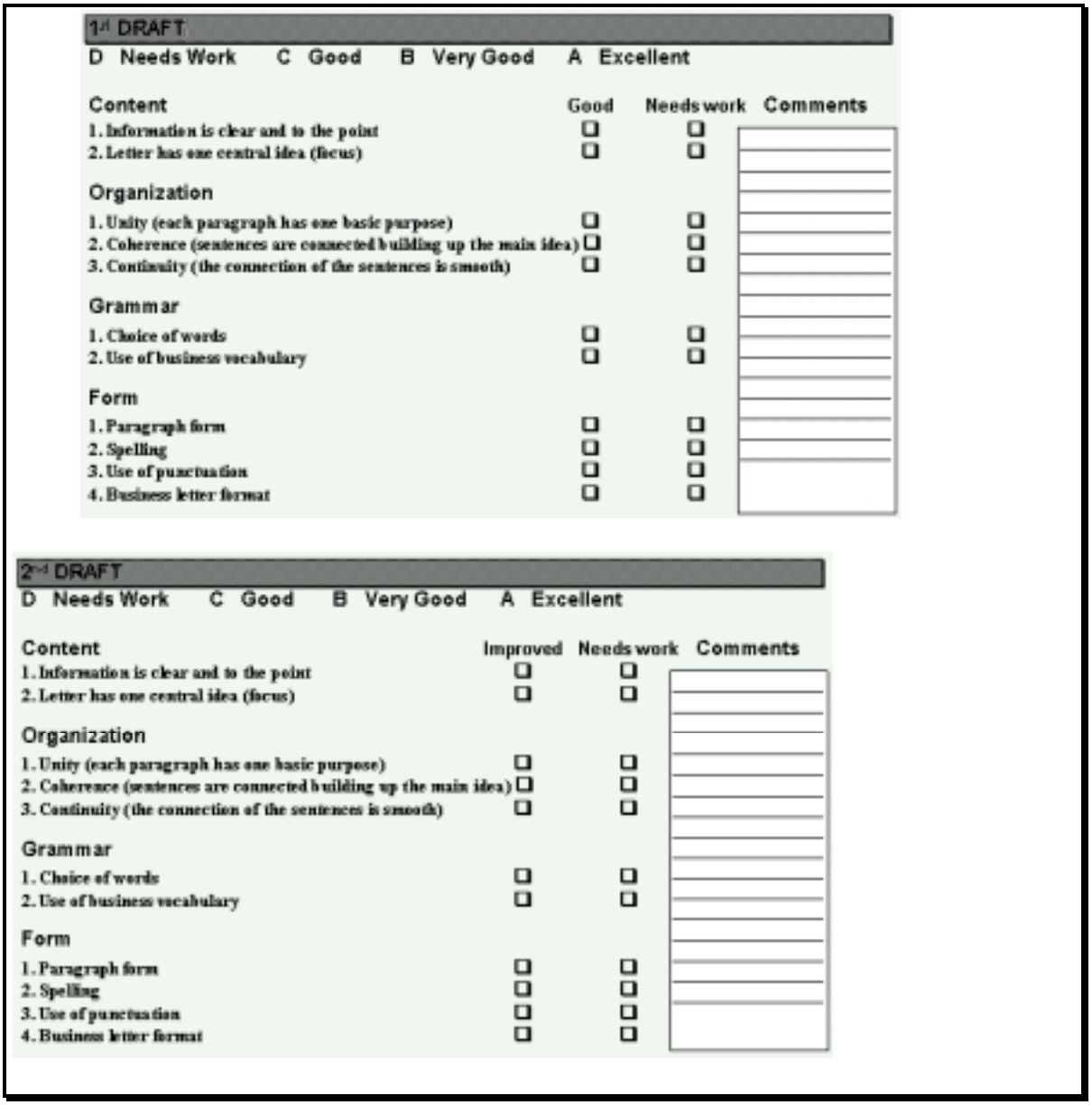


B. Teacher Process-Based Feedback Forms (1996-97)

One group in this study did not receive any form of computer-based feedback but instead received a process-based feedback form. In order to maintain some level of consistency for valid statistical measurements, a two part form was developed that

follows the general thrust of process-based writing. This specific form was adapted from Interactions I (Kirn & Hartmann, 1990) with a few alterations and has been tested and used successfully in previous experiments (Yao & Warden, 1996).

Figure 20. Process feedback form



1st DRAFT

D Needs Work C Good B Very Good A Excellent

Content	Good	Needs work	Comments
1. Information is clear and to the point	☐	☐	
2. Letter has one central idea (focus)	☐	☐	
Organization			
1. Unity (each paragraph has one basic purpose)	☐	☐	
2. Coherence (sentences are connected building up the main idea)	☐	☐	
3. Continuity (the connection of the sentences is smooth)	☐	☐	
Grammar			
1. Choice of words	☐	☐	
2. Use of business vocabulary	☐	☐	
Form			
1. Paragraph form	☐	☐	
2. Spelling	☐	☐	
3. Use of punctuation	☐	☐	
4. Business letter format	☐	☐	

2nd DRAFT

D Needs Work C Good B Very Good A Excellent

Content	Improved	Needs work	Comments
1. Information is clear and to the point	☐	☐	
2. Letter has one central idea (focus)	☐	☐	
Organization			
1. Unity (each paragraph has one basic purpose)	☐	☐	
2. Coherence (sentences are connected building up the main idea)	☐	☐	
3. Continuity (the connection of the sentences is smooth)	☐	☐	
Grammar			
1. Choice of words	☐	☐	
2. Use of business vocabulary	☐	☐	
Form			
1. Paragraph form	☐	☐	
2. Spelling	☐	☐	
3. Use of punctuation	☐	☐	
4. Business letter format	☐	☐	

The page is split into two parts, the top for the first draft and the bottom for the redraft. Generall topics of content, organization, grammar and form are covered in

the feedback form. To encourage students in the process approach, specific grades are not assigned, but general ratings used instead. For each measure, a box is checked for *good* or *needs work*, in the first draft, and *improved* or *needs work* in the second draft. Overall ratings are listed at the top of each section and use a general letter based system rather than specific number grades. With this form, students are told that grades are based on improvement and effort between drafts. In order to facilitate this, an area on the right of the form is open for teacher comments on what a student should concentrate on during redrafting or for positive feedback on topics that the student did well on.

C. Redrafting Analysis Software (1996-97)

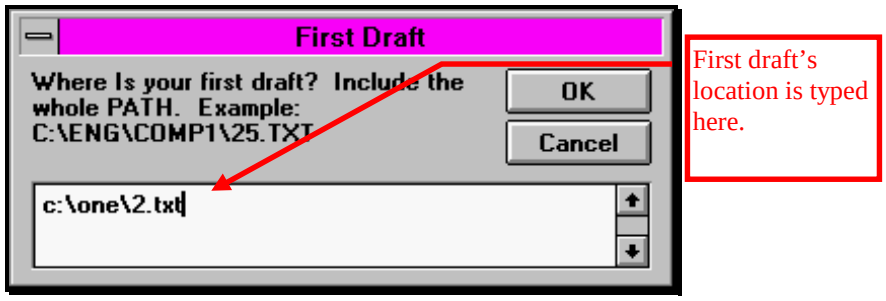
In order to bring some consistency to the evaluation of the process based redrafts (completion of the bottom half of the process-based feedback form seen on page 60), a program was developed within Microsoft Word for Windows (coded in Visual BASIC for Applications). This program allowed the teacher to see exactly where changes had been made in a student's redraft.

For the first student of a class, the teacher starts the program and inputs the path and seat number of the first student to be checked (see Figure 21). Each time the program is run, the previous paths used are retrieved from disk (in the file c:\compare.txt). If the path ended in a file name with letters, such as c:\one\model.doc, then that name is used again. However, if the file is a number, such

as 10.doc, the number is increased by one, thus progressing through students' files and eliminating any need for the teacher to input new file names.

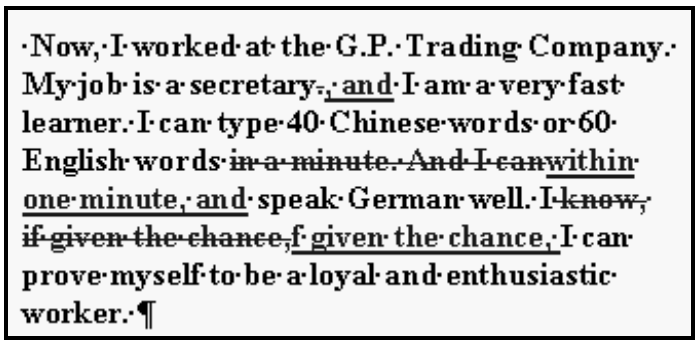
For example, students' first drafts could be in the directory c:\one and the second drafts in c:\two. Their files are named 1 to 50. To review the changes made between students' first drafts and redrafts, in the first dialog box the first student's draft location is input: c:\one\1.txt and then upon prompting, to the redraft location is input: c:\two\1.txt. Next time the macro is run, the dialog boxes will open with the correct paths and names increased by one (c:\one\2.txt and c:\two\2.txt).

Figure 21. Software to compare first and second drafts



The result is that the teacher can quickly have, on screen, an exact view of what a student has done to the document in response to the teacher's feedback on the first draft (see Figure 22). This is especially important for use with the process based feedback form, since without it, trying to measure what a student had done and then assign grades, based on improvement, would be extremely difficult and certainly inconsistent. Since statistical analysis of all data was the goal of this experiment, consistency in feedback was of paramount importance.

Figure 22. Result of comparing first draft and redraft (underlined text has been added while text with line through it has been deleted)

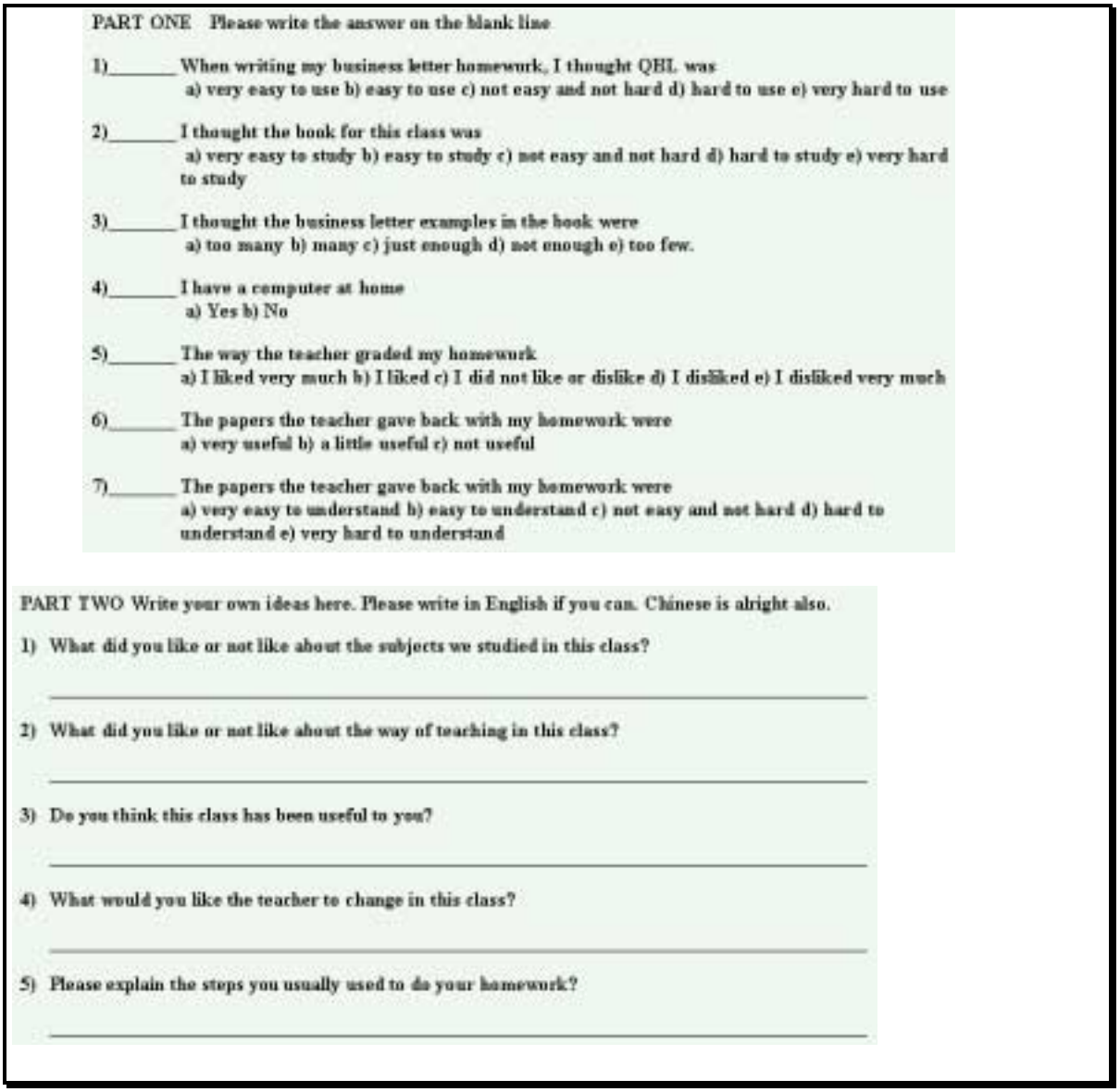


D. Open-Ended Survey (1996-97)

The last new addition to the present study was the creation of an open-ended survey form (see Figure 23). This survey was created to be given only at the end of the experiment and did not have a matched pretest survey. The questions on this survey were directed more at the specific activities of the class rather than the skills such activities may affect, as is the case with the pre/post-survey. Using multiple choice questions, this survey asked students to rate the success of QBL, the textbook, computer generated feedback, teacher grading, etc.

Such direct questioning of the actual tools and methods used in this experiment cannot be seen as accurate measures of the tools' successes or failures. This is simply because it is the final effect such tools have on students' skills that is most important to this study. Additionally, it is well understood that direct responses may not solicit information that is related to the measures a survey ultimately attempts to evaluate. However, it was thought that such questions may be useful as they do reflect students' opinions and feelings at the end of the experiment.

Figure 23. Open-ended survey form



PART ONE Please write the answer on the blank line

1)_____ When writing my business letter homework, I thought QHL was
a) very easy to use b) easy to use c) not easy and not hard d) hard to use e) very hard to use

2)_____ I thought the book for this class was
a) very easy to study b) easy to study c) not easy and not hard d) hard to study e) very hard to study

3)_____ I thought the business letter examples in the book were
a) too many b) many c) just enough d) not enough e) too few.

4)_____ I have a computer at home
a) Yes b) No

5)_____ The way the teacher graded my homework
a) I liked very much b) I liked c) I did not like or dislike d) I disliked e) I disliked very much

6)_____ The papers the teacher gave back with my homework were
a) very useful b) a little useful c) not useful

7)_____ The papers the teacher gave back with my homework were
a) very easy to understand b) easy to understand c) not easy and not hard d) hard to understand e) very hard to understand

PART TWO Write your own ideas here. Please write in English if you can. Chinese is alright also.

1) What did you like or not like about the subjects we studied in this class?

_____

2) What did you like or not like about the way of teaching in this class?

_____

3) Do you think this class has been useful to you?

_____

4) What would you like the teacher to change in this class?

_____

5) Please explain the steps you usually used to do your homework?

_____

The first section of the survey includes six scaled questions (interval based data) and one nominal question (ownership of computer). The second part of the survey is completely open-ended and solicits opinions about teaching, class usefulness as well as specific steps taken in completing assignments.

VI. Study Design

A. Subjects

1. Student Background

Three intact classes of students were selected for this study in order to maximize control of variables while retaining a high number of students being measured. The class sections were all very similar in nature in that they were sections of the same academic department, the same academic year and taking the same course work.

2. Academic Institution

The study was held at a business college in central Taiwan, Chiao Kwang (The Overseas Chinese College of Commerce). While the higher education system on Taiwan is highly similar to the U.S. structure, there are differences, especially at the college level. Chiao Kwang is a business college that contains three tracts for students to pursue. The five year program includes three years of high school equivalent work, finished with two years of college equivalent work. A two year program is offered to students from vocational high school and supplies two years of college work. These two years are, for the most part, the same as the final two years of the five year program. Night school is the final tract offered and resembles the two year program but is only offered at night and requires three years to complete. Completion of any

of these three tracts entitles a student to begin university at or above the sophomore year.

Students participating in this experiment were all part of the five year tract and in their final year, the fifth year or graduation year. All three class sections involved in this study were from the International Trade Department of Chiao Kwang. Because Taiwan's Export sector has been extremely successful over the past twenty years, students can actually specialize in this subject and have very good job opportunities upon graduation. Over their five years, Trade students undergo a thorough English program that includes writing, reading and conversation classes during every semester. English classes center on skill achievement with little or no exposure to language theory or literature. By graduation, Trade students have had over 30 credits of English classes, which amounts to more than 470 in-class hours of English instruction.

Students about to graduate, as those in this experiment, range in age from 19 to 21 with the majority of Trade Department students being female. One special note relevant to this study is the method used to arrange classes. Students in Taiwan, at all levels, belong to a class section, i.e., Trade 5 Section A. When a student begins at a school s/he is placed in a section. Throughout his/her career at the same academic institution, the year will change but the section will remain the same. This means that the approximately fifty students who begin school in the same section will attend most classes together, following the same schedule, and will graduate together. Due to this structuring, it is difficult to obtain randomly sampled groups for experimentation.

However, because the original grouping into sections was not based on any specific system, one can assume that little differences exist between sections. All sections follow the same curriculum and for the most part even have the same teachers. In this experiment, International Trade graduating class (fifth year) sections A, B and C classes were used.

3. Business Writing Class

All three participating classes were attending English classes in their fifth year at college. The curriculum included four hours in class a week of business English and two hours a week of English conversation. The business English class consisted of two hours a week of international business English writing instruction and two hours a week of practice class, which could include instruction on more general English topics or allow students to work on assignments from the business writing class.

Emphasis in the business writing class is on practical skill acquisition which will enable students to produce numerous written communications often used in Taiwan based international business. Two English textbooks were used along with the QBL software for assignment completion. Both textbooks are in English with one introducing business letter genres and the other covering mechanical issues in English writing such as punctuation, writing structures, etc. Participating sections had class instruction in English due to the fact that the teacher was a native speaker. The medium of in-class instruction is left up to the teacher and can include a heavy use of Chinese in explaining and translating English examples.

Table 1. Subjects participating in experiment

Class/Group	*Males*	*Females*	*Total*
A	**4**	**40**	**44**
B	**3**	**38**	**41**
C	**8**	**39**	**47**

B. Treatments

All groups followed the exact same in-class procedures except when it came to feedback. The opportunity to control all variables, due to the fact that a single teacher was teaching all three sections, was seen as a huge advantage over designs involving numerous teachers or students in differing classes.

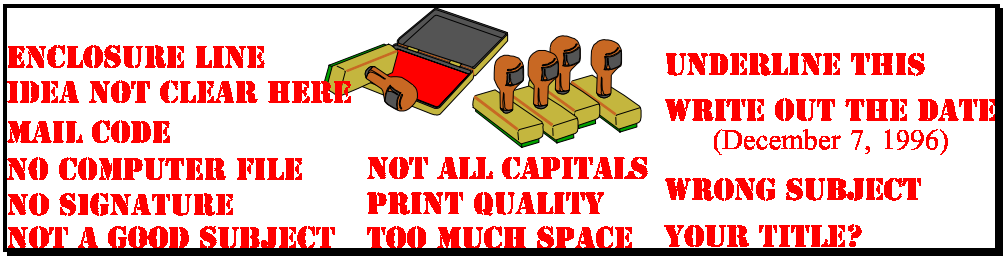
1. Common to All Groups

Class structure followed a similar procedure week to week. Normally, a single business letter genre was introduced and explained with emphasis on paragraph development. Examples of paragraphs were read and explained in class accompanied by small exercises such as organizing the specific genre's paragraphs into the correct order or finding the misplaced or mismatched sentences and paragraphs in a faulty example. During the writing practice section, two hours a week, basic grammar and mechanics were focused on. Although fundamental to accurate writing, most mechanical issues have not been covered well in Taiwan English classrooms. Part of the reason for this is that Chinese writing does not use many of the punctuation marks used in English writing, or at least not in the same way. Additionally, the use of punctuation in Chinese writing is not as standardized, as in English, which leads many students to think English punctuation is also simply a question of personal style.

For this reason, the exercise class spent at least part of its time reviewing mechanics and then completing short exercises. The rest of the time was given to students to begin work on the main business letter writing assignment given for the week. If the assignment was a complete business letter and it was to be completed using the computer software (QBL), then the practice class would be held in a computer classroom and students allowed to freely work on their assignments.

Consistency in grading and non-computer related feedback among the three groups was reinforced by the application of semi-standardized or automated techniques. When the teacher reviewed students' business letters for formatting errors in the heading, opening or closing of the letter, the number of possible errors is finite as well as having the tendency to repeat among students. For example, when an assignment required the use of an enclosure line, as is the case with a letter of application for employment, many students simply forgot to include it. This type of error was marked using a custom made stamp. In the case of a missing enclosure line, a stamp would be used in the location where the enclosure line should have been, reading: "ENCLOSURE LINE.**" Figure 24 shows all of the stamps used to mark errors in the business letters' heading, opening and closing sections.**

Figure 24. Custom made stamps for standardized marking in heading, opening and closing



2. DIFFERENCES AMONG GROUPS

While nearly all variables among the three sections were held constant, the methods of feedback and redraft were different.

GROUP A

This group of students had the least complex pattern of homework (see Figure 25) completion involving:

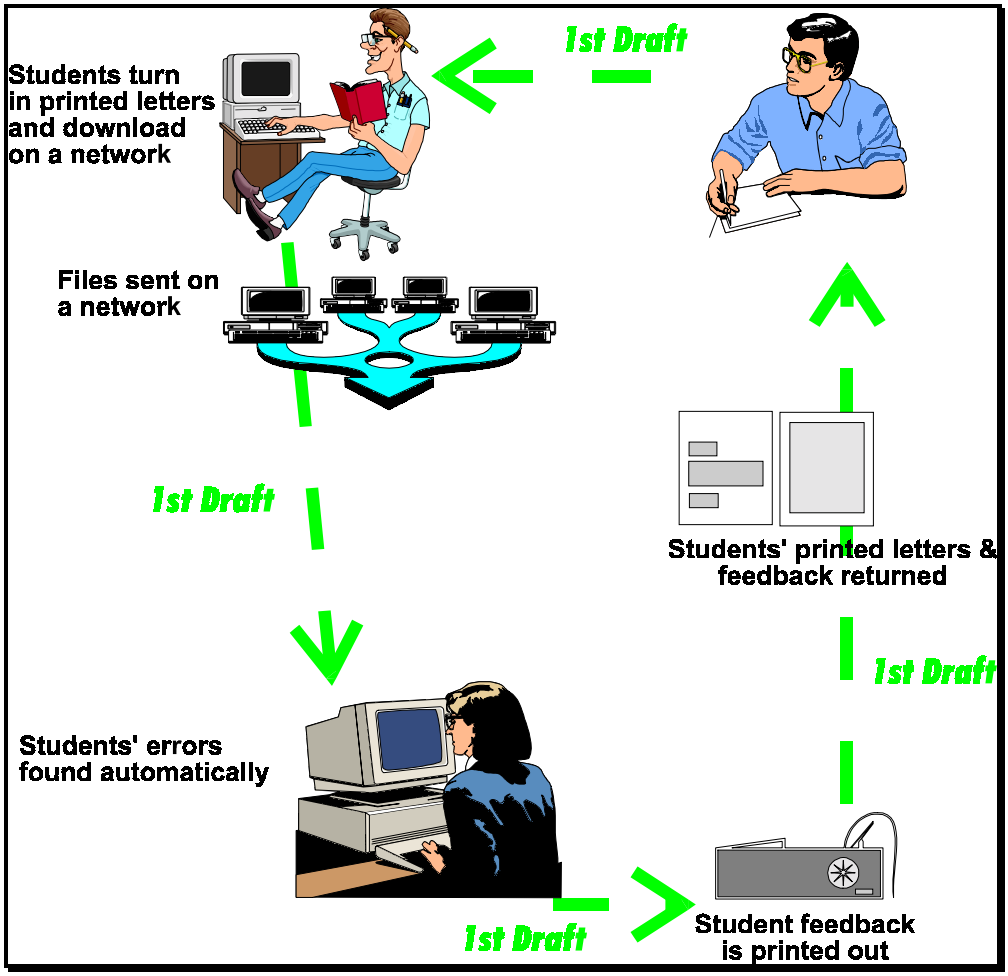
1) Assignment completion and submission over network (including hard copy).

2) Computer generated feedback was printed and returned to students.

3) Grades assigned based on number of errors found by computer combined with teacher's score deductions or additions due to formatting and general clarity and accuracy for the given business letter genre.

4) No redraft was assigned or accepted.

Figure 25. Group A's assignment completion process (adapted from Chen, 1997)



GROUP B

The second section was similar to the first, except for the addition of redrafting and delayed grade assignment (see Figure 26).

1) Assignment completion and submission over network (including hard copy).

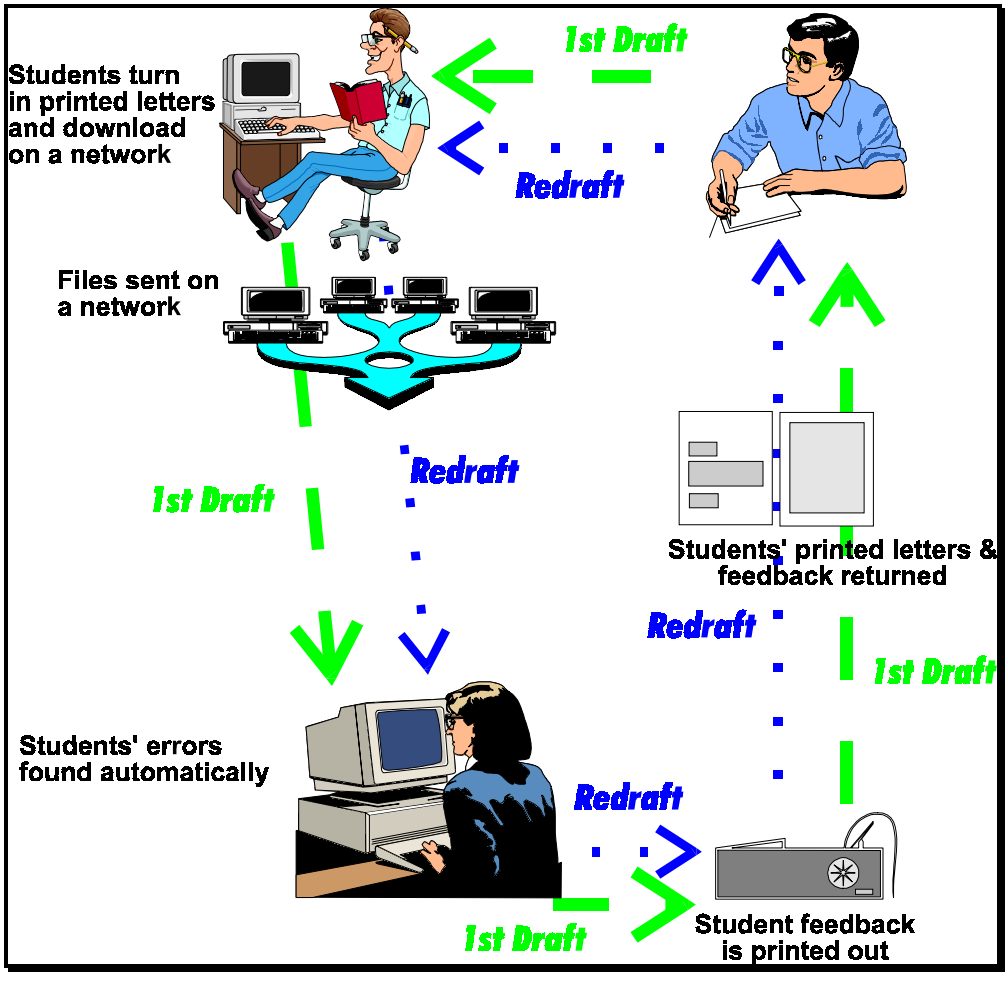
2) Computer generated feedback was printed and returned to students without the teacher's comments or grades.

3) A redraft was completed within a week and submitted (both hard copy and electronic file).

4) Computer generated feedback was printed and returned to students.

5) Grades assigned based on number of errors found by computer combined with teacher's score deductions or additions due to formatting and general clarity and accuracy for the given business letter genre.

Figure 26. Group B's assignment completion process (adapted from Chen, 1997)



GROUP C

The third section did not receive any computer generated feedback but was process oriented (see Figure 27).

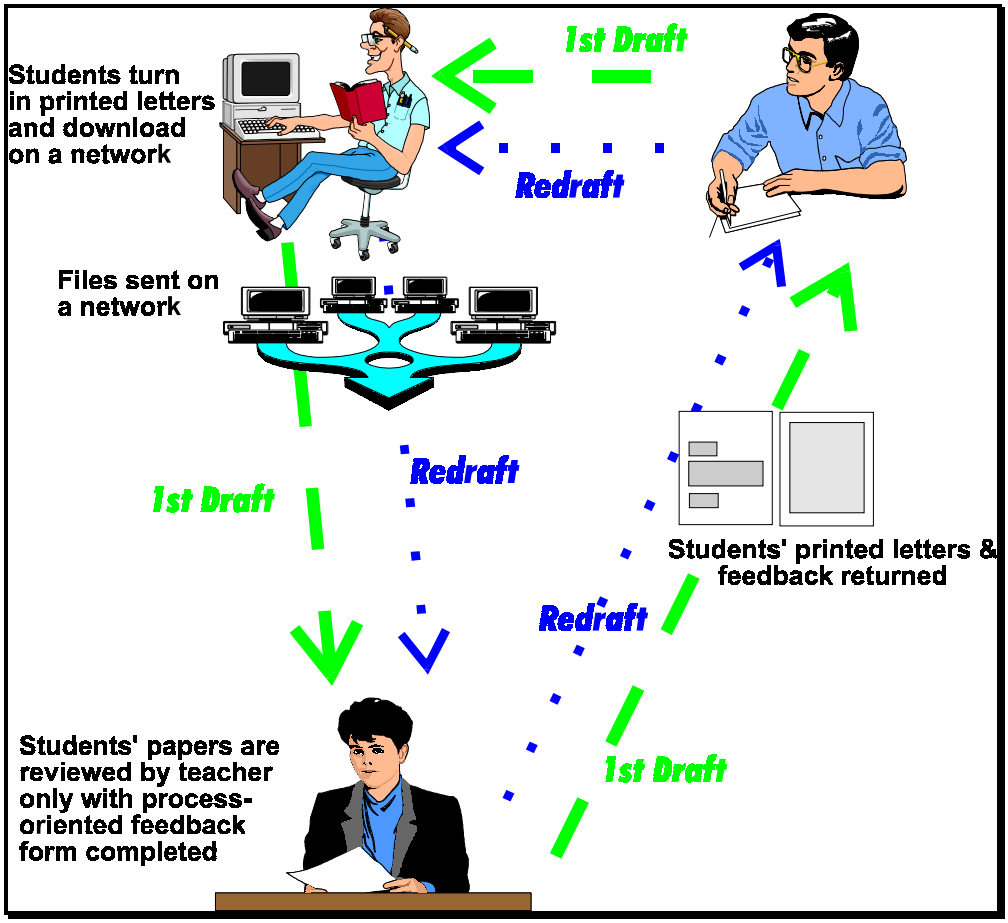
1) Assignment completion and submission over network (including hard copy).

2) A process feedback form is attached to a student's completed first draft (see Figure 20 on page 60). The top half of the feedback form is completed giving feedback to the student on general areas. No grade is assigned.

3) A redraft was completed within a week and submitted (both hard copy and electronic file).

4) The bottom half of the process form was completed by the teacher and a grade assigned based on overall quality of the paper as well as improvement from the first draft (any changes between the first and second drafts was easy to see through the use of software--see page 61).

Figure 27. Group C's assignment completion process (adapted from Chen, 1997)



C. Writing Assignments

All three sections were held concurrently during the first (Fall) semester of the 1996-97 school year although in-class time differed slightly. Differences in the three sections' weekly school schedules combined with holidays meant that for each class, the day an assignment was turned in could differ somewhat (see Table 2, Table 3, and Table 4). The time between assignments are not equally spaced throughout the semester because other assignments were also completed that were not part of this experiment. For example, between the application letter and inquiry letter is a teaching section on creating résumés. This assignment is especially important to these

students since they will soon graduate; however, a résumé is not suitable for computer analysis due to its special formatting and lack of complete sentences.

Finally, no redraft was completed for the last assignment, a sales letter, due to time constraints. This was not seen as a problem for this experiment since the emphasis of this research is on how students approach their first drafts, not their redrafts, and what influence having the opportunity to redraft has on first drafts.

Table 2. Section A's assignment submission dates

Assignment	*1st Draft Due*	*Redraft Due*
Employment Application	October 25	NA
Business Trade Inquiry	December 8	NA
Response to Inquiry for Business	December 26	NA
Sales Letter	January 10	NA

** NA = Not Applicable*

Table 3. Section B's assignment submission dates

Assignment	*1st Draft Due*	*Redraft Due*
Employment Application	October 25	November 11
Business Trade Inquiry	December 8	December 16
Response to Inquiry for Business	December 26	January 1
Sales Letter	January 10	NA

** NA = Not Applicable*

Table 4. Section C's assignment submission dates

Number	*Assignment*	*1st Draft Due*	*Redraft Due*
1	Employment Application	October 20	November 2
2	Business Trade Inquiry	December 8	December 18
3	Response to Inquiry for Business	December 26	January 6
4	Sales Letter	January 10	NA

** NA = Not Applicable*

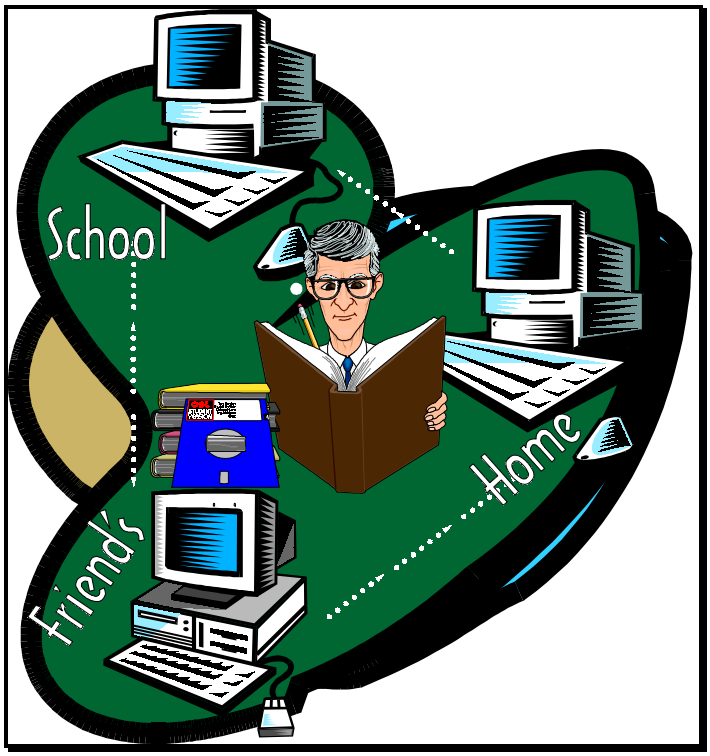
D. Computer Access

Students were not limited to completing their work in a specific classroom or at a special time. While the writing practice class was occasionally held in a computer room, the assignment was not due at that time and no restrictions were placed on the students.

In general, the ability to take the homework software anywhere since it was on a floppy disk, afforded students flexibility in their computer access (see Figure 28). Over half the students reported, when asked informally, they had computers at home.

Students generally divided their on-line time between school, home and at classmates' homes.

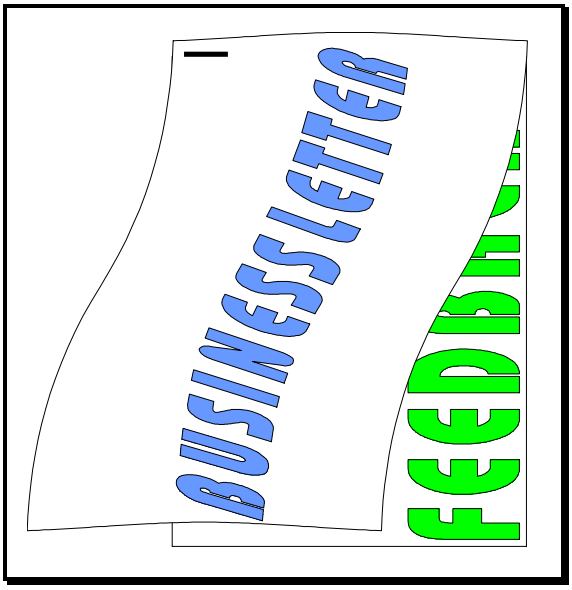
Figure 28. Computer access at any location



E. Feedback

All three groups received some type of feedback after turning in both a printed hard copy of their business letters as well as the electronic version. When feedback was returned, it was attached behind the original business letter as shown in Figure 29. The original business letter contained numerous corrections, from the teacher, written directly on the page or standardized corrections to formatting in the form of stamps (see Figure 24).

Figure 29. Feedback was attached behind original assignment



1. Computer

For groups A and B, computer generated feedback was supplied on errors within the body of the business letter. Figure 30 shows an example of a student's business letter body, and Figure 31 shows an example of the computer generated feedback for the student's text.

Figure 30. Example of assignment's body

We bring it to you only because you are a very special customer. We know that you are concerned about creating a smell. Paris Perfumes Clothes Company gives you the details of widespread developments around the world.

While other companies may offer lower prices, be aware that their quality does not match ours. You will have the chance to understand a widespread developments. We designed every feature with the customer in mind. Today, I honestly believe no one makes a better clothes than Paris Perfumes Clothes Company.

Please take a few minutes and look over the enclosed brochures. A smell person like you needs a clothes like Paris Perfumes Clothes. Paris Perfumes Clothes Company gives you a good feeling without sacrificing a widespread. If you would like to try Paris Perfumes Clothes, just drop by one of our outlets or give us a call at 04-3280666. Take our advice and buy one today.

Figure 31. Example of accompanying feedback

```
Seat Number:   12
Date:          September 15, 1996
Number of words in body: 155
Number of errors:   5
=====================================================================
Check:   a widespread developments
Rule Class: Noun Phrase
Advice:   `A` is not usually used with a plural _noun_ such as
`developments`.
=====================================================================
Check:   feature
Rule Class: Custom Rule Class 1
Advice:   'feature' is usually used in the plural form: features
=====================================================================
Check:   A smell person like you needs a clothes like Paris Perfumes Clothes .
Rule Class: Incomplete Sentence
Advice:   This doesn't seem to be a complete sentence.
=====================================================================
Check:   a clothes
Rule Class: Noun Phrase
Advice:   `A` is not usually used with a plural _noun_ such as `clothes`.
=====================================================================
Check:   a widespread
Rule Class: Adjective
Advice:   The _adjective_ `widespread` is not usually used with the
singular _modifier_ `a`.  Check for missing words or hyphenation.
```

2. Process

The two-part process form was first attached to a student's business letter, with the top half of the form completed (see page 60). When the redraft was completed, it was attached on top of the first draft and feedback form, stapled together and all turned into the teacher again. After reviewing changes made, with the assistance of the redrafting comparison software (see page 62).

F. Surveys

While computer measurements could obtain objective data, the more general impressions of the students could not be captured through any computer software. To understand impressions the students had of their own skill levels as well as their opinions on the type of feedback and redrafting methods used, surveys were employed.

1. Pre/Post Treatment Surveys

Figure 17, on page 57, shows the survey instrument used in this study. It was administered before the first writing assignment was given, during the week of October 20. This survey instrument has been successfully used in previous studies in Taiwan, with business English students to show perceptions of their own skill improvement over time (Warden, 1995). During the pre-treatment administering of the survey, a consistent explanation of its use was given to each group with emphasis placed on what the scores represented. This included instruction that the scores were strictly measures of what an individual student felt about him/herself and had no relationship to grades, class standing, courses completed, outside study, classmates' opinions or teachers' opinions, but was strictly an opinion of one's own skill level.

Explanation of the survey's use as well as each individual part was orally given in Chinese during class time. Students were assured that the survey results had nothing to do with their grades or the teacher's opinion of them and that the surveys would be stored away and not examined until after the students had graduated (nine months later). This point was emphasized as each survey instrument did include a location for students to write their identifying seat numbers. This identification was not equivalent to a student number, which could be used school-wide, but was unique to each individual class a student attends. Previous experience shows that without some identification, student completion of the survey instruments drops off to unacceptable levels. Additionally, since students are not familiar with survey completion, it is not unusual for misunderstandings to cause a significant number of

survey responses to go missing. With the inclusion of seat numbers, the class leader (ban-dai) automatically takes responsibility for assuring all present students complete the survey and turn it in (without the participation of the teacher). After the instrument was collected, a large envelope was labeled and the surveys placed inside. The envelope was then sealed in front of all students and the regular class begun.

The exact same instrument was administered after the last assignment was completed during the week of January 13. Administration of the post-survey followed the exact same procedure as the pre-survey. In this case, after the surveys were sealed in an envelope, one more survey was distributed, i.e., the open-ended survey.

2. Open-Ended Survey

Figure 23, on page 64, shows the open ended survey that was administered at the end of the experiment. Again, the method followed the basic procedures of the pre and post-test surveys. Since this instrument contained some multiple response items and some open opinion questions, students were given up to the maximum class period, fifty minutes, to complete the questions. On the second half of the survey, students were instructed to use English if possible, but that Chinese was equally acceptable.

G. Resulting Data Types

As planned, this experiment produced numerous data types which, it was hoped, would allow different approaches in discovering students' underlying editing behaviors and strategies. A summary of the data types is shown in Table 5.

Table 5. Resulting data types

Data Type	*Explanation*
Error Types:	**43 error types found by software (see Listing 2 on page 217)**
Total Errors:	**Each student's total errors in a single document**
Book Matches:	**Number of exact matches with the class textbook**
Edit Time:	**Total amount of time spent with the computer program running for a single assignment**
Keys Added:	**Total number of keystrokes input for a single assignment**
Keys Deleted (Cut):	**Total number of keystrokes cut from a single assignment**
Edit Ratio:	**Shows the amount of keystrokes a student removes after inputting (Keys deleted divided by keys added)**
Navigation:	**The number of times any of the up, down, left, write, page up or page down keys were pressed during a single assignment**
QBL Start:	**Number of times the student's program was started during the completion of a single assignment**
Time to First Print:	**The time using the student's program from starting a new assignment, to the first printout being made**
Times Printed:	**Total number of times the document was printed during the completion of a single assignment**
Used On-Line Help:	**The total number of times a student accessed on-line help (F1) during the completion of a single assignment**
Words:	**The total number of words in a student's completed assignment when submitted over network**

Note: These error types are based on the error definitions from the software package Grammatik 5.0 for Windows (see 217, Listing 2). However, for this study, the rule base was modified and in some places heavily extended (as in the case of custom errors which was programmed to include common errors of Chinese EFL learners).

VII. Results

A. First Draft Data

1. Descriptive Analysis

Before beginning statistical analysis, we may examine the experiment's resulting data in a descriptive form. This can help give an overview of the results, especially since the amount of data produced is substantial. One must keep in mind, however, that descriptive data only examines means and does not take variance or outliers into account and therefore cannot be used for drawing any accurate or reliable conclusions.

a) Error Types

Over the four assignments, all three groups showed similar patterns in their most commonly occurring error types, as detected by the QBL system. Previous experiments with the QBL system have shown the common error type occurrence rates are more a reflection of the specific assignment being completed than of error trends or overall language weaknesses For this reason, the most common errors are examined here as a percentage of total errors over all four assignments with any error type below 2% being eliminated from the display (see Figure 32, Figure 33 and Figure 34). These figures can give an indication of the largest problem areas for the students in this experiment, and in a wider perspective, English writing students throughout Taiwan.

Figure 32. Group A's most common error types (first draft)

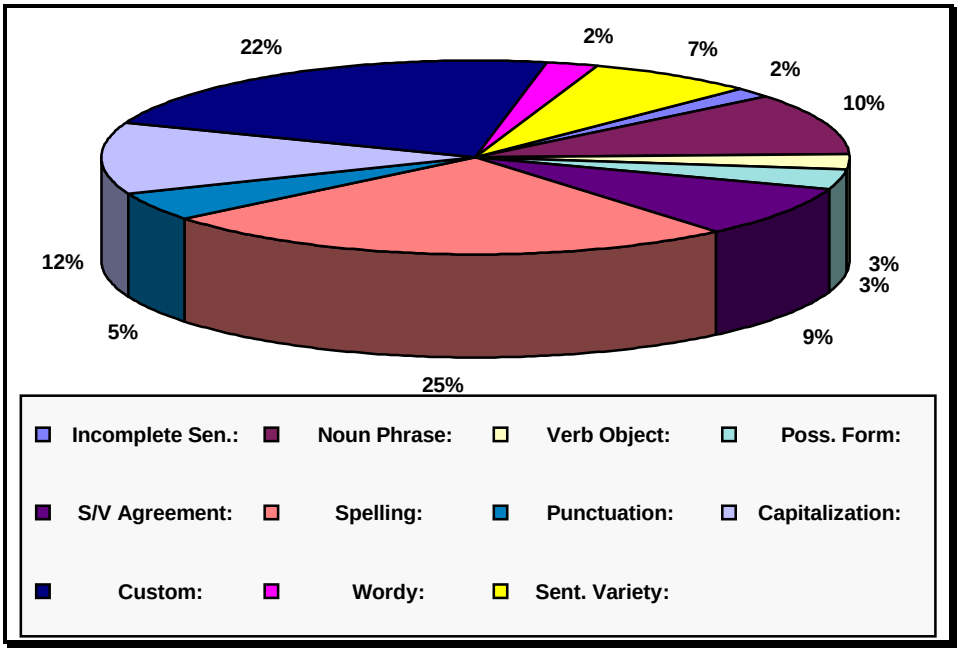


Figure 33. Group B's most common error types (first draft)

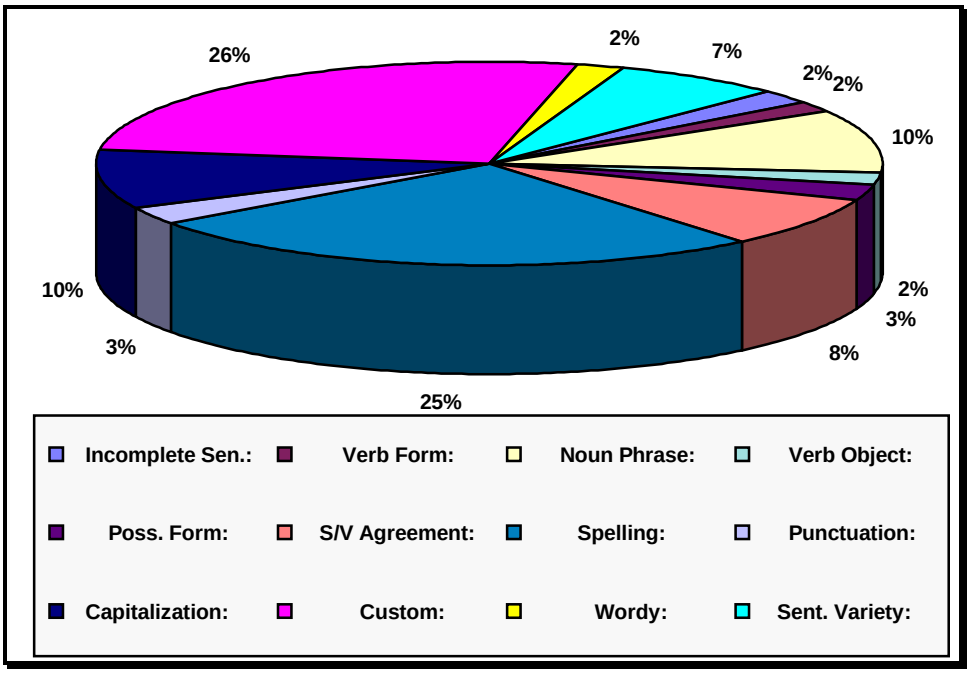
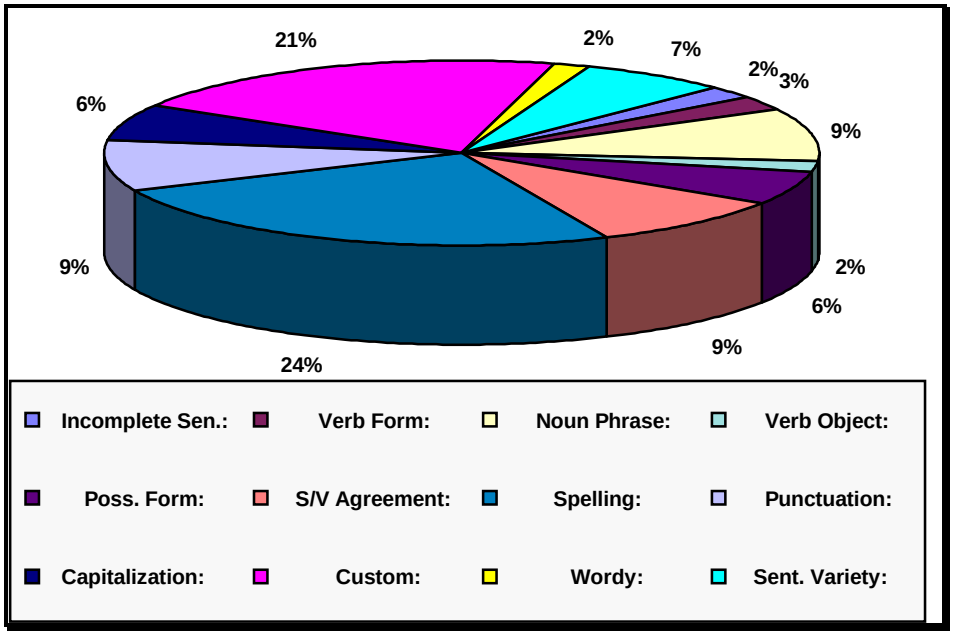


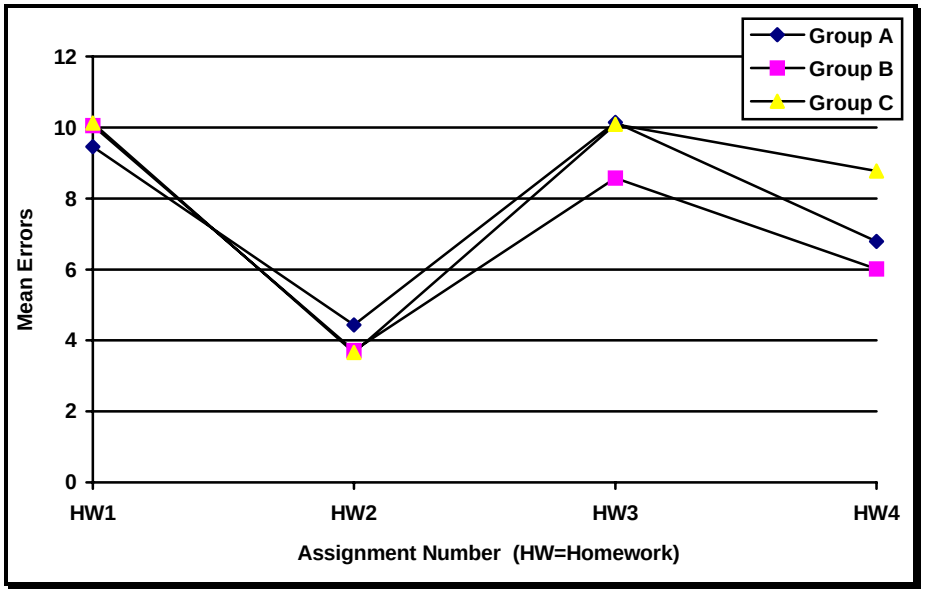
Figure 34. Group C's most common error types (first draft)



b) Error Rates

Throughout the four assignments, all three groups showed fluctuation in the mean error rates, as shown in Figure 35. Typical of QBL experiments, error rates rise and fall depending the specific business letter genre assigned. This fluctuation reflects the difficulty of different letter types as well as the availability of reference material for the specific exercise.

Figure 35. Mean error rates over all four assignments in first draft



Of the four assignments, it is clear that assignment 2 produces the lowest error rates. This assignment was a letter of trade inquiry. Such a letter is probably one of the most formalistic in the trade genre and therefore presents fewer problems for students, not to mention that previous classes, such as trade documentation, have covered this specific letter.

Overall, each group showed a decline in error rates using linear trend analysis:

1) **Group A: -0.22917**
2) **Group B: -0.72045**
3) **Group C: -0.237372**

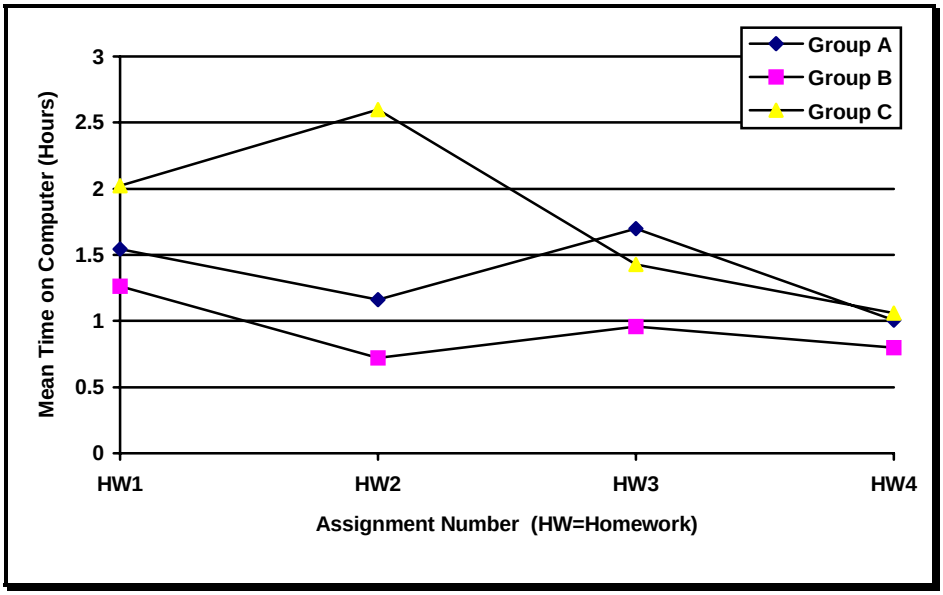
Important to note here is that at no time did the class emphasize the importance of error reduction. In previous experiments, when error reduction was emphasized, computer feedback, as well as non-computer feedback caused significant reductions in error rates over a relatively short time span (with computer based feedback

outperforming more traditional feedback methods). Because this experiment included a group that was employing a process feedback style, it was not appropriate to center on error rate reduction. Therefore, it is not surprising that the decline in error rates for all three groups is rather shallow, confirming that the class emphasis was on writing in general and any error reduction was a result of students' own motivations and efforts.

c) Editing Rates

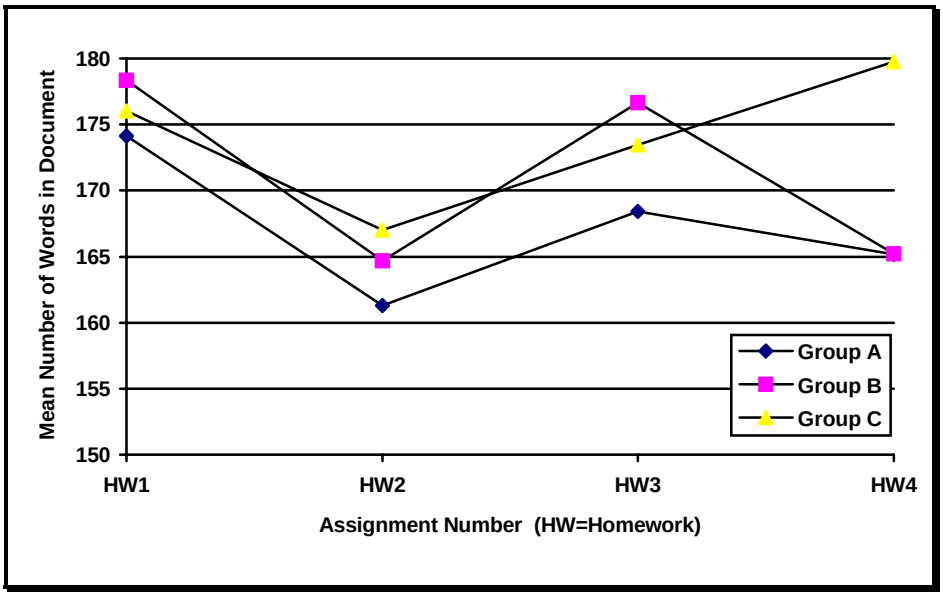
The detailed data gathered on activity related to editing of documents is unique to this study and allows an insight to what students are doing to create their business letters. The first measurement is of mean time spent on the computer creating the first draft. As Figure 36 shows, group C has a somewhat different pattern than the other groups. Of special interest is how all three groups tend to move towards a similar amount of time by assignment three and four. This trending towards similarity is not unexpected, as so many of the class variables are exactly the same across all three groups. We would expect the main impact on students to come from in-class activity, thus influencing most students into similar patterns.

Figure 36. Mean editing time spend on computer (in hours) preparing first draft



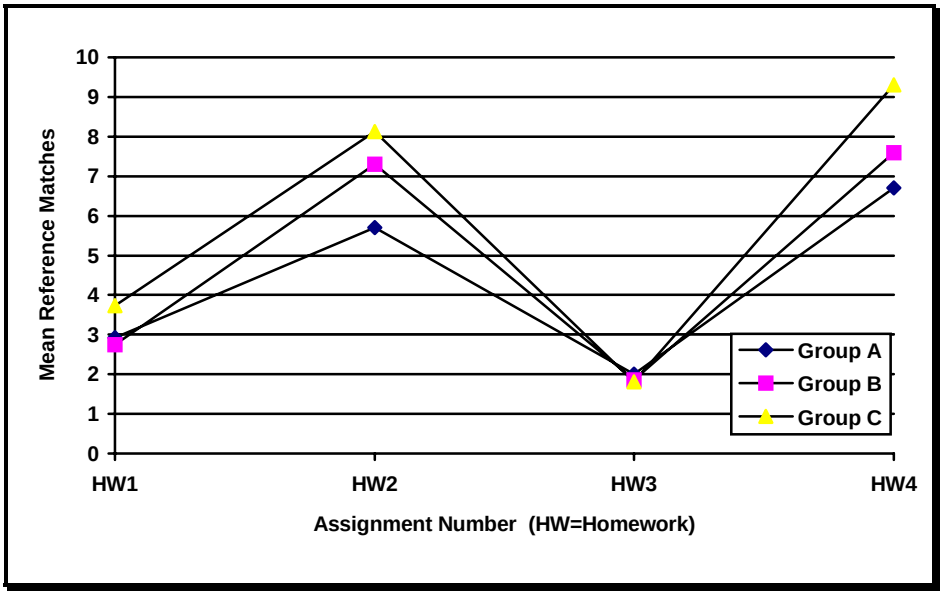
For every assignment, the minimum number of words required, within the body of the business letter, was 150. Figure 37 shows that students in each group routinely surpassed that requirement, with Group A often writing the least words and group C writing more words in the final assignment.

Figure 37. Mean words in document first draft (150 minimum requirement)



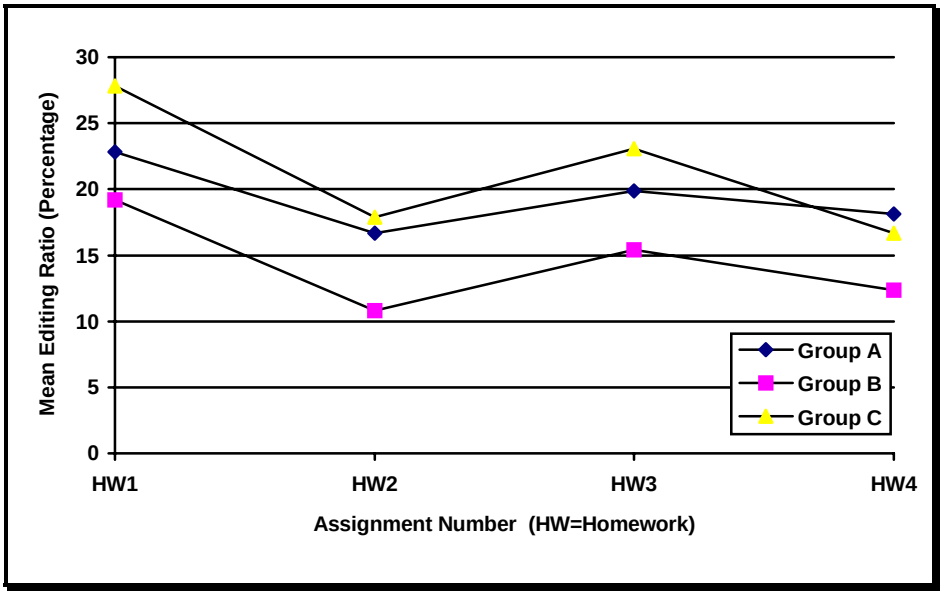
Exact matches between students' letters and the reference material shows an interesting pattern in Figure 38. The three classes appear to spread apart in the same pattern for the second and last assignments; however, the third assignment shows nearly identical means for all three groups. This is most likely a reflection of the type of letter being completed and the number of relevant examples available in the textbook. Assignment number three was a letter of response to an inquiry about attending college in Taiwan. Because the letter is so case specific, there are fewer opportunities to copy directly from the textbook. This availability of reference material affects all three groups equally when the number of usable examples approaches zero. When the number of usable examples is larger, the three groups show differing rates of reference matching. This difference can be attributed to the difference in feedback and redrafting opportunities.

Figure 38. Mean reference matches in first draft



The amount students change their documents is reflected in the editing ratio (percentage of keystrokes entered that were later removed) measurement, shown in Figure 39. The chart shows that editing means are similar for each group throughout all four assignments.

Figure 39. Mean edit ratio in first draft (percentage of keystrokes removed)



While the editing ratio can give a general indication of the amount students change their documents, examination of the underlying measures, namely keys added and keys deleted, can show, in more detail, any differences between the groups. Figure 40 and Figure 41 show that while the percentage result, editing ratio, appears similar for all three groups, the underlying measures reveal more separation among the groups. In both measures, keys added and keys deleted, group C shows the highest number of keystrokes overall.

Figure 40. Mean keys added to document in first draft

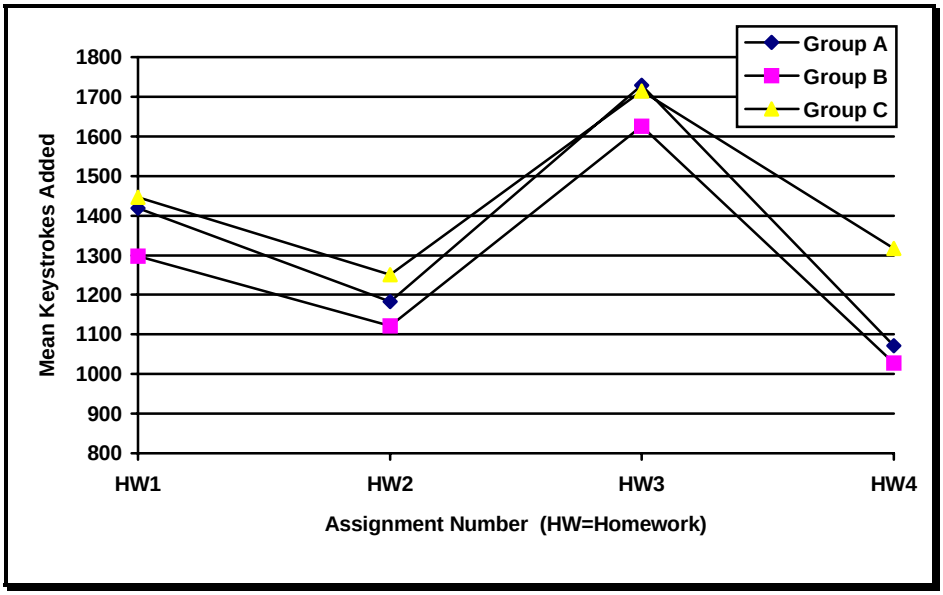
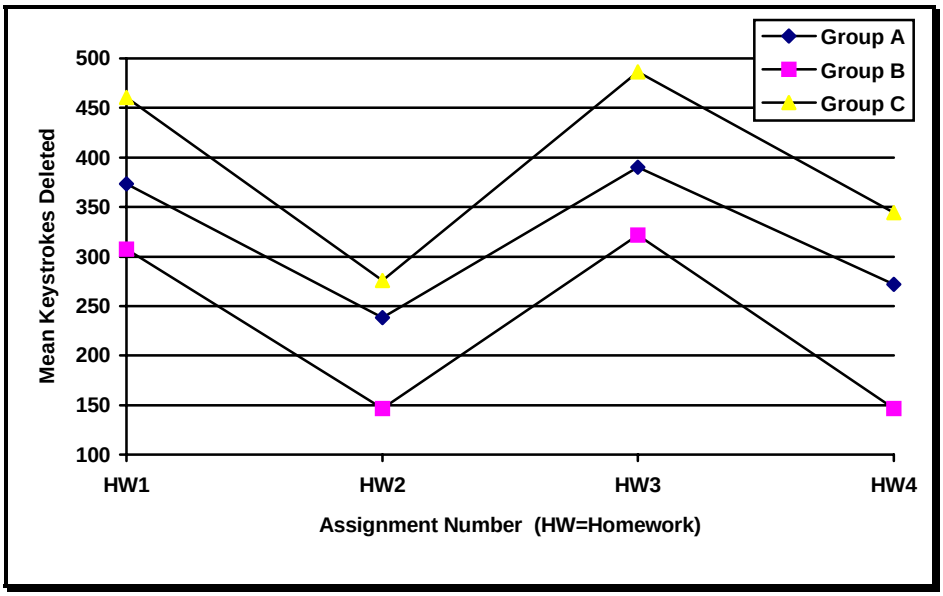
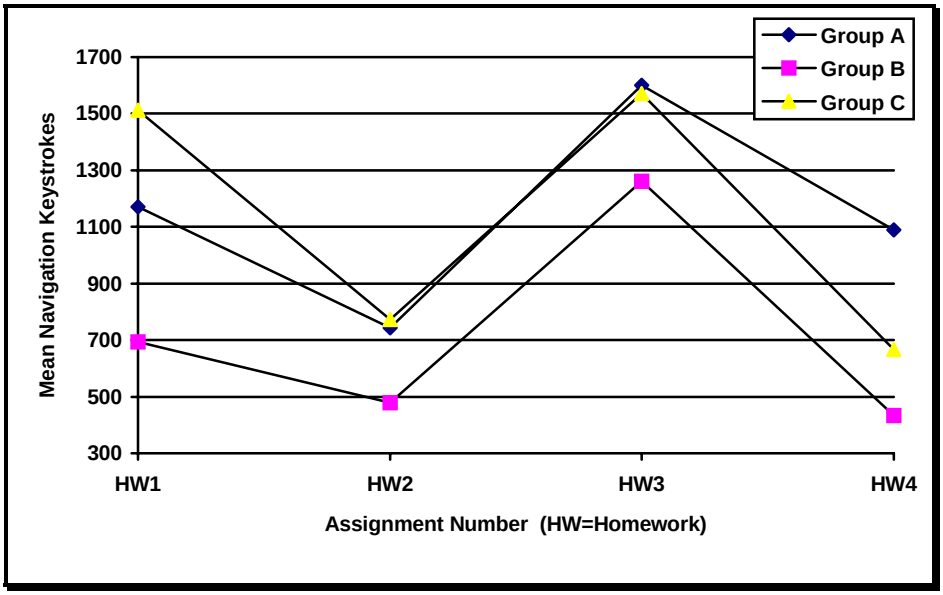


Figure 41. Mean keys deleted from document in first draft



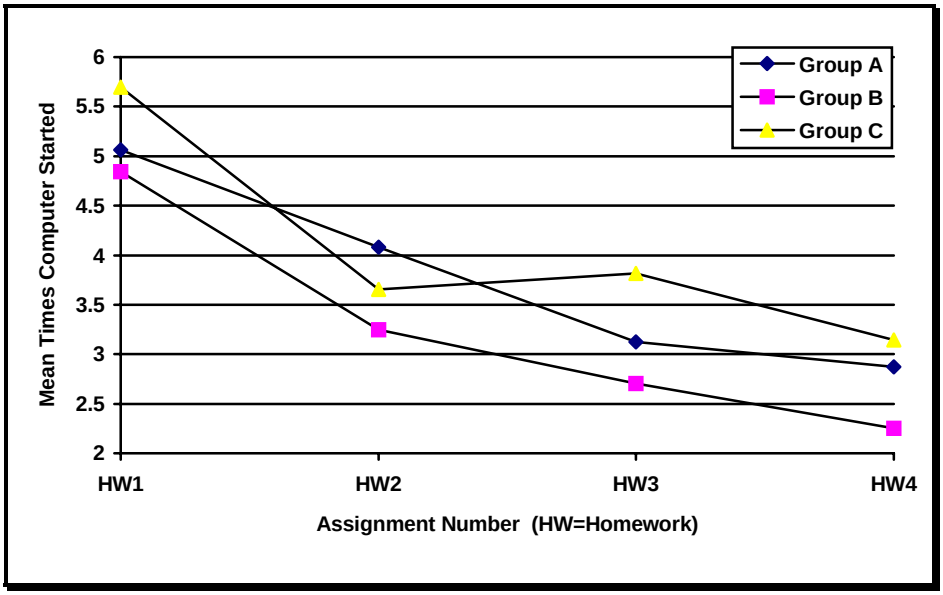
While preparing the first draft, all three groups showed a large amount of variation in the amount they moved about (navigated) the document. Figure 42 shows group B consistently had a lower mean than the other two groups.

Figure 42. Mean navigation keys in first draft



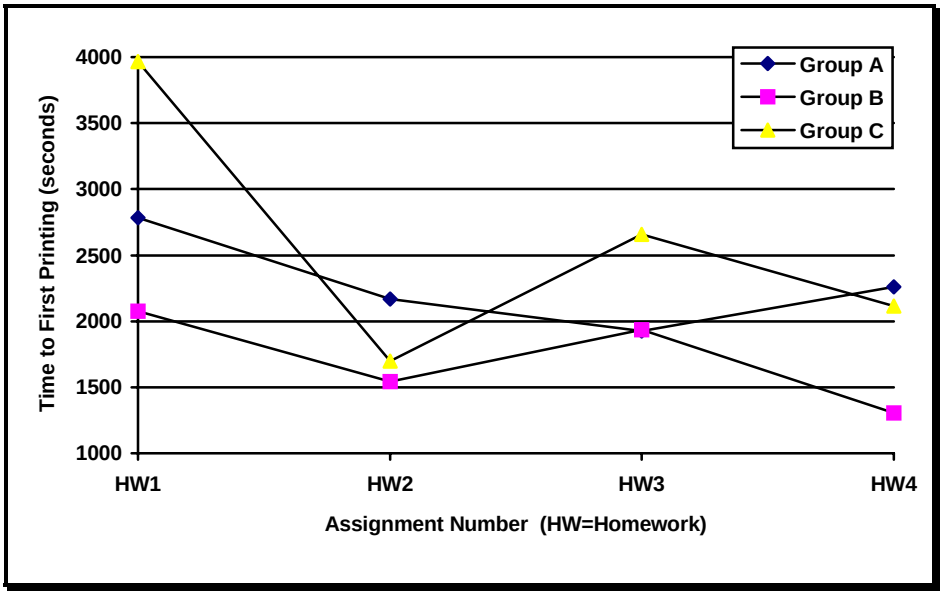
Of all the descriptive measures, the number of times the computer was turned on, to work on the first draft, shows the most consistent decline over the four assignments. Figure 43 shows that the first assignment saw students go to the computer about five times compared with the last assignment at around three times, for the final assignment. Group B was consistent in turning on the computer less than the other two groups.

Figure 43. Mean times software started in first draft



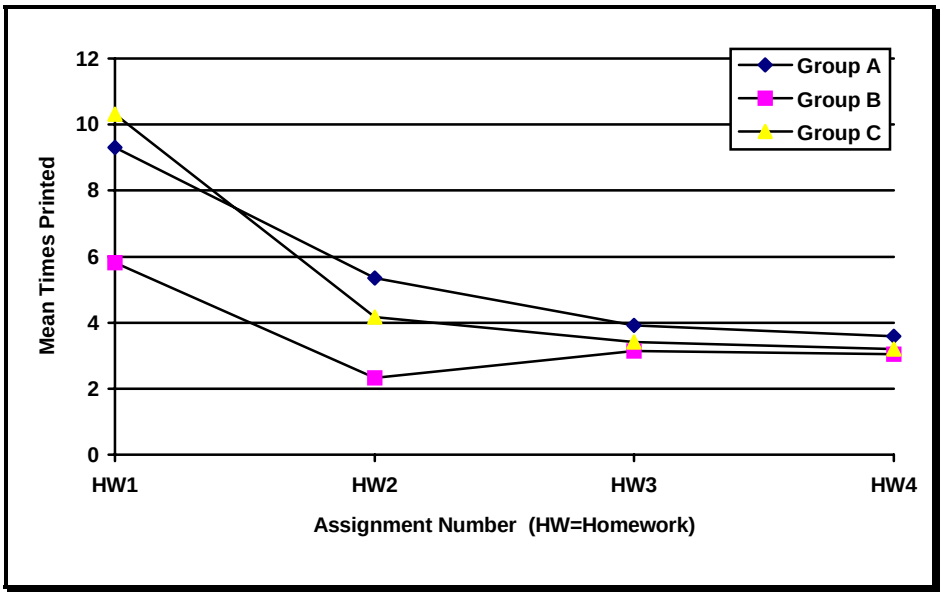
The time from starting a new assignment to first sending it to a printer is shown in Figure 44. The three groups display means that begin at different levels, but keep in mind that 1000 seconds is about 17 minutes. This measure does show a general decline over the four assignments, meaning that on average, the time to the first printing becomes shorter as more assignments are completed.

Figure 44. Mean time to first printing (in seconds)



Another printing measure is the average times an assignment's first draft was printed, shown in Figure 45. This measure also shows a general decline with the additional feature that the three groups appear to approach the same point at approximately 3 printouts.

Figure 45. Mean times printed in first draft



2. Statistical Analysis

The statistical analysis of all error types and editing measures revealed details that more accurately portray the differences among the three groups and the impact of the various treatments. Of importance at the outset of this analysis is the understanding of how these three groups are related before any treatment is begun. This is done in the pretest analysis. The pretest analyses is the first assignment since no treatments had yet been administered. All statistical tests on assignments after the pretest are based on work completed after the differential treatments had begun, or after the return of feedback on the first draft.

a) ANOVA Tests

Analysis of variance was performed to find if any of the variables were outside of a single population. All one way ANOVA tests are followed up with a post hoc Scheffe multiple range test (this test is conservative for pairwise comparisons) in order to find what group was outside the population relevant to the other groups. The significance level tested for was P<.05, and lower levels of significance are signified.

(1) Pretest

Testing the first assignment revealed that the three groups did differ in some of the measures used, thus signifying that the groups did not form a single population in all variables before the beginning of the experiment. Table 6 shows the variables where the assumption of a single population was not supported. While there really is

no one group that stands out from the rest in every measure, there are some general observations to be made.

Group B begins the experiment with a much higher custom error rate. This difference should be kept in mind, as it is later statistically corrected for in other statistical tests. Other than the custom errors, we can see that group C appears to score higher on the remaining measures. Closer examination reveals that the high score of group B on custom errors may actually be related to the apparently high scores of group C on the other variables.

When the Post hoc column list C>B (looking at the editing time measure as an example), we should keep in mind that this means B<A and B<C (and C=A since no significant difference is reported). This can be seen by looking over at the mean columns. Such a view informs us that the significant differences of group C are a combination of group C scoring relatively high while group B scored relatively low. From this observation, we can already see that a relationship between the editing measures and errors appears to exist, since group B scores consistently low on the editing scores while scoring high on an error measure (remember that custom errors is one of the most common errors making up approximately 25 percent of all errors and as such is a good indicator of total errors).

Table 6. Homework 1 (pre-test) ANOVA with Scheffe multiple range test

Variable	Group A Mean (Std Dev)	Group B Mean (Std Dev)	Group C Mean (Std Dev)	DF	F	Post hoc
Custom Errors	1.78 (1.66)	2.75 (2.10)	1.57 (1.46)	140	5.85**	B>C B>A
Editing Time	1.54 (.96)	1.26 (.80)	2.03 (1.06)	140	7.71***	C>B C>A
Navigation Keys	1170.84 (1291.71)	693.84 (586.71)	1513.25 (1404.33)	140	5.74**	C>B
Possessive Form	.1042 (.31)	.0227 (.15)	.2449 (.52)	140	4.41*	C>B
Time to First Printing	2784.67 (1872.72)	2074.32 (1764.12)	3966.90 (3145.55)	140	7.64***	C>B
Times Printed	9.3 (8.88)	5.82 (5.94)	10.31 (8.37)	140	4.08*	C>B
Verb Object	.40 (.61)	.09 (.29)	.18 (.44)	140	5.15**	A>B

**P<.05 **P<.01 ***P<.000*

The lack of a single population at the beginning of this experiment is not a hindrance to the following statistical analysis since the primary objective is to examine how each group changes over the experiment's four treatments. Thus the focus is on each group individually, rather than comparing groups directly. While performing any statistical test that did compare among the groups (such as the repeated ANOVA test), each of the variables that appear in Table 6 were held as a covariate in order to control for any influence.

The explanation for the beginning difference between the three groups is that while college classes were not originally formed (four years previously) with any special purpose, any single class has spent much time together and thus has formed a class personality. In this case, group C was later found to be a very dedicated and self motivated class when compared to the other two classes, and especially when

compared with group B which had much more of an individualistic nature among the students.

In any case, further analysis is all the more relevant because group C received the process based treatment, which the author can say, after teaching the class for a year, most suited them. Although this match was completely random, such a construct is actually desirable since it makes for more robust conclusions, which will be further explored in the following analysis.

(2) Among Groups for Each Assignment

Continuing the ANOVA analysis, the second assignment (inquiry letter) found fewer significant differences among the three groups (Table 7). A review of the descriptive analysis shows that many measures converged during the second assignment while also dropping to lower levels.

Closer examination shows that the feedback has begun to have an influence on students. For example, class A clearly has moved to the bottom of the reference match rate while class C continues to navigate the document more.

Table 7. Homework 2 ANOVA with Scheffe multiple range test

Variable	Group A Mean (Std Dev)	Group B Mean (Std Dev)	Group C Mean (Std Dev)	DF	F	Post hoc
Reference Matches	5.71 (2.86)	7.30 (2.62)	8.12 (2.93)	140	9.20***	B>A C>A
Navigation Keys	742.29 (573.57)	477.80 (390.69)	772.59 (651.69)	140	3.89*	C>B
Times Printed	5.35 (5.35)	2.32 (2.32)	4.16 (4.16)	140	7.20**	A>B
Wordy	.13 (.39)	.23 (.52)	.02 (.14)	140	3.44*	B>C

**P<.05 **P<.01 ***P<.000*

The third assignment (response letter), again showed few significant differences among the classes, but clearly revealed class C as outscoring the other groups in four error type rates (see Table 8). In contrast to assignment two, this assignment brought out differences among the groups in error types rather than editing measurements. Previous studies have shown that more reference material available in the textbook leads to more opportunity for students to copy such material. For the letter of response, the amount of reference material available is low, since the assignment is to respond to information about the student's school (a specific topic that does not have any corresponding example in the textbook). This could account for the absence of the book matching rate measurement in Table 8.

Table 8. Homework 3 ANOVA with Scheffe multiple range test

Variable	Group A Mean (Std Dev)	Group B Mean (Std Dev)	Group C Mean (Std Dev)	DF	F	Post hoc
Capitalization	2.92 (2.73)	2.14 (2.18)	1.33 (1.69)	140	6.12**	A>C
Custom	2.23 (1.52)	1.84 (1.28)	2.80 (1.53)	140	5.13**	C>B
Possessive Form	.06 (.25)	.09 (.29)	.29 (.50)	140	5.32**	C>A C>B
Pronoun	.00 (.46)	.046 (.48)	.18 (.31)	140	6.60**	C>A C>B

**P<.05 **P<.01 ***P<.000*

The final assignment, a sales letter, reveals the largest number of significantly different variables among all the assignments. In this assignment (see Table 9), both editing measures and error rate measures were significantly different among the three groups. Table 9 clearly shows class C standing out in nearly all measures that did not form a single population . For class C, this letter was the seventh writing exercise

(remember class C had performed redrafts on assignments one through three). It is no surprise that by this time differences would appear in larger numbers.

Only a single error type is common between assignment one and four, where class C was the group standing out (the error type in common is possessive form). We can summarize, from this change, that the measures where group C stood out to start with, in the first assignment, have not kept class C from being influenced by the feedback.

Table 9. Homework 4 ANOVA with Scheffe multiple range test

Variable	Group A Mean (Std Dev)	Group B Mean (Std Dev)	Group C Mean (Std Dev)	DF	F	Post hoc
Reference Matches	6.71 (4.63)	7.59 (4.09)	9.31 (4.69)	139	4.17*	C>A
Keys Added	1070.73 (457.54)	1027.61 (230.41)	1316.90 (790.96)	139	3.77*	C>B
Long Sentence	.04 (.20)	.02 (.15)	.17 (.38)	139	4.12*	C>B
Navigation	902.06 (1000.55)	433.43 (397.41)	665.52 (951.20)	139	3.59*	A>B
Possessive Form	.60 (.79)	.41 (.54)	1.19 (1.36)	139	8.11***	C>B C>A
Sentence Variety	.23 (.56)	.11 (.32)	.42 (.54)	139	4.55*	C>B
Time to First Printing	2262.00 (1918.76)	1304.48 (1660.19)	2114.73 (1519.35)	139	4.13*	A>B
Total Errors	6.79 (3.72)	6.02 (3.43)	8.77 (4.00)	139	6.73**	C>B C>A
Words in Document	165.17 (12.69)	165.21 (15.15)	179.77 (23.88)	139	10.39***	C>A C>B
Wordy	.17 (.38)	.05 (.21)	.27 (.45)	139	4.43*	C>B

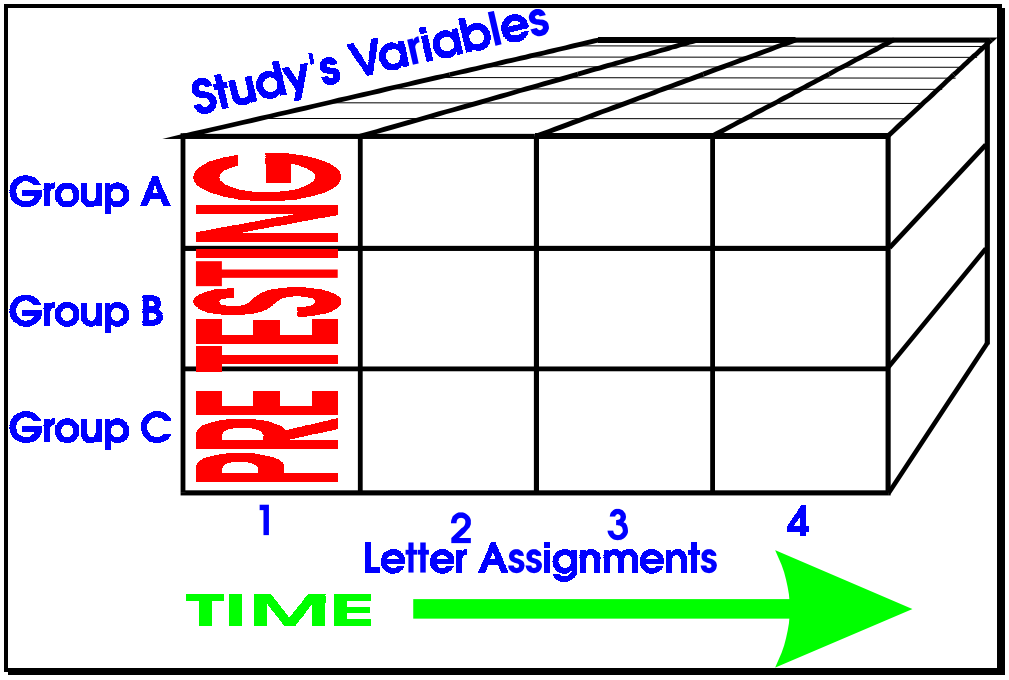
**P<.05 **P<.01 ***P<.000*

b) Repeated Measures

More important than simple differences among the groups is to understand the different roles played by the three treatments and the three writing assignments (after

the first assignment) as well as the interaction of these variables. This experiment emphasized internal validity through a split-plot design (sometimes also called a *mixed design*) and allowed the testing of between-subjects and within-subjects factors. The structure of the design can be seen in Figure 46 and is made up of a three by three design with repeated measure running along the X axis. Although the actual number of letter assignments was four, the first assignment was treated as a pretest, thus reducing the X axis by one factor in the statistical analysis. The third dimension of the study was the various variables measured through the QBL computer system, i.e., error and editing data. While shown in Figure 46 as part of the design, the variables were not tested all at once, but instead were simply examined one at a time, thus making up the cells of the design. Later, correlation and regression analysis is used to examine relationships between these variables (see page 153).

Figure 46. Split-plot design of study



A standard ANOVA would not be satisfactory for these measures as the scores throughout the four assignments come from the same groups and thus are repeated measures. A normal ANOVA test assumes each score to be from a different source, but a special repeated ANOVA test solves this problem. The repeated ANOVA test used here is more sensitive to changes in data which is repeatedly taken from the same group. This test also allows us to see the interaction between groups, i.e., the treatments being used, and the letter writing assignments. This is especially useful as previous research, confirmed by the descriptive data in this experiment, show the letter writing assignment has a large impact on the resulting error data.

Each variable is first tested with all groups, A, B and C, and is then followed by repeated ANOVA test for groups A-B, B-C, and A-C in order to observe specific differences among the three treatments. Charts from the descriptive data are included for quick reference. This can be helpful to spot which group is higher or lower relative to the other groups; however, the charts are simple means and are not modified in any way, i.e., exclusion of outliers. Conclusions can only be drawn from statistical test while the charts are included simply for reference.

All the repeated ANOVA measures shown here are for assignments 2 to 4. Since the first assignment was not influenced by any feedback treatment, and the three groups were not the same population in all measures, these repeated tests only examine changes in measures after feedback treatment had begun. Additionally, all measures that violated the assumption of a single population in the first assignment, using an ANOVA test among the three groups (see Table 6), were held as covariates in

order to eliminate their influence in the following repeated ANOVA tests. The only variable that had an impact on the results (when being held as a covariate versus normal inclusion in the data) was the custom error variable. Therefore, all repeated ANOVA test results shown here do hold the custom error variable as a covariate in order to eliminate its influence.

(1) Error Variables

As expected, Table 10 shows the strong influence the letter assignment has on the total errors measure. Such a result warns us not to draw too strong a conclusion from simple descriptive data when studying a decline, or a lack of it, in error rates over assignments. Some assignments clearly present more difficulty or less opportunity to use strategies that reduce errors. If such *more difficult* assignments came at the end of a study, there could actually be a rise in error rates no matter what type of treatment is being used.

Of more importance is the result that the treatment type does make a difference in the total errors measure. The three treatments are not having equal impact on the students. Interaction between the treatment type and the letter assignment also shows a statistically significant result. This tells us that the affect a treatment varies with the specific letter assignment. It is the case that a specific treatment will have greater influence on a specific type of assignment.

Table 10. All groups repeated ANOVA total errors (with custom error as covariate)

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	429.80	2	214.90	21.88***
Treatment	88.99	2	44.49	3.44*
Letter X Treatment	152.92	4	38.23	3.60**

**P<.05 **P<.01 ***P<.000*

Based on the clear impact treatment has on the total errors measure, we can now examine the specific difference between any two groups, based on similarities in treatment. Since groups A and B both received computer generated feedback, statistical difference between these two groups could be attributed to the redrafting component of the study (redrafting opportunity was the only difference between groups A and B).

Results in Table 11 confirm that the letter assignment does have a strong influence on total errors. However, there is no significant impact on the two groups from the treatment. Interaction of treatment and letter assignment also show no statistically significant difference. When a group receives the computer generated feedback, this result informs us that the impact on total errors made during the following first draft is not influenced by the availability of redrafting. Additionally, the type of letter assigned does not change this finding.

Table 11. Groups A & B repeated ANOVA total errors (with custom error as covariate)

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	407.58	2	203.79	21.32***
Treatment	35.46	1	2.72	.107
Letter X Treatment	4.22	2	2.11	.22

**P<.05 **P<.01 ***P<.000*

When comparing groups B and C (see Table 12), the results do show a significant effect for the treatment as well as the interaction of treatment and letter

type. These two groups differed only in feedback type. This result informs us that the presence of computer generated feedback does play a role in reducing errors during first draft.

Table 12. Groups B & C repeated ANOVA total errors (with custom error as covariate)

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	326.40	2	163.20	15.86***
Treatment	98.21	1	98.21	6.79*
Letter X Treatment	131.93	2	65.96	5.73**

**P<.05 **P<.01 ***P<.000*

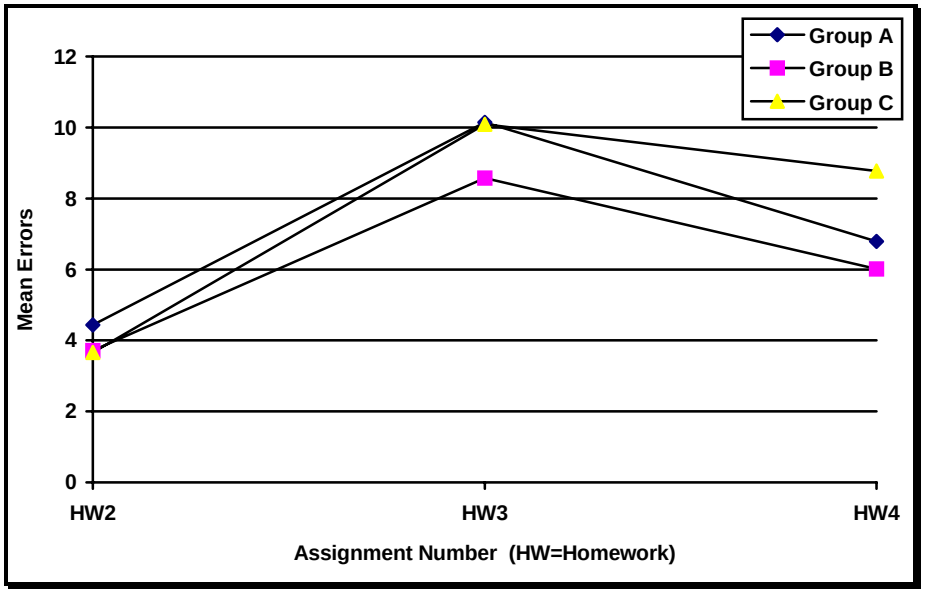
Table 13 confirms the effect of computer generated feedback when interacting with letter type in influencing total errors during first drafts (graphically shown in Figure 47). However, this result does not show a significant difference for treatment. Groups A and C differed in both feedback type and opportunity for redrafting. This difference in treatment is the largest between any two groups in the study (two variables) and is difficult to draw out any conclusions at this stage less we risk being confused by a possible confounding variable. We may, however, generally observe that each group develops a strategy to use the information and opportunities at hand in order to lower total errors in their writing. For any single assignment type, one of the developed strategies may be more or less successful, but overall it appears that straight computer generated feedback has an equivalent effect on total errors as teacher generated process based feedback and redrafting combined.

Table 13. Groups A & C repeated ANOVA total errors (with custom error as covariate)

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	475.85	2	237.93	24.20***
Treatment	5.80	1	5.80	.56
Letter X Treatment	111.14	2	55.57	5.41**

**P<.05 **P<.01 ***P<.000*

Figure 47. Mean error rates in first draft



A similar picture is seen when examining the custom error type (see Table 14 to Table 17 and Figure 48). While this error type presents some problems in the statistical analysis because it did not form a single population in the pretest, the repeated ANOVA shows that it is the interaction of the treatment and letter type where the three classes show different results for this specific error type.

Table 14. All groups repeated ANOVA custom error type

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	200.37	2	100.18	48.32***
Treatment	2.46	2	1.23	.50
Letter X Treatment	18.81	4	4.70	2.75*

**P<.05 **P<.01 ***P<.000*

Table 15. Groups A & B repeated ANOVA custom error type

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	103.66	2	51.83	26.58***
Treatment	2.00	1	2.00	.84
Letter X Treatment	4.87	2	2.44	1.16

**P<.05 **P<.01 ***P<.000*

Table 16. Groups B & C repeated ANOVA custom error type

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	143.78	2	71.89	32.45***
Treatment	1.67	1	1.67	.75
Letter X Treatment	18.02	2	9.01	6.27

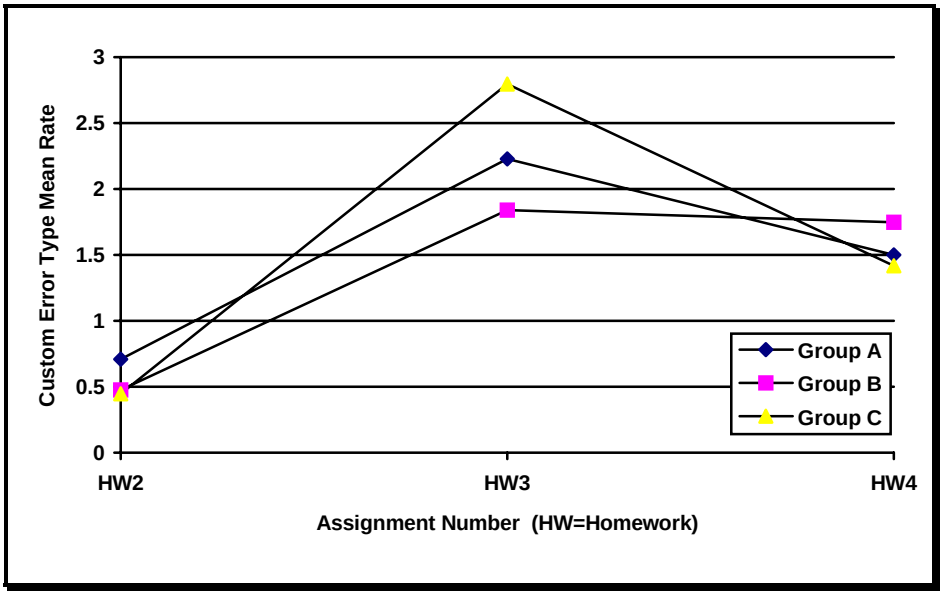
**P<.05 **P<.01 ***P<.000*

Table 17. Groups A & C repeated ANOVA custom error type

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	172.86	2	86.43	51.92***
Treatment	.22	1	.22	.08
Letter X Treatment	7.44	2	3.72	2.36

**P<.05 **P<.01 ***P<.000*

Figure 48. Mean custom errors in first draft



(2) Editing Variables

The same procedure for examining total errors was used to examine editing related variables. While it is clear that feedback type does play a role in error reduction, the above results also hint at the possibility that the affect on students may not be absolute and simplistic, but a matter of degrees and complexity. To further

understand the nature of the influence feedback and redrafting had on the three groups, repeated ANOVA tests were used to examine editing related data.

(a) Reference Matches

Table 18 shows the strong differential affect both treatment and treatment with assignment interaction had on the three groups when using reference material (changes in means shown in Figure 49). The second assignment documents nearly the same amount of reference use among the three groups, clearly a reflection of less material related to the assignment available for copying. When reference material was available, group C consistently copied more while group A copied less.

Table 18. All groups repeated ANOVA reference matches

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	2799.16	2	1399.58	156.19***
Treatment	235.22	2	117.61	10.56***
Letter X Treatment	140.59	4	35.15	4.32**

**P<.05 **P<.01 ***P<.000*

More specific testing shows that indeed group A copies less from the reference material than the other two groups. Table 19 reveals that the presence of redrafting does influence the amount of reference materiel used in the first draft. In this case, group B has more material in their first drafts that exactly match examples from the textbook.

Table 19. Groups A & B repeated ANOVA reference matches

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	1393.30	2	696.65	96.06***
Treatment	50.97	1	50.97	4.92*
Letter X Treatment	33.30	2	16.65	1.97

**P<.05 **P<.01 ***P<.000*

Table 20 shows that the presence of computer feedback also influences the amount of reference material used, with group C copying more than group B. Interaction between the letter assignment and the specific group is reported as significant here and thus takes precedence over any treatment effects. This is also the case between groups A and C in Table 21. Thus, the availability of redrafting leads to higher levels of copied material in the first draft. In the case of computer or process based feedback, the difference depends on the specific assignment given, but generally, we can observe that the process based treatment leads to increased reference copying.

Table 20. Groups B & C repeated ANOVA reference matches

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	2383.23	2	1191.62	106.96***
Treatment	67.00	1	67.00	7.26**
Letter X Treatment	45.01	2	22.50	3.65*

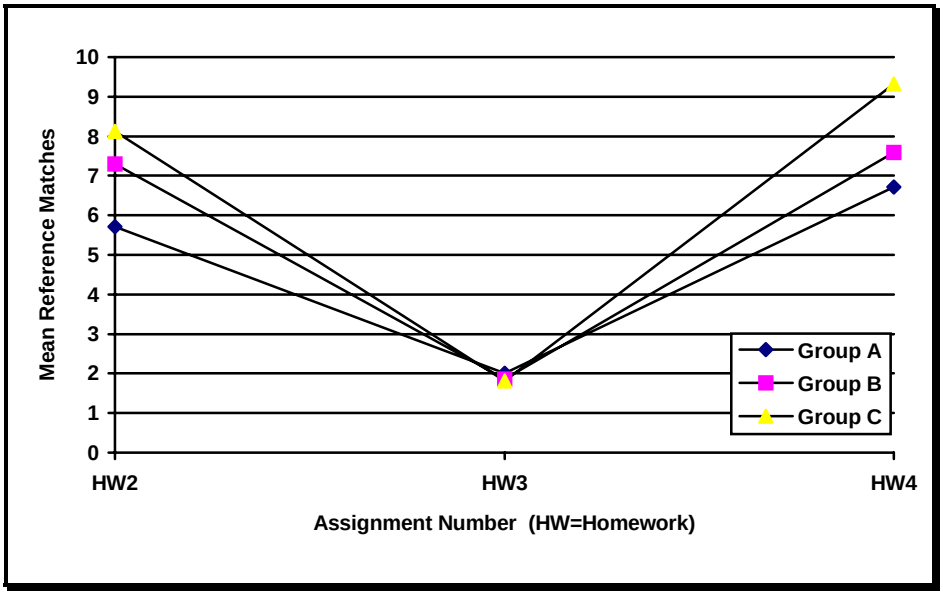
**P<.05 **P<.01 ***P<.000*

Table 21. Groups A & C repeated ANOVA reference matches

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	2036.58	2	1018.29	121.30***
Treatment	188.50	1	188.50	13.36**
Letter X Treatment	117.69	2	58.85	5.97**

**P<.05 **P<.01 ***P<.000*

Figure 49. Mean reference matches in first draft



(b) Editing Ratio

Editing, deleting or changing what was input, shows no affect from letter type, treatment, or the interaction, when all three groups are examined together (see Table 22). More specific analysis shows that there is a treatment effect between groups B and C, as shown in Table 24. Of the two groups, group C has the higher editing ratio, which infers that the presence of computer feedback with redrafting may lower editing on first drafts.

Table 22. All groups repeated ANOVA editing ratio

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	157703.54	2	78851.77	.96
Treatment	183654.53	2	91827.27	1.12
Letter X Treatment	342733.07	4	85683.27	1.05

**P<.05 **P<.01 ***P<.000*

The lack of any significant result in Table 23 and Table 25 may help to focus this idea more. Groups A and B differ in their redrafting opportunity and show no

statistically significant effect from the difference in treatment. Groups A and C differ in both redraft opportunity and computer generated feedback and also show no significant effects from the differences in treatment. We may ask what is the influence that drives the editing ratio of class B down? If the answer is that computer generated feedback alone reduces editing ratio, then the test between groups A and C (see Table 25) should show some effect, which it does not. We must then conclude, for this measure, that it is the combination of computer generated feedback with the opportunity for redrafting that reduces the editing ratio in students' first draft.

Table 23. Groups A & B repeated ANOVA editing ratio

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	247220.12	2	123610.06	1.00
Treatment	155554.73	1	155554.73	1.27
Letter X Treatment	251944.60	2	125972.30	1.03

**P<.05 **P<.01 ***P<.000*

Table 24. Groups B & C repeated ANOVA editing ratio

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	1611.98	2	805.99	9.19***
Treatment	2707.16	1	2707.16	6.15*
Letter X Treatment	140.51	2	70.25	.98

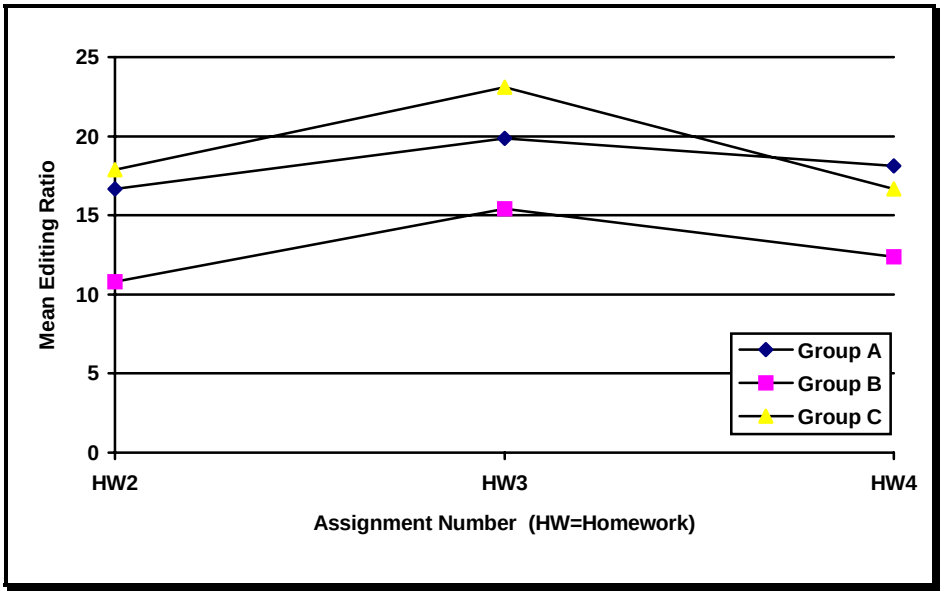
**P<.05 **P<.01 ***P<.000*

Table 25. Groups A & C repeated ANOVA editing ratio

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	210602.90	2	105301.45	.93
Treatment	106326.09	1	106326.09	.94
Letter X Treatment	239917.99	2	119959.00	1.07

**P<.05 **P<.01 ***P<.000*

Figure 50. Mean edit ratio in first draft (keys removed/keys added)



(c) Editing Time

Table 26 through Table 29 show that the total time spent editing a document was significantly influenced only in the treatment between groups A and B. Figure 51 reveals that it was group A that had the higher editing time. This leads us to suspect that the absence of redrafting causes students to spend more time on their first drafts. Stated another way, the opportunity for redrafting reduces the amount of time spent editing the first draft.

Table 26. All groups repeated ANOVA editing time

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	23.50	2	11.75	.79
Treatment	55.77	2	27.89	1.92
Letter X Treatment	60.59	4	15.15	1.05

**P<.05 **P<.01 ***P<.000*

Table 27. Groups A & B repeated ANOVA editing time

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	10.06	2	5.03	2.14
Treatment	14.85	1	14.85	6.95*
Letter X Treatment	2.98	2	1.49	.64

**P<.05 **P<.01 ***P<.000*

Table 28. Groups B & C repeated ANOVA editing time

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	30.55	2	15.27	.77
Treatment	55.76	1	55.76	2.86
Letter X Treatment	41.83	2	20.91	1.08

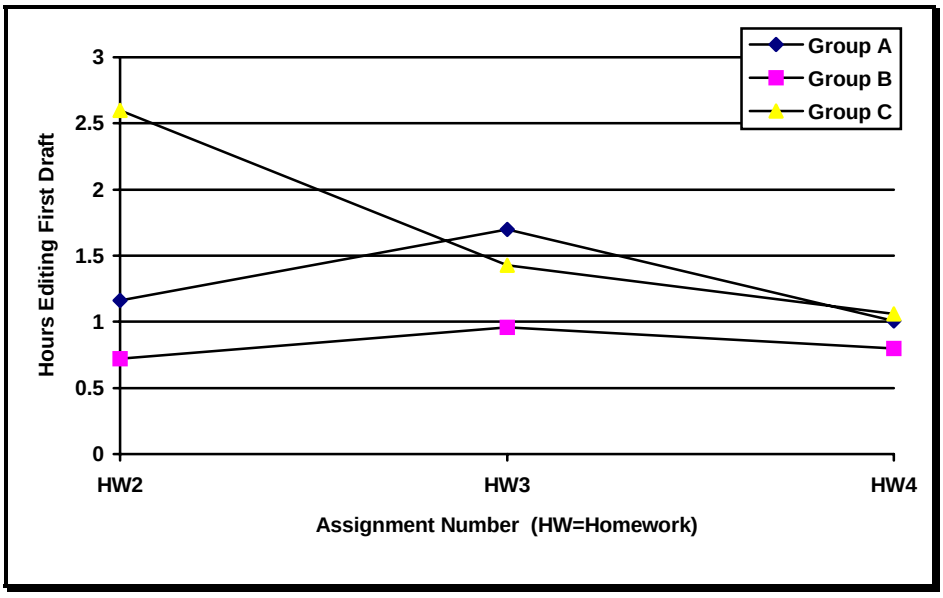
**P<.05 **P<.01 ***P<.000*

Table 29. Groups A & C repeated ANOVA editing time

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	36.84	2	18.42	.91
Treatment	13.15	1	13.15	.65
Letter X Treatment	41.18	2	20.59	1.04

**P<.05 **P<.01 ***P<.000*

Figure 51. Mean editing time spend on computer (in hours) preparing first draft



(d) Navigation Keys

Moving around the document is a sign of work being done on a document or of content being examined and possibly changed. This measure should closely parallel the editing ratio and edit time measures, if all worked as planned. Table 30 does show a treatment effect among the three groups which is then followed by similar effects between groups A and B (see Table 31) as well as between B and C (see Table 32). These treatment effects do indeed have a similar pattern with the editing ratio and editing time measures. As in editing time, group A navigates the document more than group B, which proves that the editing time variable, the total time the computer is turned on for a single assignment, is not idle time at all, but time in which students are moving about their documents. As in edit ratio, group C is navigating more than group B, thus spending more of their time editing or making changes to their documents.

Table 30. All groups repeated ANOVA navigation

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	60201925.22	2	30100963	31.92***
Treatment	14161804.73	2	7080802.40	5.39**
Letter X Treatment	4563221.18	4	1140805.30	1.41

**P<.05 **P<.01 ***P<.000*

The differential impact the treatments had on these three groups, for this navigation variable, is central to the thrust of this research and recurs throughout the study. Redrafting opportunity decreases the amount a student navigates his/her document while the presence of computer feedback also decreases the amount of navigation throughout a document (or stated another way, navigation decreases with the inclusion of redrafting and computer feedback). Thus we can observe the strong

treatment influence on group B, which receives computer feedback and has opportunity for redrafting.

Table 31. Groups A & B repeated ANOVA navigation

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	35033956.23	2	17516978	15.19***
Treatment	13733353.67	1	13733353	12.74**
Letter X Treatment	2449151.80	2	1224575.9	1.57

**P<.05 **P<.01 ***P<.000*

Table 32. Groups B & C repeated ANOVA navigation

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	46007662.55	2	23003831	47.83***
Treatment	5855403.37	1	5855403.4	6.61*
Letter X Treatment	396238.73	2	198119.37	.40

**P<.05 **P<.01 ***P<.000*

Table 33. Groups A & C repeated ANOVA navigation

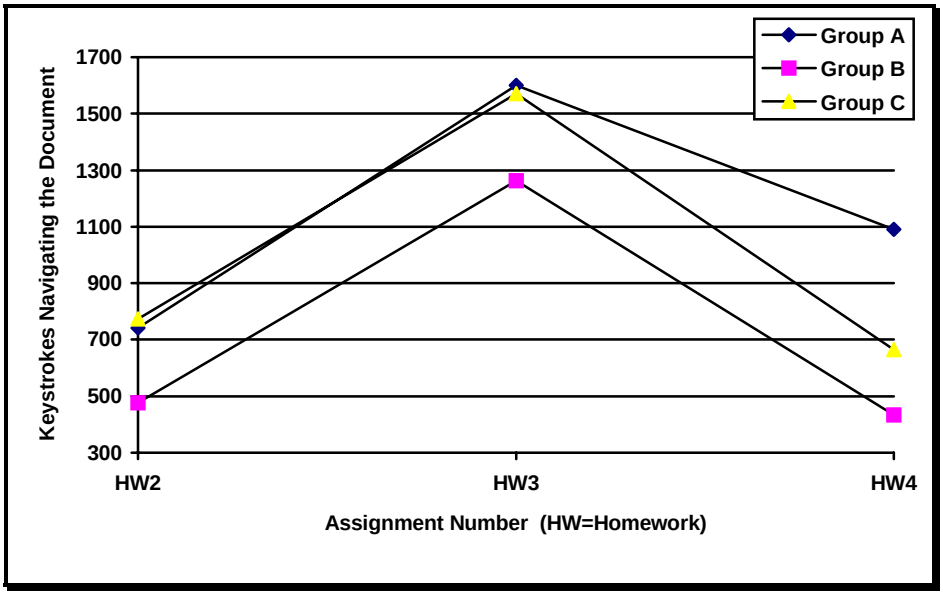
Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	39465058.15	2	19732529	18.88***
Treatment	1189396.06	1	1189396.1	.65
Letter X Treatment	3164325.84	2	1582162.9	1.40

**P<.05 **P<.01 ***P<.000*

Since group C did have opportunity for redrafting, the amount of navigation is lowered. However, group C did not receive any computer feedback, which increased its navigation amount. This combination, places group C near the middle of the other two test groups, thus showing less effect from treatment on navigation amounts (note the effect between B and C is not nearly as strong as between A and B). What this means is that the C group may perform an amount of navigation that does not significantly differ from either group A or B, thus leading us to see the different treatments as approximately equal, at least in the case of groups A and C comparisons. Based on this observation, one could be left with the impression that treatments received by groups A and C are approximately equal. Keep in mind,

however, that these tests are only describing results and in no way tell us how the results were achieved. The more important question, to be answered later, is exactly what different strategies are these two groups using in order to obtain roughly equal scores?

Figure 52. Mean navigation keys in first draft



(e) Program Started

With differences in editing and time working on the first draft, we can next examine if these differences are reflected in the number of times students turn on the computer and start the QBL program. One would expect that more editing time would also mean more times starting the program, but this is not the case. Table 34 to Table 37 show that the different treatments had no significant impact on the number of times students returned to use the software. It appears that any differences in editing time do not lead to differences in number of times students start the program.

Table 34. All groups repeated ANOVA program start

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	32.58	2	16.29	3.26*
Treatment	42.20	2	21.10	.317
Letter X Treatment	29.22	4	7.31	1.51

**P<.05 **P<.01 ***P<.000*

Table 35. Groups A & B repeated ANOVA program start

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	44.21	2	22.11	5.17**
Treatment	28.02	1	28.02	2.74
Letter X Treatment	1.30	2	.65	.17

**P<.05 **P<.01 ***P<.000*

Table 36. Groups B & C repeated ANOVA program start

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	20.69	2	10.34	2.05
Treatment	34.91	1	34.91	1.90
Letter X Treatment	17.66	2	8.83	1.71

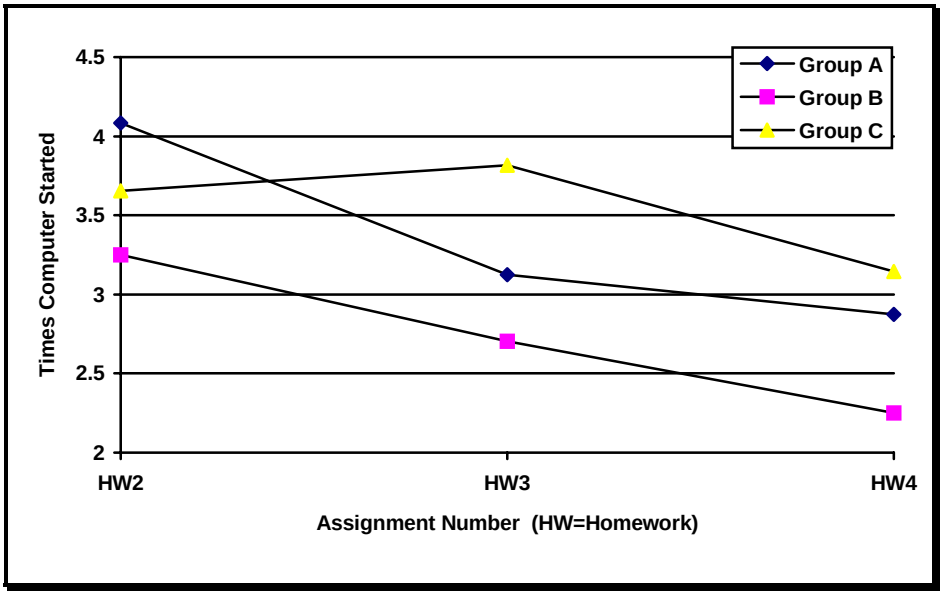
**P<.05 **P<.01 ***P<.000*

Table 37. Groups A & C repeated ANOVA program start

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	32.80	2	16.40	2.26
Treatment	2.00	1	2.00	.08
Letter X Treatment	18.52	2	9.26	1.72

**P<.05 **P<.01 ***P<.000*

Figure 53. Mean number of times software started in first draft



(f) Time to First Printing

When starting a new assignment, the amount of time that elapses until the first printout is measured by the variable: *time to first print*. This measurement should be complementary to other editing variables such as editing ratio. If a student is performing more editing on the first draft, the first printout should be delayed somewhat, whereas if little attention is being paid to the first draft, a printout can take place as soon as the required number of words are input.

Table 38 does show that among all three groups treatment does have a significant influence for the first printing variable. In fact, this variable tracks the navigation variable closely. Both combinations of A-B and B-C have significant differences between them due to the differences in treatment. In the A-B case (see Table 39), the absence of redrafting delays the first printing, where as in the B-C case (see Table 40), the inclusion of redrafting combined with computer feedback quickens

the time to the first printing. In the case of A-C (see Table 41), there is no clear treatment effect but there is an effect from the letter type. In Figure 54, we can observe that the process approach leads to a delayed printing in general; however, the presence of redrafting may shorten that time thus leading to no statistically significant effect from treatment.

Table 38. All groups repeated ANOVA time to first printing (seconds)

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	8577267.31	2	4288633.70	2.07
Treatment	25694749.41	2	12847375	3.54*
Letter X Treatment	16707329.89	4	4176832.50	2.26

**P<.05 **P<.01 ***P<.000*

Table 39. Groups A & B repeated ANOVA time to first printing (seconds)

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	1288016.76	2	644008.38	.37
Treatment	21053032.97	1	21053032.97	4.91*
Letter X Treatment	9662961.85	2	4831480.9	2.68

**P<.05 **P<.01 ***P<.000*

Table 40. Groups B & C repeated ANOVA time to first printing (seconds)

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	19061294.14	2	9530647.1	4.47*
Treatment	17305600.24	1	17305600	5.61*
Letter X Treatment	4242730.69	2	2121365.3	1.17

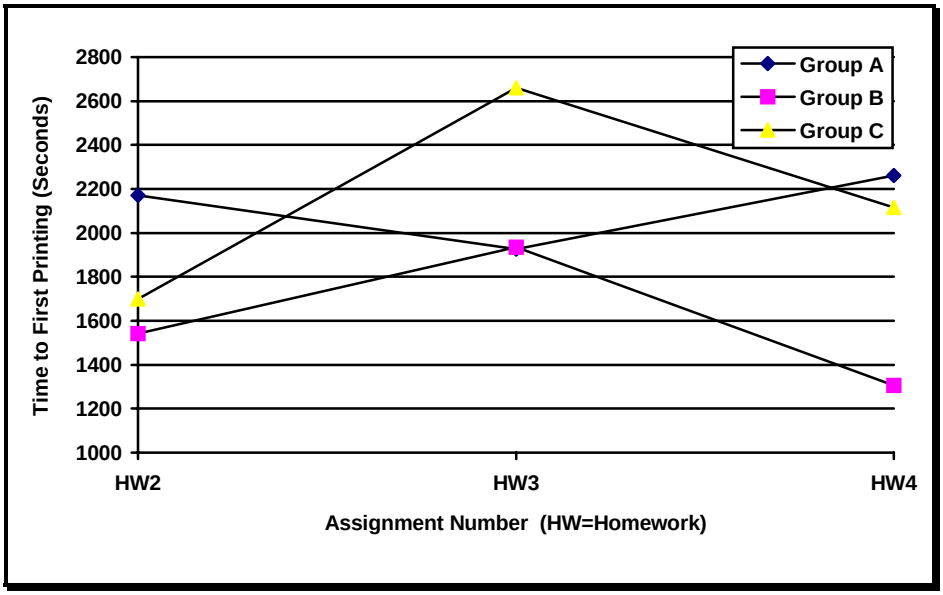
**P<.05 **P<.01 ***P<.000*

Table 41. Groups A & C repeated ANOVA time to first printing (seconds)

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	6946058.63	2	3473029.3	1.62
Treatment	148330.89	1	148300.89	.04
Letter X Treatment	19527342.80	2	9763671.4	4.95**

**P<.05 **P<.01 ***P<.000*

Figure 54. Mean time to first printing in first draft (in seconds)



(g) Times Printed

The number of times an assignment's first draft is printed out could be a clue to the number of modifications a student makes to his/her document's first draft. We could assume that after some modifications to a document, a student may print out in order to proofread it or pass it on to a classmate for review. The lack of any significant difference, however, in the QBL start variable shows that this may not be the case. If students did print out more often when making more modifications, one of the groups should have also shown an increase in starting the software since clearly after printing out for proofreading the computer would be shut down.

Table 42 shows that among all three groups, the treatment differential did have a statistically significant impact. Breaking out each combination, we can see, Table 43, Table 44, and Table 45, the difference comes from the A-B combination which differs in redrafting. Again, the A group shows higher levels of printing the document

even though this group did not show any difference in the number of times the program was started.

It could be the case that although group A is printing the first draft more, the students in the group are not shutting down their computers. The A group did show longer on-line times, in the editing time variable (see page 112), which could confirm this assertion.

Table 42. All groups repeated ANOVA times printed

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	27.02	2	13.51	1.44
Treatment	142.02	2	71.01	3.16*
Letter X Treatment	79.65	4	19.91	1.74

**P<.05 **P<.01 ***P<.000*

Table 43. Groups A & B repeated ANOVA times printed

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	8.01	2	4.00	.43
Treatment	141.09	1	141.09	7.65**
Letter X Treatment	73.64	2	36.82	2.45

**P<.05 **P<.01 ***P<.000*

Table 44. Groups B & C repeated ANOVA times printed

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	2.20	2	1.10	.12
Treatment	45.83	1	45.83	2.09
Letter X Treatment	40.51	2	20.25	2.14

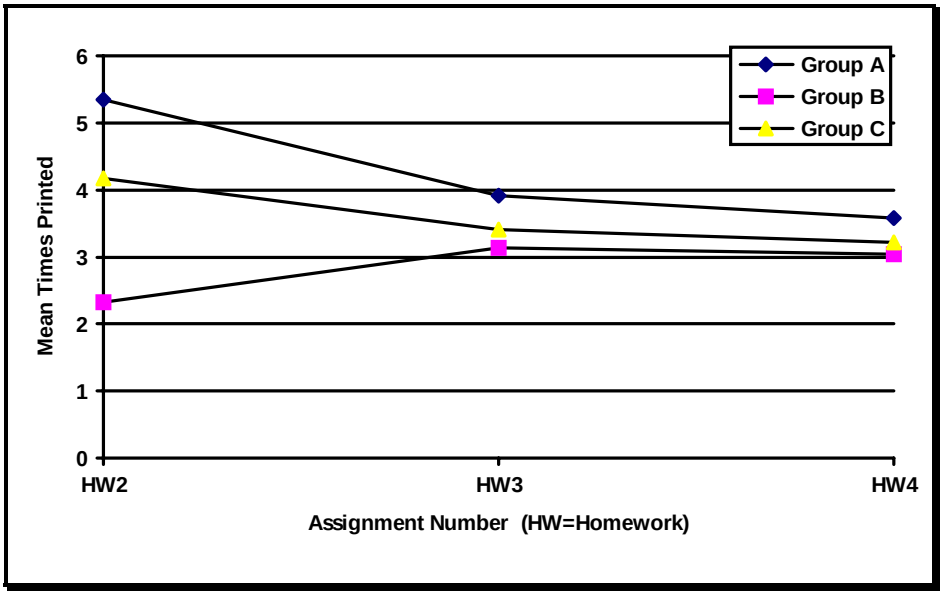
**P<.05 **P<.01 ***P<.000*

Table 45. Groups A & C repeated ANOVA times printed

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	104.08	2	52.04	4.31*
Treatment	30.68	1	30.68	1.21
Letter X Treatment	8.11	2	4.06	.43

**P<.05 **P<.01 ***P<.000*

Figure 55. Mean times printed in first draft



(h) Words in Document

The final variable to be examined in detail is the number of words in the first draft when it was sent over the network for correction by the teacher. Table 46 shows that there was a statistically significant effect from the treatment when examining all three groups together. For this measure, we see the first and only time that the A-C grouping has a significant treatment effect (not including significant treatment and letter type interaction). This test shows group A stands out as the group producing the least number of words in their documents. Keep in mind that each assignment required a minimum of 150 words. Moreover, although was no limit on the high end, Taiwan students do tend to write towards the minimum requirement.

In the test comparing groups A and B (see Table 47), the treatment showed an influence on reducing the number of words in group A's documents. This would lead us to assert that the absence of redrafting leads to fewer words in a document. Both

groups B and C did have the opportunity for redrafting and thus show no significant difference from treatment in Table 48. Group C did have the opportunity for redrafting and thus shows an impact from the treatment when comparing groups A and C in Table 49.

Such a finding would support giving students an opportunity for redrafting since during the their first draft, such students write more. Once again, we must be careful to remember that these tests only examine the final product and do not show us causes or underlying strategies being used by students. If it were the case that having the opportunity for redrafting increases the work a student puts into the first draft, why then is it that group A shows more editing time, more navigation through the document, and a longer time from start to first printing? Groups with redrafting opportunity should score higher on these measures if the time is really being used for inputting more words.

A more plausible explanation is that the extra time and work group A is putting into the first draft comprises not only keyboarding input but changes being made to the first draft. Figure 41, on page 91, does support this somewhat, showing that group A does delete more keystrokes than group B. Finally, we cannot discount the possibility students in group A are sensitized to the number of words in the document simply because more words increase opportunities for errors to be caught by the computer assessment. QBL Student Version does include a menu option for quickly calculating the number of words in a document so that if students were to pay

attention to the 150 word minimum requirement they could minimize the amount of words over that minimum.

Table 46. All groups repeated ANOVA words in document

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	4966.11	2	2483.05	13.68***
Treatment	4974.68	2	2487.34	6.92**
Letter X Treatment	3702.76	4	925.69	3.39*

**P<.05 **P<.01 ***P<.000*

Table 47. Groups A & B repeated ANOVA words in document

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	4352.19	2	2176.09	11.35***
Treatment	1243.67	1	1243.67	5.25*
Letter X Treatment	777.70	2	388.85	2.56

**P<.05 **P<.01 ***P<.000*

Table 48. Groups B & C repeated ANOVA words in document

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	3986.19	2	1993.09	8.66***
Treatment	1243.67	1	1243.67	2.90
Letter X Treatment	3585.16	2	1792.58	4.63*

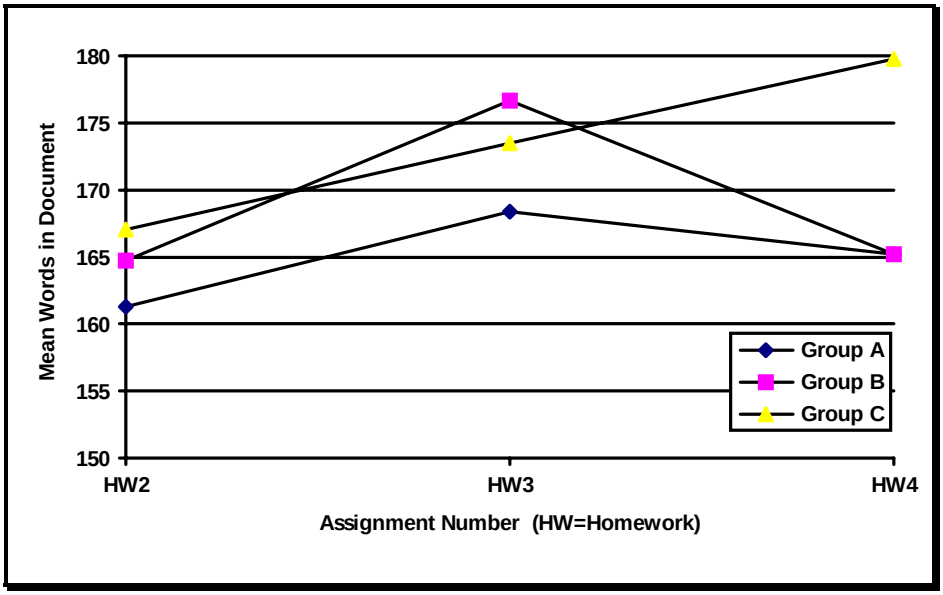
**P<.05 **P<.01 ***P<.000*

Table 49. Groups A & C repeated ANOVA words in document

Source	*SS*	*DF*	*MS*	*F*
Letter Assignment	3571.90	2	1785.95	8.02**
Treatment	5151.13	1	5151.13	13**
Letter X Treatment	1376.69	2	688.34	2.65

**P<.05 **P<.01 ***P<.000*

Figure 56. Mean words in document in first draft



c) Regression

Stepwise linear regression analysis was performed on all variables for each group (variables from the first assignment or pretest were not included). The total error variable was held as the dependent variable while all other variables were tested in the formula. Regression results and resulting predictive formulas are shown below. Regression does not give us a clear picture of causational relationships, but instead simply shows variables that may help predict the dependent variable. Causational relationships may very well exist between the dependent variable and other variables that make it into the regression results, but proof of such a connection lies not in regression analysis, but in path analysis (the next section of this report).

Regression results supply us with some ability to predict error rates. Group A gave the best result with an R square of .35, meaning that the resulting formula can account for 35 percent of the variability in the error rate for this group. That

measure did achieve statistical significance as shown in Table 50. Four variables were found to contribute to the predictive ability of the final formula (see Table 51). Equation 1 shows the final formula for predicting the error rate of a group receiving computer generated feedback and having no opportunity for redraft.

As with the other two groups, addition of reference material is a good predictor of lower error rates. The link here is quite obvious, as the more phrases and sentences of a document that exactly match the textbook, the fewer errors students will have given that the total amount of words in their documents are roughly equivalent. On the opposite side is the measure of words in a document which predicts a positive relationship to error rates. These two measures are quite fundamental and clearly can help us to predict the total number of errors a student will make. More words in a document increases errors while more material copied from the textbook reduces errors.

Of special interest for group A are the two remaining variables included in the regression analysis. Keys deleted, or cut, here shows a positive relationship with total errors while the program started variable shows a negative relationship. For this group, receiving feedback and no redraft, final error rates can be predicted as rising when more keys are cut from the document and falling the more number of times the computer program is started.

Table 50. Group A regression summary statistics

Multiple R:	.58895		
R Square:	.34686		
Adjusted R Square:	.32807	F:	18.46
Standard Error:	3.52055	Signif F:	.0000

Table 51. Group A variables included in predictor equation

Variable	B	SE B	Beta
Reference Matches:	-.502586	.078025	-.444853
Keys Deleted:	.002124	7.0841E-04	.224352
Program Start:	-.297758	.119611	-.186356
Words in Document:	.087385	.023019	.262079
Constant:	-4.511694	3.839510	

Equation 1. Group A predictor equation of total errors

Total Errors =-4.511694 -.502586(*Reference Matches*)+ .002124(*Keys Deleted*)-.297758(*Program Start*)+ .087385(*Words in Document*)

For group B, the central variables of reference matches and words in document are included in the resulting summary in Table 52 and Table 53. While the R squared=.29 is smaller than the R squared for group A, a level of statistical significance was reached in this test. Compared to group A, this result shows almost the exact same increase in errors related to the variable words in document (.086 for group B and .087 for group A). However, the variable reference matches shows quite a different result (-.34 for group B and -.50 for group A). For every reference match, group A's error rate drops .16 more than group B's error rate. This may be a signal that group B is reducing errors through a more complex interrelationship of variables while group A's error reduction may be more clearly linked with the reference matching variable.

Neither of the other two variables, which contributed to group A's predictive formula, added predictive power to group B's formula (see Equation 2). One variable, times printed, did prove to be useful in predicting total errors for group B.

Interestingly, this variable was shown to be significantly different between groups A and B in the previous repeated ANOVA tests (see page 120). In that analysis, group A can be seen to print significantly more times than group B. If we can assume that a printout follows major revisions, this could be an important clue to the different strategies being pursued by these two groups (group A with computer feedback and no redraft; group B with both computer feedback and redrafting).

As previously established, group B prints the first draft fewer times than group A, but students in group B who print more than their peers (within the same group) tend to have higher error rates than their peers. This result raises the suspicion that the presence of redrafting opportunities may lead to students being less successful in error reduction during the first draft.

Table 52. Group B regression summary statistics

Multiple R:	.53562		
R Square:	.28689		
Adjusted R Square:	.27017	F:	17.16478
Standard Error:	3.50709	Signif F:	.0000

Table 53. Group B variables included in predictor equation

Variable	B	SE B	Beta
Reference Matches:	-.339600	.078982	-.322427
Times Printed:	.234275	.094511	.185647
Words in Document:	.086012	.019000	.340598
Constant:	-7.192112	3.283695	

Equation 2. Group B predictor equation of total errors

Total Errors=-7.192112 --.339600(*Reference Matches*)+ .234275(*Times Printed*)+ .086012(*Words in Document*)

Group C's regression analysis produces the least number of variables that are good predictors of the total errors variable. Only two variables are retained in the regression analysis seen in Table 54 and Table 55. These two variables are the same

two that appear in both group A and B's predictor equations. The R squared value is the lowest out of the three groups, at .20, while it does achieve a statistical level of significance. Equation 3 shows the resulting predictive formula, which parallels the results from the other two groups in that reference use reduces errors while more words in the document increase errors.

Table 54. Group C regression summary statistics

Multiple R:	.44802		
R Square:	.20072		
Adjusted R Square:	.18954	F:	17.95540
Standard Error:	4.45478	Signif F:	.0000

Table 55. Group C variables included in predictor equation

Variable	B	SE B	Beta
Reference Matches:	-.444913	.081149	-.415392
Words in Document:	.058258	.017784	.248188
Constant:	.239223	3.064803	

Equation 3. Group C predictor equation of total errors

Total Errors=.239223-.444913(*Reference Matches*)+.058258(*Words in Document*)

d) Covariance (Partials)

As stated earlier, regression analysis can only assist in making a prediction based on the outcome of some independent variables. The reason regression generally cannot be used for describing actual events and relationships is that the underlying influences of the independent variables may actually have an affect on the dependent variable in indirect ways that are not clearly observed in normal regression. It is even possible that regression analysis could find an independent variable that is highly predictive of the dependent variable's value but actually has no relationship or direct influence on the dependent variable.

Since the purpose of this research is to understand the underlying differences in the strategies employed by students in the three groups, a more fundamental understanding of true interaction and influences is required. Therefore, this section employs path analysis to build a detailed model of the divergent writing strategies used by the three groups. Because the computations required for such an analysis are extensive, the number of variables are first limited to what the theoretical model may possibly include. In this case, all specific error type variables are not included in the analysis and are instead represented by the macro variable of total errors. Editing data variables are all included, with the exception of editing ratio, which is instead broken into its absolute values of keys added and keys cut.

Before any model can be constructed, partial correlation coefficients must be generated for all possible interactions. A partial correlation coefficient differs from a normal correlation measure in that all influences from other variables are eliminated, thus showing only the influence that exists between the two variables being tested. Since ten variables have been included in this test (nine editing measures and one error measure), eight variables will be held constant while two are tested for correlation, thus each result shown is an eighth order partial correlation coefficient. The level of statistical significance tested for was set at $P<.01$ in order to assure a robust model (partial correlation coefficients are tested on a t distribution).

Results for group A are displayed in Table 56. In general, the correlations observed can be useful in answering some of the question raised in the earlier statistical analysis. For example, the fewer number of words in group A's documents

did appear strange since their editing time was higher than the other groups. Partial correlation reveals that when group A navigated the document they were deleting keys (keys cut) at a ratio of .27, i.e., for every navigation key pressed, keystrokes deleted rose by .27, or visa versa, for every keystroke deleted, navigation rose by .27. Since we already have observed that group A navigated the document significantly more, we may now assume that the fewer number of words in the document is not the result of less work, but of more work in the form of editing the document down.

Table 56. Group A partial correlation coefficients (8th order partial correlation)

	Reference matches	Keys Added	Keys Cut	Edit Time	Navigation	Program Start	Time to 1st Print	Times Printed	Words in Doc	Total Errors
Reference matches	1									
Keys Added	-.17	1								
Keys Cut	.24*	.49*	1							
Edit Time	-.02	.07	-.04	1						
Navigation	-.20	.19	.27*	.03	1					
Program Start	..01	.04	.13	.13	.03	1				
Time to 1st Print	.16	.22*	-.03	.04	.10	.05	1			
Times Printed	-.02	-.03	.15	.03	.04	.47*	.22*	1		
Word in Doc	.16	.10	-.01	-.03	-.03	.00	-.17	.09	1	
Total Errors	-.44*	.10	.17	.14	-.07	-.15	-.02	-.08	.29*	1

** significant at P<.01*

Where as group A had eight partial correlation coefficients test significant at the P<.01 level, Table 57 shows that group B had many more significant relationships among the variables. A total of 17 variables tested significant at the required significance level for group B. This tells us that the way variables are influencing each other is much more complex for group B than for group A. This also holds true relative to group C, which had eight significant relationships (see Table 58).

Table 57. Group B partial correlation coefficients (8th order partial correlation)

	Reference matches	Keys Added	Keys Cut	Edit Time	Navigation	Program Start	Time to 1st Print	Times Printed	Words in Doc	Total Errors
Reference matches	1									
Keys Added	-.26*	1								
Keys Cut	.25*	.86*	1							
Edit Time	.12	-.08	.22	1						
Navigation	.01	.43*	-.24*	.37*	1					
Program Start	.04	.24*	-.22	.29*	-.13	1				
Time to 1st Print	-.09	-.02	.10	.52*	-.07	-.004	1			
Times Printed	.10	.15	-.28*	.24*	-.12	.17	.18	1		
Word in Doc	.27*	.41*	-.37*	-.001	.09	-.16	.02	-.07	1	
Total Errors	-.32*	.06	-.02	-.006	-.06	-.12	-.07	.25*	.31*	1

** significant at P<.01*

Table 58. Group C partial correlation coefficients (8th order partial correlation)

	Reference matches	Keys Added	Keys Cut	Edit Time	Navigation	Program Start	Time to 1st Print	Times Printed	Words in Doc	Total Errors
Reference matches	1									
Keys Added	-.07	1								
Keys Cut	.07	.62*	1							
Edit Time	.08	.67	-.07	1						
Navigation	.20	.63*	-.08	-.01	1					
Program Start	.07	.20	.49*	.12	.06	1				
Time to 1st Print	.03	.10	-.20	-.05	.14	.04	1			
Times Printed	.09	-.01	.20	.08	.12	.23*	.12	1		
Word in Doc	.32*	.26*	-.14	.03	-.01	-.19	-.01	.04	1	
Total Errors	-.35*	-.06	.08	-.001	.08	-.01	.03	-.11	.24*	1

** significant at P<.01*

3. Resulting Models

The partial correlation coefficients generated can be used for connecting together the variables in paths of influence that reveal the chain of events leading to total error rates. This technique of path analysis builds a causational model that not only describes relationships but actual causes (Sirkin, 1995; Retherford and Choe, 1993). By only including in the model the partial correlation coefficients that surpass our minimum significance requirement, a high level of confidence in the model can be

obtained (depending on the significance level chosen). In this case, we shall only retain the coefficients that are significant at the .01 level or better. All models created are saturated with standardized coefficients.

The model is built by connecting variables that have significant partial correlation coefficients. For example, in the case of group A, the program start variable is significantly correlated with the times printed variable so a line can be drawn between these two variables. The direction of influence is based on the existing model, theory, or common sense. In this example it is not likely that the number of times the document is printed causes the program to be turned on, but it is likely that the program is turned on with the goal to print the document. An arrow head is placed appropriately showing the direction flowing from starting program to times printed. This process of connecting the variables continues until all significant correlations have been represented in the model. Of course, it is highly unlikely that all the variables that influence the final outcome, in this case: total errors, have been measured in the study. There is no guarantee that the variables measured will connect to form a model at all. In the example, if the variables times printed and program started did not have any significant correlation with any other variables, these two measures would simply be orphaned (a clear sign that the research method is missing some important variables, the measurements are not reliable or an overall relationship simply does not exist).

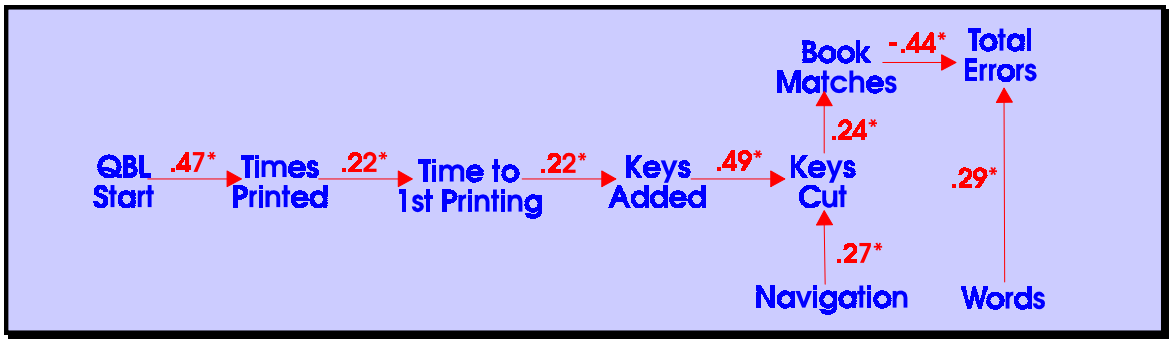
If a model can be constructed, we can be relatively sure of the flow of influence as well as the magnitude of that influence although numerous unknown variables may still exist and play a role in the model.

For this study, the resulting models left no orphans (all included variables had lines of influence connecting them to the model). All models presented are based on results from the first drafts of assignments two to four. Class A's model shows a straight path for the first five variables (see Figure 57). For students in group A, the process of completing the first draft, begins with starting the program. Nearly half of the time QBL is started, a printout occurs and the more a student prints out the document the longer s/he tended to wait before making the first printout. When the first printing was delayed, more keys were input to the document (a longer delay meant more words input). At this stage, group A students cut keys out, as they input and while navigating through the document. While a student moves through the document, making changes, the similarity with the textbook increases, which in turn reduces total errors. Outside the main flow of the model, the number of words in a document increases total errors.

From the group A model, we can get an idea of the underlying strategy at work. It appears that these students are placing an emphasis on reviewing and editing their work before submission. If we can assume that a new printout occurs after major revision, or at least every time a student wants to examine, review or pass on to classmates for proofreading, then the increase in times printed combined with the delay to first printing makes perfect sense. That is to say, the times printed variable is

really measuring amount of review a document receives. If a student intends to review his/her document thoroughly, then the first printing will be delayed as the first draft is carefully reviewed. The longer that delay, the more words typed in during the first session. It would seem that this group places an emphasis on putting in as much as possible in the first session, before the first printing. They then return and navigate through the document to make cuts. It could be that this group prints more (as shown earlier) in order to check for errors, then goes back to the electronic version to cut out the specific errors found in their checking. Thus error rates are reduced by reviewing printouts and possibly taking advantage of classmates' proofreading abilities.

Figure 57. Model of Class A (computer-based feedback & no redrafting)



*** P ≤ .01**

While group B's model appears complex, there are some important features that stand out (see Figure 58). Unlike group A, the time to first printing has a positive influence on editing time. This is the expected result and is quite intuitive, as a longer time to the first printing adds time to the overall editing time. Another feature of interest is the navigation impact on the model. Group B moves about the document while adding and cutting keystrokes. The amount of movement through the document directly increases the editing time. Rather than concentrating on entering

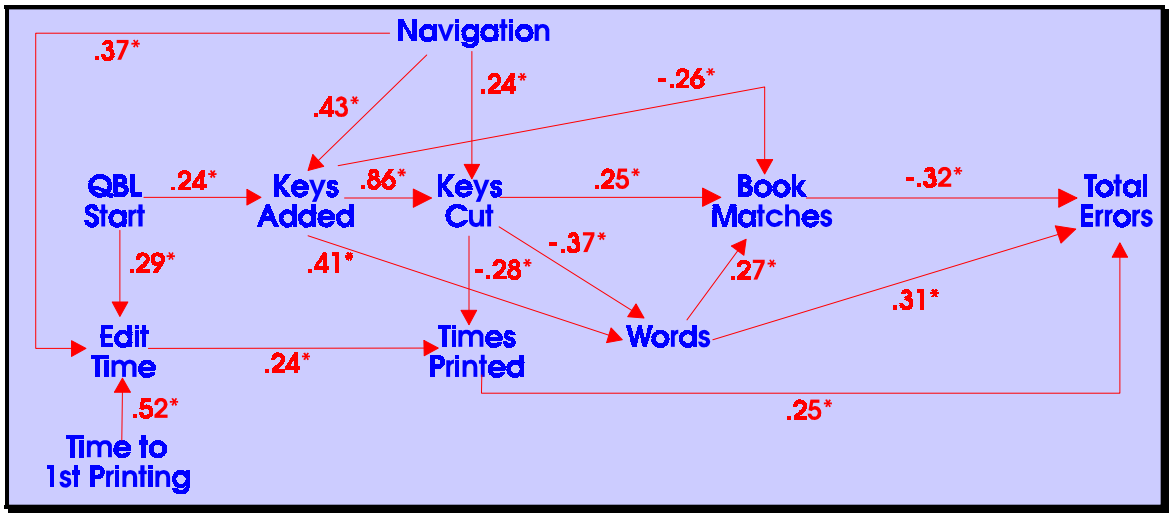
the document for editing out problems (as is the case with group A), this group is simply creating the document with no special overriding emphasis.

Increases in the keys added have a negative influence on book matches while keys cut have an almost equal, but opposite influence. Book matching is taking place as a combined influence from keys added, through words in document, and keys cut, which is no doubt the elimination of typos (typing error) as the typing is taking place. Increases in editing time lead to more printouts which leads to more total errors. The path starting at navigation, leading to edit time and then to times printed is clearly an important influence on total errors. This line is unlike any found in the other two models and clearly shows that students in group B who move about the document, spending more time on it, have little effective error reduction through editing efforts. Following the previously presented argument, that printouts occur after major revision or for proofreading purposes, group B is having little impact on total errors after making changes and printing again. Group B's model is displaying activity that suggests that group B should have a higher error rate than group A. This explanation makes sense if all other inputs, such as editing time are equal; however, the inputs to the models are not equal for each group.

We do know that the total errors of the three groups are approximately equal. Therefore, given the unique line from navigation to total errors displayed by group B, we can state with confidence that a better explanation is that group B simply navigates less and when they do navigate and edit, the results are not especially good.

In fact, evidence of lower group B navigation rates is substantiated by the repeated ANOVA analysis on page 115.

Figure 58. Model of Class B (computer-based feedback & redrafting)



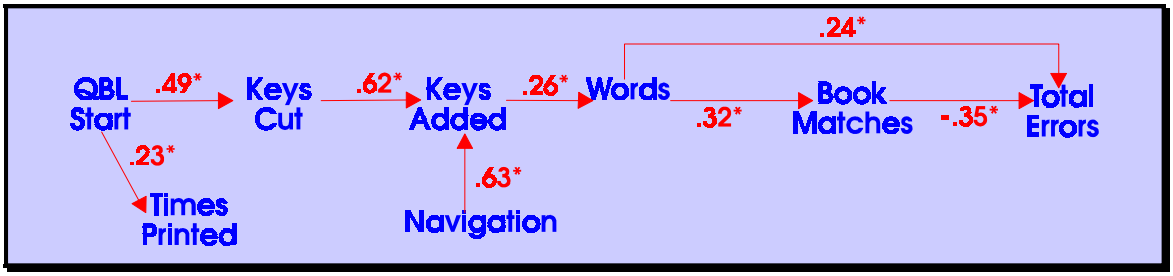
*** P ≤ .01**

Group C produces a model that is less complex than that of group B and in some ways echoes group A (see Figure 59). Like group A, this group starts the program with some intention to print out the document although for group C this relationship is weaker. Movement from starting QBL, through keys cut, to keys added reveals what appears to be group C's attempt at editing their documents for higher quality during the first draft. The more times QBL is started, the more keys are cut. The link from navigation to keys added shows the strong relationship between moving through the document and adding material to it. This is in sharp contrast to group A which navigates to cut keys. ANOVA testing of the navigation measure showed group C to navigate significantly more than group B, and about the same amount as group A (see page 115).

Number of words in the document is increased by both paths moving through keys added. This relationship shows that group C's work, on balance, is adding words to the document during the first draft. While editing certainly plays a role, as group C's editing ratio is significantly larger than that of group B's (see page 111), it seems to lack the direction of group A. For example, increases in the keys cut variable actually exhibit a strong relationship to increases in the keys added variable while navigation has an equally strong relationship to keys added. Previous ANOVA analysis showed that group C had significantly more words in the first draft than group A, while approximately an equal amount as group B.

Without ever receiving computer generated feedback, one would suspect that such an emphasis on adding material to the document should increase resulting computer measured errors. However, the link between number of words in the document and book matches reveals that as group C increases the number of words they also increase the number of reference matches. Along with increases in reference matches, comes a weaker increase in total errors (.32 for group B compared to .24 for group C). Knowing that group C has significantly more book matches than the other two groups (see page 108) completes the picture. Group C is placing its emphasis on adding directly copied material from the textbook. This strategy keeps error rates down.

Figure 59. Model of Class C (process-based feedback & redrafting)



*** P ≤ .01**

B. Redrafting Data

Two groups, B and C, in this experiment did have the opportunity to perform redraft. Since it appears that such an opportunity plays a role in differing strategies during the first draft, it may be useful to examine exactly what did these two groups do during the redrafting. Redraft data is available for assignments one through three. The final assignment, assignment four, did not have any redraft completed due to time limitations as the semester came to an end. Students, however, were not told the final assignment would be any different than the other three; therefore there is no reason to suspect their behavior on the final fourth assignment was changed in any way by this difference. As far as the redrafting data are concerned, we may begin analysis with assignment one's redraft because students had already received feedback, computer or human generated, after the first assignment's first draft. This means that the redraft analysis includes three points of measurement over the time of the experiment.

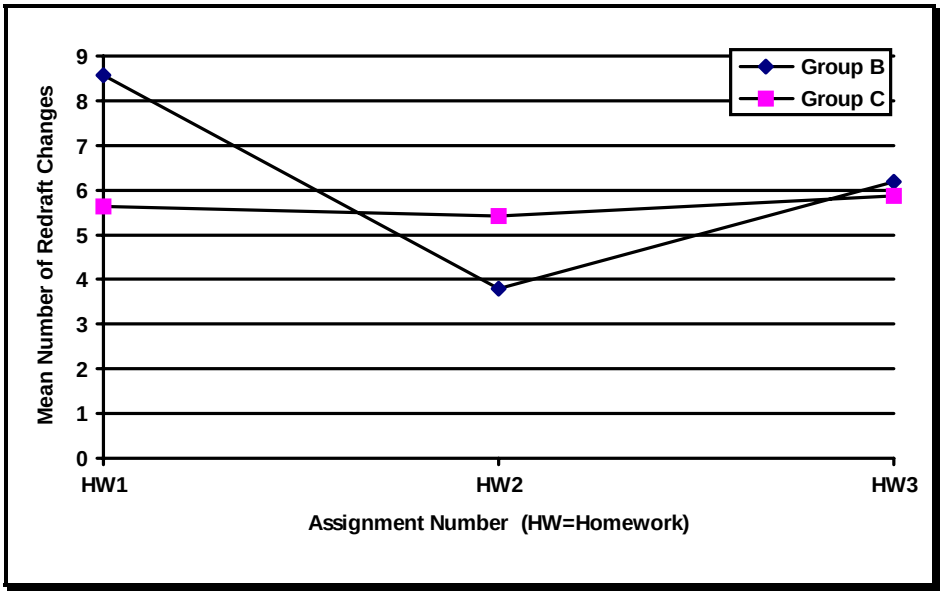
1. Descriptive Analysis

A quick look at some raw data can give us an idea of how student behavior differed between the two redrafting groups.

a) Redraft Changes

Measuring changes in the redrafts was completed through the newly created program reviewed on page 62. Figure 60 shows that through the three redrafts, groups C's changing activity was roughly unchanged where as group B's activity closely paralleled the error rate reported on the computer feedback.

Figure 60. Changes made in redrafting



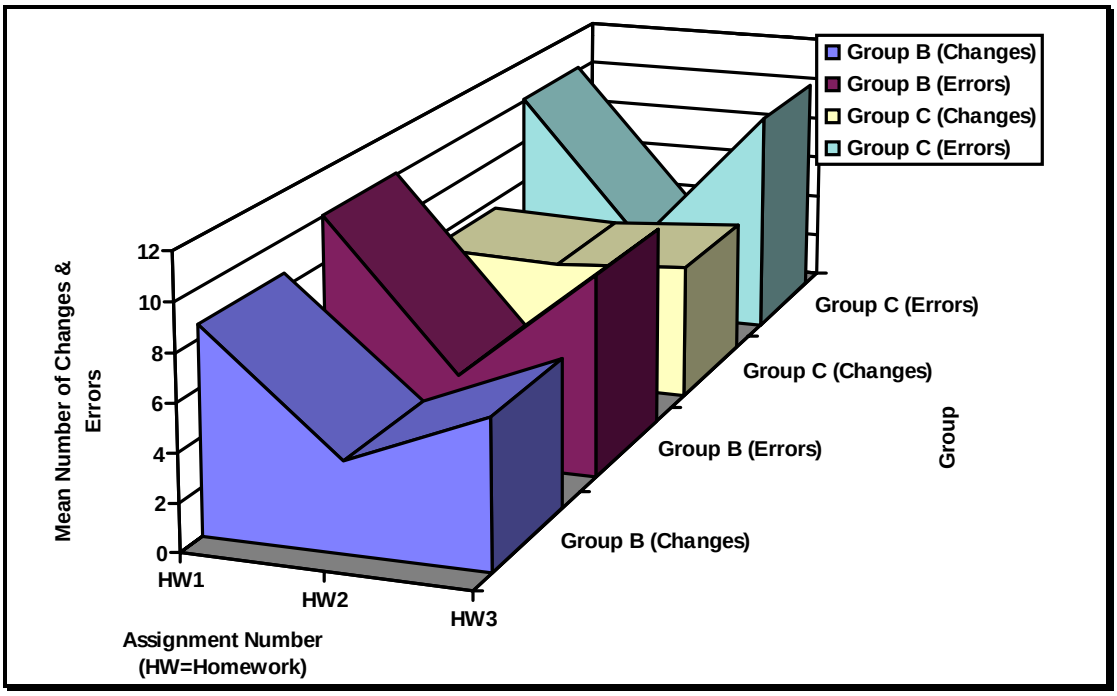
The three dimensional chart in Figure 61 clearly shows that group B's changes closely follow the pattern of errors reported on the computer feedback. Since group C did not receive the computer feedback, its flat line confirms there was no carry over from other test groups which could have led to an awareness of the objective error types being checked for through the QBL system. Since the feedback given to group C was based on more generalities, the flat line makes sense.

We could ask the question: what keeps the line straight? In this study, the grades given out on the feedback sheet, seen on page 60, range from A (excellent) to D

(needs work). A student's rank in this range was determined by the teacher through the use of the program that tracked changes made between the first and second drafts of an assignment. Since submission of the redraft included both the first draft printout and the feedback sheet, along with the network submission of the redraft in electronic form, the teacher could quickly and clearly see what the student had changed and what the first feedback suggestions from the teacher were. A grade was then assigned based on how much effort had gone into the areas pointed out as needing work on the first feedback form.

It would appear that the constant line supports this grading process as somewhat effective, or at least consistent. If the grades assigned did not appear related to efforts made in redrafting, one would suspect that students' modifications of the redraft should decline as little benefit is perceived from such behavior.

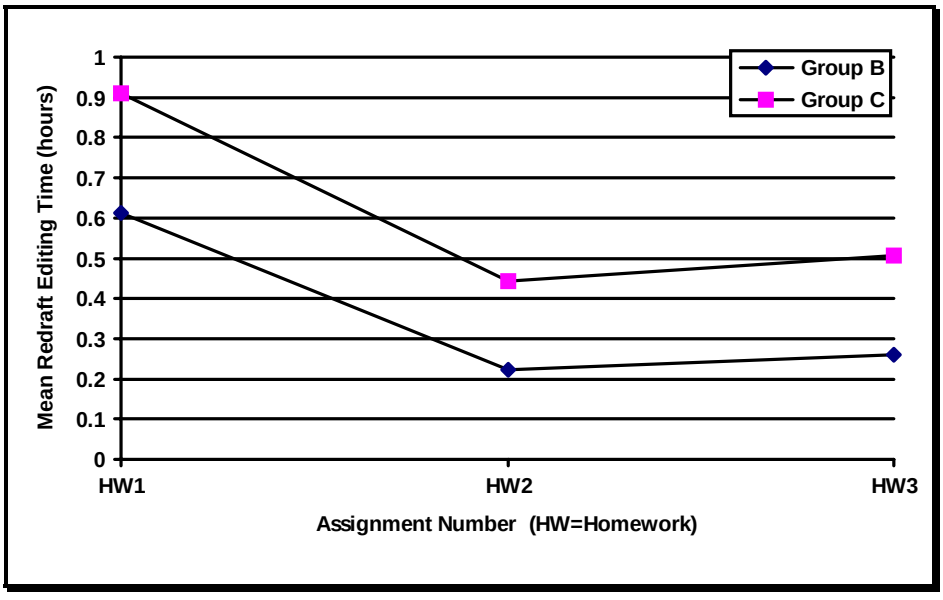
Figure 61. Changes made in redrafting with mean error rates



b) Time Spent Redrafting

A sharp drop in time spent on the redraft is observed after the first assignment (see Figure 62). With this information, we can get a better idea of just how the two groups approach the changes being made in the redraft. From the start, group A spends less time on the redraft, yet the number of changes being made, in the case of assignment one's redraft, is higher than group C. The reason for this difference is simply that changes are being made on paper before the computer is turned on. Since group B received their feedback on errors, changes made during redrafting were largely based on this feedback. Both groups appeared to develop this technique throughout the three redrafts, i.e., redrafting first on paper, then copying changes to the computer.

Figure 62. Editing time in redrafting (in hours)



c) Redrafting Editing Ratio

Editing ratio measures the percentage of keys cut from those added. In the redrafting stage, this measurement takes on a somewhat different meaning than that in the first draft. During the first draft, it is impossible for the editing ratio percentage to reach 100 as this would mean no keys are added to the document (100% of those added are cut). During redrafting, however, it is possible for the editing ratio to approach and even pass 100. This would happen if during redrafting a student deleted more keystrokes from the document and made little or no additions. Because there is already an amount of text to work with, a student can mostly concentrate on deleting text.

Both groups spent much of their time deleting keys during the redrafting stage (see Figure 63). Groups C is fairly consistent at around the 90 percent range, which means on average, two keys are added for every eight being deleted. Group B shows more variation through the three redrafts but is cutting more keys (or an equal amount) than adding in the first two redrafts. Remember that the numbers charted here are means, so some students are exclusively cutting keys, while some may be adding a few without any cutting.

Figure 63. Editing ratio in redrafting (in percent)

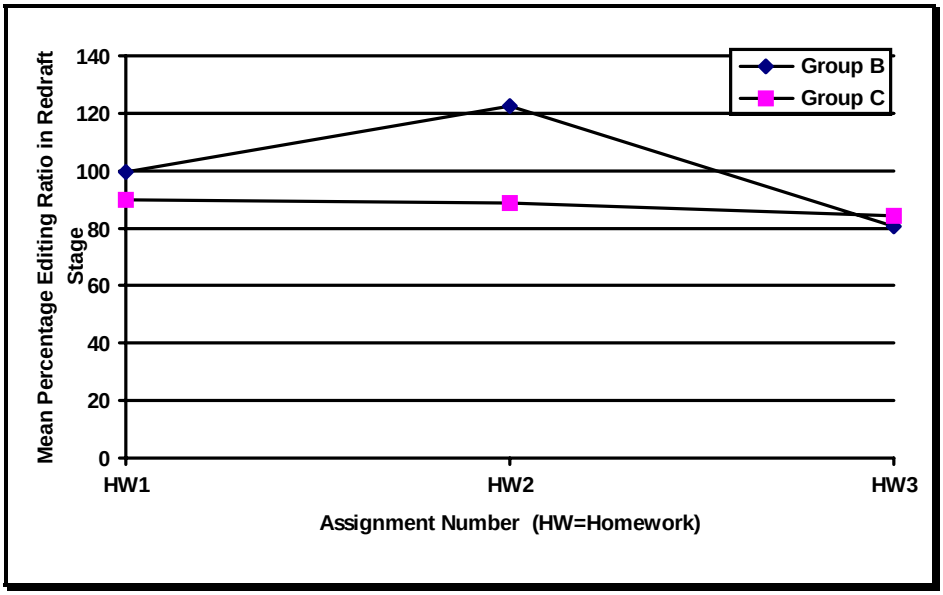
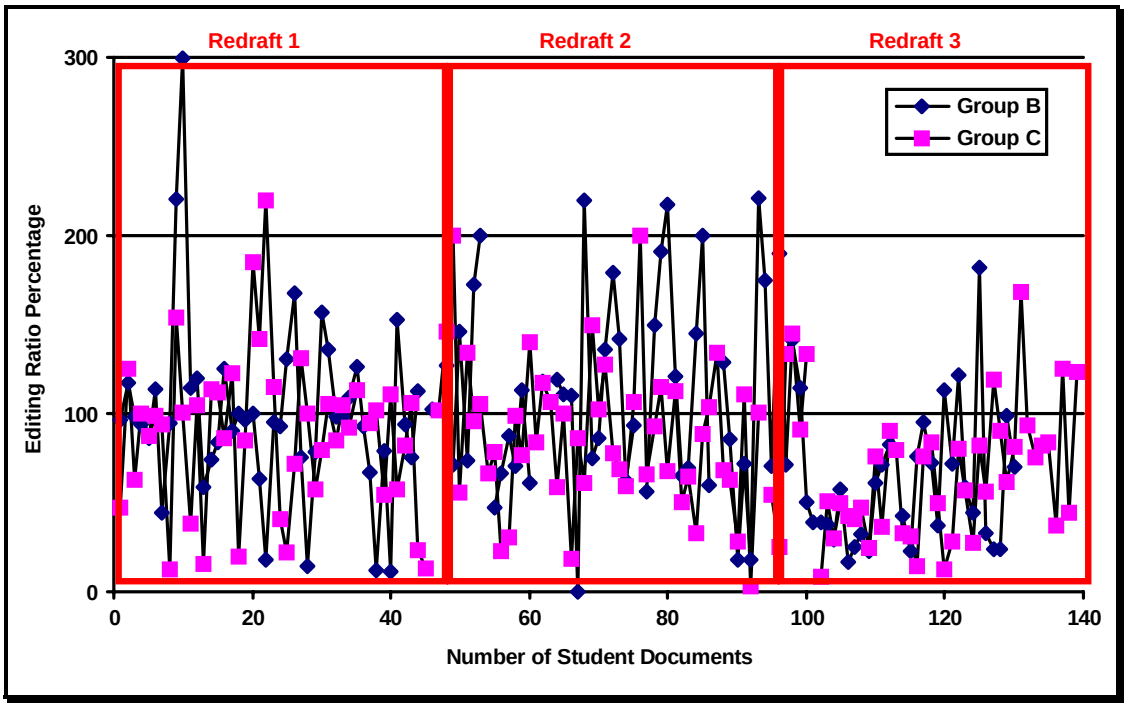


Figure 64 shows all the students' edit ratios throughout all three redrafts. This chart clearly shows the differences between the three redrafts, with redraft three's lower key deletion rates.

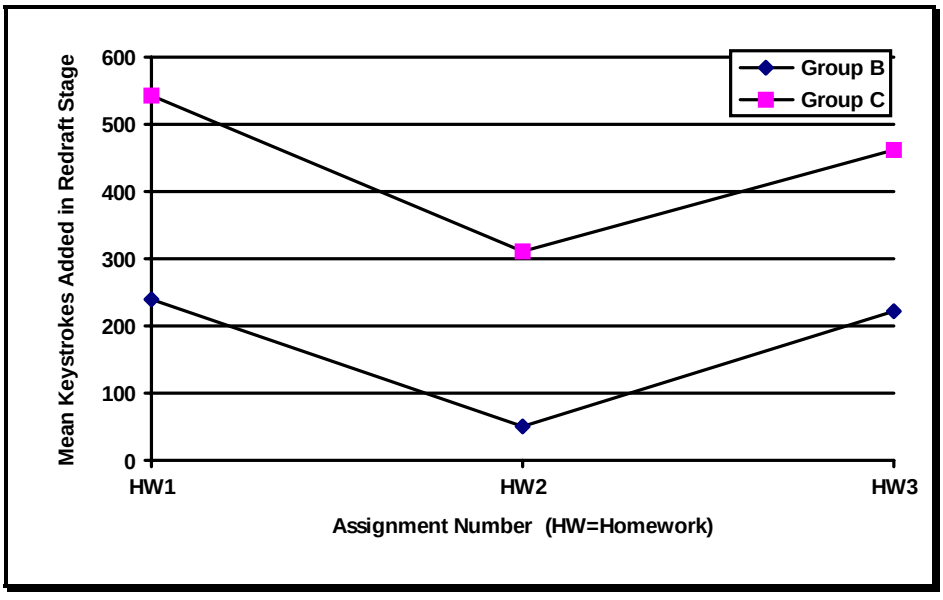
Figure 64. Editing ratio through all redrafts (scatter chart)



d) Keys Added During Redrafting

Number of keys added to the redraft shows the gap between group B and C. Group C was adding nearly twice the number of keys group B was. This gap can explain the difference in time using the software during redraft (editing time) since group C must spend more time to complete the larger amount of work. The dip during assignment two's redraft is interesting due to the recovery in assignment three's redraft. Since group B paralleled group C so well, it is likely that this dip was due to the original assignment. Indeed, if we examine the number of words in the first draft (see Figure 37 on page 88), the exact same dip appears. This tells us that the amount of changes going into the redraft is related to the overall size of the first draft—the longer the first draft, the more keystrokes observed going into the redraft.

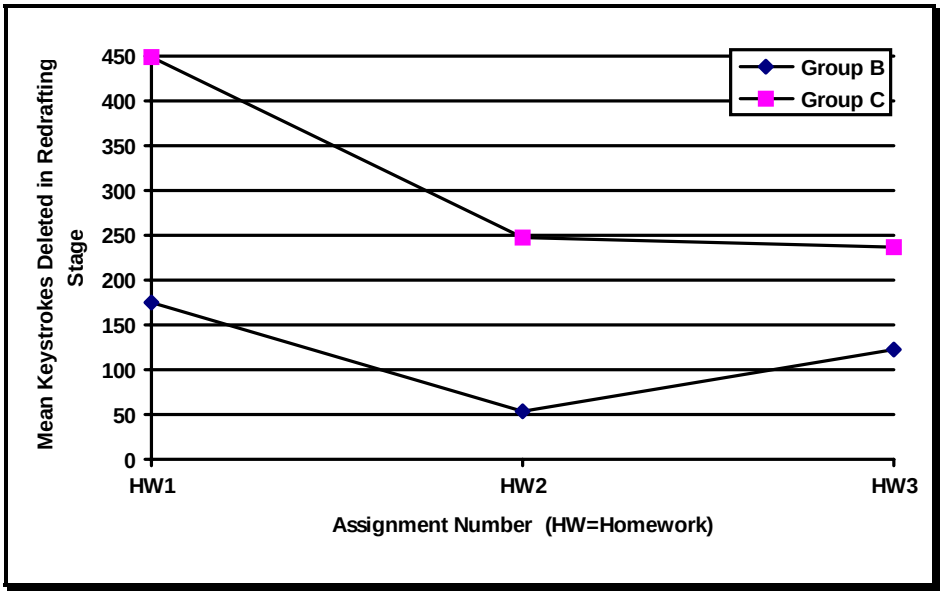
Figure 65. Keys added in redrafting



e) Keys Deleted During Redrafting

A similar pattern is seen in keys deleted as that observed in keys added. The one exception is the lack of rebounding for group C in the third redraft. This lowering of keys deleted is the reason for group C's editing ratio falling downward in the third redraft (see Figure 63). The reason for this decline may be attributable to the feedback. While the process-based feedback has encouraged students to input keys at a higher rate than the computer-based feedback group, the deleting of keys may not be encouraged. If more treatments were to take place and the key deletion rate continue its fall, we may be able to contribute such a decline to the process feedback.

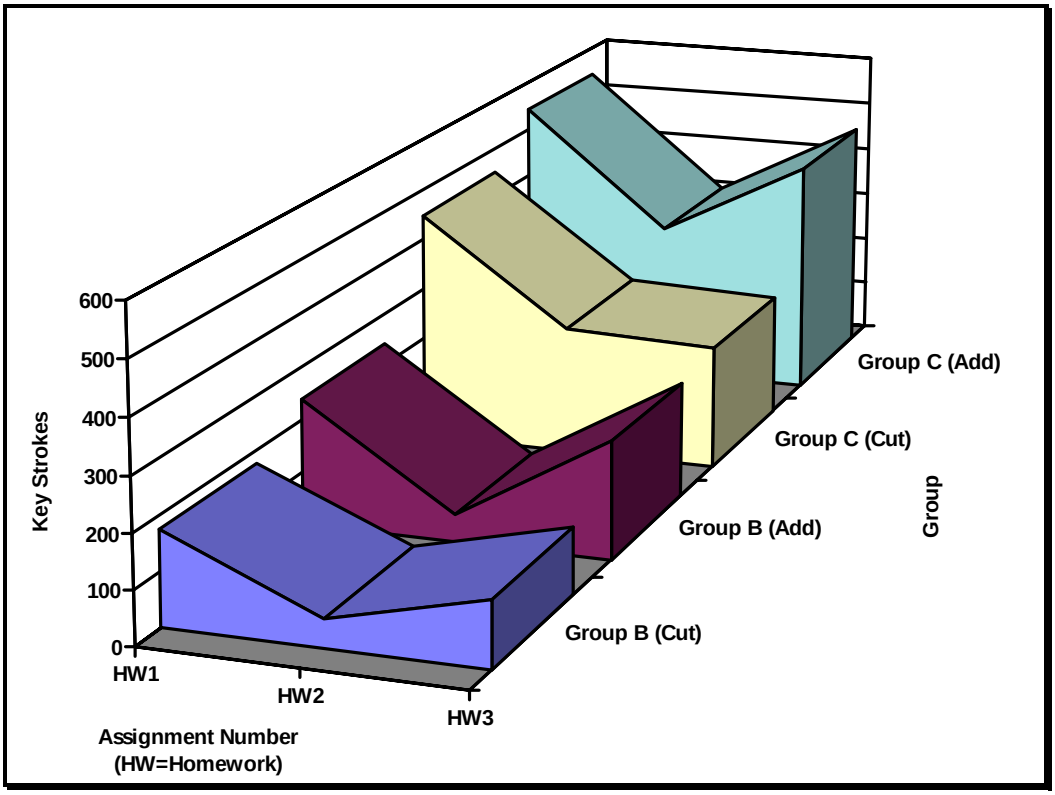
Figure 66. Keys deleted in redrafting



A three dimensional chart in Figure 67 gives a clear picture of the two group's cutting and adding patterns. Reflecting on the feedback form (see page 60) for group C, supplies a clue as to why students find deleting keys less useful than adding keys. When objective errors, such as spelling or punctuation, were found in a student's first

draft, the feedback form was marked to reflect this. Upon submission of the redraft, if the same errors were present, that student's grade would reflect the lack of improvement. However, if the same student did add to the document in a substantial way, the amount of effort would be higher and thus a corresponding increase in evaluation appropriate. Given the fact that students in group C would have a very hard time to locate objective errors without some guidance, or at least some training in the spotting of such errors, it may be the case that adding, rather than deleting, to a document has a better payoff for the process-based group.

Figure 67. Comparing keys cut and added



2. Statistical Analysis

A closer analysis of the redrafting data does not bring any surprises but does quantify the observations from the previous descriptive data section.

a) ANOVA Tests

The ANOVA analysis presented here closely parallels the procedures followed in the error and editing variables analysis. Redrafting data analyzed is a subset of the full variable set in order to concentrate on the most relevant measures in understanding the differences in redrafting between groups B and C.

(1) Each Group Through All Redrafts (Repeated Measures)

Group B exhibited variation throughout the three redrafts. Table 59 shows that the four measures: changes, edit time, keys added and keys deleted all varied significantly. Changes made to the document during redrafting are highest during the first redraft and lowest during the second. Editing time was also longest during the first assignment, but remained constant between the second and third assignment redrafts with no significant difference. The second redraft was significantly lower in keys added and deleted while the first redraft was highest. These two variables differed in the third assignment; however, as the keys added variable rebounded, to show no difference with the first redraft keys added variable, while the keys deleted variable could not reach the first redrafts rate although it did significantly differ from the second redraft's rate.

Table 59. Group B ANOVA of redraft variables with Scheffe multiple range test

Variable	*Assignment 1 Mean*	*Assignment 2 Mean*	*Assignment 3 Mean*	*F*	*Post hoc*
Changes	8.57	3.79	6.19	38.33***	1>2 1>3 3>2
Edit Time	1.07	.22	.33	64.06***	1>2 1>3
Keys Added	357.73	51.19	295.70	17.82***	1>2 3>2
Keys Deleted	302.41	53.02	171.88	18.35***	1>2 1>3 3>2

**P<.05 **P<.01 ***P<.000*

At first glance, group C exhibits fewer significant changes over the three assignments (see Table 60). Closer examination of the post hoc data reinforces this observation as the first redraft consistently stands out from the rest. Changes made during the redraft are fairly constant as are the number of keys added. A significant change is observed in the drop in keys deleted between the first and second assignment's redrafts with the highest number of deletions occurring in the first redraft. Deletions are constant between the second and third assignment, but the rise in keys added informs us that students in group C spend an increasing amount of energy on adding to the document compared to removing from the document. Finally, editing time also shows a significant decline, with some rebounding in the third assignment's redraft. Simple assimilation to program use can best explain this decline as the actual amount of changes being made are not declining.

Table 60. Group C ANOVA of redraft variables with Scheffe multiple range test

Variable	*Assignment 1 Mean*	*Assignment 2 Mean*	*Assignment 3 Mean*	*F*	*Post hoc*
Changes	5.64	5.43	5.87	.25	
Editing Time	.93	.53	.62	7.10***	1>2 1>3
Keys Added	554.40	345.09	490.37	3.00	
Keys Deleted	455.30	272.45	273.83	4.89**	1>2 1>3

**P<.05 **P<.01 ***P<.000*

(2) Between Groups for Each Redraft

Differences between the two redrafting groups are more important measures when investigating what impact the computer feedback had compared to the process feedback. For the first assignment's redraft (see Table 61), there was only one significantly different measure: keys deleted. Group C showed higher numbers of both keys deleted and keys added to the redraft, with the deletions just achieving a statistical level of significance.

Table 61. Redraft comparisons; Assignment 1 (Levene's test for equality of variance)

Variable	*Group B Mean (SD)*	*Group C Mean (SD)*	*DF*	*F*
Changes	8.57 (2.61)	5.64 (2.75)	89	.320
Editing Ratio	99.67 (50.66)	89.82 (43.11)	89	1.00
Editing Time	1.07 (.59)	.93 (.65)	89	.94
Keys Added	357.73 (344.17)	554.40 (447.62)	89	2.94
Keys Deleted	302.41 (278.78)	455.30 (423.24)	89	5.64*

**P<.05 **P<.01 ***P<.000*

More differences become apparent in the results from the second assignment's redraft, seen in Table 62. The two groups achieved significantly different scores in all but the changes measure.

While the difference in keystrokes between the two groups is certainly stark, the difference in number of changes is surprisingly small. This is likely a reflection of the conservative technique used to measure changes made. With so much more activity by group C, details of what is being changed deserves a closer look. This issue is examined in the next section, starting on page 154. For the moment, suffice it to say that the changes measure should be seen as a standardized measure in that it is not directly comparable to the keystrokes measures.

Group B displayed a much higher editing ratio, well over 100 percent, while group C's mean stayed below the 100 percent mark. This difference combined with the significant difference in editing time reinforces the assertion that group B is simply removing the errors found by the computer generated feedback. Group B is spending an average of 13 minutes in redrafting, while group C is spending about 32 minutes in the same activity. The computer generated feedback is leading group B students to cut 1.2 keys for every one key added, while group C is deleting .8 keys for every key added. In total, group B is displaying only 17 percent of the keyboarding activity shown by group C, yet group B is on the computer nearly 40 percent of the time group C is. This disparity would lead us to assume that group B students are doing more than just cutting out the errors found by the computer feedback, but

understanding just what that difference is requires a closer examination (see page 154).

Table 62. Redraft comparisons Assignment 2 (Levene's test for equality of variance)

Variable	*Group B Mean (SD)*	*Group C Mean (SD)*	*DF*	*F*
Changes	**3.79 (2.39)**	**5.43 (3.2)**	**88**	**3.81**
Editing Ratio	**122.47 (74.69)**	**88.90 (41.78)**	**88**	**7.08****
Editing Time	**.22 (.17)**	**.53 (.39)**	**88**	**13.50*****
Keys Added	**51.19 (91.67)**	**345.09 (324.26)**	**88**	**41.24*****
Keys Deleted	**53.02 (86.37)**	**272.45 (269.91)**	**88**	**45.65*****

***P<.05 **P<.01 ***P<.000*

Assignment three's redraft follows much the same pattern as the second assignment's redraft with one important difference in the editing ratio measurement (see Table 63). Once again, the number of changes in the redraft remains approximately equal between the two groups. Group C shows significantly higher numbers on editing time and the two keystroke measures.

Editing ratio now shows the two groups are cutting and adding at approximately the same ratio, about .8 keys deleted for every one key added. This change from the second assignment's redraft, where we observed a large difference, can be attributed to the computer feedback's reported error rate. Group B edits the document in a way that depends on the amount of errors reported by the computer generated feedback. That is to say, fewer errors reported seem to lead to simply cutting the problem areas, but more errors reported lead to more overall revision—including adding more text than is removed.

Table 63. Redraft comparisons Assignment 3 (Levene's test for equality of variance)

Variable	*Group B Mean (SD)*	*Group C Mean (SD)*	*DF*	*F*
Changes	6.19 (2.63)	5.87 (3.09)	87	.67
Edit Ratio	80.42 (70.95)	84.31 (114.32)	87	.037
Edit Time	.33 (.23)	.62 (.42)	87	8.36**
Keys Added	295.70 (251.45)	490.37 (486.45)	87	7.91**
Keys Deleted	171.88 (156.58)	273.83 (255.19)	87	4.88*

**P<.05 **P<.01 ***P<.000*

b) Correlation

Using correlation coefficients give a picture of how the redrafting variables are related. For this measure, the variables across all three assignment redrafts were included. Group B and C display similar correlations, with all relationships statistically significant, but there are a couple important differences between the two groups (see Table 64 and Table 65). Most important to this study is the strong relationship found between group B's editing time and changes variable. At .51, this measure is nearly twice as strong as group C's .26 relationship. Group B is using its redrafting time to make changes. That is not to say group C does not use its time to make changes, but group C does appear to spend its redrafting time doing other things as well. Nearly the same inference can be drawn from the stronger relationship shown by group B between keystrokes and changes. Once again, these relationships are nearly twice as strong for group B than for group C. This data again reinforces the assertion that group B is going into redrafting with the goal of making numerous specific changes.

Table 64. Group B redrafting variables bivariate Peason correlation coefficients

	Changes	Edit Time	Keys Added	Keys Deleted
Changes	1			
Editing Time	.51***	1		
Keys Added	.45***	.44***	1	
Keys Deleted	.49***	.50***	.75***	1

**P<.05 **P<.01 ***P<.000*

Table 65. Group C redrafting variables bivariate Peason correlation coefficients

	Changes	Edit Time	Keys Added	Keys Deleted
Changes	1			
Editing Time	.26**	1		
Keys Added	.25**	.57***	1	
Keys Deleted	.25**	.55***	.74***	1

**P<.05 **P<.01 ***P<.000*

3. Qualitative Analysis

As mentioned earlier, quantitative measurement of changes made during redrafting presents the question of just what a single change is. For statistical measures, the custom created software assured consistency among all measures. The drawback of the software is that it counts one change whether the change is small or large as long as there is no break within the modified or changed section.

Measurements from the study indicate that group C's redrafting activity includes about twice the keystrokes of group B, but results in an equal number of changes made. A closer examination of the changes being made by the two groups shows that the way changes are being made within the text differ.

a) Examination of Changes

The following section supplies actual examples from the second and third assignments' redrafts. In the left column are group B's redrafts and in the right

column are group C's redrafts. Assignment two redrafts are shown first, followed by assignment three redrafts.

Assignment two had the lowest number of errors for all groups. This low error rate corresponded to a drop in changes from the first assignment's redraft for group B (see Figure 60). In the Table 66's first nine examples, we can see that while changes as measured by the software were approximately equal between the two groups, group B shows very specific changes, often to just one or two words, while group C displays changes that involve numerous words or whole sentences. The contrast is at times striking and could lead to the suspicion that group C is making more meaningful changes to content while group B is only making surface level changes based on the computer feedback. Table 67, however, tells a somewhat different story **(discussion continued on page 162).**

(1) Samples of Groups B & C

Table 66. Examples of assignment two redraft changes (changes shown in blue: strikethrough is text that was cut while underlined is text added)

	Group B Assignment 2 Redraft	*Group C Assignment 2 Redraft*
2	"I saw your advertisement in the July 5 issue of Trade Monthly. The Canadian Consulate introduced us to your products and we know of your company's good reputation for high quality automotive goods. We have been thinking of buying some of your company's computer disks. Antex company has been marketing computer parts in Taiwan since 1975. Our OEM work began soon after. Our products have been very successful in Asian markets. We would like to distribute your computer disk products here in the Taiwan market. Please send me some information about the products with price and discounts. If you have any other products that you feel would better suit my needs, please include information on them. I understand that you are busy, and I	"Last week, November 28, I saw your advertisement in the PC HOME~~.~~ . In your advertisement, I read that you are offering a 20 percent discount on your new SONY 3.5 computer disks. I know the SONY 3.5 has won the Japan Quality Award this year. As a assistant, I have found your products to be most useful in my work. The SONY 3.5 computer disks are good replacement for my MAXELL 3.25 computer disks. I hope that you can be flexible in your pricing policy. In the past, when I dealt with your company, I found your terms agreeable and fair. In the next six months, ~~I~~my manager would like to purchase new computer disks. Please send me any information about you have on the SONY 3.5 computer disks, including

	appreciate the time you have taken to answer my inquiry. If it is possible, please respond by letter or fax before the end of the month. We look forward to a very productive relationship with your company. Thank you for your time. "	**pricing, finance terms, warranties and performance specifications. If you have any other products that you feel would better suit my ~~needs, please include information on them.~~ ~~Thank you for your assistance in this matter. I hope you can respond to my inquiry before January. I plan to make my purchasing decision in last January~~needs. I understand that you are busy, and I appreciate the time you have taken the time you have taken to answer my inquiry. If it is posible, please answer before the first of next month. Thank you for your time. "**

3	"In the October 23 issue of Trade Monthly we have learned that you are o~~ne of the leading exporters in Hong Kong~~ffering a 10 percent discount on your computer disks. The consistent quality of your products interests us very much. We have been importing electric products for distribution throughout Taiwan for twenty ~~five~~ years. At present, our company imports from Korea, Japan, Europe and ~~U.S.A~~America. We find out that your computer disks may be suitable in our market and would like you to supply us with the latest information of your computer disks. Please send us your best terms, including pricing, finance terms, warranties and performance specifications. We would also like to have one typical sample of your product ~~together~~ with an illustrated brochure. Thank you for your cooperation in this matter. If it is possible, please answer before the end of November. Make sure the information is complete so that a decision can be made quickly. We are looking forward to your early reply. "	"~~I saw your advertisement in the November 20 issue of Trade Monthly. I know the new products~~During the International Computer Trade Show, in America, October 10-15, your representative, Mr. Chen, introduced us that you are offering a 20 percent discount on your new AC-124 computer disk. I know the AC-124 has won the National Quality Award this year. ~~Because our company deal with amount of data every day, we need dependable disks. I~~As you may already know, we are the largest computer company in Taiwan. We have found your products to be most useful in ~~my work. The C-199 disks is a good replacement for my AB-25 FUJI disks. Good quality is very important to me.~~ our business. The AC-124 computer disk is a good placement for my CK-235 Fuji computer disk. I hope that you can be flexible in your pricing policy. In the past, when I dealt with your company, I found your terms agreeable and fair. ~~What I need from you is a complete list of all the new disks you have manufacted recently.~~ In the next six months, I would like to purchase new computer disks. Please send me any information you have on ~~C-199 disks~~AC-124 computer disk, including pricing, finance terms and warranties. If you have any other products that you feel would better suit my needs, please include information on them. ~~I understant that you are busy, and I appreciate the time you have taken to answer my inquiry. If it is possible, please answer before December 10~~Thank you for your assistance in this matter. I hope you can respond to my inquiry before November. I plan to make my purchasing decision in late November. "
4	"During the International Computer Trade Show, in Australia, July 12-15, which we took your company's name. We understand that in Hong Kong, your company is the market leader. The high quality of your products interests us very much. Our new products are made with quality as the number one goal. Our distribution system has grown so large that the old computer system cannot handle the amount of variebles we need to input. We are presently marketing our own brand name products in the U.S. and E.C. markets. I would greatly appreciate details on the products you off for sale in this area. Some information about the history of your	"Last week,December 19, I saw your advertisement in ~~computers~~the PC journal. Your company is offering a ~~lot of computer disks~~new computer disk. In your advertisement, I read that you are offering a ~~30~~25 percent discount on your new computer disks. I know that new disks has just won the Number One Quality Award on October this ~~disks.I know of your company's disk has won for high quality goods~~year. As you may already know, our company is the largest computer distributor company in Taiwan.I have found your products ~~to be most useful in my work.The IAWI 770~~

	company would be useful. Please send us any information you have on the computer disks or any other products that you feel would better suit my needs. Thank you for your assistance in this matter. If it is possible, please respond at your earliest convenience. "	~~computer~~SONY-007 disk is a good replacement for my IBM-586 ~~computer~~ disk. I hope that you can be flexible in your pricing policy. ~~In the past, when I dealt with your company, I found your terms agreeable and fair.~~ ~~Please send me any information, you have on the IWAI-770 computer~~I would like to consider distributing your disks. please send me any information you have on the SONY-007 disk, including pricing, ~~finance ferms,~~ warranties and performance specifications. Please respond by letter or fax before the end of the month. We look forward to a very productive relationship with your company. Thank you for your time. "
6	"During the International Computer Trade Show, in Taiwan, November 25, I saw you company's presentation. My company is very interested in your products. In Taiwan, you products are well ~~received~~successful. We are happy to have this opportunity to do business with you. We have the pleasure to introduce ourselves as ~~one of the leading importers~~a leading importer of computer disks. For the past ten years, our experience gives us a great advantage over other distributors in Taiwan and European. We would like to purchase ~~a lot~~ninety pieces of computer disks. Please send us any information on your new computer disks ~~products~~, including pricing, size and performance specifications. If you have any other products that feel would better suit my needs, please include information on them. Thank you for taking the time to answer our questions. Please send a reply before December 20. Make sure the information is complete so that a decision can be made quickly. "	"During the November 20-25 Taipei Computer Trade Exhibit, your representative, Mr. Chen~~g~~, introduced your new computer~~s~~ disks. I understand that your business has recently made an agreement to supply Acer, of Taiwan, with computer disks. Because we are going to ~~change~~exclude the computers that the old 5.25 disks could not be used. Recently, we have begun looking for the new 3.5 disks to replace our 3M of 5.25 disks. In the next months, I would like to purchase the new 3.5 disks. Please send me any information you have on the 3.5 disks, including pricing, finance terms, warranties and performance specifications. Thank you for your assistance in this matter. ~~I hope you can respond to my inquiry before January. I plan to make my purchasing decision in late Januar~~Please send a reply before January 10. Make sure the information is complete so that a decision can be made quickly. "
7	"It was from the trade journal New York Business, of December 1, which we took your company's name. In this trade journal, I read that you are offering high quality computer disks. It interests us very much. This product~~s~~ would be perfect in the Taiwan market. In Taiwan, we have strong connections with many outlet busines~~s~~s. Our company has been marketing computer	" I saw your advertisement in the October 10 issue of China Post. In your advertisement, I read that you are offering a 10 percent discount on your new B99 computer disks. I know of your company's good reputation for high quality computer disk goods. Two years ago, we had found your products to be most useful in our work. The B99 computer disk is a good replacement for

	parts in Taiwan since 1985. We have a great amount of experience in international shipments. If you are interested, we would like to examine some samples of your computer case. Please send us some information about the products with price~~,~~ size. We would also like to know if you presently have any marketing activities in Taiwan. Thank you for taking the time to answer my questions. Please send a reply before December 10. Make sure the i~~mn~~formation is complete so that a decision can be made quickly. We look forward to your response. "	my ND88 computer disk. I hope that you can be flexible in your pricing policy. In the past, when I dealt with your company, I found your terms agreeable and fair. In the next two months, we would like to purchase 50000/PCS disks. Please send me any information you have on the B99 computer disk, including pricing, finance terms, warranties and performance specifications. If you have any other products that you feel would better suit ~~my~~our needs, please include information on them. Thank you for taking time to answer my questions. If it is possible, please answer before December. We plan to make my purchasing decision in late December. "
8	"Last week we had the opportunity to see your exhibit at the Taipei World Trade Show, your representative, Mr. Smith, introduced your new products. I understand that your company is offering a 20 percent discount on your new computer disks. Our distribution system has grown so large that we need ~~a lot of~~many computer disks. In Japan, we have strong connections with many outlet ~~busines~~companies. We want to supply computer disks that will surpass every requirement of the customer. In the next three months, I would like to purchase computer disks. Please send me any information you have on computer disks, including price, service, finance terms and performance. If you have any other products that you feel would better suit my needs, please include information on them. Thank you for taking the time to answer my questions. Please respond at your earliest convenience. I plan to make my purchasing decision in late December. "	"I recently met one of your employees, a Mr. K. Gates, at the Taipei World Trade Show (Auguest 18 to 21). He informed me that your company is offering a ~~2~~15 percent discount ~~on~~for your new K188 computer disks. I know the K188 has won the National Quality Award this year. As a computer worker, ~~we~~I have found your products to be most useful in our company. The K188 computer disks are good replancement for our A140 computer disks. We hope that you can be flexible in your pricing policy. In the past, when we dealt with your company, we found your terms agreeable and fair. In the next five months, we would like to purchase new computer disks. Please send us any information you have on the K188 computer disks, including pricing, finance terms, warranties and performance specifications. If you have any other products that you feel would better suit our needs, please include information on them. Thank you for your assistance in this matter. Please respond by letter or fax before the end of the month. We look forward to a very productive relationship with your company. ~~Thank you for your time.~~ "
9	"I saw your advertisement in the November 30 issued of Computer Home. Your company is a leading manufacture of computer equipment and is known by everyone in Asia. You ha~~s~~ve won the National Quality Award three times. As you may already know, our company is the largest importer of	"~~Last week, October 1-7, I had the opportunity to see your exhibit at~~During the International Computer Trade Show, ~~and I saw your company's presentation. I know~~in Canada, October 1-10, your representative, Mr. Wang, introduced that you are offering a 1~~0~~5 percent discount on your new M007 computer disks. I ~~also~~ know ~~your product~~the M007 has won the National Quality Award

	computer equipment in Taiwan. I ever imported your computers six months ago, and they sold well in Taiwan markets. I would like to import computer disks which their capacities are 1.44MB and suit your computers. Some of our specific needs include: 1 Please sent ~~me a catalogeus a catalog~~ of computer disks. 2 Please offer us the minimum prices in NT dollars. 3 ~~I hope you canPlease~~ offer us the best after sales service. 4 Some information about the history of your company would be useful. ~~I understand that you are busy, and I appreciate the time you have taken to answer my inquiryThank you for your cooperation~~. Please sent a reply before December 20. ~~Thank you for your cooperation.~~Make sure the information is complete so that a decision can be made quickly. "	this year. ~~As a computer worker, I~~As you already know, we are the largest computer company in Taiwan. We have found your products to be most useful in ~~my work. The X130~~our business. The M007 computer disk is a good replacement for my ~~old B200~~A102 Fuji computer disk. I hope that you can be flexible in your pricing policy. In the past, when I dealt with your company, I found your terms agreeable and fair. In the next five months, ~~I~~we would like to purchase new computer disk~~s. Please send me a catalog of all your computer disks, including lowest possible price, finance terms,~~. Please sent me any information you have on the M007 computer disk, including pricing finance terms, warranties and performance specifications. If you have any other products that you feel would better suit my needs~~. P~~, please include information on them. ~~I appreciate the attention you have given to~~Thank you for your assistance in this matter. I hope you can respond to my inquiry before October ~~18~~. I plan to make my purchasing decision in late October. "
10	"It was from the trade journal California Business, of December 10, which we took your company's name. In Taiwan, your products are well received. We are happy to have this opportunity to do business with you. As you may already know, our company is the largest distributor of foreign produced makeup in Taiwan. We want to supply computer disks that will surpass very requirement of the customer. We have just the type of product you are looking for. Please send me a catalog of all your computer disks supplies. I would be happy to enter your company's name for consideration if you can supply details of your production capacity. We would like to examine a sample from each of your product line~~s~~. I understand that you are busy, and I appreciate the time you have taken to answer my inquiry. If it is possible, please answer before the first of next month. "	"~~I saw your advertisement in November 25 issue of 0-1 Bytes. I saw that your company is offering the computer products and you are offering a 12 percent discount on your computer disks. I know this new computer disk has won the National Quality Award. As you may already know, our company is the largest distributor of computer products in Taiwan. At present, we distribute over twenty brand names. Our products have been very successful in local markets. Our experience gives us a great advantage over other distributors in Taiwan.~~ I saw your advertisement on November 25 issue of 0-1 Bytes. In your advertisement, I read that you are offering a 12 percent discount on your computer's disks. I know the 3M disks has won the National Quality Award this year. I have found your products to be most useful in my work. The 3M computer disks are good replacement for my LEMEL MD-2HD computer disks. I hope that you can be flexible in your pricing policy. In the past, when I dealt with your company, I found your terms agreeable and fair. ~~We would like to distribute your computer disks in the Taiwan market. If you~~

		~~are interested, we would like to begin negotiations right away. Please send me any information you have on the 3.5 inches computer disks, including pricing~~In the next two months, I would like to purchase some computer disks. Please send me any information you have on the 3M computer disks, including cpricing, finance terms, warranties and performance specifications. Thanks you for your assistance in this matter. I understand that you are busy, and I appreciate the time you have taken to answer my inquiry. I hope you can respond to my inquiry before December 30. We look forward to your response. "
11	"We found your name in the November 27 issue of the Taipei World Trade C~~o~~enter. Your products ~~are~~sell well ~~received~~ in Taiwan and the reputation of your service is indisputable. We are happy to have this opportunity to do business with you. In European, we have strong connections with many outlet businesses and the products have been very successful. As you may already know, our company is the largest distributor of foreign produced makeup in Taiwan. Our experience gives us a great advantage over other distributors in Taiwan. Before we can consider your company, we must have the exact specifications of the computer disks. Please send us any information about the products, including pricing, finance terms and performance specifications. Some information about the history of your company would be useful. Thank you for taking the time to answer our questions. If it is possible, please answer before the first of next month. We shall be glad to receive your immediate reply. "	"I saw your advertisement in the July 10 issue of Trade Monthly. In your advertisement, I read that you are offering a 10 percent discount on your new 1.44MB disk. I know the 1.44MB disk has won the National Quality Award this year. For the past three years, we have had great success in marketing American computer disk products in local markets. Recently, we have begun looking for a useful computer disk system to replace our A-48 tape system. ~~We are interested in supplying you with parts for your new line of cleaning equipment. Some of our specific needs include: A. lowest possible price and smallest possible size B. good resolution of computer disk C. minimum service problems, preferable with self-diagnostic system~~In the next six months, I would like to purchase a new computer disk. Please send me any information you have, including pricing, finance terms, warranties and performance specifications. If you have any other products that you feel would better suit my needs, please include information on them. Thank you for your assistance in this matter. I hope you can respond to my inquiry before September. I plan to make my pruchasing decision in late September. "

Table 67 confirms a trend seen in the redrafting editing ratio measurement (see page 144). Group B moves from mostly cutting keys in assignment two's redraft to mostly adding keys in assignment three's redraft. While the changes measurement again showed no significant difference between the two groups, it is clear that group B

is completing its editing in a different manner than that used in the second assignments redraft.

Number of changes made by group B in assignment three's redraft is significantly higher than changes made in assignment two's redraft, as seen in Table 59. This was not the case for group C, which performed approximately the same number of changes throughout the three redrafts. We can see in Table 67's example redraft changes that group B is no longer simply cutting a few words or letters, but is also making more extended changes. We can also observe that some students in group B make very few changes or even no changes at all (as seen in case 6 and 7). In fact, reviewing statistical tests of the redrafting changes, see pages 150 to 153, informs us that group C consistently has higher variation in the changes variable than group B. The complete story is not so simple as only stating group C is making more meaningful changes.

Clearly some students in group C are making extended changes during the redrafting opportunity but some students in group C are doing little to nothing during the redraft opportunity. Group B, on the other hand, responds in a way that is related to the number of errors reported on the computer generated feedback. If few errors are reported, then during redrafting, group B students will simply remove those few errors. However, if numerous errors are reported, students in group B will undertake more extended editing of the redraft.

Table 67. Examples of assignment three redraft changes (changes shown in blue: strikethrough is text that was cut while underlined is text added)

	Group B Assignment 3 Redraft	*Group C Assignment 3 Redraft*

2	"I would like to take this opportunity to thank you personally for your communications of May 1. We have given your inquiry immediate consideration and we are happy to introduce you ~~of~~to our school. At present, our school is cultivating the student's English ability. Let me take this chance to answer your questions: 1. You have to study five years to graduate ~~in~~at our school. 2. Our department is International Trade. Required courses are including Chinese, English, accounting, insurance, English typing, and so on. 3. When you are in four or fi~~ve~~fth grade of college, some of our classes can choose by yourself, by way of Japanese and Spanish. 4. There are fifty minutes in a class, ~~about thirty classes in a week and they have a lot of free time. 5.~~less than forty classes in a week. 5. We consider our teachers must have special skills, experience, and patience. Thank you for your interest in our school and I would like to thank you again for taking the time to write me. If you have any other questions, please feel free to contact me. We can immediately respond via fax. "	"Thank you for your letter of May 1, in which you expressed an interest in looking for a ~~school to attend in Taiwan.~~ ~~My~~business school. Our school is an excellent choice for your purpose ~~in moving to Taiwan is to improve my Chinese skills while also being able to graduate from a business school.~~ You will find ~~my~~our school is the highest business school in Taiwan. Let me supply you with some information about ~~my~~our school, and answer the following questions: 1.Five-Seven years are needed to graduate. 2.~~See enclosed a table. 3.Some classes can choose by myself, but some classes can't choose by myself. Examples BUSINESS PSYCHOLOGY can choose by myself, but~~In our International Trade department's courses, I have included some brochures that you will find informative. 3.Some classes are required and some classes are ~~BUSINESS LETTERS can't choose by myself.~~chosen by oneself. 4.Thirty hours a week is spent in the classroom and examples BUSINESS LETTERS are very important so ever a lesson has a homework and studying are usually required. 5.~~My~~Our teachers' abilities in my impression is well-experienced in the ways of the world. Let me thank you again for your interest in ~~my~~our school. If the information I have included is not satisfactory or if you have any other questions, please feel free to contact me. "
3	"Thank you for your letter of May 1. I appreciate the opportunity to supply you with the information about our school. The Overseas Chinese College of Commerce is the best private business college in the central part of Taiwan. It~~'~~ is my pleasure to answer your questions. Here are the answers: 1. You are a high school student, so you need two years to graduate from our school. 2. My major is international trade. ~~Economics, accounting, the practice of international trade, business administration and computer courses are required in my department. You can improve your Chinese skills in Chinese courses. 3.As a senior student, y~~My department requires business administration, accounting, economics, and computer courses. 3. You can	"Thank you for your letter of May 1, in which you expressed an interest in studying business. We are delighted to be included in your search for a school to attend. The Overseas C~~n~~hinese College of Commerce is an excellent choice for the business schools. You will find the school is the highest quality school in Taichung, Taiwan. ~~To~~In response to your 1-3 ~~inquirie~~questions, I have included 3 brochures that you will find informative. Let me supply you with some information about our courses and teachers: * We spend 5-7 hours in the classroom. Homework and studying are required once a week. * My impression of my teachers' abilities is ~~wise,~~reponsible, knowledgenable and ~~challenging the student~~having experience in teaching business. Let me thank you again for your interest in The Overseas Chinese College of Commerce.

	choose classes by yourself. For example, you can choose Japanese or Spanish as your second foreign language. 4. There are fifty minutes a class and seven classes a day in the weekdays. One course has one assignment in a semester and that has to be typed and printed by computer. 5. Our teachers are learned and affable. Thank you for your interest in my school. If you have any other questions, please feel free to contact me ~~at any time~~. I am looking forward to offering my help. "	If the in~~f~~vormation I have included is not satisfactory or if you have any other questions, please contact me. "
4	"I would like to take this opportunity to thank you personally for your communications of May 1. To be included in your search for a school to attend is delighted. It is my pleasure to supply you with the information you quested about our school: 1. ~~-~~To graduate from our school needs five years at least. 2. ~~I'm~~I major in International Trade. We have to study The Foreign Trade Practice, English Conversation, ~~B~~business English and Insurance. 3.-When forth grades, the optional course is Japanese or Spanish. When fifth grades, ~~it's Economic or Commercial Psychology. 4.~~ the optional course is economic or commercial Psychology. 4.Our classes are fifty minutes a class, seven classes a day. According to the semester's schedule, the teachers can decide the ~~homework and studying's amount. 5.~~ amount of our homework and studying. 5.Our teachers are professional, frie~~dnly,~~ ndly, competent, patient and reliable. Thank you again for your inquiry. If reliability and selection are important to you, our school is just what you need. Please inform us, if any of the details are unclear. "	"Thank you for your letter of May 1, in which you expressed an interest in business of our school.~~Our school~~ It has perfect teachers and equipment. Our school is an excellent choice for studying business. You will find The Overseas Chinese College of Commerce is a perfect business college in Taiwan. In respone to your first to third inquiries, I have included two brochures that you will find informative. Let me supply you with some information about our courses and teachers: * On the average, we spend 20 hours a week in the classroom. Homework and stydying are usually required twice a month. * ~~My impression of my teachers'abilities is responsible, kind, smart, knowledgenable, and challenging the students~~The teachers in our school are excellent. Every time we ask the teacher questions, their answers always make us easy to understand. Let me thank you again for your interest in our school. ~~I am glad to respond you.~~ If the information I have included is not satisfactory or if you have any other questions, please feel free to contact me. "
6	"I was glad to receive your letter of May 1, in which you expressed an interest in our school. At present, The Overseas Chinese College of Commerce is the best private college in the central part of Taiwan and is eager for you to join it. It is my pleasure to supply you with the information you requested: 1. To graduate from our school needs five	"I was pleased to read your letter of May 20, inquiring about our school. The Overseas Chinese College of Commerce is an excellent choice for you. You will find our school is the best school in Taichung. It is my pleasure to supply you with the information you requested. 1. Five years are needed to graduate. 2. I am studying in the Internatioinal Trade department. International Trade, Computer, Economy

	years at least. 2. You must major some courses about the ~~International~~ ~~T~~international trade, English conversation and English typing in my department. 3. You can choose Japanese, Spanish, ~~Differential C~~differential calculus, ~~Economics and Commercial P~~economics and commercial psychology. 4. Our classes usually are fifty minutes a class, seven classes a day, six days a week. We only have four classes on Saturday. Teachers sometimes give us some homework and examinations. In general, you still have free time to do something. 5. Each teacher encourages us to ask questions in class. They are friendly and patient. I would like to thank you for taking the time to write me. If you have any other questions, please feel free to contact me personally. "	and English courses are required in my department. 3. We can choose Japanese or Spanish classes by ourselves. 4. Eight hours a day is spent in the classroom. Our teachers will give us different homework every week. They request us to study every day. 5. Our teachers must have an M.A. degree and the specialization in their professional area. In the class, they are patient and intelligent. Let me thank you again for your interest in our school. If the information I have included is not satisfactory or if you gave any other questions, please feel free to contact me. "
7	"Thank you for your letter of May 1. There are five departments ~~in~~at our school. In Taichung, The Overseas Chinese College of Commerce is the best of private schools. We wanted to respond immediately to your questions, concerning the best way to find out more about our school before July. It is my pleasure to answer your question: 1. ~~In~~At our school, you will need ~~two~~five years to graduate. Because you are a high school student. 2. We have to study ~~International Commercial Credit Practice, Business Letter, Statistic, Economics and English Conversation in Internation Trade D~~international commercial credit practice, business letter, statistic, economics and English conversation in international trade department. 3. You can choose Japanese or Spanish when you are in fourth grade. When you ou are a fifth grader, you can study ~~Commercial Psychology or Economics by yourself. 4. In~~commercial psychology or economics by yourself. 4. At our school, there are seven classes a day. We have to go to school six days a week and we do homework three times a month. 5. Our teachers are responsible, experienced and helpful. There is no doubt that at they have a master's	"Thank you for your inquiry of May 1 in which you expressed an interest in looking for good commercial schools. The Overseas Chinese College of Commerce is the best choice for studying business. Let me supply you with some information about our school: 1. You need study 5 years in our school. 2. In our department, Business English and International Trade courses are required. 3. You can choose Japanese or Spanish which you like in the forth year. 4. We spent 4-7 hours in the classroom one day and we usually have homework once a week. 5. Every time we ask our teacher questions, their answer always make us satisfy. 6. If you want more information, please see the enclosure. Let me thank you again for your interest in our school. If the information I have included is not satisfactory or if you have any other questions, please feel free to contact me. "

	degree. I would like to thank you for taking the time to write me. If you have any other question, please feel free to contact me. "	
8	"Thank you for your letter of May 1, in which you expressed an interest in our school. ~~The Overseas Chinese College of Commerce is the best pirvate junior college in Taichung. Our school has~~Our school is the best private junior college in Taichung and it has been established for thirty years. It is my pleasure to supply you with the information you requested. Five years are needed to graduate for everyone. The courses of the international trade department are languages, the theorem of international trade, computer, business letters, statistics, calculus and accounting. We can choose Japanese, Spanish, economics, business psychology and physical training class by ourselves. We study fifty minutes a class and usually had five reports a semester. All of our teachers have master degrees and their abilities are no doubt in the central area. Let me thank you again for your interest in our school. If the information I have included is not satisfactory or if you have any other questions, please feel free to contact me. "	"Thank you for your inquiry of May 1 in which you expressed an interest in looking for good commercial schools. The Oversea Chinese College of Commerce is an excellent choice for the business schools. If you want to study very hard and need a very quiet place our school is a very good place to study. Let me supply you with some information about our school. * Our school is a f-years jounior college and it adds 2-years junior college. So you need less than five or two years to graduate. * In our department Business English and International Trade courses are required. Other courses you can see the enclosures. * We spent seven hours in the classroom one day and we usually have homework once a week. * Recently, our school have just won the Teacher Quality Award. Our teacher have rich knowledge and every time we ask our teacher questions they are very happy to answer our questions. And their answer always make us satisfy. In response to your questions ~~1 and~~ 3, I have included some brochures that you will find informative. Thank you for your interest in our school. We have sent you the informations you requested. If the informations we have included are not satisfactory or if you have any other questions please feel free to contact us. "
9	"Thank you for your inquiry of May 1, in which you expressed an interest in k~~on~~nowing my school's information. I am delighted that my school is to be included in your search. The Overseas Chinese College of Commerce is distinguished in Taiwan for its business teaching. We have the best business teachers of all Taiwan schools. It is my pleasure to supply you with the information you requested. The following are the answers about my school's information: 1 You have to study five years in my school. 2 Our department is International Trade. Required courses are including principles of international trade, the foreign trade practice, principles of	"We were pleased to read your letter of May 1, in which you expressed an interest in looking for a good commercial school. The Oversea Chinese College of Commerce is an excellent choice for the business schools. Our school appear to be just what you are looking for. Let me supply you with some informations about our school. * ~~In our department~~Our school is a 5-years junior college and it adds 2-years junior college. So You need five or two years to graduate. * In our department (International Trade), Business English and International Trade courses are required. Most courses are professional books. You can see the enclosure about ~~other courses. * We spent 5-7~~the details. * We spent 4-8 hours in the classroom ~~once~~each day and ~~we~~

	accounting and business English conversation. 3 As a fourth grader, you can choose classes by yourself. 4 There is fifty-five minutes in a class and seven classes a day. It is not over eight hours to stay ~~in the classroom~~at school every day. 5 The teachers in my school have professional knowledge, master diplomas and commercial experience. Thank you for your interest in my school's information. If you have any other questions, please feel free to contact me. I hope that you can make a perfect decision. "	~~usually~~ have homework twice a month. * Recently, our school have just won the Teacher Quality Award. Every teacher in our class pay a lot attention to students. When we ask questions, their ~~The~~explanation always make us easy to understand. We think teachers in our school are excellent. ~~Every time we ask our teacher questions, their answers always make us easy to understand. In response to your questions 1 and 3, we have included 2~~About the question Can you choose any classes by yourself?, you can see the enclosure (we have included 1 brochures that you will find informative.~~)~~ Thank you for your interest in our school. We have sent you the informations you requested. If the informations we have included are not satisfactory or if you have any other questions. Please feel free to contact us. "
10	"Thank you for your letter, of May 1, inquiring about our school. Our school is best quality for private college and well known in Taichung. I~~ am happy to inform you of our~~n response to your inquiry I would like to point out advantages of my school. Here are the answers to your questions: 1. I need five years to graduate. 2. In my department, international trade is my major. I need to learn about English. For example, business ~~english, computes~~English, computer courses and typing courses are important for m~~y. 3.~~e. 3. I can choose some classes by myself~~. For example~~: Japanese, Spanish, ~~Japanese, Spanish, Economics, Business Psychology. 4.From Monday to Friday, I must spent eight hours in~~economics and business psychology. 4. From Monday to Friday, I must spend eight hours at school. On Saturday, I need spent four hours. I must write some reports. 5.~~My teacher almost~~ My teachers have master degree. Their abiliti~~e~~s are best quality for professional subject. They are patient and friendly. Thank you for your interest in our school. If any of the details are unclear, please inform me. I hope you are successful in your research. "	"~~—~~I was glad to receive your letter of May 29, in which you expressed on interest in our school. We are happy to inform you of ~~our information of school. Our school~~the information of the OCCC. Our college is an excellent college of commerce in Taiwan. Let me supply you with some information about our school. 1. The OCCC is 5-year junior college, so you need~~ed~~ 5 years to graduate. 2. In our department, International Trade and English Conversation are required. 3. ~~You can only choose the second foreign language (Japanese,~~There are two classes that we can choose--the second foreign language, Japanese or Spanish~~) by yourself.~~. 4. We spent 7 hours in the classroom one day and we usually have homework twice a week. 5. All of our teachers have excellent ~~teaching~~ experience and abilities ~~of~~in their professional domin, they always make us satisfy. Thank you for your interest in our school. If the information I have included is not satisfactory or if you have any other questions, please feel free to contact me. "
11	"I was very pleased to read your letter	"We appreciate your including our school in

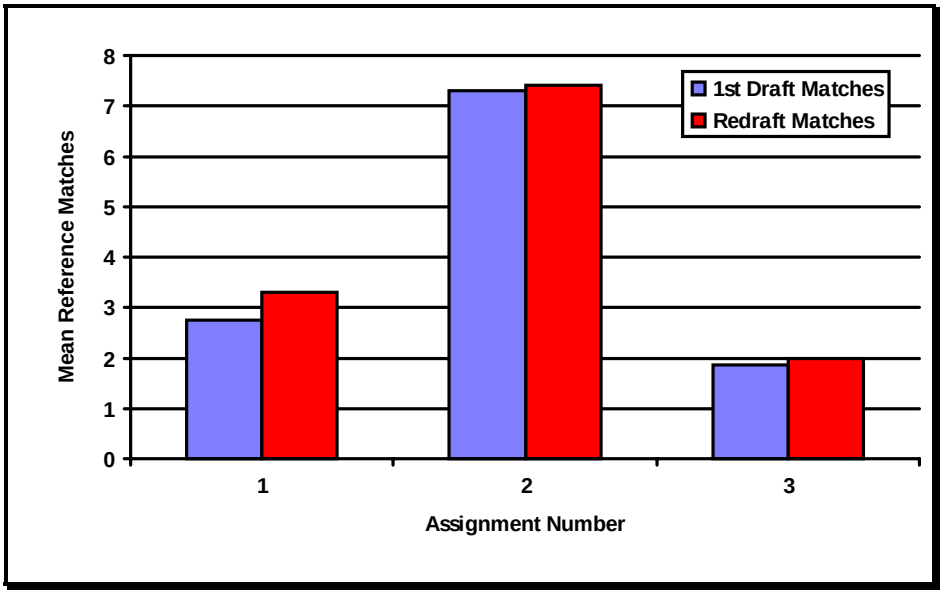
	of May 1. Your inquiry, soliciting information about my school, is very timely. My school has a good educational system. I appreciate the opportunity to supply you with details about my school. There is no doubt that my school can satisfy your requirements. Let me supply you with some information about my school. 1. You have to study five years ~~in~~at my school. 2. My school has a variety of course~~. My major is Inters~~. My major is International Trade. There are some courses required in my department, including English typing, English business letters, Chinese, treasure, computer programming ability and so on. 3. ~~You can choose two courses by yourself when you are in four grade of college~~About languages, you can choose Japanese and Spanish. 4. The students spend less than eight hours in ~~the classroom and they have a lot of free time~~a classroom. The homework and studying are usually required twice a week. 5. All of my teachers have advanced education and academic ranks. They have many professional knowledge and experience. Thank you for your interest in my school. I am confident my school will be to your satisfaction. If any of the details are unclear, please inform me. "	your search for a school to attend in Taiwan, reference your inquiry of May 1. Our school is well acquainted with this business class. The Overseas Chinese College of Commerce is an excellent choice for studying business. You will find our school is the highest quality school in this class. We are pleased to submit our information for consideration. We need five years to finish our studies. The major subjects which we must study are international trade, business letters and English conversaton. We can choose classes like Pysical Education and language. There are twenty seven hours in the classroom a week and the teacher always ask us to do report by ourselves. It can make us understand the information clearly. Our teachers are very kind and always telling the useful information to us. They are the best for me. Thank you again for your interest in our school. If the information I have included is not satisfactory or if you have any other questions, please feel free to contact me. "

After examining the above tables, it is not difficult to see that group C, in the right column, often removes whole sentences and replaces them with new sentences. Since group C had shown a tendency to copy from the reference material more than the other groups (see page 89), this behavior could be very positive in that group C students are now working out their redrafts with more originality rather than copying whole chunks from textbooks.

A quick comparison of first draft and redraft reference matches can quickly show just how original group B and C students are being in their redraft efforts.

More originality should result in a lowering of reference matches in the redraft. Figure 68 shows that this is not the case for group B as the number of matches during redrafting are approximately the same or even a bit higher. This result is not a surprise as group B shows the tendency to make small changes. These smaller changes should actually result in more matches as small errors are corrected and phrases that did not match, due to an error, can now register as a match with the reference material. Since there is no increase in reference matches, we can conclude that the corrections made were not within phrases copied from the textbooks but from material created by the students on their own.

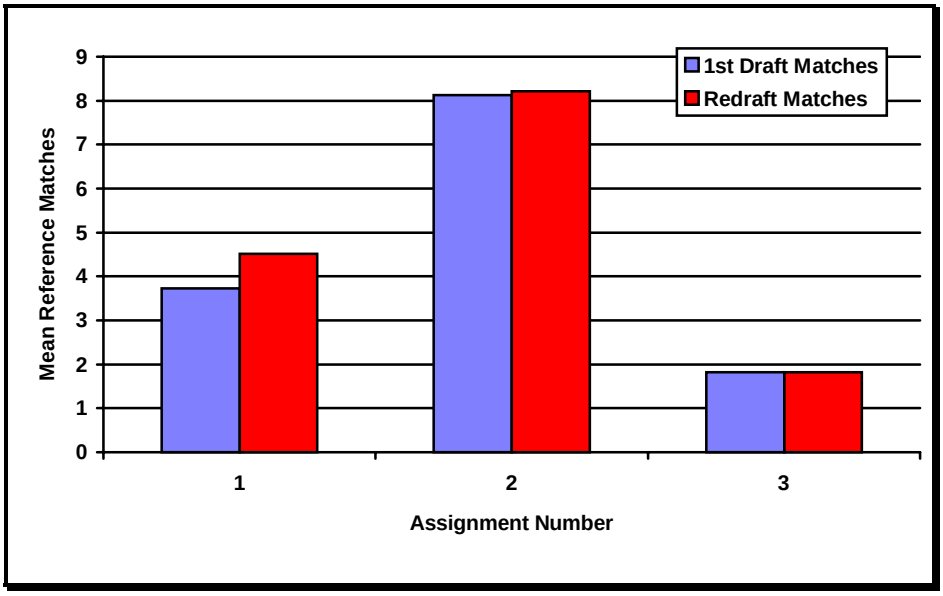
Figure 68. Group B first draft and redraft reference matches



Group C's results are a bit of a surprise, shown in Figure 69. Even while numerous extended changes are being made, there is little decrease in the number of reference matches for group C's redrafts. Even if numerous students had made no changes to their redrafts, some effect should be seen on the mean matches resulting

from the extended changes being made during redrafting (as those seen in Table 66 and Table 67). We conclude, therefore, that the net keys added by group C in redrafting are not reducing reference matches because previously copied material is simply being replaced with newly copied material. This is not quite the result desired in a process-based writing class.

Figure 69. Group C first draft and redraft reference matches



C. Survey Data

The last main component to this study was the students' own opinions as revealed through three surveys (survey instruments are covered on pages 56 and 63). A pre-/post-survey centered on skill levels and therefore aimed to show changes in skills related to business writing that may be related to the three treatment types. A final survey was administered at the end of the experiment that concentrated on more general opinions about the treatments and the class in general. This last survey also included open-ended questions for students to freely express opinions.

1. Pre/Post-Surveys

Testing for a single population before any treatment revealed all three groups to have equal means on all responses except one (see Table 68). Group B stood out from the other two groups with a higher score on their self-reported understanding of business letters (lower scores represent higher skill level).

Table 68. All groups ANOVA of pre-test survey questions with Scheffe multiple range test

Variable	*Group A Mean*	*Group B Mean*	*Group C Mean*	*F*	*Post hoc*
Understand Business Letters:	3.14	3.81	3.15	9.80***	B>A B>C
English Skill for Business:	4.16	4.39	4.09	1.47	
English Writing Skill:	3.59	3.83	3.55	1.50	
English Grammar Skill:	3.68	3.71	3.72	.02	
English Important:	1.34	1.61	1.38	1.45	
Like Writing English:	2.80	2.90	3	.51	
English Listening Skill:	3.96	4.37	3.81	4.42	
English Spelling Skill:	3.5	3.71	3.47	1.06	
English Sentence Structure:	3.48	3.85	3.58	2.61	
Like to Study English More:	2	2.20	2.21	.75	

**P<.05 **P<.01 ***P<.000*

After treatment, the post survey revealed only two significant differences among the three groups (see Table 69). Group C showed a higher score on sentence structure. A post hoc test reveals group C was significantly higher than group A, meaning that students in group C felt their English sentence structure was not so good, while group A students felt somewhat better about their ability on this measure.

A strange result was found in the English listening skill question. Since this study, and the class as a whole, dealt only with writing, there seems to be no reason for group B's significantly higher score in this measure (group B students report a lower skill level in listening skill). The main purpose for inclusion of this measure is

to check on internal validity as all listening and speaking instruction and exposure should be held constant among all groups regardless of treatment received. Either a clear explanation exist for this difference or the survey, and/or study, is flawed in some fundamental way.

After numerous inquiries into possible explanations, it was found that the three groups were also attending English conversation class. Because each group attends required classes as an intact group, this seemed a likely explanation for the difference. Original plans had anticipated that outside classes would be taught by different teachers and since the conversation curriculum was standardized the impact should have been uniform. This assumption was found to have been violated as groups A and C were assigned the same English conversation teacher while group B had a different teacher. Inquiries about teacher style revealed that the conversation instructor of groups A and C made extensive use of English during class, where as the instructor of group B used mostly Chinese and only employed English when reading from the textbook. As a result, rather than bring the survey instrument's validity into question, this difference in group B's self reported listening ability actually verifies the accuracy of the survey instrument.

Table 69. All groups ANOVA of post-test survey questions with Scheffe multiple range test

Variable	*Group A Mean*	*Group B Mean*	*Group C Mean*	*F*	*Post hoc*
Understand Business Letters:	2.89	3.17	3.15	2.23	
English Skill for Business:	3.30	3.42	3.66	3.00	
English Writing Skill:	3.09	3.29	3.36	1.53	
English Grammar Skill:	3.48	3.56	3.72	1.27	
English Important:	1.59	1.54	1.38	.75	
Like Writing English:	2.77	3.10	2.85	1.58	
English Listening Skill:	3.52	4.20	3.55	8.29***	B>A B>C
English Spelling Skill:	3.41	3.51	3.43	.23	
English Sentence Structure:	3.32	3.49	3.68	3.22*	C>A
Like to Study English More:	2.11	2.42	2.28	1.00	

**P<.05 **P<.01 ***P<.000*

While differences among the three groups were not numerous, the changes between the pre- and post-surveys for each group is more revealing in how the differing treatments had impact. For group A (see Table 70), two measures were reported as significantly improving in skill level: English skill for business and English Writing skill. One measure showed decline in skill level, English important, while the listening skill is ignored in this examination.

Table 70. Group A paired t-test of change in pre/post-surveys (larger numbers are negative)

Variable	*Pre-Test Mean (SD)*	*Post-Test Mean (SD)*	*DF*	*t-value*
Understand Business Letters:	3.14 (.70)	2.89 (.62)	43	-2.55
English Skill for Business:	4.16 (.83)	3.30 (.80)	43	-5.85***
English Writing Skill:	3.59 (.79)	3.09 (.77)	43	-3.91***
English Grammar Skill:	3.68 (.98)	3.48 (.79)	43	-1.85
English Important:	1.34 (.68)	1.59 (.84)	43	2.05*
Like Writing English:	2.80 (.82)	2.77 (.94)	43	-.12
English Listening Skill:	3.96 (.81)	3.52 (.85)	43	-3.02**
English Spelling Skill:	3.50 (.85)	3.41 (.73)	43	-1.00
English Sentence Structure:	3.48 (.85)	3.32 (.67)	43	-1.31
Like to Study English More:	2.00 (.81)	2.11 (.84)	43	.76

*2-tail significance *P<.05 **P<.01 ***P<.000*

Results from changes in group B's self reported skill levels seem to indicate that redrafting opportunity does have a positive affect on students' attitudes (see Table 71). Four measures show an increased positive attitude after treatment. No declines in skill level are indicated. The English skill for business and English writing skill increases in skill level are in common with group A; however, the increase in understanding business letters and English sentence structure are unique to group B.

One obvious fact to keep in mind is that group B has had more assignments than group A. While the total amount of time on the computer is not larger for group B, it is in fact shorter; they have had to return for redrafting on multiple occasions. Additionally, the opportunity to correct the errors reported on the computer generated feedback may give these students a feeling of making progress on those

problems. Group A students only see the list of their errors with no chance to return to them and attempt correction. This idea is further reinforced when we remember that group B students receive a second computer generated feedback which of course always shows large improvements. It could be the case that group B students feel they improve more because they are being told they are improving. Even though each new assignment's first draft shows clearly that their errors are still prevalent, these students instead choose to center on the error reduction during redrafting to judge their abilities.

Table 71. Group B paired t-test of change in pre/post-surveys (larger numbers are negative)

Variable	*Pre-Test Mean (SD)*	*Post-Test Mean (SD)*	*DF*	*t-value*
Understand Business Letters:	3.81 (.78)	3.17 (.59)	40	-4.31***
English Skill for Business:	4.39 (.59)	3.42 (.71)	40	-6.88***
English Writing Skill:	3.83 (.74)	3.29 (.72)	40	-3.35**
English Grammar Skill:	3.71 (.96)	3.56 (.74)	40	-.90
English Important:	1.61 (.86)	1.54 (.98)	40	-.42
Like Writing English:	2.90 (1.11)	3.10 (.97)	40	.98
English Listening Skill:	4.37 (.92)	4.20 (.90)	40	-.89
English Spelling Skill:	3.71 (.84)	3.51 (.71)	40	-1.35
English Sentence Structure:	3.85 (.73)	3.49 (.75)	40	-2.11*
Like to Study English More:	2.20 (.98)	2.42 (1.12)	40	1.20

*2-tail significance *P<.05 **P<.01 ***P<.000*

Discounting the self-reported increase in listening skill, group C shows only one skill, English skill for business, to be significantly improved (see Table 72). This finding is very interesting in light of the group B's self reported improvements. While

group C students had opportunity for redrafting and the chance to see their feedback forms improve, they still report little skill enhancement.

This finding allows us to more narrowly define the positive effect found with group B's self reported improvements. It is not only the presence of redraft opportunity, but also the combination of specific feedback and the ability to see those specific errors decline that lead to students' feeling of improvement. Group C's process feedback seems to leave students with little understanding of what it is all about. Table 72 even shows two measures with absolutely no change and two measures with reported decreases in skill levels.

Table 72. Group C paired t-test of change in pre/post-surveys (larger numbers are negative)

Variable	*Pre-Test Mean (SD)*	*Post-Test Mean (SD)*	*DF*	*t-value*
Understand Business Letters:	3.15 (.88)	3.00 (.66)	46	-.98
English Skill for Business:	4.09 (1.06)	3.66 (.67)	46	-2.44*
English Writing Skill:	3.55 (.86)	3.36 (.79)	46	-1.93
English Grammar Skill:	3.72 (.93)	3.72 (.71)	46	.00
English Important:	1.38 (.80)	1.38 (.71)	46	.00
Like Writing English:	3.00 (.96)	2.85 (.72)	46	-.83
English Listening Skill:	3.81 (.97)	3.55 (.83)	46	-2.38*
English Spelling Skill:	3.47 (.78)	3.43 (.83)	46	-.32
English Sentence Structure:	3.58 (.77)	3.68 (.63)	46	.93
Like to Study English More:	2.22 (.94)	2.28 (.98)	46	.33

*2-tail significance *P<.05 **P<.01 ***P<.000*

Figure 70 through Figure 79 graphically show the changes from pretest to post-test. While non of these measures are at all validated for measuring true ability, one cannot dismiss the implications for student motivation. After a semester of class work, students in group C report themselves as little improved. This self-analysis certainly could not lead to students who are motivated to write more or study harder. Clearly this result is at odds with the fundamental premise of the process writing approach. The very students who were given the most freedom of expression and least *discouraging* feedback report their own skills as not affected. The last survey of this study aims to look into just what students do feel as far as motivation and satisfaction are concerned (see page 182).

Figure 70. Group A pre/post-test paired t-test question: understand business letters

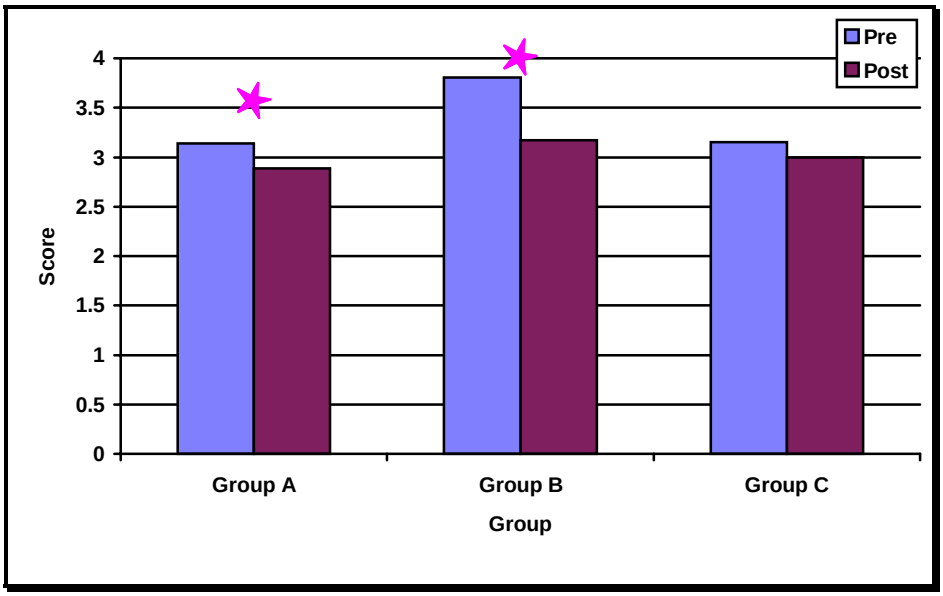


Figure 71. Group A pre/post-test paired t-test question: English skill for business

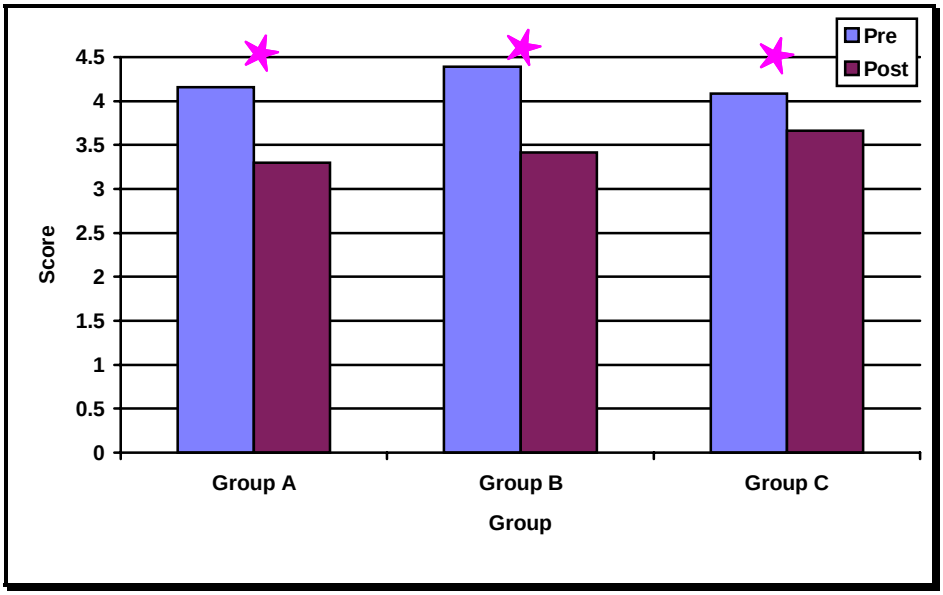


Figure 72. Group A pre/post-test paired t-test question: English writing skill

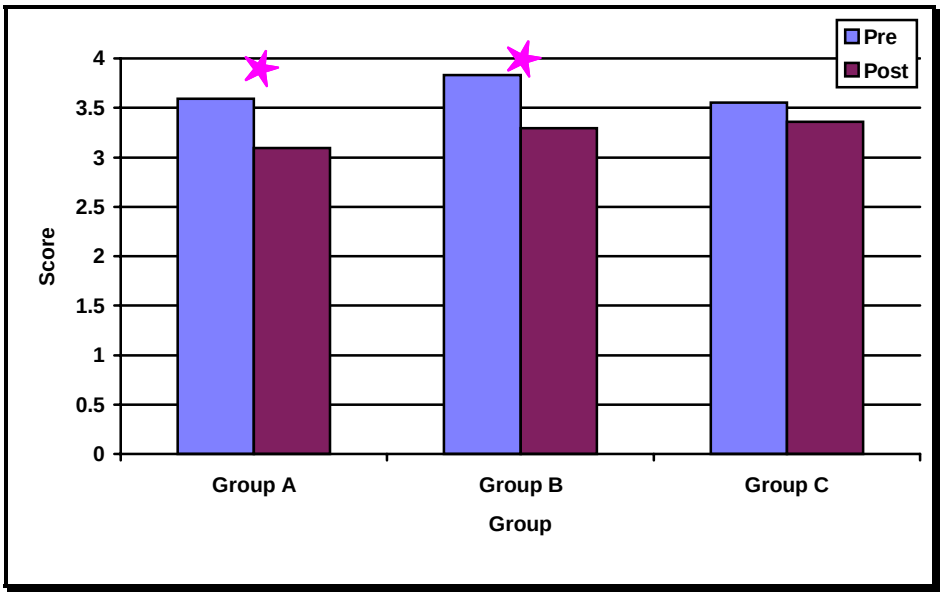


Figure 73. Group A pre/post-test paired t-test question: English grammar skill

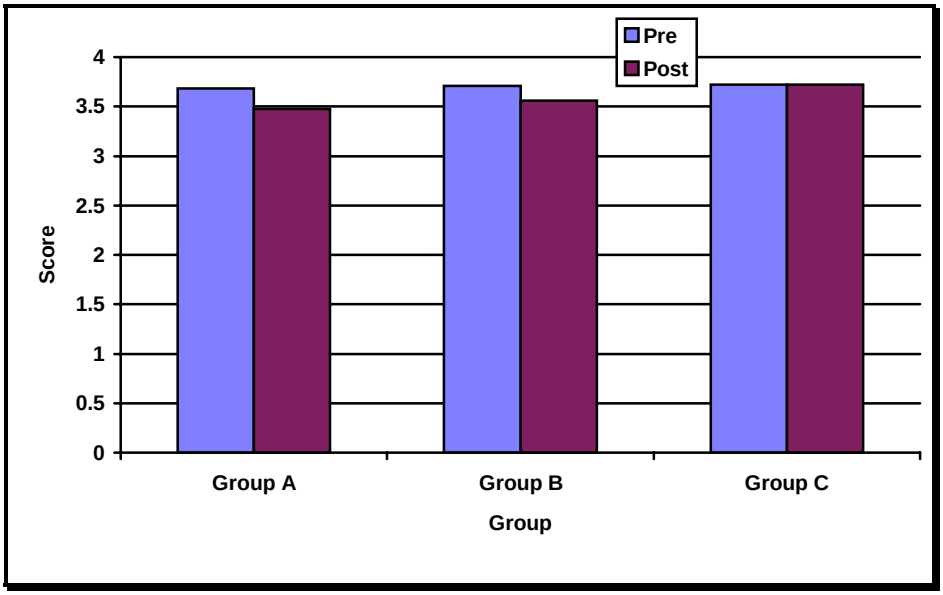


Figure 74. Group A pre/post-test paired t-test question: English important

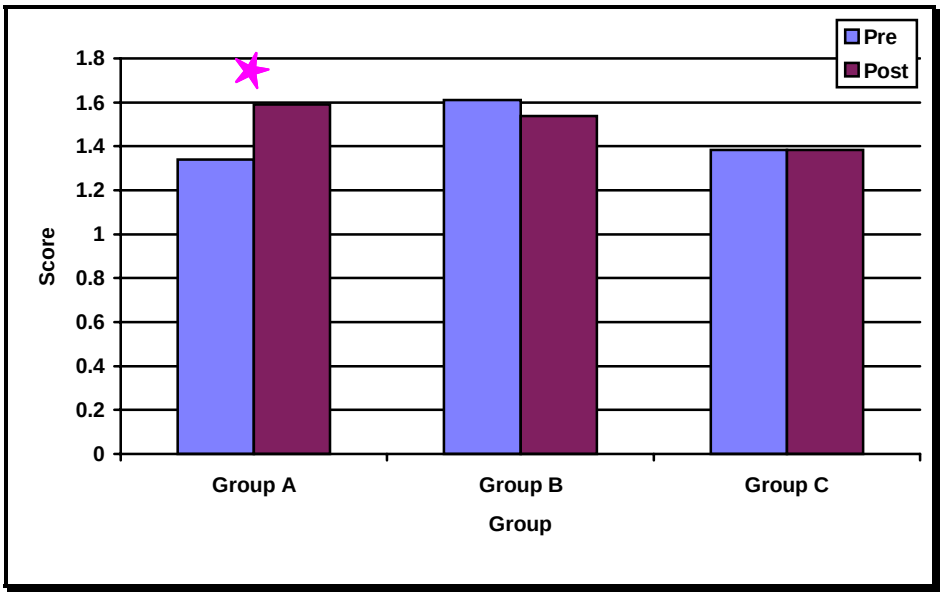


Figure 75. Group A pre/post-test paired t-test question: like writing English

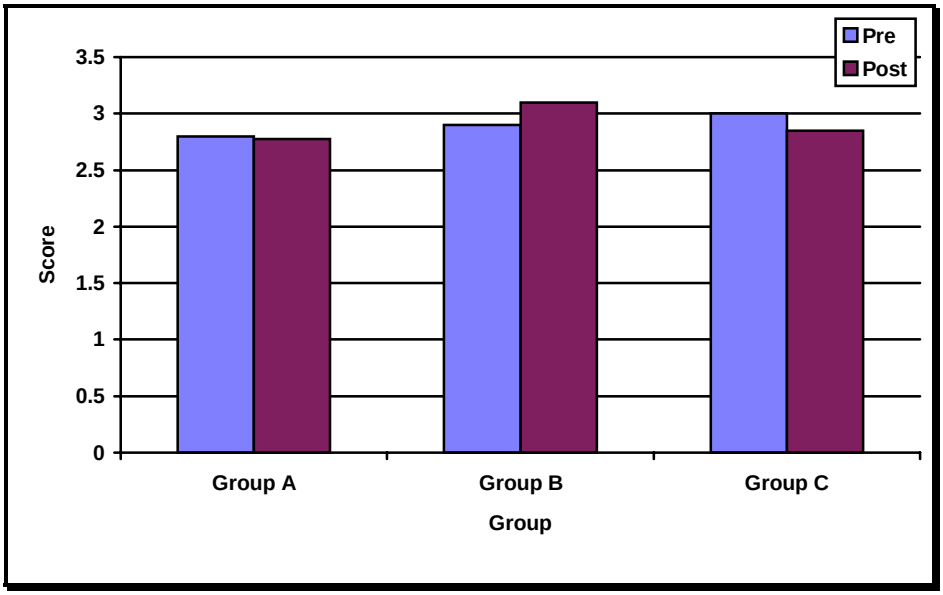


Figure 76. Group A pre/post-test paired t-test question: English listening skill

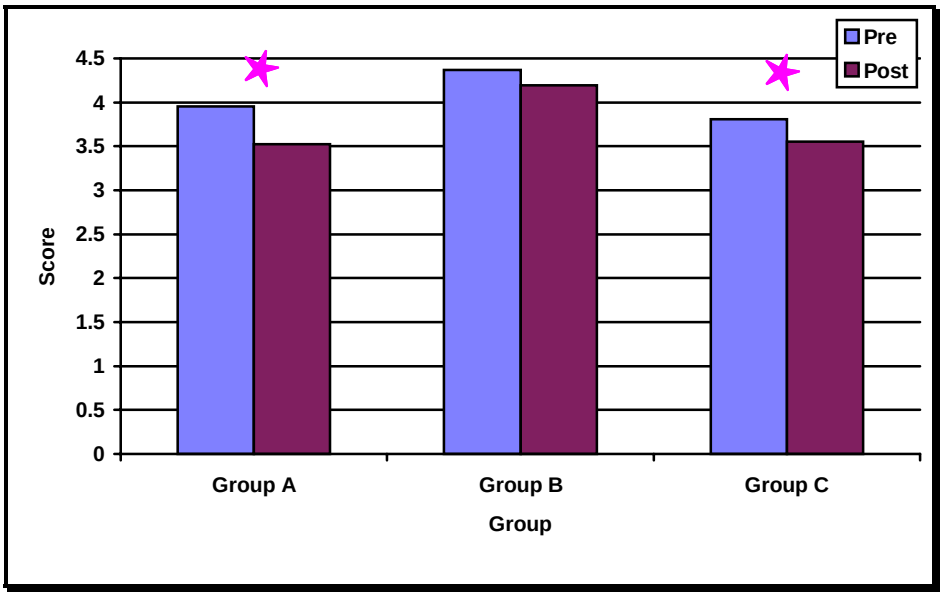


Figure 77. Group A pre/post-test paired t-test question: English spelling skill

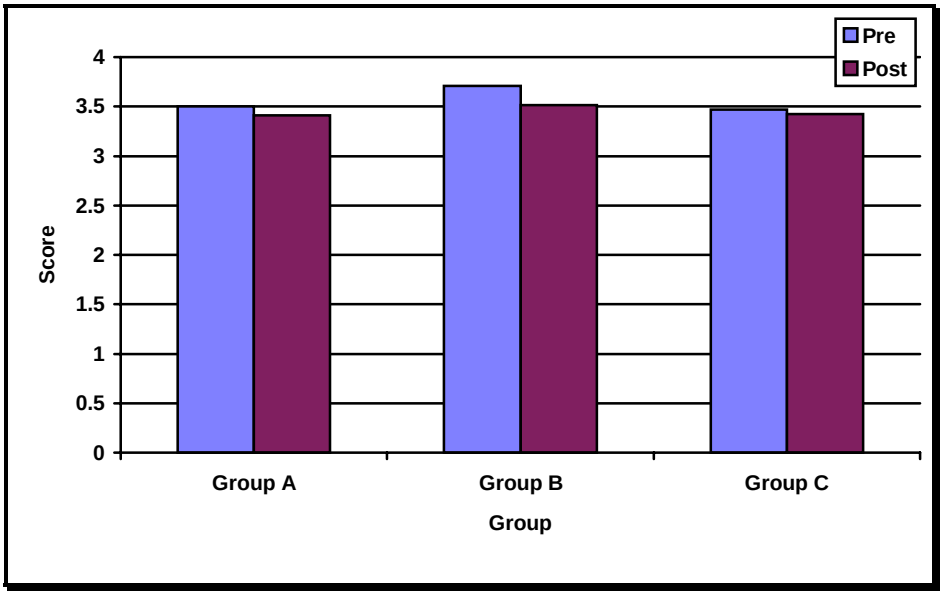


Figure 78. Group A pre/post-test paired t-test question: English sentence structure

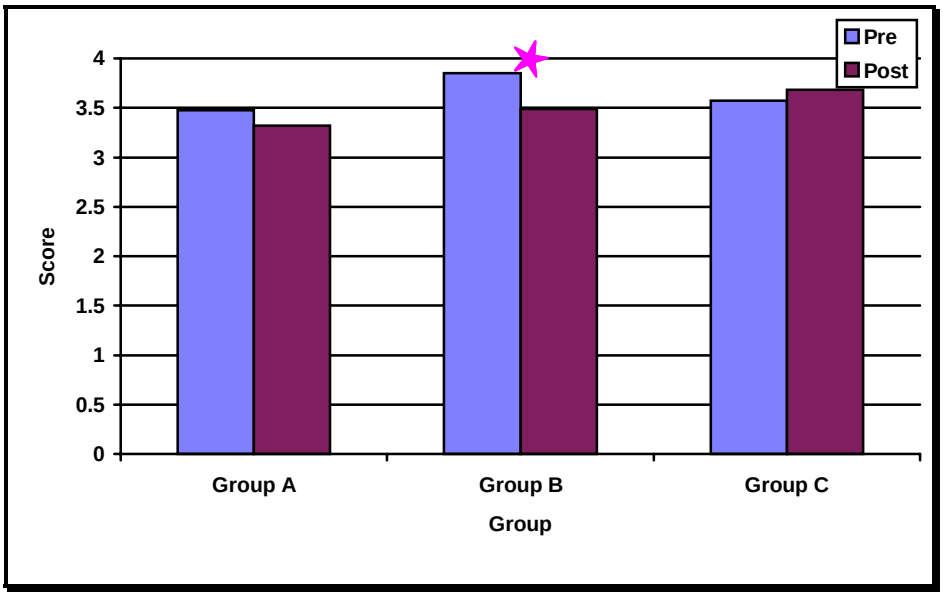
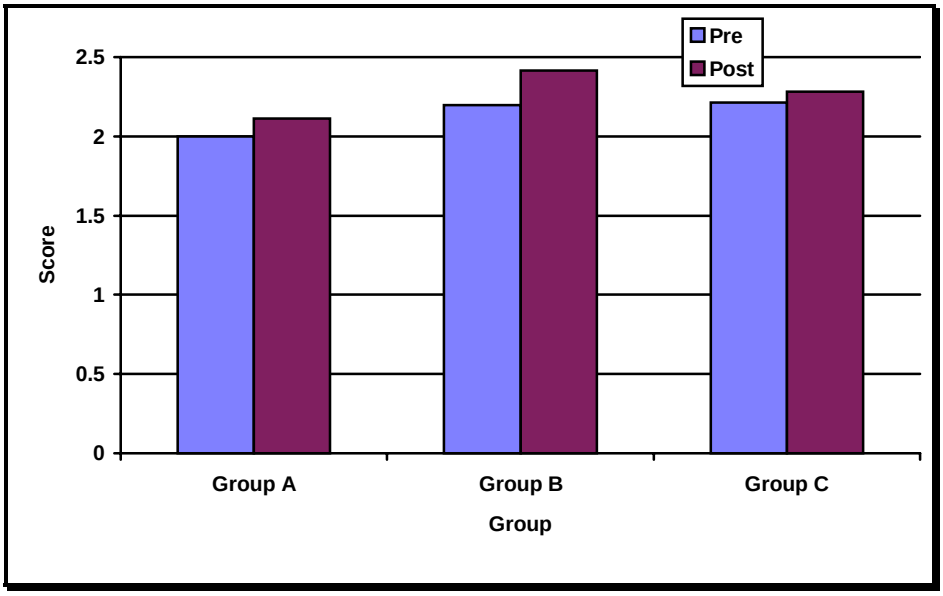


Figure 79. Group A pre/post-test paired t-test question: like to study English more



2. Open Survey

This final survey is divided into two parts, a lickard like scaled section and questions soliciting students' own opinions and input. Statistical examination of the first section is possible, while only general observations can be made concerning the open-ended section.

Answer scales in the open survey are constructed somewhat differently from those in the pre-/post-survey so as to avoid any carry over from the pre-/post-scale or inheritance of tendencies. In the open survey, answers are scalled in letters, not numbers. These letters were converted to numerical scores for the following analysis, with a=1, b=2, c=3, and so on. Higher numbers usually represent less positive opinions.

a) Scaled Section

Results from the scaled section of the open-ended survey, shown in Table 73 and Figure 80, show quite clearly that group A students were least satisfied with the usability of their QBL software (low scores reflect more positive attitudes). This is an interesting result as the software and training for its use was consistent across all three groups. The main difference, as far as usability is concerned, is that group A used their software fewer times since they were not required to redraft. Where as groups B and C completed four assignments and three redrafts, group A completed only four assignments. This extra time, for groups B and C, could contribute to familiarization with the software and thus to fewer problems in using it. In addition, the lack of redrafting may lead group A students to feel that some of the errors reported by the computer feedback are caused by human/computer interface problems, and the lack of opportunity to correct such non-intentional errors reinforces an idea of the software being somewhat difficult to use.

Group A also reports a significant difference in satisfaction with the grading method used. Nearly the same reasons could be applied for this dissatisfaction as those for the dissatisfaction with the software. With no chance to correct clearly displayed errors, students feel somewhat helpless. It is this very result that process writing instruction attempts to avoid, yet the final result does not demonstrate the superiority of the process approach in this case.

Ability to understand the feedback can also be a vital ingredient in student satisfaction and motivation. Without motivation it is hard to imagine how students,

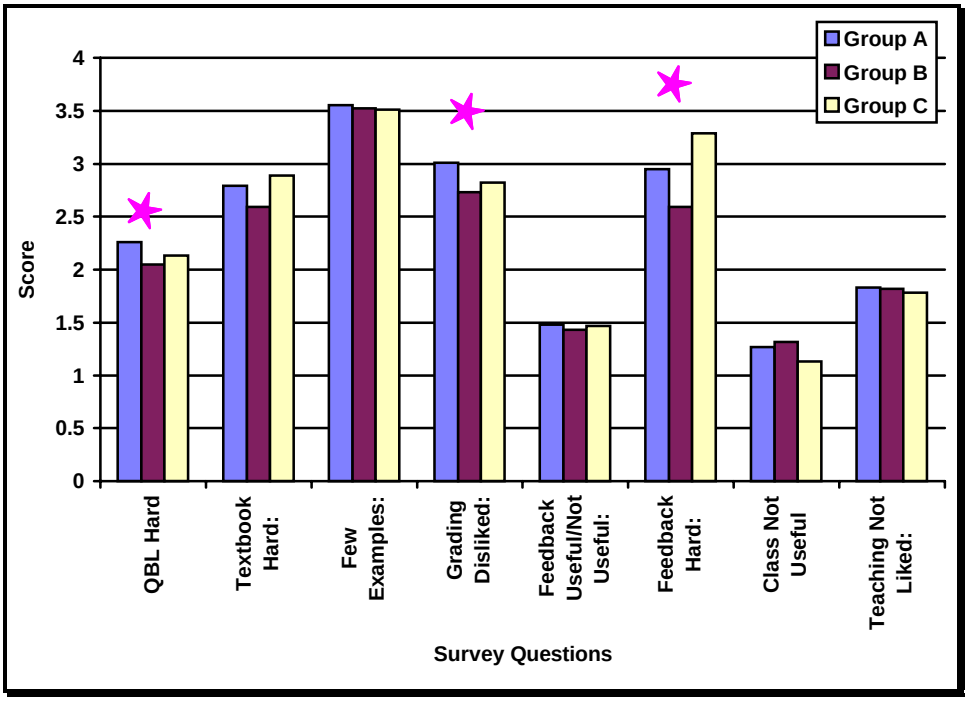
especially in Taiwan class settings, can excel in a process writing environment. Group C shows a significantly compromised ability to understand the feedback given to them.

Table 73. All groups ANOVA of open-ended survey (scaled questions included) questions with Scheffe multiple range test

Variable	*Group A Mean*	*Group B Mean*	*Group C Mean*	*F*	*Post hoc*
QBL Easy/Hard to Use:	2.26	2.05	2.13	5.11**	A>B A>C
Textbook Easy/Hard to Use:	2.79	2.59	2.89	2.47	
Reference Examples Many/Few:	3.55	3.52	3.51	.25	
Method of Grading Liked/Disliked:	3.01	2.73	2.82	10.72***	A>B A>C
Feedback Useful/Not Useful:	1.48	1.43	1.47	.36	
Feedback Easy/Hard to Understand:	2.95	2.59	3.29	8.28***	C>B
Class Useful/Not Useful	1.27	1.32	1.13	2.47	
Teaching in Class Liked/Not Liked:	1.83	1.82	1.78	.26	

**P<.05 **P<.01 ***P<.000*

Figure 80. Open-ended survey results



A final statistical test can be applied to the binary question of computer ownership in order to assure this issue did not have any undue impact on this research. Table 74 shows a chi-square test with no significant differences among the three groups. An encouraging sign is the high rate of computer ownership. Over 70 percent of students in this study own their own computers.

Table 74. All groups chi-square computer ownership

	Group A	*Group B*	*Group C*	*Row Total*
Yes:	30	28	37	95
Percent:				70.9
No:	15	16	8	39
Percent:				29.1
Column	45	44	45	134
Percent Total:	33.6	32.8	33.6	100.0

Chi-Square	Value	DF	Sig.	
Pearson:	4.31	2	.1158	
Likelihood Ratio:	4.54	2	.1035	
Linear Association:	2.62	1	.1056	
Minimum Expected Frequency:	12.806			

b) Open-Ended Section (General Satisfaction)

This part of the survey contained five questions (see page 64). Questions one through four cover general satisfaction with the class. In this group of questions, some differences among the three groups were clear. As would be expected with an open-ended survey, many students simply did not answer questions about the class quality or what could be changed or only wrote short comments such as, *no change*, or *everything fine*. However, students who did answer often had negative impressions that ranged from the language the class was taught in to the way grades were

assigned. Most relevant to this research were comments that touched on aspects of computer use and feedback.

(1) General Satisfaction; Group A

Group A students often raised problems in QBL software use, such as lack of labs at school and problems with printers.

Some negative comments included:

Because there are too few computers in shcool, it is difficult to send the homework.

I like to practice speaking English. Don't like to write many business letters. Some grammer I think right but wrong in my business letter. The teacher grade my homework too seriouly that will strike my self-confidence

The way the teacher graded my homework. I think you are not fair. You discriminate against our class.

Not too bad. I don't like the subject very much but it's OK. Anyway, even if I dislike the subject, I still must study this. That's why I am here.

Some positive comments included:

I liked to discuss with classmates in this class.

The way of teaching in this class is appropriate to me.

I like the way of teaching in this class. Because very relax; free.

In general, there were no specific comments that were positive about computer use in the class although there were some negative comments about it. This attitude is

in general agreement with group A's scaled questions showing some dissatisfaction with grades and computer ease of use. The above specific comment concerning unfair grading practices shows the source of difficulty does not lie so much with the system itself, but the knowledge that other classes have opportunity for redrafting. Although explained clearly at the start of the semester, that final grades were based on improvement within their own class, students did not approve of what appeared to be differential treatment among the three classes.

(2) General Satisfaction; Group B

In contrast to group A, group B students were generally satisfied with the class and only a few students reported dissatisfaction specifically with the computer assignments while there were some positive comments about the computer assignments. Some negative comments included:

> I like this way of teaching in this class. But I feel our homework is too much. We have a lot of other reports. Computer classrooms are not enough—if we stayed at shcool after school to use QBL, these are not enough classroom.

> Sometimes my printout quality is bad because the school printers are too old.

> I hope that you don't use the QBL because when I use QBL at home there are some (Chinese characters for *virus*) in my computer. That's too bad. I think that we can write the letter, and don't use QBL by computer.

Some positive comments included:

> The way of teaching in this class is good.

I don't want the teacher to change in this class.

I think this class has been useful to me. When I do QBL homework, I must use computer. The computer and English are very important. We study this class we can learn computer and English.

Group B students tended to give very few opinions about the quality of the class, leaving the first four questions blank or using short answers expressing satisfaction. Opinions that were given usually dealt with the teacher and the teaching methods rather than specifically mentioning the software. We could take this to mean that students in group B are generally satisfied with the software and redraft approach that they experienced.

(3) General Satisfaction; Group C

Groups C's comments rarely touched on the software at all, except occasionally mentioning that homework was too much or it was inconvenient to complete it. Some students commented on the feedback being hard to understand, while others requested more specific feedback.

Some negative comments included:

I feel the computers of our school are not enough. It is not convenient.

I hope the homework doesn't to do second times. the papers the teacher gave back with my homework were not easy to understand. So I think the teacher can write or tell us directly and more details.

> But I did not like—when we do the QBL homework, then we have to send it to network two times. Because the computer classroom always not seat that make us (Chinese for *coming and going*).

Some positive comments included:

> I like the way of teaching. Because it is very free and relax. The teacher doen't give the pressure to us.

> When we work and it is time to write business letter well is going to keep me have a good position.

Group C lacked many clear comments relevant to this study. Nearly all comments centered on the teaching style and suggestions involving other English subjects such as speaking and listening. This may be a reflection of the process approach having less emphasis on the feedback component. Without this emphasis, students have little opinion since such an approach appears, at least on the surface, to differ little from traditional handwritten feedback.

c) Open-Ended Section (Assignment Completion Procedure)

Open ended question number five asked for the steps used in completing the assignments. Whereas it was common for students to not answer the other open-ended questions, or answer in a minimal fashion, this final question usually received detailed responses.

(1) General Procedure for Group A

Group A students most often responded to this question by making a list of steps. Common to most group A students was a checking, rechecking or giving to classmates for proofreading step. This step often occurred after text had been input to the QBL software although it also often occurred after a handwritten draft.

Some comments included:

Before use QBL, I usually look Business Letter's example, then I begin write my QBL homework. I type, print, and sent QBL after discuss with classmates.

(In Chinese)

1) Write a draft.

2) Check for errors.

3) Input to QBL.

4) Check text again.

5) Send over network.

1) Reading the chapter one more time, then get the subject of each sentence.

2) Writing the letter. It cost a long time, because I have to use the Chinese-English Dict. and English-Chinese Dict. over and over again. Of course, I review the letter many times.

3) Typing the letter with QBL. First time I use the QBL, to my amazement, it's just so convenient.

4) Go to the school, and print the homework.

1) Look examples in the book.

2) Write homework. 3) Ask classmate to revise my homework.

4) Key in.

5) Finished.

(2) General Procedure for Group B

Responses from group B did not take the form of steps or lists as often as group A responses did. There was no specific mention of proofreading by classmates although some students wrote about discussing the assignments with classmates.

Some comments included:

First, I study every words in book. Then I think in Chinese and write in English. At my free time, I use QBL at school's computer classroom. After school, I print out QBL at home, because my printer is good.

1) Read the question.

2) Think this question.

3) reference sentences in the book or others'

4) Think again.

5) Create my own letter which has my style.

I read the examples in the book first, then to write the letter and type it.

First, write (in Chinese *draft*) then ask classmates my questions of homework. Finally, write it completely and go to computer classroom to send homework.

(3) General Procedure for Group C

Most often mentioned is the checking of examples from the textbook. Not a single student wrote about proofreading. Discussions with other students were always brought up before writing the letter.

Some comments included:

Usually I read the example in book and then I try to write another one.

Usually, I read the examples in the book. And my classmates and I talk to each other. Finally, I do my homework.

1) Copy the book if possible.

2) Look other people's homework.

3) Change it by myself.

1) Read my textbook and all example two times.

2) Write it on my paper. Correct it and to compare the textbook.

3) Type it on QBL disk, the print it out.

4) Set my homework to the network.

First, I read the Business English book carefully. Then I study with my classmates. When we have questions, we see the book's examples to do my homework. If we can't find the answer, we go to ask teacher.

VIII. Conclusions

A. Error Rates

The present research project has gone far beyond simple measuring of error rates; however, such objective measures still serve as an important and consistent metric in understanding just what students are doing in their writing. Previous research projects, using QBL and error measures, have clearly shown the superiority of computer generated feedback in changing students' behavior when error reduction was the goal. Rather than simple spell checking, such use of error correction in the classroom activates students' awareness of the writing behaviors that they may have known of, but did not employ.

Logically, it follows that a teacher who could produce the same volume of error feedback as a computer system, would obtain similar results. The clear superiority of teacher-based error correction over computer-based error correction would, most likely, lead to even better results than those obtained through computer-generated feedback. Key to such a result is a teacher who is able to match the computer's error correction volume. With normal class sizes in Taiwan, as well as most EFL classrooms throughout Asia, ranging from thirty to one hundred, it is virtually impossible to produce even a small amount of feedback for individual students. Without changing the teacher's role in the writing class, the question remains of how to best incorporate such computer-based error correction and what is the impact of such incorporation when mixed with other EFL/ESL instructional methods?

All three approaches applied in this experiment differed only slightly, with variation in feedback generation (teacher or computer) and opportunity to redraft. Resulting objective error rates showed little significant difference among the three groups. Numerous differences were revealed about how the three groups achieved the end result. The most interesting finding of this study may be that the computer feedback actually encourages students to perform in ways that we would think of as resulting from a process environment. However, when we add a redrafting component to a group receiving computer feedback, the direction of effort is completely changed.

B. Editing Activity

Group A, with computer feedback and no redraft, directed their efforts towards editing the first draft document. Students in this group took advantage of proofreading and other strategies in order to catch their errors. While some teachers would assume that pressing students to avoid errors would lead to shallow editing and increased direct copying of reference material, this is not the case. Group A, being unaware of their specific errors, actually move about their first drafts, making changes and editing the document. In essence, group A is redrafting on their own before turning in the assignment. The key factor for group A appears to be not so much the specific feedback given, but the way it is given. Delaying error feedback, causes students to perceive their first drafts not as the first step in the writing process, but as the final step in the process. This brings forward redrafting activity that the other two groups delay until the actual redraft is due.

What is most interesting about this activity is that it was enacted by the students on their own. More time spent honing their documents, group A has no redraft opportunity to fall back on if errors are made. In fact, the delayed nature of the feedback means that it is only an indicator of English writing areas a specific student is having trouble with. The feedback cannot be used to direct error correction, since only a first draft was accepted by the teacher (in the case of group A).

Opportunity to redraft, after receiving very specific error feedback seems to have a negative result on how students approach their first draft. In this study, it is clear that students in group B are postponing their work until they receive the computer generated feedback. When feedback is received, the redrafting is mostly spent simply making corrections to the errors indicated by the feedback. This group is copying more reference material and not moving around their documents. Clearly the goal is to meet the minimum requirements of the first draft, and then take corrective action based on the error feedback.

Group C cannot wait for error feedback to correct specific errors since they receive only general observations from the teacher. The teacher's observations are not well understood, however, and the resulting action is to copy reference material. Redrafting, seems to have little benefit for these students as the editing stage is not actually spent refining the document, but adding material that is just as error prone as the first draft. This observation is not based simply on objective errors, but by reviewing the examples seen on pages 155-68.

You can lead a horse to water but you cannot make him drink is an appropriate adage for group C's situation. While they are given a process like environment, they have little clue as to what to do with it. Years of schooling that emphasizes a more objective approach leave these students confused. Additionally, Taiwan EFL students do not have the wide ranging language background of native speakers from which to springboard into action.

C. Redrafting Activity

There is little doubt about the stand of most language teachers in the U.S. on error correction—it is generally observed as not being the most effective path to good writing. However, in the EFL context of English writing in Taiwan, these assertions simply may not apply. Lacking the years of exposure to natural English language, Taiwan EFL students are starting out at a disadvantage. Additionally, without knowledge of what errors look like, is it reasonable to expect students to be able to reduce errors and simultaneously create flowing and fluent text? Group C's decline in keys deleted during redraft is a sign that they simply cannot track down objective errors.

D. Process or Product Oriented Writing & Teaching

Assumptions surrounding the correctness of the process-based approach to teaching writing has led to CALL research that introduces CALL software into process-based classrooms and acts as a teacher to encourage the process. Thus, redrafting and allowing students to interact with computer generated feedback has

been the central approach of EFL/ESL language researchers. According to the results of this study, CALL plays a very different role than the role played by the teacher. By using CALL in a product-based approach, software can maximize the natural potential of the computer, while also encouraging students to employee process writing strategies. This makes perfect sense if we truly believe that writing a document is a process. By placing more energy on the process, what we end up with is a better final product. Computers simply are not process oriented, and no matter what we do to the computer-human interface, it is always clear that the computer is only one step away from a non-process approach. Students ultimately are product oriented in that their goals encompass completing a course, a semester, a degree, etc. Even if we create computer-based feedback that is entertaining, human students will be able to quickly find the maximum path in order to reach their goals.

A good example is a simple spell checker. These programs have advanced in the past decade to become very accurate and even able to read context so as to accurately guess at the correct spelling of a misspelled word. Word processors can even catch misspellings while the user is typing. If we allowed our students to create documents with such software, they would simply rely on the spell checker to catch their misspellings. The instantaneous interaction would be perceived by students as an easy and efficient method for reducing spelling errors. With such an approach, dictionary use would be reduced, and the learning of correct spellings would simply be a waste of time (from the student's perspective).

If the misspelling information was withheld until after the document was turned in for a grade, students would see the benefit to learning spelling. While delayed spelling error feedback would not be directly applicable to future assignments, simply because the next assignment will not use all the same vocabulary, it is a sure bet, that at some future time, many of the misspelled words will turn up in an assignment. In this case, applying energy to learning the vocabulary would appear to have a payoff. Thus, a very product oriented direction, actually can lead to a process orientation for the student.

E. Summary of Findings

A summary of findings can be seen in Clearly the inclusion of redrafting when using computer-generated error feedback is not beneficial to the process students employ when completing their first draft. Beyond this fundamental finding, the declaration of computer-generated error feedback or teacher-generated process feedback being superior is not possible. It would appear that these two approaches to feedback lead to differences in student behavior during the first draft, but which one is superior depends on what the teacher's goals may be. Given the nature of large EFL classes, it would appear that for business writing students, a process-based feedback approach hold little benefit.

Table 75. Summary of results

Original Hypothesis	*Supported*	*Summary*	*Location in Report*
H_{1a}: Students receiving computer feedback on their writing errors will produce fewer objective errors in later assignments.	✓	**By the last assignment, group C showed increased error rates. A statistically significant difference was found between groups A and C based on treatment only and between B and C based on treatment and letter interaction.**	**Page 104**
H_{1b}: Students receiving computer feedback will directly copy less reference material than students receiving process-based feedback.	✓	**Group C copied more reference material when such material was available. Additionally, group C changed the material they copied less, thus retaining more of the copied reference material in their documents. Statistically significant differences were found between A and C based on treatment and letter interaction.**	**Page 109109**
H_{1c}: Students receiving computer generated feedback will show improvement in more error types than students receiving process-based feedback.	✓	**Group C showed statistically significant higher error rates on four error types (not including total errors or editing measures) in the final assignment.**	**Page 100**
H_{2a}: Students who receive computer generated feedback and then redraft their assignments will have fewer errors on new assignments than students not completing redrafts.	✗	**Redrafting opportunity did not have an impact on errors in first drafts, however, the method used to reduce errors differed between the A and B groups. No statistically significant difference was found between A and B for the total errors variable**	**Page 104**
H_{2b}: Students receiving process-based feedback will make fewer alterations during redrafting than students receiving computer-based feedback.	✗	**During redrafting, groups B and C do not statistically significantly differ in number of changes made. It appears that group B makes revisions depending on the amount of errors reported in the feedback. If there are few errors reported, then just those are corrected. If numerous errors are reported, overall revision of the document is much deeper and widespread.**	**Page 150, 152, 152**
H_{2c}: Students not completing redrafts will spend more time working on their first draft.	✓	**Group A showed statistically significant longer time editing the first draft than group B.**	**Page 112**
H_{3a}: Students receiving no computer feedback, using the generally accepted	✓	**Group C showed a total error rate statistically significantly higher than both A and B groups in the final assignment.**	**Page 100**

process approach, including redraft, will not reduce errors in later assignments.			
H_{3b}: Students receiving process-based feedback will write more in their letters.	✓	Group C places statistically significantly more words in the first draft than groups A or B based on both treatment and treatment by assignment interaction.	Page 124
H_{3c}: Students receiving process-based feedback will navigate their document less than students receiving computer feedback.	✗	Students receiving computer feedback and having opportunity for redraft, group B, navigated the document at a statistically significant lower rate. The difference in navigation between process- and computer-based feedback is in what was being done during navigation.	Page 115
H_{4a}: All students will express improvement on a range of English business writing skills.	✓	All groups scored statistically significant improvements in self-reported skills. Group C showed the least improvement while group B showed the most skills improved.	Page 174, 175, 176
H_{4b}: Satisfaction with the class will be higher among students receiving computer feedback.	✗	The three groups significantly differed in only three measures of satisfaction with group A least satisfied in two measures.	Page 184
H_{4c}: Students receiving process feedback will express confusion and/or frustration.	✓	Group C students rated the feedback as hard to understand at a significantly higher rate than the other groups.	Page 184,

F. Cultural/Societal Implications

Imagine the possibilities of having all Taiwan's business school graduates able to write flowing and fluent natural English text. With such a skill, certainly we would benefit immensely, or would we? What is often missed in English instruction research is the goal of the students and the society visa-via the tool we call English. Certainly we can train students to reach the highest goals. Taiwan has no shortage of excellent students, teachers and administrators. The issue is not one of ability or simply the lack of will, but one of economics and cost/benefit ratios. Training students who will enter trading companies to have English skills that are so high, will result in the

lowering or absence of other important skills. With Taiwan's trade standing at XXX per year, clearly the market has already made its judgment on the existing skills of graduating students. As educators in Taiwan, we must first examine the mandate given to us from the society our students will graduate into, then adopt teaching techniques that best fulfill that mandate.

Beyond those who will go on to teaching, one could assert that all EFL language in Taiwan is ESP related. In fact, the often cited lack of success in American general language education could benefit from more targeted teaching and some objective standards. How many research papers are written by basic English teachers in American junior high schools and high schools? The whole structure of the American academic system leads to most of the research into writing being done by those who are teaching advanced writing and creative writing. This is simply not the normal situation of the majority of students in Taiwan who are learning English not because they volunteered to or have any interest to, but because of historical events that have lead to a world dominated by the English language.

If we were to imagine a slightly different world, where all American students were required to obtain a minimum level of proficiency in Chinese, would teachers all be emphasizing a process approach? When implementing such an approach means that a majority of students simply drop out and cannot obtain any measurable standard, would the partisan and dogmatic approach continue? Would it be allowed to continue? Would not students and businesses complain that new graduates need a minimum of Chinese ability so as to interact with Chinese people and companies for

very specific purposes? How many American teachers can we imagine would take a stand that American students learning Chinese must learn towards fluency and be able to write Chinese text that expresses themselves? Seeing the world in this slightly different angle brings a bit of reality to our perspective on teaching English in Taiwan.

We owe it to ourselves and our students to examine and adopt methods that maximize our students' future potential. If we could have classes with motivated students who are interested in excelling at English writing, while schools could afford to give us small class sizes and sufficient resources, then the best methods would be different. But the reality today requires us to adopt other more practical and proven methods.

CALL design can follow this path with software designs that meet specific needs of students (Keith & Laffort, 1989; Levy, 1997; Nakajima, 1990; Paramskas, 1995). Solid and objective research can lead the way in showing us how to maximize students' process orientation, even if that means including non-process approaches.

IX. Future Research

A. Goal Based Research

Interactivity and multimedia elements of computer software are set to grow in importance. When used with EFL students, software that includes video and audio has been found to improve learning somewhat (Brett, 1997), but we must be careful to understand what our research goals are. The newest technologies should not be brought into the classroom simply because they are new.

B. Improved Computer Access (WWW)

Over 70 percent of students in this study own their own computers. This rate is sure to increase, thus making it vital that future research into computers in writing take into account the activity of students at home, away from the lab. Part of this expansion of PC use is the increasing use of expanded networks that reach out from schools and expand the area of coverage. Not only can students perform tasks from their homes, they can access classroom activity on the other side of the Earth!

Continued growth in the WWW will pressure writing researchers to moved onto the Web. Beside this, software interface design, even for writing classes, will have to adopt more of the Web's HTML flavor. This will happen because young people today are being exposed to the Web and thus will enter writing class with a much higher degree of computer experience, but not the traditional experience set we are used to.

They will be experienced in the easy to use, event driven and free roaming Web type interface.

We are already seeing this in some research using Web pages (Vilmi & Malmi, 1996) that incorporate game-like activities. The danger of this new built-in experience is that it becomes an expectation. If the Web fosters students who expect to always play games and be entertained, while simply jumping from one topic to another, with no real depth of understanding, the result may make Web-based CALL software like television entertainment (Maddux, 1996; Newhagen, 1996).

Once again, the questions must center on how to fit these new technologies into our classrooms. A special emphasis must be placed on the realities of our Taiwan teaching experience rather than simply adopting whatever EFL/ESL methods are placed on the Web in the West.

X. References

1) **Aljaafreh, A., & Lantolf, J. (1994). Negative feedback as regulation and second language learning in the zone of proximal development. Modern Language Journal, 78, 465-483.**

2) **Baldry, A., Piastra, M. & Bolognesi, R. (1991). A new parsing technique for building CALL applications on small computers. Computer Assisted Language Learning, 4(3), 183-189.**

3) **Barnes, D. and Shemilt, D. (1974). Tranmission and interpretation. Education Review, 26, 213-228.**

4) **Beason, L. (1993). Feedback and revision in writing across the curriculum classes. Research in the Teaching of English, 27, 395-421.**

5) **Bernard, S. (1993). ESL/EFL process writing with computers. CAELL Journal, 4(2), 16-22.**

6) **Bhatia, V.K. (1993). Description to explanation in English for professional communication-application of genre analysis, In T. Boswood, R. Hoffman & P. Tung (Eds.),** ***Perspectives on English for Professional Cummunication*** **(pp. 133-157). Honk Kong: City Polytechnic of Hong Kong.**

7) **Bialystok, E. (1981). The role of conscious strategies in second language proficiency. Modern Language Journal, 65, 24-35.**

8) **Bialystok, E. (1982). On the relationship between knowing and using linguistic forms. Applied Linguistics, 3, 181-206.**

9) **Bolt, P. (1991). eL: A computer-based system for parsing and correcting written English. Computer Assisted Language Learning, 4(3), 173-182.**

10) **Bolt, P. (1992). An evaluation of grammar-checking programs as self-help learning aids for learners of English as a foreign language. Computer Assisted Language Learning, 5(1-2), 49-91.**

11) **Bonk, C.J., Cavalcante, R., Liszewski, A.B., & Reynolds, T.H. (1995). Microgenetic keystroke analysis of developmental differences in preadolescent composing. Paper presented 6th European Conference for Research on Learning and Instruction, Nijmegen, The Netherlands.**

12) **Brady, L. (1990). Overcoming resistance: computer in the writing classroom. Computers and Composition, 7(2), 21-33.**

13) **Brannon, L., & Knoblauch, C.H. (1982). On students' rights to their own texts: A model of teacher response. College Composition and Communication, 33, 157-166.**

14) **Brehony, T., & Ryan, K. (1994). Francophone stylistic grammar checking (FSGC) using link grammars. Computer Assisted Language Learning, 7(3), 257-269.**

15) Brett, P. (1997). A comparative study of the effects of the use of multimedia on listening comprehension. System, 25(1), 39-53.

16) Brock, M. N. (1990). Customizing a computerized text analyzer for ESL writers: Cost versus gain. CALICO Journal, 8, 51-60.

***17)* Cardelle, M., & Corno, L. (1981). Effects on second language learning of variations in written feedback on homework assignments. TESOL Quarterly, 15, 251-261.**

18) Carnicelli, T. (1980). The writing conference: A one to one conversation. In T. Donovan & B. McClelland (Eds.), Eight approaches to teaching Composition (pp. 101-131). Urbana. IL: National Council of Teachers of English.

19) Carroll, S., & Swain, M. (1993). Explicit and implicit negative feedback: An empirical study of the learning of linguistic generalizations. Studies in Second Language Acquisition, 15, 357-386.

20) Carson, J.G., & Nelson, G.L. (1994). Writing groups: Cross-cultural issues. Journal of Second Language Writing, 3, 17-30.

21) Carson, J.G., & Nelson, G.L. (1996). Chinese students' perceptions of ESL peer response group interaction. Journal of Second Language Writing, 5, 1-19.

22) Chaudron, C. (1988). Second language classrooms: Research on teaching and learning. New York: Cambridge University Press.

23) CHECK FOR THE EARLY TESOL MATTERS BY WARDEN ON SAVING MONEY IN USING OLD MACHINES

24) Chen, J. (1997). Computer generated feedback and writing process: A missing link uncovered, Paper presented at The Thirteenth Computers And Writing Conference, Honolulu, Hawaii, (June).

25) Clarke, M. (1992). Vocabulary learning with and without computers some thoughts on a way forward. Computer Assisted Language Learning, 5(3), 139-146.

26) Coniam, D. (1991). A simple syntax analyzer? In J. Milton & K. Tong (Eds.), Text Analysis in Computer assisted language learning (pp. 132-138). Hong Kong: Hong Kong University of Science & Technology.

27) Coniam, D. (1997). A computerised English language proofing cloze program. Computer Assisted Language Learning, 10(1), 83-97.

***28)* Connor, U., & Asenavage, K. (1994). Peer response groups in ESL writing classes: How much impact on revision? Journal of Second Language Writing, 3, 257-276.**

29) Connor, U., & Asenavage. K. (1994). Peer response groups in ESL writing classes: How much impact on revision? Journal of Second Language Writing, 3, 257-276.

30) Connors, R., & Lunsford, A. (1993). Teachers' rhetorical comments on student papers. College Composition and Communication, 44, 200-223.

31) Cumming, A. (1990). Metalinguistic and ideational thinking in second language composing. Written Communication, 7, 482-511.

32) Cumming, A. (1995). Fostering writing expertise in ESL composition instruction: Modelling and evaluation. In D. Beicher & G. Braine (Eds.), Academic writing in a second language: Essays on research and pedagogy (pp. 375-397). Norwood, NJ: Ablex.

33) Cumming, A. and So, S. (1996). Tutoring second language text revision: Does the approach to instruction or the language of communication make a difference? Journal of Second Language Writing, 5(3), 197-226.

34) Daiute, C. A. (1983). The computer as stylus and audience. College Composition and Communication, 32(2), 134-145.

35) Dalgish, G. (1991). Computer-assisted error analysis and courseware design: Applications for ESL in the Swedish context. CALICO Journal, 9(2), 39-56.

36) Donaldson, R. & Morgan, L. (1994) Making the most of scarce resources: A small college language department's experience with HyperCard. CALICO Journal, 11(4), 41-59.

37) Downs-Gamble, M. (1994). The Daedalus integrated writing environment: Interactive humanities education. Computer Assisted Language Learning, No. 7 (July), 4-5.

38) Ellis, R. (1986). Understanding second language acquisition. Oxford: Oxford University Press.

39) Ellis, R. (1994). The study of second language acquisition. Oxford: Oxford University Press.

40) Fathman, A., & Whalley, E. (1990). Teacher response to student writing: Focus on form versus content. In B. Kroll (Ed.), Second language writing: Research insights for the classroom (pp. 178-190). New York: Cambridge University Press.

41) Ferris, D. (1995a). Student reactions to teacher response in multiple-draft composition classrooms. TESOL Quarterly, 29, 33-53.

42) Ferris, D.R. (1995b). Teaching ESL composition students to become independent self-editors. TESOL Journal, 4(4), 18-22.

43) Ferris, D.R., Pezone, S., Tade, C.R. & Tinti, S. (1997). Teacher commentary on student writing: Descriptions & Implications. Journal of Second Language Writing, 6(2), 155-182.

44) Fisher, G. (1983). Word processing–Will it make all kids love to write? Instructor and Teacher, 92(6), 87-88.

45) Fitzgerald, J. (1987). Research on revision in writing. Review of Educational Research, 57, 481-506.

46) Fullan, M. (1982). The meaning of educational change. New York: Teachers College Press.

47) Garton, J., & Levy, M. (1994). A CALL model for a writing advisor. CAELL Journal, 4(4), 15-20.

48) Goldstein, L. & Conrad, S. (1990), Student input and negotiation of meaning in ESL writing conferences. TESOL Quarterly, 24, 443-460.

49) Goldstein, L., & Conrad, S. (1990). Student input and the negotiation of meaning in ESL writing conferences. TESOL Quarterly, 24, 443-460.

50) Goodfellow, R. (1993). CALL for vocabulary requirements, theory & design. Computer Assisted Language Learning, 6(2), 99-122.

51) Grammatik5 User's Guide, 1992, Reference Software International.

52) Grimmett, P.P. and Crehan, E.P. (1992). The nature of collegiality in teacher development: The case of clinical supervision. In M. Fullan & A. Hargreaves (Eds.), Teacher development and educational change (pp. 56-85). London: Falmer Press.

53) Gula, R. J. (1983). Beyond the typewriter: An English teacher looks at the word processor. Independent School, 42(3), 41-43.

54) Harrington, M. (1996). Intelligent computer-assisted language learning. ON-CALL, 10(3), 2-9.

55) Harris, M. (1992). Collaboration is not collaboration is not collaboration: Writing centre tutorials vs. peer-response groups. College Composition and Communication, 43, 369-383.

56) Havelock, R. (1982). The change agent's guide to innovation in education. Englewook Cliffs, NJ: Educational Technology Publications.

57) Healey, D. (1992). Where's the beef? Grammar practice with computers. CAELL Journal, 3(1), 10-16.

58) Hedgcock, J., & Lefkowitz, N. (1994). Feedback on feedback: Assessing learner receptivity to teacher response in L2 composing. Journal of Second Language Writing, 3, 141-163.

59) Hedgcock, J., & Lefkowitz, N. (1994). Feedback on feedback: Assessing learner receptivity to teacher response in L2 composing. Journal of Second Language Writing, 3, 141-163.

***60)* Hedgcock, J., & Lefkowitz, N. (1996). Some input on input: Two analyses of student response to expert feedback in L2 writing. Modern Language Journal, 80, 287-308.**

***61)* Herrmann, A. (1987). An ethnographic study of a high school writing class using computers: Marginal, technically proficient, and productive learners, In L. Gerrard (Ed.), Writing at Century's End: Essays on Computer-Assisted Composition (pp. 79-97). New York: Random House.**

62) **Holland, V., Melissa, R., Maisano, C., Alderks, & J. Martin. (1993). Parsers in tutors: What are they good for? CALICO, 11(1), 28-46.**

63) Horowitz, D. (1986). Process, not product: Less than meets the eye. TESOL Quarterly 20(1), 141-4.

64) Hyland, K. (1993). ESL computer writers: What can we do to help? System, 21(1), 21-30.

65) Jacobs, G. (1987). First experiences with peer feedback on compositions: Student and teacher reaction. System, 15, 325-333.

66) Jamieson, J., Campbell, J., Norfleet, L., & Berbisada, N. (1993). Reliability of a computerized scoring routine for an open ended task. System, 21(3), 305-322.

67) Johnson, M.A. (1988). Word processing in the English as a second language classroom. In: J.L. Hoot, & S.B. Silvern (Eds.), Writing With Computers in the Early Grades (pp. 107-121). New York, NY: Teachers College Press.

68) Keith, C.J. & Lafford, P.A. (1989). Designing software for vocational language programs: An overview of the development process. In M.C. Pennington (Ed.), Teaching Languages with Computers: the State of the Art, La Jolla, CA: Athelstan.

69) Kenning, M. (1991). CALL evaluation the learner's view. Computer Assisted Language Learning, 4(1), 21-27.

70) Kirn, E. & Hartmann, P. (1990). _Interactions 1 a writing skills book_. New York: McGraw-Hill Publishing Company.

71) Krashen, S. (1981). Second language acquisition and second language learning. Oxford: Pergamon.

72) Lam, F., & Pennington, M. (1995). The computer vs. the pen: A comparative study of word processing in a Hong Kong secondary classroom. Computer Assisted Language Learning, 8(1), 75-92.

73) Lange, E. (1993). Using computer-based grammar exercises in ESL composition classes. CAELL Journal, 4(3), 15-19.

74) Leki, I. (1990). Coaching from the margins: Issues in written response. In B. Kroll (Ed.), Second language writing: Research insights for the classroom (pp. 57-68). New York: Cambridge University Press.

75) Levy, M. (1997). Theory-driven CALL and the development process. Computer Assisted Language Learning, 10(1), 41-56.

76) Li Siu-leung, E. & Pemberton, R. (1994). An investigation of students' knowledge of academic and subtechnical vocabulary, In L. Flowerdew, & A.K.K. Tong (Eds.), Entering text (pp. 183-196). Hong Kong: The Hong Kong University of Science & Technology.

77) Liou, H. (1991). Development of an English grammar checker a progress report. CALICO Journal 9(2), 57-70.

78) Liou, H. (1992). An automatic text-analysis project for EFL writing revision. System, 20(4), 481-492.

79) Liou, H. (1993a). Integrating text-analysis programs into classroom writing revision. CAELL Journal, 4(1), 21-27.

80) Liou, H. (1993b). Investigation of using text-critiquing programs in a process-oriented writing class. CALICO Journal, 10(4), 17-38.

81) Liou, H. (1994). Practical considerations for multimedia courseware development: an EFL IVD experience. CALICO Journal 11(3), 47-74.

***82)* Lockhart, C., & Ng, P. (1995). Analyzing talk in ESL peer response groups: Stances, functions, and content. Language Learning, 45, 605-655.**

83) Ma Ka-Cheung, B. (1994). Learning strategies in ESP classroom concordancing: An initial investigation into data-driven learning, In L. Flowerdew, & A.K.K. Tong (Eds.), Entering text (pp. 197-214). Hong Kong: The Hong Kong University of Science & Technology.

84) Maddux, C. (1996). The World Wide Web and the television generation. Computers in the Schools, 12(1/2), 23-29.

85) McEnery, T. & Wilson, A. (1993). The role of corpora in computer-assisted language learning. Computer Assisted Language Learning, 6(3), 233-248.

86) McLaughlin, B. (1987). Theories of second--language learning. London: Edward Arnold.

87) Mendonca, C., & Johnson, K. (1994). Peer review negotiations: Revision activities in ESL writing instruction. TESOL Quarterly, 28, 745-769.

***88)* Mendonca, C.O., & Johnson, K.E. (1994). Peer review negotiations: Revision activities in ESL writing instruction. TESOL Quarterly, 4, 745-769.**

89) Milton, J. & Tsang, E. (1993). A corpus-based study of logical connectors in EFL students' writing: Directions for future research, In R. Pemberton, & E.S.C. Tsang (Eds.), Studies in lexis (pp. 215-246). Hong Kong: The Hong Kong University of Science & Technology.

90) Morris, P. (1985). Teachers' perceptions of the barriers to the implementation of a pedagogic innovation: A South East Asian case study. International Review of Education, 31, 3-18.

91) Murray, D.M. (1980). Writing as process: How writing finds its own meaning. In T.R. Donovan and B.W. McClelland (eds), *Eight approaches to teaching composition*, (pp. 3-20). Urbana, IL: National Council of Teachers of English.

92) Nakajima, K. (1990). Developing Hypercard stacks for the study of Japanese ideographic scripts. In M-L. Craven, R. Sinyor & D. Paramskas (Eds.), CALL: Papers and Reports, La Jolla, CA: Athelstan.

93) Nash, T., Hsieh, T., & Chen, S. (1989). An evaluation of computer-aided composition. . In: S. Chang, D. Tseng, & B. Hwang (Eds.), A Collection of Papers Presented in The Sixth Conference on English Teaching and Learning In the Republic of China (pp. 313-323). Taipei, Taiwan: The Crane.

94) Nelson, G.L., & Murphy, J.M. (1992). An L2 writing group: Task and social dimensions. Journal of Second Language Writing, 1, 171-193.

95) Newhagen, J.E. (1996). Why communication researchers should study the Internet: A dialogue. Journal of Communication, 46(1),4-13.

96) Nicholls, A. (1983). Managing educational innovations. London: Allen & Unwin.

97) Paramskas, D.M. (1995). Meanwhile, up north: The beginnings of CALL in Canada. CALICO Journal, 12(4), 97-105.

98) Patthey-Chavez, G.G., & Ferris, D.R. (1997). Writing conferences and the weaving of multi-voiced texts in college composition. Research in the Teaching of English, 31, 51-90.

99) Peng, Y. (1993). Answer markup on computer assisted language learning. CALICO Journal, 10(3), 31-40.

100)Pennington, M. (1991). An assessment of the use and effectiveness of computer-based text analysis for non proficient writers. City Polytechnic of Hong Kong Research Report, No. 4.

101)Pennington, M. (1992). Beyond off-the-shelf computer remedies for student writers: Alternatives to canned feedback. System, 20(4), 423-437.

102)Pennington, M. (1995, March 15). Sensitizing bilingual teachers to the use of two languages in the English class. Paper presented at the Third International Conference on Teacher Education in Second Language Teaching, City University of Hong Kong.

103)Pennington, M.C., Brock, F. and Yue, F. (1996). Explaining Hong Kong students' response to process writing: An exploration of causes and outcomes. Journal of Second Language Writing, 5(3), 227-252.

104)Pickard, V. (1994). Producing a concordanced-based self-access vocabulary package: Some problems and solutions, In L. Flowerdew, & A.K.K. Tong (Eds.), Entering text (pp. 215-227). Hong Kong: The Hong Kong University of Science & Technology.

***105)*Radecki, P., & Swales, J. (1988). ESL student reaction to written comments on their written work. System, 16, 355-365.**

***106)*Radecki, P., & Swales, J. (1988). ESL student reaction to written comments on their written work. System, 16, 355-365.**

107)Retherford, R.D. & Choe M.K., (1993). Statistical Models for Causal Analysis (pp. 93-118). New York: John Wiley & Sons, Inc.

108)Reynolds, T. & Bonk, C. (1996). Computerized prompting partners and keystroke recording devices: two macro driven writing tools. ETR&D, 44(3), 83-97.

109)Rogers, E.M. (1983). Diffusion of innovations (3rd ed.). New York: Free Press.

110)Rothstein, R.I. & McKnight, L. (1996). Technology and cost models of K-12 schools on the national information infrastructure, *Computers in the Schools, 12(1/2),* 31-57.

111)Saito, H. (1994). Teachers' practices and students' preferences for feedback on second language writing. TESL Canada Journal, 11, 46-70.

112)Santiago, R., Nakata, M., Einwaechter, N., Marschmeier, R., & Shimada, R. (1996). Integrating technology in the writing curriculum of Japanese learners of English as a foreign language. ETR&D, 44(3), 103-109.

113)Schmidt, R. (1983). Interaction, acculturation, and the acquisition of communicative competence: A case study of an adult. In N. Wolfson & E. Judd (Eds.), Sociolinguistics and language acquisition (pp. 137-174). Rowley, MA: Newbury House.

114)Schmidt, R. (1990). The role of consciousness in second language learning. Applied Linguistics, 11,129-58.

115)Schmidt, R. (1993). Awareness and second language acquisition. Annual Review of Applied Linguistics, 13, 206-226.

116)Schmidt, R. (1994). Deconstructing consciousness in search of useful definitions for applied linguistics. AILA Review, 11, 11-26.

117)Shillaw, J. (1994). Using a corpus to develop vocabulary tests, In L. Flowerdew, & A.K.K. Tong (Eds.), Entering text (pp. 166-182). Hong Kong: The Hong Kong University of Science & Technology.

***118)*Silva, T. (1993). Toward an understanding of the distinct nature of L2 writing: The ESL research and its implications. TESOL Quarterly, 28, 657-677.**

***119)*Simmons, J. (1984) The one-to-one method of teaching composition. College Composition and Communication, 35, 222-230.**

120)Sirkin, M.R. (1995). Statistics for the Social Sciences (pp. 436-442). London: Sage Publications.

121)Sommers, N. (1982). Responding to student writing. College Composition and Communication, 33, 148-156.

***122)*Spada, N., & Lightbown, P. (1993). Instruction and the development of questions in L2 classrooms. Studies in Second Language Acquisition, 15, 205-224.**

123)Sperling, M. (1994). Constructing the perspective of teacher-as-reader: A framework for studying response to student writing. Research in the Teaching of English, 28, 175- 207.

124)Stanley, J. (1992). Coaching student writers to be effective peer evaluators, Journal of Second Language Writing, 1, 217-233.

125)Sullivan, N., & Pratt, E. (1996). A comparative study of two ESL writing environments: A computer-assisted classroom and a traditional oral classroom. System, 29(4), 491-501.

126)Swales, J.M. (1981). *Aspects of article introductions.* Aston ESP Research Report No.1, Language Studies Unit, University of Aston in Birmingham, Birmingham, U.K.

127)Swales, J.M. (1990). *Genre analysis-English in accademic and research settings*, Cambridge: Cambridge University Press.

128)Tarvin, W, & AI-Arishi, A.Y. (1991). Rethinking communicative language teaching: Reflection and the EFL classroom. TESOL Quarterly, 25, 9-27.

129)Tribble, C., (1991). Applications of stylistics in English language teaching, In J. Milton & K. Tong (Eds.), Text analysis in computer assisted language learning (pp. 158-166). Hong Kong: Hong Kong University of Science & Technology.

130)Tschichold, C., Bodmer F., Cornu, E., Grosjean, F., Grosjean, L., Kubler, N., & Tschumi, C. (1994). Detecting and correcting errors in second language texts. Computer Assisted Language Learning, 7(2), 151-160.

***131)*Villamil, O.S., & deGuerrero, M.C.M. (1996). Peer revision in the L2 classroom: Social-cognitive activities, mediating strategies, and aspects of social behavior. Journal of Second Language Writing, 5, 51-76.**

132)Vilmi, R., & Malmi, L. (1996). Learning English by creating writing and playing WWW adventure games. ETR&D, 44(3), 109-120.

133)Warden, C. (1995). Experts system's impact on student's writing errors in Taiwanese business English classes. CAELL Journal, 6(2), 22-29.

134)Warden, C. (1997). Price of progress, *TESOL Matters. (February/March)*, 9.

135)Webster, J. (1991). Text analysis using the functional grammar processor, In J. Milton & K. Tong (Eds.), Text Analysis in computer assisted language learning (pp. 139-157). Hong Kong: Hong Kong University of Science & Technology.

136)Wenden, A., & Rubin, J. (Eds.). (1987). Learner strategies in language learning. Englewood Cliffs, NJ: Prentice-Hall.

137)Wresch, W. (1988). Six directions for computer analysis of student writing. The Computer Teacher, 42(April), 13-16.

138)Xu, L. (1994). Smart Marker--an efficient GPSG parser, In L. Flowerdew, & A.K.K. Tong (Eds.), Entering text (pp. 144-156). Hong Kong: The Hong Kong University of Science & Technology.

139)Yalden, J. (1975). Language teaching and language learning in the universities. Canadian Modern Language Review, 31, 334-339.

140)Yao, Y. & Warden, C. (1996) Process writing and computer correction: Happy wedding or shotgun marriage. ***CALL Electronic Journal (Japan) [On-line], HTTP://WWW.LC.TUT.AC.JP/CALLEJ/CALLEJ.HTML, 1(1).***

141)Zamel, V. (1985). Responding to student writing. TESOL Quarterly, 19, 79-102.

142)Zhang, S. (1995). Reexamining the affective advantage of peer feedback in the ESL writing class. Journal of Second Language Writing, 4, 209-222.

XI. APPENDIX

Listing 1. Complete code

```
Sub MAIN
 REM NAME THIS MACRO: COMPARE
 REM OPEN USER PATHS TO DISK
 On Error Goto PROBLEM       'send to error handler if no file
 Open "c:\compare.txt" For Input As #1
 Read #1, ADraft$, AReDraft$
 Close #1
START:
 On Error Goto OVER      'Error handling is over so jump to end of sub on error
 REM SEND TO FUNCTION TO INCREMENT
 ADraft$ = Increment$(ADraft$)
 AReDraft$ = Increment$(AReDraft$)
 REM CREATE USER DIALOG BOX
 ADraft$ = InputBox$("Where Is your first draft?  " +  "Include the whole PATH. " + " Example:
C:\ENG\COMP1\25.TXT", "First Draft", ADraft$)
 ARedraft$ = InputBox$("Where Is your second draft?", "Second Draft", ARedraft$)
 REM SAVE USER PATHS TO DISK
 Open "c:\compare.txt" For Output As #1
 Write #1, ADraft$, ARedraft$
 Close #1
 REM MACRO RECORDED MENU ACTIONS
 FileOpen .Name = AReDraft$, .ConfirmConversions = 0, .ReadOnly = 1, .AddToMru = 0, .PasswordDoc = "",
.PasswordDot = "", .Revert = 0, .WritePasswordDoc = "", .WritePasswordDot = ""
 ToolsRevisions .MarkRevisions = 0, .ViewRevisions = 1, .PrintRevisions = 1
 ToolsCompareVersions .Name = ADraft$
 Goto OVER     'If there is no error, skip error handler
PROBLEM:
 ADraft$ = ""
 AReDraft$ = ""
 Err = 0
 On Error Goto OVER
 Goto START
OVER:
End Sub


Function INCREMENT$(File$)
```

```
        REM INCREMENT THE FILE IF IT IS A NUMBER
        File$ = LTrim$(File$)
        Letters = Len(File$)
        FileEnd$ = Right$(File$, 4)
        For i = (Letters - 4) To 0 Step - 1
            If Mid$(File$, i, 1) = "\" Or Mid$(File$, i, 1) = ":" Then
                FileMid$ = Mid$(File$,(i + 1),((Letters - 4) - i))
                FileFront$ = Left$(File$, i)
                i = 0
            End If
        Next i
        If Val(FileMid$) <> 0 Then
            FileNumber = Val(FileMid$)
            FileNumber = FileNumber + 1
            File$ = FileFront$ + LTrim$(RTrim$(Str$(FileNumber))) + FileEnd$
        End If
        Increment$ = File$
    End Function
```

1)

Listing 2. The 43 error types and explanations

1) ABBREVIATION: Abbreviations follow rules, such as the use of periods and commas before and after the abbreviations. Additionally, in more formal writing, such as business communication, abbreviations should be avoided and all words written out to assure better understanding on the part of the reader, e.g., Mr. Smith Ph.D. can't come next week.

2) ADJECTIVE: Incorrect adjective used to modify noun or pronoun, e.g., This is an interested story.

3) ADVERB: An adjective was used to modify a verb instead of an adverb, e.g., She certain is smart, but she is also stubborn.

4) ARCHAIC: The use of words that are out of date or not in common use, e.g., We can all go, albeit we must go separately.

5) ARTICLE: Incorrect use of: a, an and the.Many words require the use of an article preceding them; Chinese EFL students often forget articles or use them incorrectly,e.g., A teachers had already distributed the tests to the class, e.g., The student claimed it was a honest mistake,e.g., We sell our products in North American Market.

6) CAPITALIZATION: Letters at the beginning of a sentence and the personal pronoun 'I' are checked for correct capitalization, e.g., THere was a book on the bed, e.g., Tomorrow, i want to visit Bill.

7) CLAUSE: Subject and verb must together form a complete thought.A dependent clause that is not a complete thought must begin with a subordinating conjunction, e.g., James went to the tennis match. Even though it was raining.

8) COLLOQUIAL: Colloquial phrases are often used in spoken English but are not appropriate in business writing, e.g., The director will make a decision when he is good and ready.

9) COMMA SPLICE: Two or more independent clauses, or complete thoughts, are joined by only a comma, e.g., He smokes when he is working overtime, it keeps him awake.

10) COMPARATIVE/SUPERLATIVE: The incorrect use of comparatives like 'more' and 'most,' e.g., It would be even more better if we all could go.

11) CONJUNCTION: A conjunction is used as a coordinating or a subordinating conjunction, e.g., We had to choose between English or French.

12) CUSTOM: These errors are the expanded data base, including common errors of Chinese students, e.g., I have ever been to America, e.g., Go in and open the light, e.g., I learn English every week.

13) DOUBLE NEGATIVE: Two negative words together is not acceptable in most written English, e.g., There was not never any doubt that he would go.

14) ELLIPSIS: The correct usage of ellipsis between words is: ' . . . ' and at the end of a sentence is: ' . . . .' Spaces are required before, between and after each period, e.g., They are white, red, yellow, blue.....

15) ENDING PREPOSITION: The use of a preposition at the end of a sentence should be avoided, e.g., He moved to an office near the people he works with.

16) INCOMPLETE SENTENCE: Usually, a sentence needs a subject and a verb; this error is when one of those is missing, e.g., Our wonderful president who devoted many years of service.

17) INCORRECT VERB FORM: The incorrect form of the verb, e.g., I will bought it next week.

18) INFINITIVE: The incorrect use of the present tense of a verb in its infinitive form, e.g., I hope graduate in June.

19) JARGON: Jargon is not known to a general audience and should be avoided when possible. This error often occurs when the writer uses an electronic dictionary for a translation from Chinese to English, e.g., Let us interface next week over lunch.

20) LONG SENTENCE: Sentences longer than that specified amount in the software (often set at 30). Shorter sentences are easier to understand and have less chance of containing errors, e.g., There are tables for scuba divers showing how fast a diver may ascend safely, but these tables make the assumption that the diver descends, remains at the same depth for some time, and then comes to the surface, which is not necessarily so.

21) NOUN PHRASE: Words missing from a phrase or a number disagreement with the phrase, e.g., He drove motorcycle, e.g., I purchased nine magazines and book.

22) NUMBER USAGE: Numbers should be spelled out when: smaller than 11 or at the beginning of a sentence. Numbers that are degrees, percentages, times, dates, page numbers, money, should be written as Arabic numerals, e.g., 5 years are required to graduate, e.g., It is made of one hundred percent cotton.

23) OVERSTATED: Wordy sentences that are vague and difficult to understand, e.g., At the conclusion of the meeting, everyone in attendance departed for their homes.

24) POSSESSIVE FORM: Possessives are words that show ownership, usually of a thing. Possessives are often followed by a noun. It is often the case that if a plural noun is followed by another noun, the plural noun should be a possessive, e.g., The secretarys desk was covered with work.

25) PREPOSITION: Normal usage dictates which prepositions are used with which words or phrases. Although a preposition may appear to follow all grammatical rules, if it is not normally used then it should be revised. e.g., Everyone in our office must comply to the new regulations.

26) PRONOUN CASE: Incorrect use of pronouns when being used as subjects or objects in the sentence. Also found in this group are incorrectly used possessive pronouns, e.g., Everyone has their own goal, e.g., The television is for you and I.

27) PRONOUN NUMBER: Pronouns take the place of nouns in a sentence. They must agree in number with any verbs in the sentence, e.g., This error is caused when the number of the verb and pronoun are not in agreement, e.g., They was going to the fair

28) PUNCTUATION: Common punctuation errors such as commas and semicolons as well as incorrect use of spaces before and after punctuation (a very common error for Chinese EFL students), e.g., While most would agree Chinese is a difficult language to learn ,

29) it is useful if you want to do business in Asia .

30) REDUNDANT: Words that repeat the same meaning, e.g., raise up, past history, cash money, e.g., Once you use a computer, you will never revert back to using a typewriter.

31) RELATIVE PRONOUN: Relative pronouns introduce restrictive and non-restrictive clauses (which, that, who). This error is the incorrect use of the relative pronoun, e.g., Her green coat, that she bought in February, has a tear.

32) REPEATED WORDS OR PUNCTUATION: This error is most often caused by typing error. Punctuation, in English, does not repeat. One period at the end of a sentence is always enough, e.g., We all like to travel to to Canada, South America, the United States, etc..

33) RUN-ON SENTENCE: A run-on sentence is simply too long or is actually two sentences together. The overuse of commas or conjunctions causes this error. As a general rule, shorter sentences are easier to understand, e.g., My name is Chaur-Sheng Jan, I went to the National Tax Bureau, which is in Jang-Huah County, and had an internship during my summer vacation.

34) SENTENCE VARIETY:Starting many sentences with the same words or structures gives a bad impression. Change some sentences so that the sentences do not seem monotone, e.g., I would like you to ship before June 20. I could open a letter of credit in your favor within the week. I will wait for your decision.

35) SIMILAR WORDS: Some words are often used wrong because they have the similar spellings or sounds to other words, e.g., We got the book form her mother, e.g., The words sited are from Shakespeare.

36) SPELLING: Spelling or typing errors are easy to correct, yet make an important impression on the reader, e.g., The acter, who is a techer, had the leading part.

37) SPLIT INFINITIVE: A word, phrase or clause that comes between the infinitive 'to' and the verb. Avoid the split infinitive structure because it makes the main idea harder to understand, e.g., Steve wants to quickly finish this project.

38) SPLIT WORDS: As English changes, words often merge together, e.g., basketball. A modern dictionary will help to avoid splitting words that belong together, e.g., The quality of this product is out standing.

39) SUBJECT/VERB AGREEMENT: Verbs must agree with their subjects in voice and number, e.g., The overcoat in the market are very heavy, e.g., My mother always encourage me.

40) TENSE SHIFT: A change in the verb tense, in one sentence, that makes the sentence difficult to understand, e.g., As long as a person could concentrate his attention, he will be successful in whatever he did.

41) TRADEMARK: Trademarks often follow unconventional capitalization. The writer should make sure of the specific capitalization, such as: WordPerfect, Band-Aid, etc., e.g., He bought some scotch tape while listening to a walkman.

42) VAGUE ADVERB: Vague adverbs are commonly used in spoken English but make written English weak. Words such as: for example, awfully, pretty, really, kind of, etc., all hurt formal writing, e.g., He found her speech pretty interesting.

43) VERB OBJECT: A verb object is a noun or pronoun that comes after a transitive verb. An error occurs when the object of a verb is missing, e.g., She fixed up.