The University of Hull

A comparative experimental study of face-to-face and web-based English for Special Purposes vocabulary learning.

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Abstract

This study investigates the comparative effectiveness of a web-based presentation of English for Specific Purposes vocabulary with face-to-face teaching. The main research questions are as follows. Is there a difference in vocabulary gain between those learners who used the web-based learning materials and those who were taught in a classroom situation? Is the language level of the learners correlated with the number of items learned? What are the experimental subjects' attitude towards the web and paper-based exercises and do they differ between the two groups? What are the learning style characteristics of police officers students at the Academy and how far does Author Plus Online, the system used, meet the learning style needs of these learners?

The study involved 27 police officer students at the Public Service Academy aged between 18 and 25. They were divided into three groups. Group 1 learned a set of words from web-based material prepared using Author Plus On-line; Group 2 used paper-based materials while Group 3 acted as a control. The words were selected from an ESP corpus developed for police officers. The subjects were tested on their language level using an Oxford Quick Placement Test (QPT), their vocabulary knowledge using pre-, post and delayed tests and completed both an on-line Learning Styles Index and a short questionnaire.

A variety of analyses were carried out. A mixed between-within ANOVA analysis was carried out of the mean vocabulary gain scores of the two experimental groups to determine if there was a significant difference between them. A T-test was used to explore correlations between language level as shown by the QPT and vocabulary gain for all group subjects. Data from the Learning Style Index were used to evaluate Author Plus' potential to meet the learning style profile of the subjects in the study.

The results indicated that there was a significant improvement in the vocabulary knowledge of both experimental groups but that there was not a significant difference between them. Language level was found to be correlated both with vocabulary knowledge and vocabulary gain over the three tests. The police officers had positive evaluations of both sets of materials. Author Plus, used with face-to-face interactions, has the potential to be an effective way of learning ESP vocabulary.

Contents

Acknowledgements

Tables

Figures

List of Appendices

1.0 Introduction

1.1 Context

This study will examine the comparative effectiveness of face-to-face classroom based English for Special Purposes (ESP) vocabulary teaching with a web-based presentation of the same vocabulary to police officers at the Public Service Academy in Estonia.

The teachers at the Academy have been asked to develop web-based learning materials using a commercially available program (Author Plus On-line) so that some vocabulary learning, a major component of any course of L2 study, can take place outside class and free up class time for fluency and project activities. This is in an effort to make learning more effective by maximising the use of in-class time for communicative activities and time outside the classroom for more exercise-based activities. It is also assumed that self-directed learning of vocabulary by the learners will result in a more effective meeting of the learners' learning needs in their zone of proximal development (Vytgotsky, 1978), than may be achieved in the necessary agglomeration of learners, materials and lock-step teaching that characterises the classroom learning situation. It is taken as a given that if vocabulary learning can be shifted onto the learners' self-study time this will have a positive effect on the learners' learning. However, this will only be achieved if the vocabulary learning in question is *as* or *more* effective on-line than it is in the classroom and it is the purpose of this study to examine this very question.

1.2 Vocabulary learning

While vocabulary learning is *'only one sub-goal of a range of goals which are important in the language classroom'* (Nation, 2001: 1), reading well in a language depends greatly on a large vocabulary store. As Laufer (1997:20) notes *'it has been consistently demonstrated that reading comprehension is strongly related to vocabulary knowledge,*

more strongly than to the other components of reading.' Laufer argues that a large vocabulary frees up cognitive resources which can be focussed on new or partially known words and for grasping the global meaning of the text.

The size of the task in English for a learner is a daunting one. Estimates of the size of a native speaker's vocabulary range from 12,000 words to over 100,000, though there are problems with such surveys (Crystal 1988, Nation 1993). Crystal (1988) notes the lack of agreement and suggests something about 30,000 words for both receptive and productive vocabulary. Thornbury (2002) suggests 20,000 word families rather than individual words and this distinction between words and word families is an important one. A word family consists of a base word or root with inflections and derivatives (Thornbury, 2002; Nation, 2001). Forms within the word family should be transparent or easily learnable from knowledge of the root form.

The task facing native English speakers and English language learners are different ones though. Read (2000: 1) comments: *'For native speakers, although the most rapid growth occurs in childhood, vocabulary knowledge continues to develop naturally in adult life in response to new experiences, inventions, concepts, social trends and opportunities for learning. For learners, on the other hand, acquisition of vocabulary is typically a more conscious and demanding process. Even at an advanced level, learners are aware of limitations in their knowledge of second language (or L2) words.'* The real task facing L2 learners is not to replicate the vocabulary knowledge of native speakers as that would be an unrealistic task due to the fact that L2 learners have considerably less exposure to English than native speakers but to learn those words which are most useful (Thornbury, 2002; Nation, 2001).

The police officers studying at the Academy have a specialised set of lexis to learn and this study will focus on the relative effectiveness of two ways of presenting and learning these words.

1.3 Computer Assisted Language Learning (CALL)

Computer Assisted Language Learning (CALL) or Computer Assisted Language Instruction (CALI) is a well established field in English language teaching. Early research (cited in Dunkel, 1991) tried comparing groups using computers with a control group using traditional methods ie not using computers. The findings of this comparative research was ambiguous and did not find consistent and clear advantages for the use of computers. Dunkel argued though that *'Systematic evaluation of the effectiveness of all aspects of CALL must continue: however, new focuses as well as methods of research inquiry will need to be developed if we are to gauge correctly the power of the computer to affect different aspects of second language acquisition.'* (p. 23-4)

Conrad (1996) notes that research shifted from comparative studies to looking at the differences between types of CALI. Yet the basic question about the effectiveness of CALL approaches compared to traditional non-computer instruction remains unanswered (Nagata, 1996). Hubbard (2002) suggests that *'a number of influential researchers long ago came to the conclusion that the type of study that pitted CALL against non-CALL was a dead-end, just as happened with "method comparison" (eg audio lingual vs TPR) in the 1970s and 80s.'* (http://www.stanford.edu/class/linguist289/CALL6.htm). Chapelle (1996) also notes a shift away from quasi-experimental research designs towards ethnographic procedures but states that *'despite the value of examining process-oriented data in CALL research there remains a need to assess the outcomes of CALL use.'* (p147).

Hubbard (2002), in a survey of 120 CALL professionals, found four groups of issues: designed-centred issues, effectiveness issues, learner-centred issues and research-centred issues. He notes: *'One of the research questions that motivated this study was what trends could be identified in surveying CALL professionals. …… it is interesting that questions of effectiveness still tend to dominate. In fact, the basic*

questions of "Is CALL effective?" and "Is it more effective than alternatives?" remain popular even among those who have been centrally involved in the field for an extended period of time. Also interesting is the fact that learner-centered issues, particularly those involving learner variables, were identified as important. This takes us back to the earliest days of CALL when the promise of individualization was a commonly mentioned strength of CALL over alternatives.' (http://www.stanford.edu/~efs/callsurvey/discussion.html)

Hulstijn (2000) also notes that *'in the area of language teaching, electronic multimedia hardware and software has replaced the traditional audio and video systems in the language laboratory. Hence, educational research comparing the relative benefits of various teaching techniques and methods is bound to investigate the use of these multimedia systems. Unfortunately, there is far too little research of this type.'* (http://llt.msu.edu/vol3num2/hulstijn/index.html)

1.4 The Study

This study attempts to investigate one use of a multimedia system designed to deliver language learning materials on the web and attempts to consider both effectiveness issues as well as learner-centeredness issues (Hubbard, 2002). In general terms this dissertation seeks to answer this question: *For these particular learners at the Public Service Academy, can vocabulary learning be moved from the classroom to web-based activities using Author Plus On-line, without any loss in learning effectiveness?*

The question then is a comparative one based on a small study of a number of learners in one particular institution studying a sub-set of ESP vocabulary. The complexities in the question will be examined in the methodology section after the literature review which follows.

2.0 Literature review

The first part of this review will consider relevant aspects of vocabulary learning and the second part will look at the issues of learning styles, memory and autonomy. The final part will consider the role of computers in language learning and vocabulary learning.

2.1 The Vocabulary Learning Task

2.1.1 Which words?

West's (1953) 2000 headword General Service List was an attempt to identify which words would be of most use for learners and was partly based on frequency of occurrence, derived by manually counting words in a small corpus and judging their usefulness. It was not until the advent of large computer corpora that West's list was improved on. With these new corpora it became possible to accurately determine the frequency of words and the percentage of texts covered by each word. **Table 1** from Nation (2001) shows the percentage of text coverage of each successive 1000 lemmas[1] in the Brown Corpus.

1000 word (lemma) level	% coverage of text (tokens)
1000	72
2000	79.7
3000	84
4000	86.7
5000	88.6
6000	89.9

Table 1 The percentage of text coverage of each successive 1000 lemmas in the Brown Corpus (Nation, 2001)

After 2000 lemmas the percentage of coverage of successive 1000 lemmas decreases significantly. The first 2000 lemmas cover 80% of texts while the subsequent 4000 lemmas only cover 10% more text.

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[1] A lemma is a headword and some inflected and reduced forms. Sinclair (1991) states that the lemma headword is either the base form or the most frequent form. Bauer and Nation (1983) list the plural, 3rd person singular present tense, past tense, past participle, -ing, comparative, superlative and possessive forms as comprising a lemma. In the Brown corpus superlatives and comparatives are not included in a lemma (Nation, 2001).

Nation and Hwang (1995) suggest that the first 2000 most frequent words in English counted as high frequency words which should be learned. Zimmerman (1997) suggests the first 1000 to 2000 words makes up a *'beginner's vocabulary'* (p14) but cautions that *'the most important words for language learners do not always appear in the first or second thousand words'.*

Nation (2001) claims that *'To read with minimal disturbance from unknown vocabulary, language users probably need a vocabulary of 15,000 to 20,000 words.'* (p20) Laufer (1992: cited in Nation, 2001) suggests that the *minimum* vocabulary level for reading an unsimplified text is 3000 word families. In a study of reading fiction, Hu and Nation (2000) showed that at 80% coverage level, ie one word in five was unknown, learners did not have adequate comprehension of the text. At 90% coverage very few learners understood the text and at 95% coverage (one word in every twenty was unknown) some did but most did not. From this study it seems that a very high percentage of the words in a text have to be understood before the text can be comprehended. Hu and Nation suggest 98% coverage for fiction texts. This is considerably more than the 3000 word families Laufer recommends as a minimum. Adolphs and Schmitt (2003) analysed the CADCODE spoken corpus and found that 2000 word families covered less than 95% of spoken discourse and for 96% coverage about 5000 word families were needed.

Different words have different frequencies but they also have different ranges ie low frequency words are found more often in some texts than others. This means that it is possible to identify those key words which are particular to particular kinds of texts. An example of this approach is Coxhead's Academic Word List (AWL) (Coxhead, 1998, 2000). Coxhead took a small (3.5 million word corpus) of academic texts of a variety of disciplines and analysed it to find words outside the first 2000 word families which were common to all of the disciplines in the corpus and had a high coverage. The result was a list of 570 word families with different coverage of different text types: see **Table 2**.

Levels	Conversation	Fiction	Newspapers	Academic text
1st 1000	84.3%	82.3%	75.6%	73.5%
2nd 1000	6%	5.1%	4.7%	4.6%
Academic	**1.9%**	**1.7%**	**3.9%**	**8.5%**
Other	7.8%	10.9%	15.7%	13.3%

Table 2 Text type and text coverage by the most frequent 2000 words of English and an academic word list in four different kinds of texts (Nation, 2001)

Note the coverage of the AWL for different text types but also how the coverage of the first 2000 word families also depends on the text type. This clearly shows the limitations of applying general vocabulary knowledge to specialised texts and the need for specialised word lists, though the AWL combined with the most common 2000 word families does not give coverage of the 98% level recommended by Hu and Nation (2000) and so remains an incomplete answer for academic learners.

It seems clear from the work cited above that principled decisions have to be taken about which words are to be taught and these decisions should rest on corpus based research.

2.1.2 What does it mean to know a word?

What though does it mean to *know* a word? Thornbury (2002) reduces *knowing* a word to its most basic level of knowing the form and meaning but 'meaning' is itself very complex and goes beyond the basic dictionary definition: *'lexical competence implies more than just knowing what a word means.'* (Ooi and Kim-Seoh, 1996:56).The complex factors involved in knowing a word are listed by Thornbury as: word class, meaning, word morphology, pronunciation, derivations, grammar, collocations, homonyms, polysemes, synonyms and antonyms, hyponyms, lexical fields, register and style and variety, and connotation.

Different words present different kinds of challenges to learners and Nation (1990) terms this the *learning burden* of the word and it is related to the language background of the learner and the learner's previous knowledge of vocabulary. De Groot and Keizer (2000) suggest that cognates and concrete words are easier to learn than abstract and non-cognate words and are also easier to remember. Tinkham (1993) showed that if new words are presented in semantically related sets this can interfere with learning those words and this study was replicated by Waring (1997). In contrast to these findings, Svenconic and Kerst (1995) found that there was no difference in learning words in tight, moderate or loose semantic groups, but that the learners preferred to learn words which were closely connected in a semantic set, though this study was of absolute beginners with limited computer skills.

2.1.3 Patterns and Collocations

Hunston et al (1997) state that all words are associated with particular patterns and that *'Patterns are not idiosyncrasies of form: they also have meaning.'* (p 125) These patterns have to be learned by the learners and this complicates the learning task though the regularity of the patterns can help the learner. Bahns (1993) points out that although there are tens of thousands of collocations not all of them need to be learned.

2.1.4 Vocabulary Teaching: Research and Teaching

Vocabulary teaching has often been neglected, even ignored, by the profession (Harlech-Jones 1983, Morgan and Rinvolucri 1986, Oxford and Scarcello 1994). Since the late 1980s though there have been attempts chiefly by Nattinger and Decarrico (1992), Willis (1990) and Lewis (1994) to push vocabulary into a more prominent position in language teaching which has always been dominated by grammar teaching but Zimmerman (1997) observed *'the teaching and learning of vocabulary have been undervalued in the field of second language acquisition (SLA) throughout its varying stages and up to the present day.' (p5)*. Gass (1988) pithily notes: *'Despite the obvious*

role of the lexicon, it has had a unique place in second language research. It's

uniqueness can best be characterised by lack of focus.' (p93)

Approaches to vocabulary teaching

Ooi and Kim-Seoh (1996) urge that vocabulary instruction should be about more than just focusing the learner's attention on the dictionary meaning. They suggest presenting a *'fuller range'* of a lexical set, though not the complete lexical set; present at least one collocation; to think in terms of activities rather an vocabulary lessons and to teach vocabulary through reading.

Coady (1997) states that there are four main positions as regards vocabulary teaching and placed these on a continuum, shown in **Figure 1**.

1.Context alone	2. Strategy Instruction	3. Development and Explicit Instruction	4. Classroom Activities

◄─────────────────────────────────────►

Figure 1 Approaches to vocabulary teaching (Coady, 1997)

Barcroft (2004) suggests a more detailed continuum from incidental to intentional and this is represented in **Figure 2**.

Incidental vocabulary learning	Lexical requirements for learning	Input enhancement and text-based factors	Vocabulary learning strategies	Combined indirect and direct vocabulary instruction	Methods of direct instruction
Incidental					**Intentional**

◄─────────────────────────────────────►

Figure 2 Overview of second language vocabulary acquisition (Barcroft, 2004)

Oxford and Scarcello (1994) though argue that both direct and indirect instruction are needed as they both promote language development.

In an experimental study Hulstijn (1992) concludes that the chances of remembering the meaning of a word met in a text which has been read for its content is quite small. Knight (1994) suggests that significant incidental vocabulary learning does occur in similar circumstances but that those students who used dictionaries leant more words than those who did not do so.

Nassaji (2003) claims that learners have a low success rate of inferring vocabulary meaning for themselves from the surrounding context. In the study the texts were chosen carefully so that the learners already knew over 95% of the vocabulary.

Fukkink et al (2001), in a study of 30 learners, suggest that single contexts can only offer partial knowledge to the learner and that word knowledge is not *a one-dimensional concept, ranging from "no knowledge" to "complete knowledge".' (p 479)* They suggest that learners have to add to their word knowledge and unlearn false attributes in their hypothesized word definition.

These studies seem to suggest that incidental vocabulary learning is not very effective and that there is a need for focussed vocabulary learning tasks and one would have thought that this would be even more important in an ESP class where the vocabulary needed is not the general English widely available from many sources and indeed it may not even be evident to the learners which language they should learn.

Methods of Instruction

Barcroft (2004: 203) suggests five principles that can act as *'positive driving forces in L2 vocabulary acquisition.'* These are:

1. present new words frequently and repeatedly in the input.
2. use meaning-bearing comprehensible input when presenting new words
3. limit forced output during the early stages of learning new words

4. limit forced semantic elaboration during the initial stages of learning new words

5. progress from less demanding to more demanding vocabulary-related activities

    Barcroft (2004: 203)

Swain (1995) and Izumi and Bigelow (2000) argue though that output (semantic elaboration) improves the use of a form and can encourage the learner to notice gaps between what they want to produce and what they *can* produce thus acting as a feedback stage.

Exercises

Paibakht and Wesche (1997) listed five distinct categories of vocabulary exercises to be used with texts:

1. selective attention

2. recognition

3. manipulation

4. interpretation

5. production

In their study learners who underwent the reading plus exercises treatment learnt more vocabulary than those who had reading alone. This suggests that instruction can make vocabulary learning more effective.

Prince (1996) compared the roles of context and translation in vocabulary learning and decided that translation was a *'low-effort strategy'* (p481) while contextualised vocabulary learning means that the learner needs to anticipate and infer meaning. While learning in context reinforces that fact that words are used in context and provides information about how they are used, Prince argues that *'effective learning of words requires a stage in which the word is in fact isolated from its context and submitted to elaborate processing.'* (p481)

In a study which suggests that instruction and practice of the lexical items helps with retention of the vocabulary, Lee (2003) experimented with a group of 65 secondary school students and found that those who read texts and completed comprehension exercises were able to use 13.19% of the target vocabulary compared with 63.62% for those who also had to write a composition.

2.2 Learner factors

2.2.1 Learning styles

Oxford and Ehrman (1993) list a number of factors which vary with individual learners: aptitude, motivation, anxiety, self-esteem, tolerance of ambiguity, risk-taking, language learning style, age and gender. Of these, in the context of this study, the most relevant may be learning styles as the teacher *may* be able to target different materials at learners with differing styles while not being able to do so with learners of different ages and so on.

Gregorc (1979: 234) defines a learning style as *'distinctive behaviours which serve as indicators of how a person learns from and interacts with his (her) environment.'* Cornett (1983: 9) notes that learning styles are consistent overall patterns with a range of variability, while Keefe (1979) suggests that learning styles are relatively stable.

Oxford and Ehrman (1993) note four sets of oppositions in learning styles which can be seen in **Table 3** but note that learner should '*extend themselves beyond their 'stylistic comfort zone' to use learning strategies that might not initially feel right.'* (p 198)
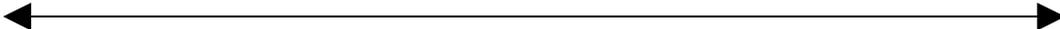
Analytic style		vs		Global style		
Visual preference	vs	Auditory preference	vs	'Hands on' (combination of kinaesthetic/movement oriented and tactile/touch oriented preferences)
Intuitive/random learning		vs		Sensing/sequential learning
Orientation to closing – the degree to which a learner needs to reach a decision ◄──────────────────────────────────────►						

Table 3 Learning Styles (Oxford and Ehrman,1993)

Baldwin and Sabry (2003) argue that learners learn better when the information is presented in line with their preferred learning style and that learning systems should be prepared on the basis of learners actual styles and in their design of an interactive learning system used the Index of Learning Styles developed by Felder and Soloman (1999).

Ehrman and Oxford (1989, 1990) favour the Myers Briggs Type Indicator and suggest that intuitive (abstract and random) L2 learners seemed to favour strategies which are more communicative than sensing/sequential learners.

The research cited here, which is part of a larger body of research, certainly indicates that there are learner differences in learning style which it would be ideal, if practical, to cater for.

2.2.2 Memory

Another important factor in vocabulary learning is memory. Pimsleur (1967: 73) notes that *'the sheer volume of vocabulary to remember precludes recalling all of it every day'* and suggests a *memory schedule* of *'graduated interval recall'* (p 75) to boost memories on the theory that each time it is boosted then it becomes stronger.

Mondria and Mondria-de-vries (1994) suggest that memorising words comes in the third *'consolidation'* stage of learning vocabulary after the initial presentation stage (with or without different kinds of context) and the second stage of semanticizing where the meaning becomes clear. They say that traditional methods of learning vocabulary using lists in coursebooks, a vocabulary book or vocabulary notebooks are inefficient for a number of reasons. Words differ in their difficulty so that some words are overlearnt; one list will not be suitable to different learners; learning words in a list can result in the 'list effect' where words are known in the context of a list but not outside it and often the words do not occur frequently enough.

While in this study there will be no specific focus on boosting the memories of learners through a learning schedule as suggested by Pimsleur (1967), the lack of any such intervention will be noted and any attrition of vocabulary gain will be attributed in part to a deficit in memory performance, focussed revision or activation of vocabulary learned. The vocabulary instruction sequence will attempt to cater for Mondria and Mondria-de-vries' (1994) consolidation phase.

2.3 The Role of the Computer in Language Learning

2.3.1 The Three Stages of CALL

Computers have been used in language English learning for about thirty years. Warschauer (2000) outlines three stages of pedagogical changes in CALL (see **Table 4**), in which developments in technology (from mainframe to multimedia and internet connected PC) have been paralleled with developments in pedagogy (from structuralism to knowledge construction).

Stage	1970s–1980s: Structural CALL	1980s–1990s: Communicative CALL	21st Century: Integrative CALL
Technology	Mainframe	PCs	Multimedia and Internet
English-teaching paradigm	Grammar translation and audio-lingual	Communicate (sic) language teaching	Content-Based, ESP/EAP
View of language	Structural (a formal structural system)	Cognitive (a mentally constructed system)	Socio-cognitive (developed in social interaction)
Principal use of computers	Drill and practice	Communicative exercises	Authentic Discourse
Principal objective	Accuracy	And fluency	And agency

Table 4 Three stages of CALL (Warschauer, 2000).

Warschauer notes though that *'I do not want to suggest that these stages have occurred sequentially, with one following the other, from "bad CALL" to "good CALL". At any one time, any of these may be combined for different purposes. However, there has been a general trend or development over the years, with new ideas and uses of computers being introduced in combination with those previous.'*

Bax (2003) complains that the above typology has not been used consistently, that there is some question whether they are historical phases or not, and that all three continue to exist simultaneously. He goes on to question whether communicative CALL is indeed communicative and whether integrative CALL, based on task-based and project-based learning (Warschauer and Healey, 1998), both part of *communicative* language teaching, can be considered a new *integrative* approach. He suggests that the whole typology is useful but flawed and argues for three new categories which are not *phases* but *approaches* and as such can co-exist.

These three approaches are *Restricted CALL,* limited in software and activity type with correct/incorrect feedback and with the teacher's role as monitor; *Open CALL*, that is open to different software types and with more flexible open feedback focused on skills development; and *Integrated CALL* which is normalised in teaching as a small part of each lesson and with the teacher acting as facilitator (Bax, 2003). Bax sees Integrated CALL as something which is *'an aim towards which we should be working.'* (p22). He notes that *'we could argue in general terms we are in an Open phase of CALL, but that each institution and classroom may also exhibit certain Restricted and even Integrated features'* (p23)

Frommer and Foelsche (1999) state that an early goal of CALL was to *'provide students with opportunity to practise grammar and vocabulary so that class time could be devoted to more communicative activities'* (p116) and this suggests that early developers were aware of the limitations of their creations. Higgins (1985) noted that *'mass teaching imposes a single pace on a class'* (p168) and that computers can alleviate this.

Warshauer (2002) argues that the role of the computer has changed from being a *tutor* to being a *tool* and that there are new electronic literacies such as using the computer for keyboarding, for finding information and critically evaluating that information, the ability to produce and interpret complex multimedia documents and the literacy of using the computer for computer-mediated communication. Similarly, Harrington and Levy (2001) distinguish between the computer as a tutor - Intelligent CALL- and the computer as a tool – computer-mediated communication CALL.

2.3.2 The Effectiveness of CALL

While there has been relatively little recent research into the effectiveness of computer assisted language learning (Hulstijn, 2000), some papers examine effects and features of CALL and these are examined below.

2.3.3 Restricted CALL

In an early study, Kleinmann (1987) compared twenty commercially available CALL packages with non CALL materials and found that there were no significant differences in reading achievement and concluded that the CALL programs were little more than electronic textbooks.

Ikeda (1999) suggests that drill type activities are more effective for repetitive practice, which can consolidate vocabulary and grammar knowledge.

Palmberg (1988) found that a text-based computer game proved to be effective in teaching a set of 50 words and that 35 words were recalled after the experiment. In a further study of an adventure game Cheung and Harrison (1992) found vocabulary learning gains.

Sullivan and Pratt (1996) compared two ESL writing environments – a traditional classroom and one where computers were used as well and found writing did improve with computer use, where the teacher's role was minimized.

Nutta (1998) found that there was no significant difference between grammar scores on multiple-choice and cloze tests between students who had computer-based instruction and those with teacher instruction, though the computer-based students had higher scores on open-ended tests.

2.3.4 CALL for Vocabulary Learning

There have been a number of studies of the reading process (Chun and Plass, 1997), and the effectiveness of glosses (eg Hulstijn 1993, De Ridder 2002, Lomicka 1998 and Gettys et al 2001); on incidental language learning using computers (Brett, 1998); on incidental vocabulary learning and using dictionaries (Hill and Laufer, 2003); and the effect of hyperlinks (De Ridder, 2002) and hyper-media (Coll, 2002); and listening and

vocabulary acquisition (Jones and Plass, 2002, Vidal, 2003) but these have not focussed on the effect of *explicit* vocabulary presentations which is the subject of this dissertation and of the literature available to this researcher through Hull and Stirling University libraries there was little of direct import to this study. .

Fox (1984) analysed two forms of CALL for vocabulary learning, that which provided uncontextualised exercises demanding one word answers and that which consisted of rebuilding or unscrambling a text which formed a context. Fox notes that *'the exercises described here encourage students to treat the computer not so much as a drill master but more as an information source, which offers hints or clues to help them complete their tasks or which positively encourages guessing.'* (p23)

Labrie (2000) compared learning 25 French words to do with the body with a computer and with traditional methods and found that the computer was more efficient in that less time was spent for the same learning effect.

Liu and Reed (1995) combined video of the film *Citizen Kane* with hyperlinked vocabulary definitions and found a positive effect on post-test and retention test scores with no significant effect of learning styles.

Cobb et al (2001) in an experiment on reading in French with on-line audio and dictionary word look-up facilities found that such help can improve vocabulary learning significantly.

Overall though, Horst et al (2005) note that *'few of the many vocabulary activities available on-line have been studied in any detail to determine their effectiveness for language learning.'* (p90) They also argued that few vocabulary resources are corpus based or offer multiple contextualised examples but mostly consist of poor interaction

with definition matching exercises which are not followed up by review and expansion activities in new contexts.

2.3.5 Vocabulary Learning Systems

A number of researchers have attempted to construct computer-based vocabulary learning systems which reflect the theory of L1 and/or L2 vocabulary acquisition.

The ALEXIA system (Chanier and Selva 1998) is described as a *computer assisted lexical learning environment of French as a foreign language*. It consists of a corpus of 400 texts for reading, a general dictionary, a personal dictionary and a lexical activities unit which includes graphic display generation of direct synonyms.

Gilbert et al (2001) describe a VOCAL – a multimedia **VO**cabulary **C**oncordance and **A**cademic **L**exis system which combines concordance and collocation software so that learners using VOCAL can analyse a text, sort the vocabulary in the text by vocabulary type and frequency and find collocations from four corpora. The authors admit that it is *'difficult to integrate into the ESP classroom.'*

The final example is the CAVOCA - **C**omputer Assisted **VOC**abulary **A**cquisition - programme described by Groot (2000). The program consists of modules of 25 words with four parts to each module. Completing each module takes about 50 minutes. However, a series of quasi-experimental of comparisons with learning with bilingual lists are reported by Groot and the results suggest that *high* level L2 learners can achieve greater receptive knowledge using the bilingual lists than by using CAVOCA.

These three examples share the fact that they are university led attempts to supply vocabulary learning solutions to learners and which, in the case of the ALEXIA and VOCAL systems, differ considerably from current paper-based or electronic materials found in English language learning CD-ROMs, and are divorced from the experience

and knowledge of language teachers like those teaching at the Public Service Academy. These are unlikely ever to be normalised into the curriculum as Bax (2003) suggests they should be.

2.3.6 Visual Effects and the Cognitive Theory of Multimedia Learning

Looking in more detail at multimedia learning, Chun and Plass (1996) found that words which were annotated with both visual and verbal information were recalled or learned better than those with only visual or verbal information. Similarly Korst et al (1999), in a study of students of German, found that those students who had textual (English translation) and pictorial glosses of words in texts learnt the target words better than those with just pictures or text to support them. Lomicka (1998) in a small study of 12 learners used think aloud protocols to examine glossing while reading online in French and found that full glosses prompted more causal inferences and suggests that full glosses may promote a deeper level of text comprehension.

In a review of the literature on electronic whiteboards, Smith et al (2005) caution that *'It is not certain whether verbal and visual information are always best presented together and if dynamic visuals are always better at promoting understanding than static visuals.'* (p97)

Sakar and Ercetin (2005) studied 44 adult EAP intermediate level learners and found that learners prefer visual annotations significantly more that the textual or audio annotations options. They also found a negative relationship between annotation use and comprehension and suggest that lower level learners may not be able to process additional information and that *'multimedia information may have deleterious effects when a single channel is overloaded.'* (p36)

Merlot and Gaonac'h (1994) found that pictures *hindered* learners' comprehension of spoken language because of the attentional resources needed to process the pictures

on top of that required to understand the speech. Later Merlot (2000) found similar effects especially for beginners and intermediate students and stated: *'A fairly common instruction strategy consists in presenting oral dialogues along with static or animated pictures. However the actual learning effectiveness of such displays has seldom been evaluated.'* (p148)

However, Jones and Plass (2002) found that when listening to a short historical account in French those students who had access to written and pictorial annotations remembered the word translations and remembered the passage better than those with only one type of annotation or with none. They suggest that this confirms Mayer's (2001) Generative (sic) Theory of Multimedia Learning (p557) (see **Figure 3**).
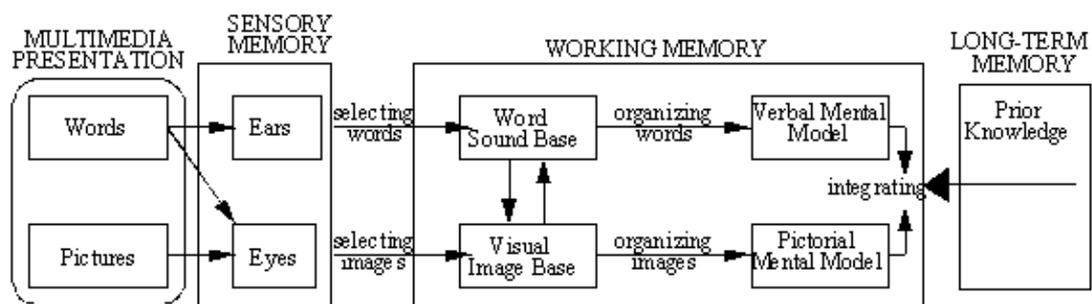
Figure 3 Cognitive theory of multimedia learning (Mayer, 2001: 44)

This theory is based on three assumptions. The first of these is Paivo's (1986) *dual-coding* approach where the learner can make connections between visual and verbal (or auditory) materials so that the visual and verbal representational systems are both engaged in effective learning. The second is that there are two channels for visual and auditory information, that there are limits to the processing capacity of either of these two channels and the third is that learning comes from being actively engaged in processing relevant incoming information, organising that information into mental representations and integrating these representations with other existing knowledge (Mayer, 2001).

Gyselinck et al (2000) argue that the integration of texts and illustrations means that learners have to use their visuospatial working memory and although this improves comprehension, they suggest that their data show that teachers should consider the limitations in the cognitive resources available to the learner to devote to a task while learning.

In a small study of 13 second year German students, Chun and Payne (2004) concluded that students who had a lower verbal working memory capacity used the look-up feature of the programme to compensate for their working memory limitations. They suggest that a rich multimedia environment increases the cognitive load on students and this can have an impact on comprehension.

Sakar and Ercetin (2005) argue that Mayer's principles are based on research on how native speakers learn and that this might mean that these findings are not wholly applicable to those learning English as a second language.

There seems to be a lack of agreement in the literature of the efficacy of presenting second language learners with multiple channel media and suggests that individual learner factors and abilities could be crucial.

2.3.7 CALL and learner autonomy

Hoven (1999) argues, in a study of listening comprehension in multimedia environments, that computers can be used to scaffold learners' development to a more autonomous state, through awareness raising activities, and by providing different entry points and modes of interaction which would allow greater learner control.

Brandl (2002) devised a set of lessons for reading on the web, which ranged from teacher-centred to student-centred. The student-centred lesson enabled the learner to take responsibility for the learning process and the outcomes.

In a small study of learning poetry in English Sanpraser (2005) compared paper-based materials with an on-line presentation and concluded that as the on-line materials allowed different entry points then it fostered learner autonomy. This is one of very few studies of a comparative nature between paper-based and computer-based materials but because of its extremely small sample size (10 subjects) not generalisable.

Barnett (1993) warns that *'self access in general and computer applications in particular, can easily fall into the trap of either leaving learners too much alone, overwhelmed by information and resources, or directing them too much by transferring lockstep classroom methods to organisation systems and programs.'* (p295). Braganorte (2005) found in an experiment that the learners had been given too many decisions to make.

Oliver et al (no date) in a web paper discuss the factors involved in the creation of effective web-based materials and contrast the general linearity of paper-based instruction with instructional material on the web having the potential to be linear, hierarchical or totally unstructured. They note however, that when the material is aimed at developing the learners' initial knowledge a linear progression is appropriate and this is so for the materials in this study.

2.4 Literature review conclusions

In this necessarily brief literature review some findings seem clear.

There is a need for principled vocabulary instruction based on vocabulary selected from appropriate corpus research. Incidental vocabulary learning is not efficient enough to meet the requirements of the vocabulary learning task.

Word meaning is a complex issue and there are several factors which need to be dealt with when teaching/learning a word and preparing materials to do so.

Learner factors such as learning style should, if possible, to be taken into account when designing learning tasks.

Within CALL there are a number of valid options – in Bax's (2003) terms: Restricted, Open and Integrated CALL, all of which are represented in language teaching today to one extent or another.

There have been some attempts at complex vocabulary learning systems but these are outside of the mainstream ELT materials and experience while, in contrast, the system being used at the academy, Author Plus, is within this experience and is more of a tutor than a tool (Warshauer 2002).

The efficacy of multi media presentations to all language learners still needs to be demonstrated.

3.0 Statement of Purpose

My aim in the present study is to explore the question of whether a web-based presentation of ESP vocabulary learning materials is as or more effective than face-to-face teaching, using the Author Plus On-line system.

The study will focus on the teaching and learning of ESP vocabulary for police officers at the Public Service Academy.

This will involve the selection of a set of words to be learned from a specialised corpus, the preparation of paper-based and web-based learning materials, the development of vocabulary tests and a questionnaire.

The learning will be measured through written vocabulary knowledge tests and this will be analysed to find out is there is a difference in vocabulary gain between the groups and whether any difference is significant. The data will also be analysed with reference to level to determine if there is a correlation between language level and learning achievement. The learning style data will be used to evaluate Author Plus as a learning system.

This analysis may help the teachers at the Academy to determine whether it is advisable to invest time and resources in developing further web-based learning materials for their students or for certain learners in particular.

4.0 Research Methodology

My research is intended to be a quasi-experimental study with a control group and different treatments under controlled conditions as far as that is possible. It is designed to be systematic and logical with a clear structure and based on quantifiable data. The research could be replicable in the future, if the same programs and procedures are used and it is intended to discover whether there are any patterns which might support the further adoption of web-based presentation of learning materials to support classroom based learning.

The main research questions are as follows:

One

Is there a difference in vocabulary gain between those learners who used the web-based learning materials and those who were taught in a classroom situation?

Two

Is the language level of the learners correlated with the number of items learned?

Three

Is there a correlation between prior experience of computers and/or computer-based learning and the effectiveness of the web-based learning materials?

Four

What are the experimental subjects' attitude towards the web and paper-based exercises and do they differ between the two groups?

Five

What are the learning style characteristics of police officers students at the Academy and how far does Author Plus meet the learning style needs of these learners?

4.1 Research Methodology for Question One

Is there a difference in vocabulary gain between those students who used the web-based learning materials and those who were taught in a classroom situation?

4.1.1 Background

The language centre at the Public Service Academy is adopting the Author Plus On-line package but its effectiveness for vocabulary learning needs to be determined.

There is limited time for face-to meetings in courses so there is a need to move vocabulary learning into learners' self-study time. Courses at the Academy language centre are 40 contact hours plus 40 hours self-study time. Future police officers will have to complete two such courses which, in contact hours, are insufficient for the vocabulary learning task. By providing on-line vocabulary learning learners will be given the responsibility of learning which of the words they feel they need to learn.

The Author Plus On-line package is a commercially available package used widely eg by the British Council, so a wide range of people might be interested in the results.

From the literature review it is clear that effectiveness of web-based English language vocabulary learning (or even classroom-based learning) is still to be established and it is also unclear which learning styles are congruent with which materials (Hubbard 2002). In addition corpus informed vocabulary materials are rare.

Data Required

The quantitative data required are listed in **Table 5.**

Data	Source
Age	Questionnaire
Male/female	Questionnaire
Language level	Test using paper-based Oxford Quick Placement Test
Learning style	Online test
Vocabulary item knowledge	Pre-test results
Vocabulary item knowledge	Post-test results
Vocabulary item knowledge	Delayed post-test results
Self-reported computer skills and prior experience of on-line learning	Questionnaire
Evaluation of learning experience	Questionnaire

Table 5 Data and Sources

4.1.2 Subjects

The subjects of the study were a convenience sample of police constable learners studying at the Police College of the Academy. All the learners were in their final semester of English and had had two previous semesters at the Academy language centre over their three years of studies. They were preparing for their final examination in English and were expected to be at a B2 level on the Council of Europe Common European Framework.

Their final semester started in November 2005 and ran for 20 lessons (40 contact hours of 45 minutes each) to the end of January 2006. Each lesson lasted for 90 minutes.

The four groups available for the study were taught by two teachers. Two groups were merged for the web-based materials experimental group. The classes were a mixture of male and female police officers and of approximately the same age. Of the potential 42 subjects only 27 completed the full range of tests and procedures.

The learners were tested with the Oxford Quick Placement test at the beginning of the course. The Oxford Quick Placement test is a valid test for placement purposes and was extensively trialled with 5000 candidates during development (OUP 2001). Each class had a range of language abilities as shown by the test and which can be seen in

Appendix A. I was able to determine which group would receive which treatment on the basis of something other than the test results without moving subjects from the current class in order to get a representative range of language level in the tests groups. The smallest group became the control group, this also had the lowest overall 'level' (with most at A2 and B1 and only one learner at B2, though she did not complete all the procedures) which was convenient. The largest group received the paper materials on the basis that it would be best to teach this group as a class without any admixture of new learners which might up-set the class dynamics. This group had a range from A2 (one subject) to C1. The two medium sized groups were combined into a web-based experimental group on the basis that as they would be working on the materials individually the combination of the class to work in the computer lab would have little impact. This group also had a range from A2 (2 subjects) to C1 though of a different profile to the paper group.

4.1.3 Materials

Selection of vocabulary items from the Criminal Justice System (CJS) Corpus and Key Word List

This corpus and word list, which I created in 2003, was modelled on the Academic Word List and Corpus (Coxhead, 2000). It contains one and a half million running words of criminal justice system texts collected from publicly available texts on the internet. The Key Word List was created by an analysis of the corpus and the elimination of words found in the first 2000 words, proper nouns and those words with very limited range of coverage. The result was a list of 850 word families (2716 words in total) which provide 10 - 15% coverage of texts of interest to criminal justice professionals and is compared with the AWL in **Table 6**.

Levels	CJS Text	CJS Text
1st 1000	72.3%	72.3%
2nd 1000	7.6%	7.6%
Academic	**9.3%**	
CJS List		**14.4%**
Other	10.0%	5.7%

Table 6 Coverage of AWL and CJS word lists

Although the AWL does provide good coverage (9.3%) of the text, the CJS is significantly better at 14.4%.

From the 850 word families of the CJS thirty were selected from A-Z. I used my judgement to select the words and assumed that some of the set would be known to the learners. Within this set of 30 items I selected a subset of words which could be used to create a coherent set of materials rather than being isolated words with no relation to each other. They do not form a close lexical set (Tinkham, 1993; Waring, 1997; Svenconics and Kerst, 1995) as such but would be found in materials related to financial crime and it is these words which formed the basis of the learning materials.

Vocabulary Item Test

Once the selection of the 30 items to be tested was made I constructed a test. This was based on the test devised by Horst and Meara (1999) and used in such studies as Cobb et al (2001). Space for an example sentence was added to check when a subject chose statement 3, similar to the end-of-course test used in Horst et al (2005). The instructions are shown in **Figure 4** and the complete test can be found in **Appendix B.**

> **Instructions**
>
> Look at these 35 words. Grade each word using this scale.
>
> > 0 = I do not know what this word means
> > 1 = I am not sure what this word means
> > 2 = I think I know what this word means
> > 3 = I definitely know what this word means
>
> Add an example sentence in the space provided if you mark the word '**3**'.

Figure 4 Vocabulary Knowledge Test Instructions

This quite robust test measures the candidate's perception of knowing a word and checks their ability to use the word productively if they claim to know it. The test avoids the issues which affect scales such as the Vocabulary Knowledge Scale (VKS) (Paribakht and Wesche 1993, 1997; Wesche and Paribakht 1996) including use of a variety of different keywords such as *know*, *have seen*, *means* and *can use* for the different levels of knowledge which leads to internal inconsistency (Waring, 2002, Read, 2000).

Five non-words were included in the test to control for learners marking words as *known* words which they hadn't seen before (Vidal 2003). The instructions were translated into Estonian so that there would be less chance of misunderstanding of the task set.

The pre- and delayed post-tests contained all 35 items but the test to be used immediately after the treatment contained only the 10 items to be taught (see **Appendix C**). This was for time reasons as well the fact that I felt there was no need to use all the items as it was clear which items were the focus of the experiment.

One problem did arise with the marking of the test and it is one that Horst et al (2005) are silent on. In certain cases subjects marked a word as *3 = I definitely know what this word means* but in the example sentence which they wrote to support this clearly

demonstrated that they did not know the word. There were a number of ways to deal with this. One would be to regard these as another category but this would make the statistical analysis problematic. The other option would be to fold these answers back into one of the other categories 0-2. I decided on *0 I do not know what this word means* as the subject had demonstrated that they did not know what the word meant though it might be argued that they did *think* they knew what the word meant and should have scored '2'.

Learning Styles Questionnaire

The learning styles questionnaire selected was the *Index of Learning Styles Questionnaire* by Soloman and Felder and is available at **http://www.engr.ncsu.edu/learningstyles/ilsweb.html**

This test has been used by previous researchers (eg Balwin and Sabry, 2003) and was chosen because of this and because it is available on-line which gives it flexibility in administration.

A parallel Estonian translation of the test was made so that there would be no confusion or misunderstanding caused by unfamiliarity of the language used in the test by the subjects.

Learning Materials

I took the ten target words and created a set of paper-based materials to teach these items in about 45 minutes of 90 minute lesson. I trialled these materials with three upper intermediate level (B2) police officers in my own class at the Ministry of Internal Affairs and then revised them.

The materials were designed to present the learners with these aspects of Thornbury's (2002) list: word class (implicit in the context); meaning; morphology; derivations;

grammar (implicit in the context); collocations and to a limited extent, lexical fields. In the classroom, pronunciation was exemplified by the teacher.

The materials were not integrated with grammar and speaking and listening activities because the addition of these elements would have mean reducing the vocabulary exercises to a token one found in many teaching materials. This would not have been enough to experiment on and would not have isolated vocabulary learning, though the materials do in effect reflect a more intensive focus on vocabulary than would normally be the case.

The approach is one of classroom activity (Coady, 1997) and intentional learning (Barcroft, 2004). The words are presented frequently and repeatedly in the input (ten words are recycled though the exercises); they are presented with '*meaning bearing comprehensible input*' (a text); the learners have to make limited output during the lesson and the progress is from less to more demanding activities (Barcroft, 2004).

In Paibakht and Wesche's (1997) terms the learners have to pay selective attention to the words in the first exercise, recognise, then manipulate and interpret the words. Some production is expected in the final error correction exercise but fuller production is expected in later classes. These materials can be seen in **Appendix D.** I then versioned these materials for Author Plus On-line, described below.

Author Plus On-line: a description and materials

Author Plus On-line, published by Clarity Language Consultants Ltd of Hong Kong is an authoring program to create interactive exercises with sound, graphics and video. It is SCORM compliant and has integrated student tracking with a 'Results Manager'. It has a Multilanguage interface, can be hosted within the institution and there are an unlimited number of authors per account.

This program differs in a number of ways from the programs reviewed in the literature review above. It is a widely used commercial program, not a bespoke university created system, and the exercises created using the system, although they can incorporate audio, graphics and video, do not differ greatly from the exercises found in modern coursebooks and in standard CD-ROM programs so there should not be a high learning curve for the learners or teachers. There are 12 exercise types which can be created which are described in detail in **Appendix E**.

Due to problems installing the program I could not use all the functionality of the program, in particular I did not have time to record the materials so that learners could listen to the pronunciation for the target items and their context sentences and texts. The program was finally installed two days before the scheduled classes and there was no leeway for postponement due to the need for the delayed post-test to be completed before the disruptions of the Christmas season. I had a less functional back up of the learning materials on the Author Plus On-line *Light* version of the program on a server in Hong Kong which I did not want to use as it lacked one of the exercise types I thought most appropriate.

This meant that there was a significant difference in the learning experience between the paper-based materials mediated by a teacher who would pronounce the words (and repeated by the learners) and the web-based materials which would be silent in this aspect. However though this might be a defect in regards overall learning, the lack of a pronunciation model for the learners would not affect their scores on the written test.

A number of writers (eg Merlot, 2000; Gyselinck et al, 2000; Chun and Payne, 2004; Sakar and Ercetin, 2005) caution against the combination of text and illustrations in the Meyer (2001) model and even though Author Plus does have the option of incorporating digital media the difficulty of getting illustrations for such concepts as

'fiscal' and 'dedicated' precluded the use of illustrations in both the paper and web-based materials. An option would have been to record a video segment instead of, or in support of, the reading text but this would be beyond both the resources of the language centre and the technical capabilities of the teachers and so impractical.

The web-based version of the paper materials is an attempted minimal difference versioning and one which the teachers would be capable of creating themselves with little training and is how the program is designed to be used. In Bax's (2003) terms it is a type of Restricted CALL though one which would be integrated into the syllabus. The learners would use the materials on the web for self-directed learning of the words which they need (and not all learners would need to learn all the words), and would do the exercise they chose and later these words would be used productively in the classroom and for formal course requirements like reports and in examinations.

The On-line *Light* versions of the materials were trialled by one colleague but due to time pressure it was not possible to test the experimental materials.

Screen shots of the learning materials can be found in **Appendix F** and compared with the paper materials. It proved impossible to produce a good version of Task 3 Word Building in the program because a table completion activity was not possible but the exercise created instead had one advantage of impelling the learner to write down the words, when otherwise there would have been no written record necessary to complete the materials. Similarly the final task could not be produced on a sentence level and the exercise turned into one of identifying the error free sentence versions rather than identifying the errors and correcting them, and as such was an easier exercise.

Post-experimental Procedure Questionnaire

This paper-based questionnaire was designed to gather the following information from

the experimental web group:

Age

Gender

Extent of learner's familiarity with computers

Extent of prior use of on-line learning exercises

Learner's perception of the exercises completed

The paper-based experimental group received a shorter questionnaire which omitted

the questions about computers and learning from on-line exercises. The control group

did not receive a questionnaire but the data regarding age and gender was supplied by

the teachers.

The questionnaire had to be quick to complete as the whole research procedure of

explanation, pre-test, paper-based lesson/web-based lesson, post-test and

questionnaire had to fit into a 90 minute lesson period.

The Group 1 questionnaire is in **Appendix G** and the Group 2 questionnaire is in

Appendix H.

4.1.4 Procedures

The research procedures took place over a period of 8 weeks. The procedures of the

Before and After (Pre-test, Post-test Design) are outlined in **Table 7**.

Group			01	X	02		03
1 Web	QPT for level	On-line learning styles questionnaire	35 item vocabulary pre-test	Web-based Treatment	10 item vocabulary post treatment test	Questionnaire	Delayed 35 item vocabulary post-test
2 Paper	QPT for level	On-line learning styles questionnaire	35 item vocabulary pre-test	Paper-based Treatment	10 item vocabulary post treatment test	Questionnaire	Delayed 35 item vocabulary post-test
3 Control	QPT for level	On-line learning styles questionnaire	35 item vocabulary pre-test	No treatment	10 item vocabulary post treatment test	No questionnaire	Delayed 35 item vocabulary post-test

Table 7 Research Procedures

Administration of QPT for Level

This test was administered by the class teachers during the first lesson of the semester. The learners had done the Version A of this test on entry to the Academy two years previously: on this occasion they did Version B.

Administration of On-line learning styles questionnaire

Learners self-administered this on-line test during the first two weeks of the semester, printed out the summary results and gave them to their class teacher.

Administration of 35 item vocabulary pre-test

This test was administered at the beginning of the experimental procedure lesson. For Group 1 this was at 8.30 on a Monday morning. For Groups 2 and 3 this was at 8.30 on the next day, the Tuesday morning.

Administration of Web-based Treatment

This took place immediately following the vocabulary pre-test in one of the Academy computer rooms. Although the materials could theoretically be done alone by the learners in their own time (and would be in the future) for the purposes of the experiment I thought it sensible to have all the learners in one place so that I could deal with any problems arising, as the learners had never used the program before, and

could make sure that the learners doing the program were who they claimed to be. The learners' identities were confirmed by the class teachers.

Administration of Paper-based Treatment

I taught the paper-based group on the Tuesday morning in place of their regular class teacher, who observed. This was because I was familiar with the materials and with the learners as I had met them before and to simulate the effect of 'doing something special' as with the experimental web-based group the day before.

Administration of 10 item vocabulary post treatment test

This followed immediately after the completion of the materials in both experimental groups and the control group.

Administration of Questionnaire – age, sex, computer experience, evaluation of materials

This questionnaire was administered upon completion of the post test.

Administration of Delayed 35 item vocabulary post-test

This was administered by the class teachers at the beginning of regular lessons three weeks after the experimental lessons, on the same day and at the same time as the initial vocabulary tests. Learners were not expecting to be re-tested and the Monday learners, being police officers, were asked and trusted not to inform their Tuesday colleagues of the forthcoming test.

4.1.5 Method of Analyses

All vocabulary tests and questionnaires were collected immediately after administration and marked by hand. The data were entered initially into Excel tables and the means determined for the groups. This task was later replicated in SPSS (which had arrived by this time). The tables of data are in **Appendix I-Q**.

Data collection and analysis.

Data were entered into a database using the SPSS software. This software was used to provide descriptive statistics for each of the three groups. The statistical analysis provided means and standard deviations for the group performances at individual stages of the experimental procedure.

Mixed Between-Within ANOVA Analysis

There are certain assumptions which must be fulfilled before using a T-test and certain of the data of this study violates a number of these for example the small overall sample size (n=27) means that it was not possible to conduct t-tests on the significance of the means of the three groups (n = 11, n = 10, n = 6) (Salkind, 2000, Pallant, 2001). It was also not possible to apply multiple regression analysis for the same reason. Stevens (1996) recommends about 15 subjects per predictor.

I decided to carry out a Mixed Between-Within ANOVA Analysis of the mean vocabulary gain scores to determine whether there was a significant difference between the achievement of the web-based and paper-based groups on their post-test scores and delayed post-test scores. There is no non-parametric alternative for this test (Pallant, 2001) and so despite some of the weaknesses of the data set in size I decided to carry out the ANOVA analysis.

This analysis tells us '*whether there are main effects for each of the independent variables and whether the interaction between the variables is significant*' (Pallant, 2001:211).

My null hypothesis was that there was no significant difference between the vocabulary gain in Group 1 and 2.

There are certain assumptions to be fulfilled in order for this analysis to produce valid results (Pallant, 2001). These are:

1. The level of measurement should be on a continuous scale. This criteria is met for these variables.

2. Random samples. This is not met with these groups which are convenience samples but this is unavoidable and often the case in 'real-life research' (Pallant, 2001:171)

3. The data observations should be independent of each other. Pallant warns about data collection in group settings but with the test conditions observed during the data collection phases of the experiment the data set is free of violations of this assumption.

4. It is assumed that the populations which the samples come from are normally distributed. Pallant suggests that this happens in a lot of social science research and the tests are 'robust' (p172) enough for violations of this assumption though she does suggest that a sample size of 30+ for major problems to be avoided. This suggests that the result of this test on the data here should be carefully scrutinized.

5. Homogeneity of variance is assumed between the two sample groups.

6. An additional assumption is that there should be homogeneity of inter-correlations and this is tested using Box's M statistic and Pallant suggests using an alpha level of .001.

Top-Five Subject Analysis.

In addition to the above analysis of the whole experimental group I analysed and compared the means of the achievement of two different samples of top five subjects in the web-based and paper-based experimental groups. This excluded a number of weak performers in both groups and showed the potential of both treatments with

strong learners. As this reduced the group size (n = 5) for each group the analysis was conducted at the level of mean scores.

4.2 Research Methodology for Research Question Two

Is the language level of the learners correlated with the number of items learned?

To examine this question I looked at the relationship between the subjects' language level as measured by the Quick Placement Test and their scores on the Vocabulary Knowledge Pre-Test (35 item) and their vocabulary gain as measured by the 10 Item Vocabulary Tests.

Although the sample size was only 27 I decided to run a T-test for correlation co-efficient to examine the significance of the correlation between the QPT level and the scores on the tests.

The assumptions underlying a T-test are the same as outlined in points 1 to 5 in the assumptions for a Mixed Between-Within ANOVA Analysis (Pallant, 2001).

My null hypotheses were that there were no relationships between the language level of the sample subjects and their level of vocabulary and their gain in vocabulary.

My research hypotheses stated that there would be a 1-tail directional relationship between the language level and the score of known words on the first pre-test (35 items) and on the scores for the vocabulary gain in the post-test and delayed post-test.

For all these analyses I used the scores: *3 = I definitely know what this word means*, as these scores showed demonstrable word knowledge.

4.3 Research Methodology for Research Question Three

Is there a correlation between prior experience of computers and/or computer-based learning and the effectiveness of the web-based learning materials?

I had hoped to explore this question by using the vocabulary gain on the tests and the questionnaire answers to find out if differing levels of prior experience with using computers and with learning with computer was correlated with the varying degrees of vocabulary gain. Upon reviewing the questionnaire responses from the sample I found that there was little to distinguish between subjects. All subjects used computers for work and study. All used Word well, 89% used PowerPoint well and 72% didn't use Excel well. With regards to their self-reported computer knowledge, this was split equally between responses 3 (basic user: 45.5%) and 4 (I could learn a lot more: 54.5%) with no outliers. Although 2 subjects said they used CD-ROMS and 7 said they used the internet for learning, they all stated that they used these less than one a month. From the data the group can be seen to be quite homogeneous in their use and experience of the internet with only very insignificant differences which could not be explored using statistical techniques, so that this research question had to be dropped.

4.4 Research Methodology for Research Question Five

What are the experimental subjects' attitude towards the web and paper-based exercises and do they differ between the two groups?

I had originally intended to examine the question of whether there was *a correlation between the perceived utility of the materials and the number of items learned in the web and paper experimental groups.*

However, again the data proved unsuitable for this analysis due to the homogeneity of the results and so I determined to use the data to throw light on the learner's

perceptions of the use of the materials and to provide background information on any interesting cases that might occur in the data.

To do this I collated the data and looked at the group means for each question and looked at if there was a correlation between the subjects perception of how many words they had learned and what the post-test showed.

4.5 Research Methodology for Research Question Four

What are the learning style characteristics of police officers students at the Academy and how far does Author Plus meet the learning style needs of these learners?

Initially I had planned to examine the data for correlations between vocabulary gain and the learning styles expressed in the Index of Learning Styles (Felder and Soloman, 1999) on 8 dimensions on four scales. This would have been a very complex analysis as there were many variables to consider. However, on reflection and consideration of the data from the questionnaire I decided that too many assumptions were violated by the data set for any meaningful statistical analysis to be carried out; principally because it was a small sample set, with uneven distribution and it was not a random sample.

I therefore changed the research question to analyse the structure of learning styles represented by the experimental groups and then to compare what Author Plus offers in terms of materials and processes with the recommendations by Baldwin and Sabry (2003). This then is a form of qualitative evaluation of the materials to see how far they might be meeting the needs of the police officers at the Academy.

5.0 Findings

5.1 *Is there a difference in vocabulary gain between those learners who used the web-based learning materials and those who were taught in a classroom situation?*

Group means for vocabulary gain

The SPSS analysis of group means can be found in **Appendix R**.

All groups (including the control group) achieved vocabulary gains though only the two experimental groups achieved significance advances in their knowledge of the target words.

Figure 5 shows the mean scores achieved on the pre-, post- and delayed vocabulary knowledge tests (10 Items). As can be seen from the graph both the experimental groups achieved significant vocabulary gain as measured in the post test but lost some of this gain before the delayed test. Notice also that the control group also achieved some small vocabulary gain.
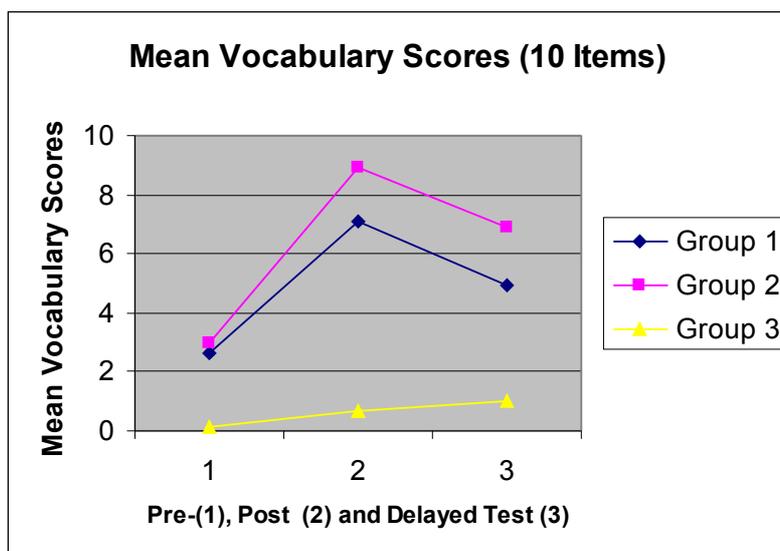

Figure 5 Group mean vocabulary scores on pre-, post- and delayed tests

Group 1 (Web) achieved a mean net vocabulary gain at level 3 of + 4.5 words in the post-test and a gain of + 2.3 words after the delayed post-test.

Group 2 (Paper) achieved a mean net vocabulary gain at level 3 of + 5.9 words in the post-test and a gain of +3.9 words after the delayed post-test.

Group 3 (Control) achieved a mean net vocabulary gain at level 3 of +0.5 words in the post-test and a gain of +0.8333 words after the delayed post-test.

The difference in vocabulary gain over the three tests *between* the two experimental groups was not significant which means that I cannot reject the null hypothesis that there was no difference between the two groups.

The Mixed Between-Within ANOVA Analysis showed that there was a significant effect over time of vocabulary gain (Wilks Lambda value: 0.118; significance 0.000) and the Partial Eta Squared value of 0.882 shows that this effect was quite large, though not as large as when the *Partial* Eta Squared value is compared with Cohen's (1988) values for interpretation of the Eta Squared values (as cited in Pallant, 2001:181) (see Levine and Hullet, 2002 for a discussion of the confusion between Partial Eta Squared and Eta Squared). For the interaction effect the Wilks Lambda value was 0.830 but with a significance value of 0.188, greater than the alpha value of 0.05. The between subjects effect for the groups had a significance value of 0.090 which was not less than 0.05 which suggests that there was no significant difference between the two groups vocabulary gain (see **Appendix S**).

With only ten words being tested, the *percentage* vocabulary gain for each group is not a particularly useful number. A more interesting statistic is the percentage gain of the total possible gain score ie what percentage of the ten words did they learn in addition to the words they already knew (see **Appendix T**). The mean scores for the groups are shown below.

Mean percentage gain of maximum possible gain

Group 1: 62.6%

Group 2: 84.53%

Group 3: 5.18%

Vocabulary loss/gain between post-test and delayed post test per group

Group 1: - 69%

Group 2: - 77.5%

Group 3: + 149%

Overall mean vocabulary gain of Sample 1 top five subjects

The overall mean vocabulary gain (after the delayed test) was the same for the top five subjects (selected by overall performance in the post-test) in each of the experimental groups (see **Appendix U**).

Group 1

Post-Test   5.8

Delayed Test 3.8

Group 2

 Post-Test   6.6

Delayed Test 3.8

Overall mean vocabulary gain of Sample 2 top five subjects

The overall mean vocabulary gain (after the delayed test) was slightly different for the top five subjects (selected by vocabulary gain on their performance gain in the Post-test) in each of the experimental groups (see **Appendix U**).

Group 1

Post-test   6

Delayed Test 3.7

Group 2

Post-test   7

Delayed Test 4.2

5.2 Is the language level of the learners correlated with the number of items learned?

There was a significant correlation between QPT level scores and vocabulary knowledge as shown with the Pre-test scores for all 35 items. I assumed an alpha level of risk of 0.01 with 25 degrees of freedom (n = 27 -2 = 25). The correlation coefficient value obtained from the test was 0.772 which, compared to 0.4451 the correlation coefficient value needed to reject the null hypothesis, enabled me to reject the null hypothesis. I ran similar tests (25 degrees of freedom) on vocabulary gain scores on the post and delayed tests and received lower but significant values for the T-tests (see **Appendix V**).

Post Test: correlation coefficient of 0.575, significant at a 0.01 level

Delayed test: correlation coefficient of 0.524, significant at a 0.01 level

5.3 What are the experimental subjects' attitude towards the web and paper-based exercises and do they differ between the two groups?

Both groups were overwhelmingly positive towards the learning material though Group 2 were slightly more positive. All respondents rated the materials as '*useful*' or better.

Only one subject in Group 1 thought the materials were not easy to use.

Nine subjects from each group (82% from Group 1 and 90% from Group 2) expressed a desire to do more such exercises.

There was no correlation at a group level between the number of words which the subjects thought they had learned and the number of words which the test showed that they had learned.

5.4 What are the learning style characteristics of police officers students at the Academy and how far does Author Plus meet the learning style needs of these learners?

Figure 6   shows the learning style characteristics of the whole sample of police officer students at the Academy and shows that for each paired dimension on the Felder and Soloman (1999) Index there is one dominant learning style except for the Sequential and Global dimensions which are approximately in balance.
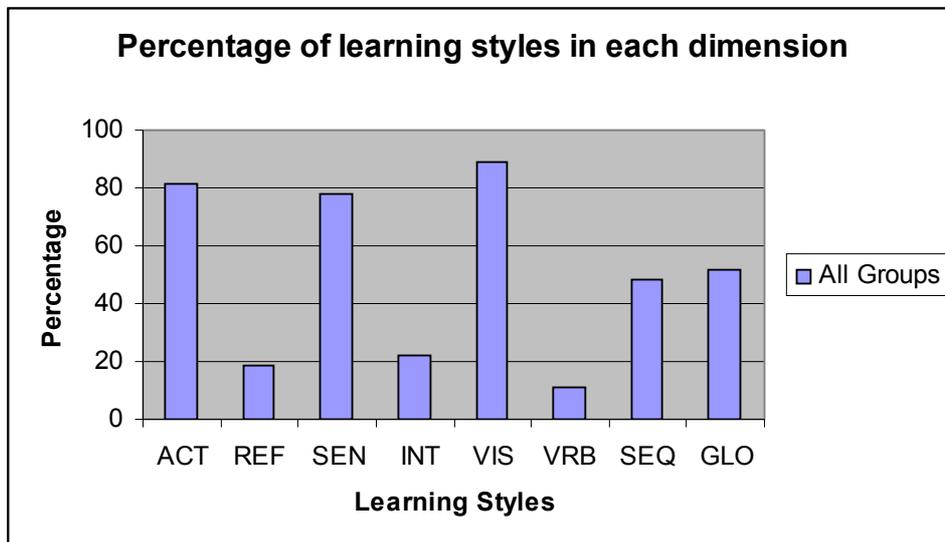
Percentage of learning styles in each dimension

Figure 6 Percentage of learning styles in each dimension.

Group 1 reflected this overall distribution quite well except that, as **Figure 7** shows, the Intuitive dimension was not represented in the sample and all members of the group were biased towards the Sensing dimension.
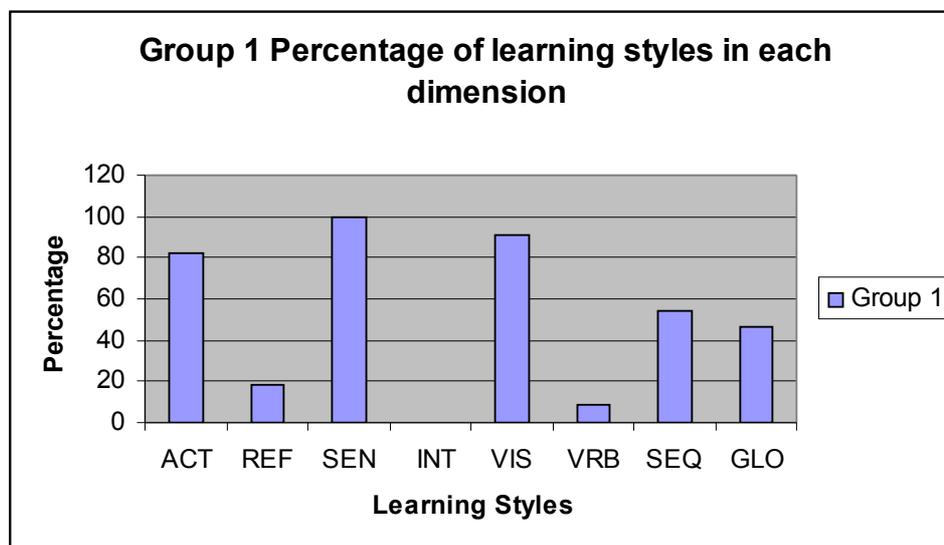

Group 1 Percentage of learning styles in each dimension

Figure 7 Group 1 percentage of learning styles in each dimension

An analysis of the features of Author Plus related to learning styles

Active

Author Plus allows learners to apply what has been taught through further exercises (should the teacher create them) but does not allow learner-learner or learner-teacher interaction.

Sensing

The program can be used for meaningful and realistic contextualisation of language examples and learning points.

Sensing and Visual

Sound, images and digital video can be used in the program.

Verbal

The materials are principally presented in a written format with sound options.

Sequential

Materials are typically ordered in a linear manner.

Global

Overviews of the topic/unit can be created by the teacher and presented to the learner so that Global preference learners can orientate themselves.

6.0 Analyses and Discussion

6.1 Is there a difference in vocabulary gain between those learners who used the web-based learning materials and those who were taught in a classroom situation?

Group means for vocabulary gain

An analysis of the group means of the ten vocabulary items taught shows that there was measurable vocabulary gain in all groups but that there was vocabulary loss shown by the delayed test.

Tables 8 - 10 show the group means for the degrees of vocabulary knowledge for the pre-, post- and delayed test.

Table 8 shows, that in the pre-test, Group 2 had a slightly higher (0.3 – 0.4 words) mean knowledge of words at Levels 1-3 than Group 1.

(n = 27)	Group 1 (n = 11)	Group 2 (n = 10)	Group 3 (n = 6)
	Mean score	Mean score	Mean score
0	3.2727 (2.19504)	2.3000 (1.41814)	5.6667 (1.63299)
1	1.5455 (1.43970)	1.9000 (.87560)	1.6667 (1.03280)
2	2.5455 (1.69491)	2.8000 (1.61933)	2.5000 (1.64317)
3	2.6364 (1.74773)	3.0000 (1.05409)	.1667 (.40825)

Table 8 Pre-test Mean Scores (note: S.D. are in parenthesis)

The distracters proved distracting in only a few cases with means for the three groups combined as follows for the levels of knowledge (see **Appendix L**):

Level 0   3.8

Level 1   0.6

Level 2   0.6

Level 3   0

In the post-test immediately after experiencing the web-based or paper-based materials both experimental groups increased their vocabulary knowledge though the paper-based group increased its knowledge by more than the web-based group (5.9 words gain compared with 4.5 words gain on average) (see **Table 9**).

The difference here in mean vocabulary gain might be explained by the differences in the materials and the learning modality of the event.

(n = 27)	Group 1 (n = 11) Mean score	Group 2 (n = 10) Mean score	Group 3 (n = 6) Mean score
0	.8182 (1.16775)	.4000 (.69921)	6.0000 (2.19089)
1	.0909 (.30151)	.0000 (.00000)	1.5000 (1.51658)
2	2.0000 (2.14476)	.7000 (1.25167)	1.8333 (1.16905)
3	7.0909 (2.70017)	8.9000 (1.66333)	.6667 (1.03280)

Table 9 Post-test Mean Scores (note: S.D. are in parenthesis)

In Group 2 the materials were experienced in a typical classroom situation with the learners working in lockstep with the teacher leading, observing and intervening with individual students, with class checking and correction of exercises as the learners finished each exercise. There was also the provision of a pronunciation model of the words and sentence contexts to enrich the learning experience. Although it was a lockstep experience, with the pace judged by the teacher on the basis of the learner's performance, it was rich learning experience with interaction at many different levels between teacher and learners and between learners, for example checking their work

with a partner before a class check of the answers. In a full 90 minute lesson there would have been time for other activities like speaking practice.

Group 1 was moved from their normal learning environment to a computer lab with 16 computers arranged around the walls and on a central table. They were introduced to a completely new learning system which, although they had had some previous experience of using computers for learning, proved to be unfamiliar to them and a number of the learners had to be helped to navigate through the exercises and some did not check all their answers. I tried to limit my interventions so that the learners were essentially working on their own (as it is envisaged they would work in the future) while providing the necessary support for them to complete the activities. I also had to ensure that the learners worked through the materials quickly enough so that a post-test and questionnaire could be administered within the lesson time. There was a wide range of times taken to complete the tasks: from 21 minutes to 50 minutes (subject stopped) and a range of scores (see **Appendix X**). The learners who took only 20-30 minutes on the materials achieved significant time savings over the classroom-based learners. They, and those who needed longer, could avoid the problems of single paced teaching (Higgins, 1985).

Despite having to learn both a new system and a new set of words and lacking the interaction with their peers which they were used to and not having a spoken model of the words the mean achievement was significant for this group and with the exception of two cases discussed below all learners made progress in their vocabulary knowledge.

The improvement in the control group scores over the course of a lesson when they dealt with an unrelated topic might be put down to a memory effect of the pre-test stimulating the memory of the learners during the lesson which then resulted in a higher score in the post-test. One subject, M17, during the course of the lesson moved

two items from 'I think I know' to 'I definitely know what this word means' and M18 increased his score on level 3 from one to two words.

The delayed test results (**Table 10**) showed that both Group 1 and 2 had suffered vocabulary knowledge attrition over the three weeks between the post-test and this test.

(n = 27)	Group 1 (n = 11) Mean score	Group 2 (n = 10) Mean score	Group 3 (n = 6) Mean score
0	.8182 (1.40130)	.5000 (.84984)	5.0000 (1.78885)
1	1.2727 (1.10371)	.7000 (.82327)	2.0000 (1.89737)
2	3.0000 (2.23607)	1.9000 (1.72884)	2.0000 (1.26491)
3	4.9091 (2.73695)	6.9000 (1.91195)	1.0000 (1.09545)

Table 10 Delayed Post-test Mean Scores (note: S.D. are in parenthesis)

During this period there was no intervention on the part of the researcher to maintain vocabulary knowledge levels through revision. Both classroom teachers knew which words had been taught as they had observed the lessons and had copies of the materials. No indication was given to them that they should take special measures with these words with these learners. They did know that they learners would be tested again but due to the pressures of the timetable – it was the learners' final semester and their final examination would take place 5 weeks after the delayed post-test – there was no time to take special measure beyond the normal learner revision and recycling processes.

The distracters in this test proved slightly more distracting than in the pre-test with one subject thinking that they definitely knew one of the words (see **Appendix P**).

Table 11 shows the mean achievement gain scores for each group over the post and delayed tests.

(n = 27)	Group 1 (n = 11)			Group 2 (n = 10)			Group 3 (n = 6)		
	Mean score			Mean score			Mean score		
	post	delayed	sum	post	delayed	sum	post	delayed	sum
0	-2.4545	0	-2.4545	-1.9	+0.1	-1.8	+0.3333	-1.0	-0.6667
1	-1.4546	+1.1818	-0.2728	-1.9	+0.7	-1.2	-0.1667	+0.5	+0.3333
2	-0.5455	+1.0	+0.4545	-2.1	+1.2	-0.9	-0.6667	+0.1667	-0.5
3	+4.4545	-2.1818	+2.2727	+5.9	-2.0	+3.9	+0.5	+0.333	+0.8333

Table 11 Mean Achievement Gain Scores

Group 1 achieved a mean net vocabulary gain at Level 3 of + 4.5 words in the post-test and a gain of + 2.3 words after the delayed post-test.

Group 2 achieved a mean net vocabulary gain at Level 3 of + 5.9 words in the post-test and a gain of +3.9 words after the delayed post-test.

Group 3 achieved a mean net vocabulary gain at Level 3 of +0.5 words in the post-test and a gain of +0.8333 words after the delayed post-test.

The difference in vocabulary gain between the two experimental groups was not significant as shown by the Mixed Between-Within ANOVA Analysis of the mean vocabulary gain scores.

The loss (or gain) in percentage terms for each group between the post- and delayed test were as follows.

Group 1: - 69%

Group 2: - 77.5%

Group 3: + 149%

There is an unexplained vocabulary improvement on the part of the control group. This is entirely down to one subject M16 who raised his score from 0 to 2 on the level 3 knowledge over the three weeks. This may have been due to his meeting these two words independently over this time.

The vocabulary knowledge attrition in both experimental groups clearly shows that vocabulary loss can be a significant factor in language learning and that these learners (and teachers) need to pay more attention to vocabulary revision strategies and that learning based on the Author Plus system should be fully integrated into the syllabus with activation of vocabulary learned a special focus of subsequent language work in the classroom or for homework. It cannot be left as a standalone add-on to the curriculum.

Top Five Performances

From an analysis of the individual vocabulary gain/loss figures over the three tests I determined that there were three anomalous results in the web group.

M7 only learned one item (measured at Level 3) during the web-treatment and then lost this before the delayed test.

M8 added one item at Level 3 knowledge but then lost two as shown by the delayed test, leaving an overall deficit of one item.

M9 improved by four on the post-test but completely lost this gain as shown by the delayed test.

By analysing the pre- and delayed scores on the 35 item tests and excluding the 10 target items taught I found an overall decline in the score of Group 1 from a mean of 3.0909 in the pre-test to one of 2.0909 in the delayed test, while Group 2 increased its scores on the same tests from a mean of 2.5 to 2.7 (see **Appendix W**)

I decided to examine the overall performance of the top five subjects in both Group 1 and 2 (see **Appendix U**) to exclude these three subjects discussed above. **Figure 8** shows the Level 3 mean vocabulary scores of the top five subjects in each of the experimental groups. The Group 2 subjects show a slightly better performance in the post-test but overall, after the delayed test, the vocabulary gain is the same with a mean improvement of 3.8 words.
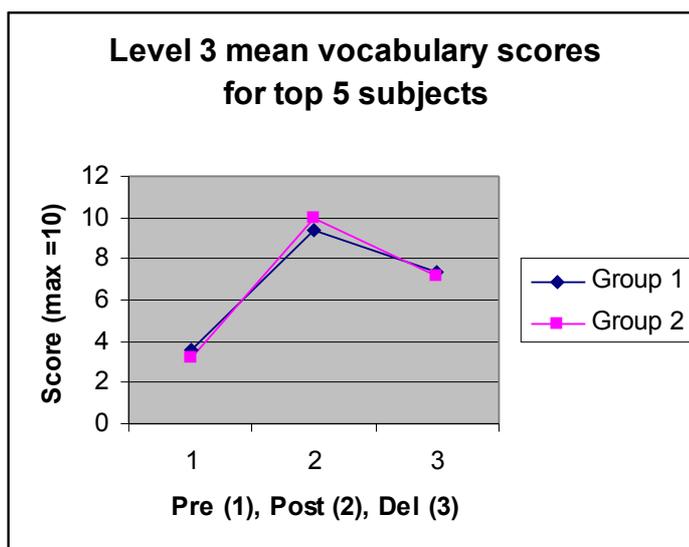

Figure 8 Level 3 Mean vocabulary scores of top five subjects in Groups 1 and 2

While there was some small difference in achievement between Groups 1 and 2 it seems that for higher performing learners the materials are equally as effective.

I looked at this same question from a slightly different perspective by choosing a second sample 'top five': those who had made the highest gains in the post test which would suggest that the experience had been most beneficial for them (see **Appendix U**).

Again Group 2 showed better performance in the Post-test and this time also in the delayed test, so for this group of subjects the paper-based experience seemed to be slightly more effective, as **Figure 9** shows.
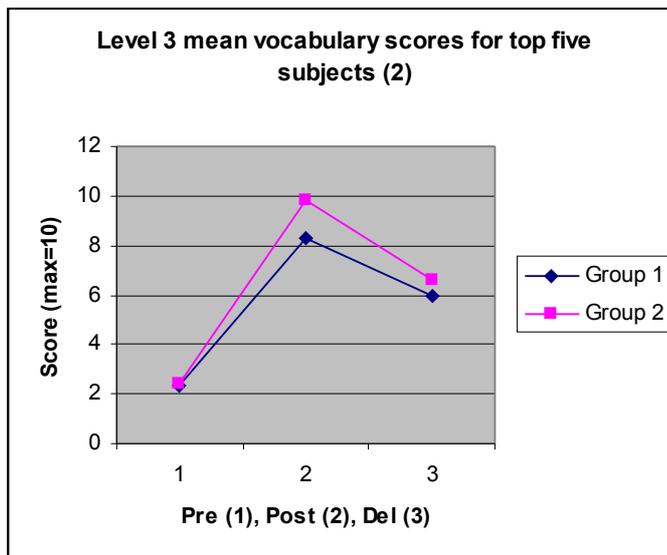
Figure 9 Level 3 Mean vocabulary scores of top five subjects (second sample) in Groups 1 & 2

It would have been useful to identify, immediately after the administration of the materials and tests, any anomalous results such as M7, M8 and M9 above and investigate the possible reasons for the decline in scores by ethnographic research methods such as interviews and to compare the responses with responses from interviews held with higher performing subjects. This, however, was not planned and the long time between the collection of the data and the analysis (4 months, due to work pressures) meant that this was not possible.

6.2 Is the language level of the learners correlated with the number of items learned?

I conducted a T-test for correlation coefficient on the relationship between the QPT scores and the results of the 35 item pre-test at Level 3 knowledge. I tested a one-way directional positive relationship between the two variables as the null hypothesis was there was no relationship between the two variables. The T-test showed that there was a significant relationship between the level attained in the QPT and the sores on the 35 Item Pre-test.

Vocabulary knowledge tests have also been used successfully for indicators of language level, for example the Eurocenters Vocabulary Size Test (Nation, 2001) and so it would seem logical to assume that there would be a relationship between the level shown by the QPT and the level of vocabulary knowledge shown by the study's subjects and this proved to be the case.

Similar tests on vocabulary gain scores on the post and delayed tests showed that vocabulary knowledge and vocabulary gain are correlated with language level for these learners, though with a small sample size it would not be possible to generalise these results to the larger population.

Group Mean Scores for QPT

The three groups were not uniform in language level as **Table 12** shows. Group 2 had a slightly higher mean than Group 1 and the Control Group was at significantly lower level.

Group	Group 1 n = 11	Group 2 n =10	Group 3 n = 6	Whole sample population n = 27
Mean	38.9091	41.1000	28.6667	37.4444
(Standard Deviation)	(9.54416)	(6.62403)	(3.61478)	(8.75009)

Table 12 Group Mean Scores for QPT

The distribution graphs (**Figure 10**) show that there were no normal distributions of scores in the three groups and that this might explain the differences in achievement on the vocabulary learning activities. One would expect that Group 2 would perform better overall due to their higher overall proficiency and this perhaps explains the different achievements of the two groups and certainly means that it cannot be stated

with any certainty that the web-based materials are in fact inferior to the paper-based materials even if the ANOVA test had suggested this.

Both set of materials were designed for a B2 level which is the level at which the learners were assumed to be and at which they would take their final test so it is not perhaps surprising that the group with a balance of higher level learners performed slightly better than the group with a lower level distribution.

This suggests that materials prepared for Author Plus should be restricted to certain levels of learners and perhaps multiple versions of materials should be prepared for different levels and the performance of learners should be carefully monitored.
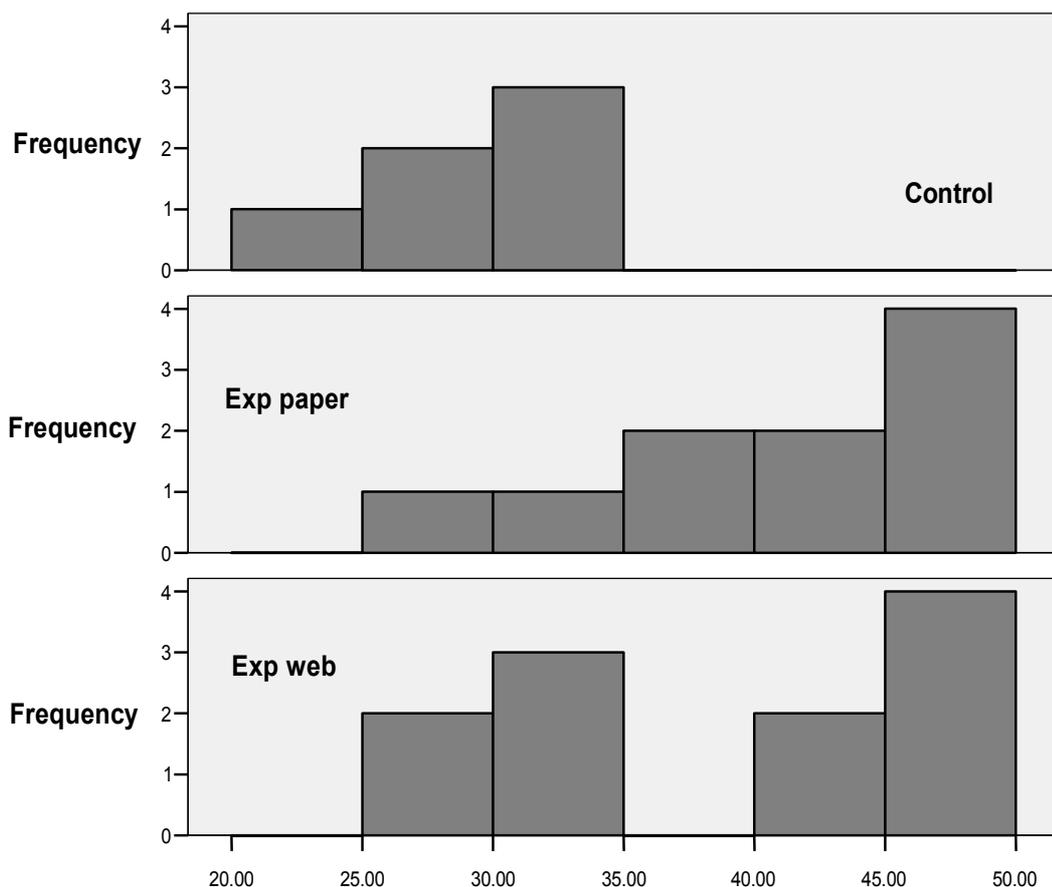

Figure 10 Group QPT Distributions

6.3 What are the experimental subjects' attitude towards the web and paper-based exercises and do they differ between the two groups?

Both experimental groups were overwhelmingly positive towards the respective learning material though Group 2 were more positive, with three subjects rating the materials as extremely useful. All respondents rated the materials as 'useful' or above in response to the question 'What did you think of the exercises you have just done?' (see **Table 13**)

	Extremely useful	Very useful	Useful	Not very useful	Not useful
Group 1 n = 11		5	4		
Group 2 n = 10	3	4	3		

Table 13 What did you think of the exercises you have just done?

All the subjects except for one in Group 1 thought the materials were easy to use.

Nine subjects from each group (82% from Group 1 and 90% from Group 2) expressed a desire to do more such exercises. One of the two to express the desire to not use the same kind of materials again in Group 1 was M7 who, as we have seen above, only learned one word in the presentation.

Question 2 in Part Four of the questionnaire asked the subjects how many words they thought they had learned. I tested whether there was a correlation between this perception and the number learned as shown by the post-test with my null hypothesis being that there would be no relationship between the two variables There was an insignificant correlation on a two way test (see **Appendix Y**) which would not allow me to reject the null hypothesis.

6.4 What are the learning style characteristics of police officers students at the Academy and how far does Author Plus meet the learning style needs of these learners?

The Learning Styles Index questionnaire (Felder and Soloman, 1999) gave a profile for each subject on 8 paired dimensions.

Active - Reflective

Sensing - Intuitive

Visual - Verbal

Sequential - Global

For each paired dimension on the Index for these groups there is one dominant learning style except for the Sequential and Global dimensions which are approximately in balance and this applies both to the sample (n = 27) as a whole and Group 1 (see above **Figures 6** and **7** above).

The Index provides a degree of strength ranking for each dimension (1-3 Mild; 5-7 Moderate and 9-11 Strong) and an analysis of the comparisons between Group 1 and all subjects are shown in **Figures 11, 12, 13** and **14**, with comments.
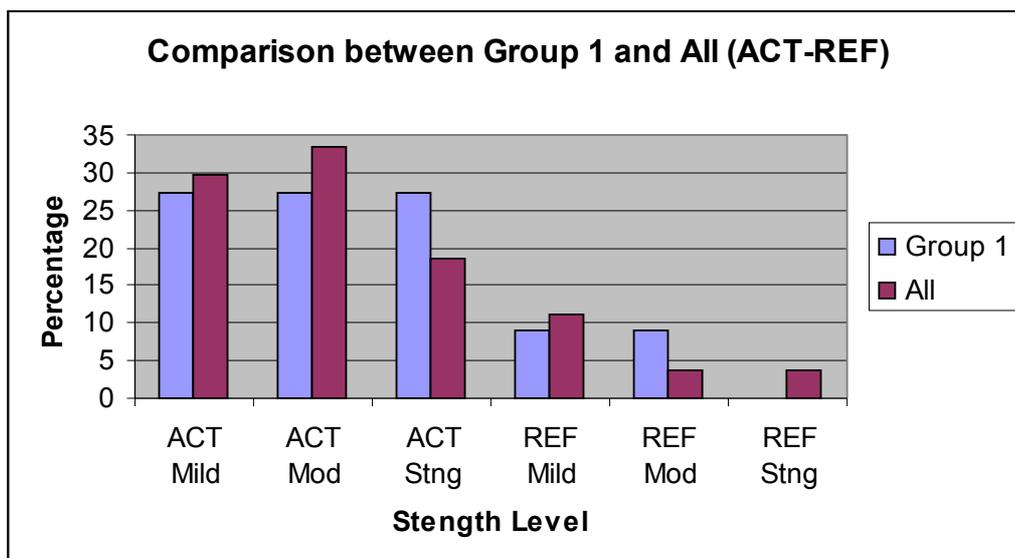

Figure 11 Comparison between Group 1 and All (ACT-REF)

Group 1 shows stronger preferences for Active learning and weaker for Reflective learning than the group as a whole.
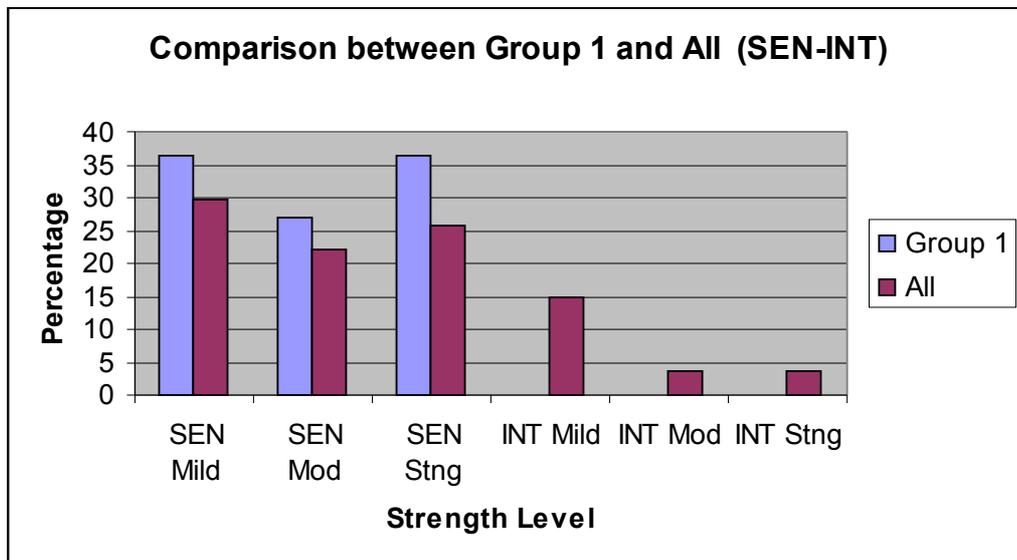
Figure 12 Comparison between Group 1 and All (SEN-INT)

Group 1 again shows a stronger preference for Sensing learning compared to Intuitive than the group as a whole though the whole sample is very weak on Intuitive learning preference. A score of 1-3 on the Sensing dimension also means that they would be able to learn through Intuitive styles as a Mild score in one dimension demonstrates balance between the two (Felder and Soloman, 1999).
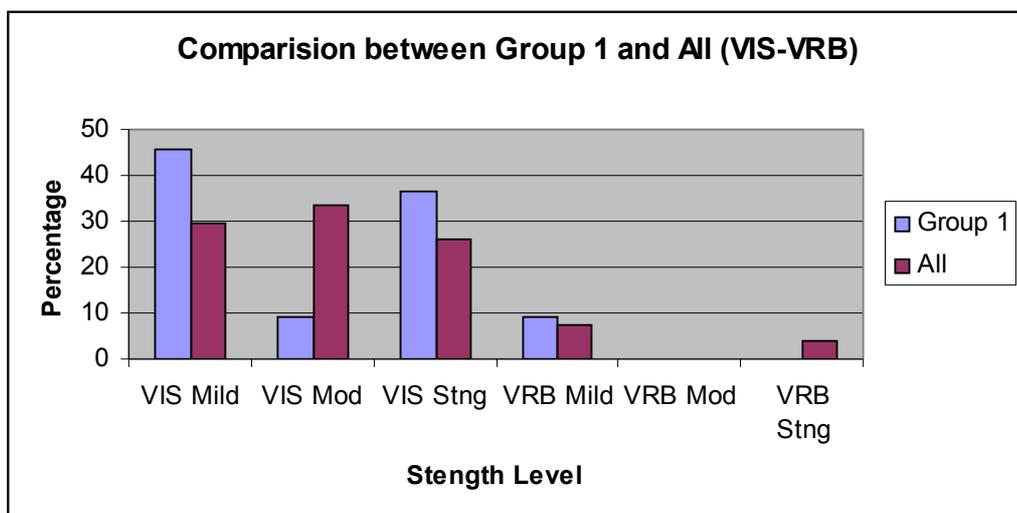

Figure 13 Comparison between Group 1 and All (VIS-VRB)

Group 1 exhibits a preference for Visual learning which is stronger than the whole group (when Moderate and Strong scores are combined) and only a mild preference for Verbal learning on the part of one subject.
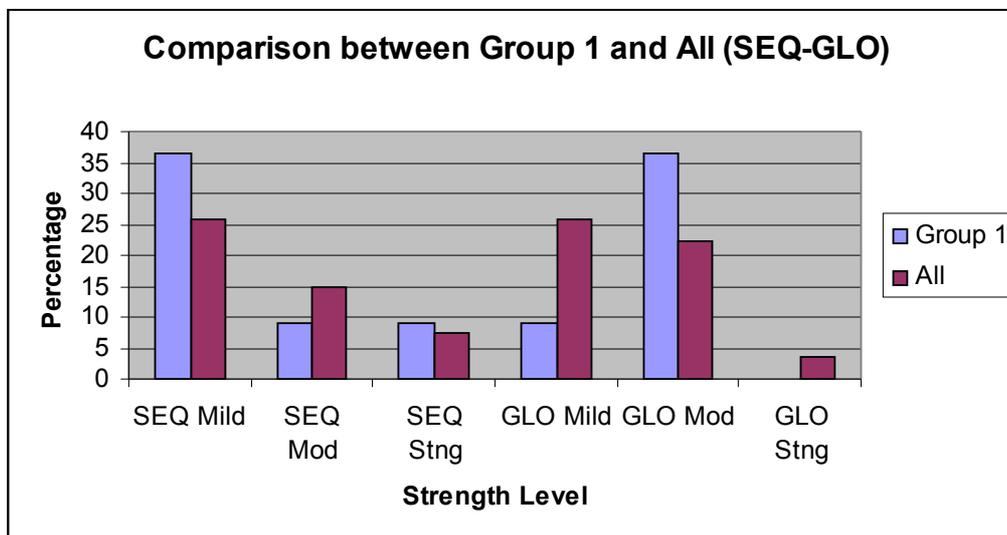

Figure 14 Comparison between Group 1 and All (SEQ-GLO)

Although the average scores for Sequential and Global learning preferences for both Group 1 and the whole sample were fairly balanced in the detailed analysis of the strength levels, Group 1 favours Global learning less than the whole sample and Sequential more than Global learning.

Because of the small sample size it was not possible to analyse whether there were any detailed implications of the different learning index profiles on the achievement of vocabulary learning in Group 1 which is unfortunate because there are interesting cases in the data like M4 and M7.

Both male subjects were quite balanced between the learning style dimensions (apart from one). M4 greatly improved his test scores after using the web-based materials in contrast to M7. M4 though is at a much higher language level and is in fact at the upper end of the band for which the materials were designed (B2). Since vocabulary gain is correlated with language level it might be possible that his improvement is entirely due

to the difference in language level and not to the slight differences in learning style (between global and active styles) or indeed another factor. It is a great weakness of this study that the sample size precludes several statistical procedures and limits the conclusions which can be drawn.

Baldwin and Sabry (2003) administered the same questionnaire to 168 undergraduates at Brunel University in the UK and received 148 completed questionnaires (an 88% response rate) from first and second year students. From an analysis of these scores Baldwin and Sabry derived support for their Balanced-Learning Design (BLADE) model for an Interactive Learning System (ILS). They summarise the challenge as *'essentially to accommodate both the exhibited styles and the required skills in a carefully balanced and calculated manner to minimize problems that could occur and to achieve a more effective ILS.'* (ibid: p333)

They produced a table of ILS design features for use in an ILS for the development of skills for computing students but noted that it is *'not an exhaustive list, and not in any way a rigid set of rules to be followed.'* (ibid: p333)

I used this list as the starting point for an evaluation of the Author Plus system and this is summarised in **Appendix Z** which takes the design features from Baldwin and Sabry and compares them with what is possible in Author Plus and notes the strength of the learning styles expressed by Group 1 and the whole sample.

For learners who have a preference for Active learning Author Plus allows these learners to apply what has been taught through further exercises (should the teacher create them). The program can be used for meaningful and realistic contextualisation of language examples and learning points for Sensing learning.

Sound, images and digital video can be used in the program to aid both Sensing and Visual preference learners.

The materials in Author Plus are principally presented in a written format (with sound options), which is a good channel for Visual learners.

While materials are typically ordered in a linear manner (Sequential), overviews of the topic/unit can be created by the teacher and presented to the learner so that Global preference learners can orientate themselves.

The main weaknesses of the materials used in this study, if one considers the learning index profiles of the learners in the study, was the lack of visual support materials (Visual: 91% Group 1) (though it would have been difficult to illustrate such words) and the lack of sound.

The main difference between Author Plus and the Baldwin and Sabry's ILS is the lack of learner-learner or learner-teacher interaction, either synchronous or asynchronous.

This deficit in features of Author Plus is not necessarily of serious concern in the particular context of these learners and the Academy. Author Plus is intended to be used principally by full-time students who have regular twice weekly face-to-face meetings with their teachers and share other classes with their peers and who will use the program in their 40 hours per semester of self-study time to learn the bulk of the vocabulary required and other skills such as presentations and report writing. This outside-class learning is supposed to be activated in subsequent face-to-face meetings, when the Author Plus material have been created and fully incorporated into the syllabus. There is not necessarily a need for on-line communication about the materials/vocabulary/skills etc as long as the knowledge is activated in a timely manner in class or by follow-up assignments.

7.0 Conclusions

Any conclusions drawn from this study must be treated with caution. While we may say that it seems from this particular study that vocabulary gain was not significantly different under face-to-face conditions and learning from web-based materials, it may be difficult to generalise beyond the particular sample under scrutiny.

The mean scores of both experimental groups showed that direct instruction – through classroom teaching and a web-based presentation of materials for vocabulary learning - did have a measurable effect on vocabulary knowledge and the study goes some way in answering the question of the effectiveness of such materials (Chappele, 1996; Nagata, 1996; Hulstijn, 2000; Hubbard, 2002).

While the top five subjects in the two experimental groups did achieve the same average level of vocabulary gain (though one top five sample did better overall with the paper materials in the classroom), there were a number of anomalous results in Group 1 where there was considerable unexplained vocabulary loss between post-testing and the delayed test.

The general language level of the subjects seems to be closely related to their level of vocabulary knowledge and also related to their ability to learn more vocabulary. Higher level learners were better able to cope with the materials developed in this study, both in paper and Author Plus versions and this is a caution for teachers, especially when designing materials for the web when the teacher is not immediately available to support or scaffold learning, unlike in the classroom. There was also a very wide range in the time taken to complete the materials which suggests that some learners could learner quicker outside the class.

The vocabulary loss between the post-test and delayed test also highlights the need for continued engagement with words leant to avoid such attrition of the vocabulary store.

The particular model of use for Author Plus will be one where the material is designed and placed on the Academy server and it will be the learners' individual responsibility to do the materials and to utilize what has been learnt in subsequent classroom encounters. The Academy does not have the time or resources to adopt a more knowledge construction approach to web-based learning.

The subjects had an overall positive regard towards the materials (both web and paper) and, for the web-based materials, this regard might increase further with greater familiarity with the system and its potential. This might be especially true with the full exploitation of the full features including digital media such as sound and video files.

However, a number of the Group 1 subjects did not seem to check their scores on some exercises and this seems to suggest that some learner training is necessary so that the learners can use all the program functions. This runs counter to my initial assumption that learner would not have too many problems with the program.

It proved impossible to analyse whether learning styles had any influence over vocabulary gain due to the small sample size. However, Author Plus in combination with face-to-face teaching does seem to have the potential to cater for a variety of learning styles and prove to be an effective medium for vocabulary learning.

The teachers at the Academy can be confident that learning can be achieved through using Author Plus, though there may be problems with individual learners (as there are in any class). While it is not possible to normalise computer use in Bax's (2003) terms in Academy classroom use because the classrooms are not equipped for this, they should spend some time creating materials to be used on Author Plus to shift some of

the vocabulary learning load out of class time (Frommer and Foelsche, 1999), as long as the vocabulary learned is effectively activated in subsequent meetings or through written assignments so that there is not too much attrition of vocabulary gain. This is especially important as current courses do not achieve the necessary coverage of the key vocabulary for police officers.

While this study has show that Author Plus is an effective way of presenting vocabulary to certain learners a number of issues need to be explored further.

A much larger sample of learners should be studied (without needing a comparison group) to ascertain if there are learning style effects.

Audio and visual media should be added to a set of materials (as appropriate) and the learning effects of these additional channels on vocabulary gain should be studied.

An ethnographic study could explore the learning preferences of learners in a course which combines both face-to-face and web-based materials and compare these with test results.

It also needs to be demonstrated that learners will learn effectively in their own time in a more autonomous way (as it is envisaged Author Plus will be used at the Academy) rather than as a group in a computer room as in this case.

These questions are beyond whether web-based learning is effective in comparison to classroom learning (the topic of this study) to evaluating and exploring the effectiveness of the web-based system in more detail, which unfortunately, due to the small sample size and the lack of an ethnographic dimension, this study was unable to answer.

Word Count: 16961

8.0 References

Adolphs, S. and Schmitt. N. (2003) *Lexical coverage of spoken discourse,* **Applied Linguistics** 24, 4, pp 425-438

Bahns, J. (1993) *Lexical collocations: a contrastive view*, **ELT Journal**, 47, 1, pp 56-63

Baldwin, L. and Sabry, K. (2003) *Learning styles for interactive systems* **Innovations in Education and Teaching International,** 40, 4, pp 325-340

Barcroft (2004) *Second language vocabulary acquisition: a lexical input processing approach,* **Foreign Language Annuals**, 37, 2, pp 200-208

Barnett, L. (1993) *Teacher off: computer technology, guidance and self-access,* **System**. 21, 3 pp 295-304

Bauer, L. and Nation, I.S.P. (1993) *Word families*, **International Journal of Lexicography**, 6, pp 253-279

Bax**,** S. (2003) *CALL – past, present and future,* **System**, 31, pp 13-28

Braganorte, M. (2005) *Self-Access Study and Cooperative Foreign Language Learning through Computers* **Linguagem and Ensino**, 8, 2, pp 145-169

Brandl, K (2002) Integrating internet-based reading materials into the foreign language curriculum: from teacher- to student-centered approaches, **Language Learning and Technology**, 6, 3, pp. 87-107 Available online: http://llt.msu.edu/vol6num3/brandl/default.html Accessed 27th Sept 2005

Brett, P. (1998) *Using multimedia: a descriptive investigation of incidental vocabulary learning*, **Computer Assisted Language Learning**, 11, 2, p179-200 (Abstract only)

Chanier, T. and Selva, T. (1998) *The ALEXIA SYSTEM: the use of visual representations to enhance learning,* Available at:

http://lifc.univ-fcomte.fr/RECHERCHE/P7/pub/call98/call98.htm#Heading28

Accessed 3rd August 2005

Chapelle, C.A. (1996) *CALL - English as a second language,* **Annual Review of Applied Linguistics**, 16, pp 139-157

Cheung, A. and Harrison, C. (1992) Microcomputer adventure games and second language acquisition: a study of Hong Kong tertiary students. In Pennington, M. and Stevens, V. (eds) Computers in applied linguistics, Multicultural matters, pp 155-178

Chun, D.M. and Payne, J.S. (2004) *What makes students click: working memory and look-up behaviour*, **System**, 32, pp 481-503

Chun, D.M. and Plass, J.L. (1996) *Facilitating reading comprehension with multimedia*, **System**, 24, pp 503-519

Chun, D.M. and Plass, J.L. (1997) Research on text comprehension in multimedia environments, **Language Learning and Technology**, 1, 1, pp 60-81 Available online:

http://llt.msu.edu/vol1num1/chun_plass/default.html   Accessed 27th Sept 2005

Coady, J. (1997) *L2 vocabulary acquisition: a synthesis of the research* In Coady, J and Huckin, T (eds) Second language vocabulary acquisition Cambridge University Press

Cobb, T., Greaves, C. and Horst, M. (2001) Can the rate of lexical acquisition from reading be increased? An experiment in reading French with a suite of on-line resources In Raymond, P. and Cornair, C. (eds) Regards sur la didactique des langues secondes Editions Logique pp 133-153

Cohen, J. (1988) Statistical power analysis for the behavioural sciences Erlbaum

Coll, J.F. (2002) *Richness of semantic encoding in a hypermedia-assisted instructional environment for ESP: effects on incidental vocabulary retention among learners with low ability in the target language,* **ReCAL**L, 14, 2, pp 263 – 282

Conrad, K.B. (1996) *CALL – Non-English L2 instruction* **Annual Review of Applied Linguistics**, 16, pp 158-181

Cornett, C.E. (1983) <u>What you should know about teaching and learning styles</u> Phi Delta Kappa Educational foundation

Coxhead, A. (1998) *An academic word list,* Occasional Publications Number 18, LALS, Victoria University of Wellington, New Zealand

Coxhead, A. (2000) *A new Academic Word list,* **TESOL Quarterly** 34, 2, 213-238

Crystal, D. (1988) <u>The English Language</u> Penguin

De Groot, A.M.B. and Keizer, R. (2000) *What is hard to learn is easy to forget: the roles of word concreteness, cognate status and word frequency in foreign language vocabulary learning and forgetting,* **Language Learning**, 50, 1, pp 1-56

De Ridder, I. (2002) *Visible or invisible links: does the highlighting of hyperlinks affect incidental vocabulary learning, text comprehension, and the reading process?* **Language Learning and Technology**, 6, 1, pp 123-146 Available online:
http://llt.msu.edu/vol16num1/deridder/default.html Accessed 27th Sept 2005

Dunkel, P. (1991) The effectiveness of research on computer-assisted instruction and computer-assisted language learning In Dunkel, P. (ed) <u>Computer-assisted language learning and testing: research issues and practice </u>Newbury House pp 5-36

Ehrman, M.E. and Oxford, R.L. (1989) *Effects of sex differences, career choice and psychological type on adults' language learning strategies,* **The Modern language Journal**, 73, pp 1-13

Ehrman, M.E. and Oxford, R.L. (1990) *Adult learning styles and strategies in an intensive training setting,* **The Modern language Journal**, 74, pp 311-327

Felder, R.M. and Soloman, B.A. (1999) *Index of Learning Styles* Available online: http://www.engr.ncsu.edu/learningstyles/ilsweb.html Accessed 26th September 2005

Fox (1984) *Computer-assisted vocabulary learning*, **ELT Journal**, 38, 1, pp 27-33

Frommer, J. and Foelsche, O.K.E. (1999) *SuperMacLang: development of an authoring system,* **CALICO Journal**, 17, 1, pp115-141

Fukkink, R.G. Blok, H. and de Glopper, K. (2001) *Deriving word meaning from written context: a multicomponential skill,* **Language Learning**, 51, 3, pp 477-496

Gass, S.M. (1988) *Second language vocabulary acquisition,* **Annual Review of Applied Linguistics,** 9, pp 92-106

Gettys, S. Imhof, L.A. and Kantz, J.O. (2001) *Computer-assisted reading: the effects of glossing format on comprehension and vocabulary retention,* **Foreign Language Annals**, 34, 2, pp 91-106

Gilbert, R., Matsuna, R. and Ushijima, K. (2001) *VOCAL: A Call Multimedia Concordance Design for Vocabulary Comprehension in the Sciences* International Conference on Information Technology Based Higher Education and Training July 4-6, Kumamoto, JAPAN
Available online at: http://www.eecs.kumamoto-u.ac.jp/ITHET01/proc/135.pdf
Accessed: 17 Sept 2005

Gregorc, A.F. (1979) *Learning/teaching styles: potent forces behind them*, **Educational Leadership**, 36, pp 234-236

Groot, P.J.M (2000) *Computer assisted second language vocabulary acquisition,* **Language Learning and Technology**, 4, 1 pp 60-81 Available online:
http://llt.msu.edu/vol4num1/groot/default.html Accessed 26th September 2005

Gyselinck, V. Ehrlich, M-F., Cornoldi, C. de Beni, R. and Dubois, V. (2000) *Visuospatial working memory in learning from multimedia systems,* **Journal of Computer Assisted Learning**, 16, pp 166-176

Harrington, M. and Levy, M. (2001) *CALL begins with a 'C': interaction in computer-mediated language learning*, **System,** 29, pp 15-16

Harlech-Jones, B. (1983) *ESL proficiency and a word frequency count*, **ELT Journal**, 37, 1, pp 62-70

Higgins (1985) *Grammarland: a non-directive use of the computer in language learning*, **ELT Journal**, 39, 3 pp167-173

Hill, M. and Laufer, B. (2003) *Type of task, time-on-task and electronic dictionaries in incidental vocabulary acquisition,* **IRAL: International Review of Applied Linguistics in Language Teaching,** 41, 2, pp 87-107 (Abstract only)

Horst, M. and Meara, P. (1999*) Test of a model for predicting second language lexical growth through reading* **Canadian Modern language Review**, 56, 2 pp308-328

Horst, M., Cobb, T. and Nicolae, I. (2005) *Expanding academic vocabulary with an interactive on-line database,* **Language Learning and Technology**, 9, 2, pp 90-110
Available online: http://llt.msu.edu/vol9num2/horst/default.html   Accessed 27th Sept 2005

Hoven, D. (1999) *A model for listening and viewing comprehension in multimedia environments*, **Language Learning and Technology**, 3, 1, pp. 88-103 Available online: http://llt.msu.edu/vol3num1/hoven/index.html   Accessed 27th Sept 2005

Hu, M. and Nation, I.S.P. (2000) *Unknown vocabulary density and reading comprehension,* **Reading in a Foreign Language** Available online: http://nflrc.hawaii.edu/rfl/PastIssues/topic.html Accessed 26th September 2005

Hubbard, P. (2002) *A Survey of Unanswered Questions in Computer Assisted Language Learning* Available online: http://www.stanford.edu/~efs/callsurvey/ Accessed 26th September 2005

Hulstijn, J.H. (1992) Retention of inferred and given meanings: experiments in incidental vocabulary learning. In Arnaud, P.J.L. and Béjoint, H. (eds) Vocabulary and applied linguistics MacMillan pp 113-125

Hulstijn, J.H. (1993) *When do foreign-language readers look up the meaning of unfamiliar words? The influence of task and learner variables* **The Modern Language Journal,** 77, pp 139-147

Hulstijn, J.H. (2000) *The uses of computer technology in experimental studies of second language acquisition: a survey of some techniques and some ongoing studies,* **Language Learning and Technology,** 3, 2 pp 32-43 Available online: http://llt.msu.edu/vol3num2/hulstijn/index.html
Accessed: 2 Oct 2005

Hunston, S., Francis, G. and Manning, E. (1997) *Grammar and vocabulary: showing the connections,* **ELT Journal**, 51, 3, pp 208-215

Ikeda, N. (1999) *Language learning strategies with sound-hints in computer-based drills,* **Journal of Computer Assisted Learning**, 15, pp 312-322

Izumi, S. and Bigelow, M. (2000) *Does output promote noticing and second language acquisition?* **TESOL Quarterly,** 35, 2, pp 239-278

Jones, L.C. and Plass, J.L. (2002) *Supporting listening comprehension and vocabulary acquisition in French with multimedia annotations,* **The Modern Language Journal**, 86, 4, pp 546-561

Keefe, J.W. (1979) *Learning style: an overview* In Keefe, J.W. (ed) <u>Student learning styles: diagnosing and prescribing programs</u>, National Association of Secondary School Principals, pp 1-17

Kleinmann, H. (1987) *The effect of computer assisted instruction of ESL reading achievement*, **The Modern language Journal**, 71, 3, pp 267-276

Knight, S. (1994) *Dictionary use while reading: the effects on comprehension and vocabulary acquisition of students of different verbal abilities*, **The Modern Language Journal**, 78, 3, pp 285-299

Korst, C.R., Foss, P. and Lenzini, J.J. (1999) *Textual and pictorial glosses: effectiveness on incidental vocabulary growth when reading in a foreign language*, **Foreign Language Annals**, 32, 1, pp 89-97

Labrie, G. (2000) *A French vocabulary tutor for the web*, **CALICO Journal**, 17, 3 pp 475- 499

Laufer, B. (1992) *How much lexis is necessary for reading comprehension?* In Arnaud, P.J.L. and Béjoint, H. (eds) <u>Vocabulary and applied linguistics</u> MacMillan pp 126-132

Laufer, B. (1997) *The lexical plight in second language reading* In Coady, J and Huckin, T (eds) <u>Second language vocabulary acquisition</u> Cambridge University Press pp 20-34

Lee, S.H. (2003) *ESL learner's vocabulary use in writing and the effects of explicit vocabulary instruction,* **System**, 31, pp 537-561

Levine, T.R. and Hullet, C.R. (2002) *Eta squared, partial eta squared, and the misreporting of effect size in communication research*, Human Communication Research Vol 28, 4 pp 612-625

Lewis, M (1994) <u>The lexical approach</u> Language Teaching Publications

Lomicka (1998) "To gloss or not to gloss": an investigation of reading comprehension online **Language Learning & Technology**, 1, 2, pp. 41-50 Available online:

http://llt.msu.edu/vol1num2/article2/default.html

 Accessed 27th Sept 2005

Liu, M. & Reed, W.M. (1995).*The Effect of hypermedia assisted instruction on second language learning,* **Journal of Educational Computing Research**, 12. pp 159-174

Mayer, R.E. (2001) <u>Multimedia learning</u> Cambridge University Press

Merlot, S. (2000) *Understanding multimedia dialogues in a foreign language,* **Journal of Computer Assisted Learning**, 16, pp148-156

Merlot, S. and Gaonac'h, D. (1994) *Mise en évidence de stratégies compensatoires dans compréhension orale* **L.E. Revue de Phonétique Appliquée**, 115, pp 273-292

Mondria, J-A. and Mondria-de-vries, S. (1994) *Efficiently memorizing words with the help of word cards and 'hand computer': theory and applications,* **System**, 22, 1, pp 47-57

Morgan, J. and Rinvolucri, M. (1986) <u>Vocabulary</u> Oxford English

Nagata, N. (1996) *Computer vs workbook instruction in second language acquisition,* **CALICO Journal**, 14, 1, pp 53- 75

Nassaji, H. (2003) *L2 vocabulary learning from context: strategies, knowledge source and their relationship with success in L2 lexical inferencing,* **TESOL Quarterly**, 37, 4, pp 645-670

Nation, I.S.P. (1990) <u>Teaching and learning vocabulary</u> Newbury house

Nation, I. S. P. (1993) *Using dictionaries to estimate vocabulary size: Essential, but rarely followed, procedures,* **Language Testing,** 10, pp 27-40

Nation, I. S. P. (2001) <u>Learning vocabulary in another language</u> Cambridge University Press

Nation, I.S.P. and Hwang, K. (1995) *Where would general service vocabulary stop and special purposes vocabulary begin?* **System**, 23, pp 35-41

Nattinger, J. and Decarrico, J. (1992) <u>Lexical phrases and language teaching</u> Oxford University Press

Nutta, J. (1998) *Is computer-based grammar instruction as effective as teacher-directed grammar instruction for teaching L2 structures?* **CALICO Journal**, 16, 1 pp 49-62

Oliver, R., Herrington, J. and Omari A. *Creating Effective Instructional Materials for the World Wide Web,* Edith Cowan University. Available online: http://elrond.scam.ecu.edu.au/oliver/docs/96/AUSWEB1d.pdf   Accessed 27th Sept 2005

Ooi, D. and Kim-Seoh, J.L. (1996) *Vocabulary teaching: looking behind the word*, **ELT Journal**, 50, 1, pp 52-58

OUP (2001) <u>quick placement test</u> Oxford University Press

Oxford, R.L. and Ehrman, M. (1993) *Second language research on individual difference,* **Annual Review of Applied Linguistics**, 13, pp 188-205

Oxford and Scarcello (1994) *Second language vocabulary learning among adults: state of the art in vocabulary instruction,* **System**, 22, 2, pp 231-243

Pallant, J. (2001) <u>SPSS Survival manual</u> Open University Press

Palmberg, R. (1988) *Computer games and foreign-language vocabulary learning* **ELT Journal**, 42, 4, pp 247-252

Paribakht, T and Wesche, M. (1993) *The relationship between reading comprehension and second language development in a comprehension-based ESL program*, **TESL Canada Journal** 11, 1, pp 68-83

Paibakht, T.S. and Wesche, M. (1997) *Vocabulary enhancement activities and reading for meaning in second language vocabulary acquisition* In Coady, J and Huckin, T (eds) Second language vocabulary acquisition Cambridge University Press pp 174-200

Paivo, A. (1986) Mental representation: a dual coding approach Oxford University Press

Pimsleur (1967) *A memory schedule,* **The Modern Language Journal**, 51, pp 73-75

Prince, P (1996) *Second language vocabulary learning: the role of context vs translation as a function of proficiency,* **The Modern language Journal**, 80, pp 478-493

Read, J. (2000) Assessing vocabulary Cambridge University Press

Rosa, E.M. and Leow, R.L. (2004) *Computerized task-based exposure, explicitness, type of feedback, and Spanish L2 development,* **The Modern Language Journal,** 88, ii, pp192-216

Sakar, A. and Ercetin, G. (2005) *Effectiveness of hypermedia annotation for foreign language reading,* **Journal of Computer Assisted Learning,** 21, pp 28-38

Salkind, N. J. (2000) Statistics for people who (think they) hate statistics Sage Publications

Sanpraser, N (2005) *Learners' attitudes towards the use of English through poetry program in comparison with the same lesson in a paper-based material* **ARECLES E-Journal***,* University of Newcastle upon Tyne, vol 2

Sinclair, J.M. (1991) Corpus, concordance, collocation Oxford University Press

Smith, H.J., Higgins, S., Wall, K., and Miller, J. (2005) Interactive *whiteboards: boon or bandwagon? A critical review of the literature,* **Journal of Computer Assisted Learning**, 21, pp91-101

Stevens, J. (1996) Applied multivariate statistics for the social sciences (3rd edition) Lawrence Erlbaum

Sullivan, N. and Pratt, E. (1996) *A comparative study of two ESL writing environments: a computer-assisted classroom and a traditional oral classroom*, **System**, 29, 4, pp 491-501

Svenconics, D.J. and Kerst, S. (1995) *Investigating the teaching of second language vocabulary through semantic mapping in a hypertext environment,* **CALICO Journal**, 12, 2 and 3, pp 33-57

Swain, M. (1995) Three functions of output in second language learning, In Cook, G. and Seidlhofer, B (eds) Principles and practices in applied linguistics: Studies in honour of H.G. Widdowson, Oxford pp.125-144

Thornbury, S (2002) How to teach vocabulary Longman

Tinkham, T. (1993) *The effect of semantic clustering on the learning of second language vocabulary,* **System** 21, 3, pp 371-380

Vidal, K. (2003) *Academic listening: a source of vocabulary acquisition*, **Applied Linguistics** 24, 1, pp 56-89

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds. and Trans.) Harvard University Press.

Waring, R. (1997) *The negative effects of learning words in semantic sets: a replication,* **System**, 25, 2, pp 261-274

Waring, R. (2002) *Scales of Vocabulary Knowledge in Second Language Vocabulary Assessment*, **Kiyo**, The Occasional Papers of Notre Dame Seishin University. March 2002 Available on-line at: http://www1.harenet.ne.jp/~waring/papers/scales.htm Accessed 14.10.05

Warschauer, M. (2000). *The death of cyberspace and the rebirth of CALL*. **English Teachers' Journal,** *53*, 61-67. Available online: http://www.gse.uci.edu/markw/cyberspace.html Accessed 26th September 2005

Warshauer, M. (2002) *A developmental perspective on technology in language education,* **TESOL Quarterly**, 36, 3, pp 453-475

Warschauer, M. and Healey, D. (1998) Computers and language learning: an overview **Language Teaching**, 31, pp 57-71

Wesche, M. and Paribakht, T. (1996) *Assessing vocabulary knowledge: depth vs. breadth*. **Canadian Modern Language Review**, 53, 1, pp 13-40

West, 1953, A General Service List of English Words Longman, London

Willis, D (1990) The lexical syllabus Collins COBUILD

Zimmerman, C. B. (1997*) Historical trends in second language vocabulary instruction,* In Coady, J and Huckin, T (eds) Second language vocabulary acquisition Cambridge University Press pp 5-19

9.0 Appendices/statistical tables and illustrations

Appendix A Levels from QPT Test

Group	Subject	QPT Score	Level
One	**M1**	49	C1 Advanced
Web	**M2**	50	C1 Advanced
	M3	48	C1 Advanced
	M4	44	B2 Upper-Intermediate
	M5	48	C1 Advanced
	M6	29	A2 Pre- Intermediate
	M7	30	B1 Intermediate
	M8	30	B1 Intermediate
	M9	30	B1 Intermediate
	F1	27	A2 Pre- Intermediate
	F2	43	B2 Upper-Intermediate
Two	**M10**	44	B2 Upper-Intermediate
Paper	**M11**	48	C1 Advanced
	M12	43	B2 Upper-Intermediate
	M13	36	B1 Intermediate
	M14	34	B1 Intermediate
	F3	46	B2 Upper-Intermediate
	F4	46	B2 Upper-Intermediate
	F5	29	A2 Pre- Intermediate
	F6	37	B1 Intermediate
	F7	48	C1 Advanced
Three	**M15**	23	A2 Pre- Intermediate
Control	**M16**	27	A2 Pre-Intermediate
	M17	27	A2 Pre- Intermediate
	M18	32	B1 Intermediate
	F8	31	B1 Intermediate
	F9	32	B1 Intermediate

Appendix B 35 Item Vocabulary Knowledge Test

Vocabulary Knowledge Test

Your Name:_____

Date: _____

.

Instructions

Look at these 35 words. Grade each word using this scale.

     0 = I do not know what this word means
     1 = I am not sure what this word means
     2 = I think I know what this word means
     3 = I definitely know what this word means

Add an example sentence in the space provided if you mark the word '**3**'.

Instruktsioonid

Palun vaata neid 35te sõna. Hinda igat sõna kasutades seda skaalat.

     0 = Ma ei tea, mida see sõna tähendab
     1 = Ma pole päris kindel, mida see sõna tähendab
     2 = Ma arvan, et ma tean mida see sõna tähendab
     3 = Ma tean kindlasti, mida see sõna tähendab

Lisa lause näide sõnale, millele panid 3 punkti

---

1. abolish [   ]

_____

2. abuse [   ]

_____

3. acquit [   ]

_____

4. adjacent [   ]

_____

5. advocacy [   ]

_____

6.   aereamia ☐

_____

7.   affiliate ☐

_____

8.   allegation ☐

_____

9.   attributable ☐

_____

10. audit ☐

_____

11. autoconcave ☐

_____

12. beneficial ☐

_____

13. categorical ☐

_____

14. coerce ☐

_____

15. consent ☐

_____

16. dedicated ☐

_____

17. degraded ☐

_____

18. escort ☐

_____

19. ebonicated ☐

_____

20. fiscal ☐

_____

21. impaired ☐

_____

22. inviolate ☐

_____

23. mandate ☐

_____

24. negligence ☐

_____

25. obstacle ☐

_____

26. objured ☐

_____

27. pilfered ☐

_____

28. ransom ☐

_____

29. repatriate ☐

_____

30. scope ☐

_____

31. sole ☐

_____

32. suspend ☐

_____

33. tramned ☐

_____

34. thwart ☐

_____

35. verification ☐

_____

Thank you.

Appendix C 10 Item Vocabulary Knowledge Test

Vocabulary Knowledge Test

Your Name:_____

Date: _____

.

Instructions

Look at these 10 words. Grade each word using this scale.
 	
    0 = I do not know what this word means
    1 = I am not sure what this word means
    2 = I think I know what this word means
    3 = I definitely know what this word means
 	
Add an example sentence in the space provided if you mark the word '**3**'.

Instruktsioonid

Palun vaata neid 10te sõna. Hinda igat sõna kasutades seda skaalat.
 	
    0 = Ma ei tea, mida see sõna tähendab
    1 = Ma pole päris kindel, mida see sõna tähendab
    2 = Ma arvan, et ma tean mida see sõna tähendab
    3 = Ma tean kindlasti, mida see sõna tähendab
 	
Lisa lause näide sõnale, millele panid 3 punkti

1. acquit ☐

_____

2. allegation ☐

_____

3. audit ☐

_____

4. categorical ☐

_____

5. dedicated ☐

_____

6. fiscal ☐

_____

7. negligence ☐

_____

8. obstacle ☐

_____

9. sole ☐

_____

10. verify ☐

_____

Thank you.

Appendix D Paper-based Materials

Reading

Task 1 Read through this text and answer these questions:

1. What kind of crime is being investigated?
2. Which company is being investigated?
3. Who is investigating the company?
4. Who first found problems at the company?

In 2001 the Serious Fraud Unit in Switzerland started an investigation of GBHI Corporation. The bank's auditors had found serious problems with the annual financial accounts for the **fiscal** year 2000 and had alerted the Serious Fraud Unit. The **audit** had found that large sums of money were being sent to Switzerland through companies linked to GBHI and that the Chairman of GBHI, Mr Pat Watershund, had **sole** responsibility for these movements of money. The auditors alleged that money seemed to be being laundered through GBHI. The auditors could not **verify** where this money was coming from or where it was going and the money did not appear in the annual accounts. GBHI issued a **categorical** denial of wrongdoing and said 'This **allegation** is completely untrue.'

The main **obstacles** to the investigation were the huge amount of money – billions of Swiss Francs – and the large number of company and company accounts involved.

During the investigation the Mr Watershund was charged with criminal **negligence** for failing to keep proper accounts. He was later **acquitted** by the central court in Zurich and retired from the company to spend more time with his family. The investigation into the financial problems at GBHI continues.

The Serious Fraud Unit was formed in 1995 and is **dedicated** to fighting financial crime in Switzerland and is a member of the UNIXPOL financial crime taskforce.

Word Meaning

Task 2 Match the meaning of the words in bold with the definitions below.

1. an inspection of the accounting procedures and records by a trained accountant	
2. not doing what you should do	
3. not divided or shared with others	
4. a problem or difficulty that stands in the way	
5. to confirm the truth of something, to find out	
6. very strongly in favour of a cause or ideal or purpose	
7. pronounced not guilty of criminal charges	
8. not modified or restricted by reservations	
9. a formal accusation against somebody (often in a court of law)	
10. involving financial matters	

Word building

Task 3 Complete the following table:

Noun	Verb	Adjective	Adverb
		sole	
obstacle			
	verify		
		dedicated	
	audit		
negligence			
		fiscal	
allegation			
		categorical	
	acquit		

Vocabulary in Use

Task 4 Complete these sentences with the correct word from the table above.

1. She was _____on all charges.
2. It was a most unfair _____– completely untrue.
3. He issued a _____denial through his lawyer
4. The customer sued the company for _____.
5. The _____were found guilty of fraud.
6. He _____his life to finding his wife's murderers.
7. The government's _____policy has been a disaster.
8. It was the _____reason, the only reason.
9. It was very difficult to _____if he was telling the truth or not.
10. The _____course was too difficult for him and he gave up and left the army that day.

Collocations

Task 5 Are these collocations correct?

1. allegation

		Correct or not?
to publish		
to prove	an allegation	
to deny		
to construct		

2. audit

		Correct or not?
to complete		
to perform	an audit	
to carry out		
to prove		

3. categorical

		Correct or not?
	denial	
a categorical	assurance	
	statement	
	assertion	

4. dedicated

		Correct or not?
a dedicated	team	

		Correct or not?
skilled and		
importantly	dedicated	
totally		

5. fiscal

		Correct or not?
	policy	
	crisis	
fiscal		
	age	
	reform	

6. negligence

		Correct or not?
to deny		
to sue for	negligence	
it was caused by		
he was accused of		

7. obstacle

	Correct or not?
major	
human	
legal	obstacle
natural	

8. sole

	Correct or not?
benefit	
concern	
sole	author
purpose	

9. verification

	Correct or not?
verification	procedure
	process

external	verification	

Error Correction

Task 6 Find and correct the mistakes in these sentences. One sentence has no mistakes in.

1. A UK auditor has been congratulated for negligence in an audit of a GBHI UK subsidiary company.

2. Mr T. G. Briggins has claimed that he is the joint author of a book he wrote in 1998 called '101 ways to skin a live cat.' He said: 'No-one helped me. It is all my work.'

3. Ms J.H. Linswind has been found guilty of obstructing justice and was set free this afternoon. She went home and had a cup of tea.

4. GBHI denied all the allegations of fiscal problems.

5. GBHI made a weak denial of responsibility in the money laundering case.

6. The prosecutor said that Mr Watershund had not helped them and had not put any obstacles in the way of the investigation. 'He was very uncooperative,' the prosecutor said.

7. The auditors claimed that they were not responsible for the movements of money into Switzerland and said that they could verify everything.

8. He works extremely hard. He comes into work at 6am and leaves at 10pm. He is absolutely not dedicated to his job.
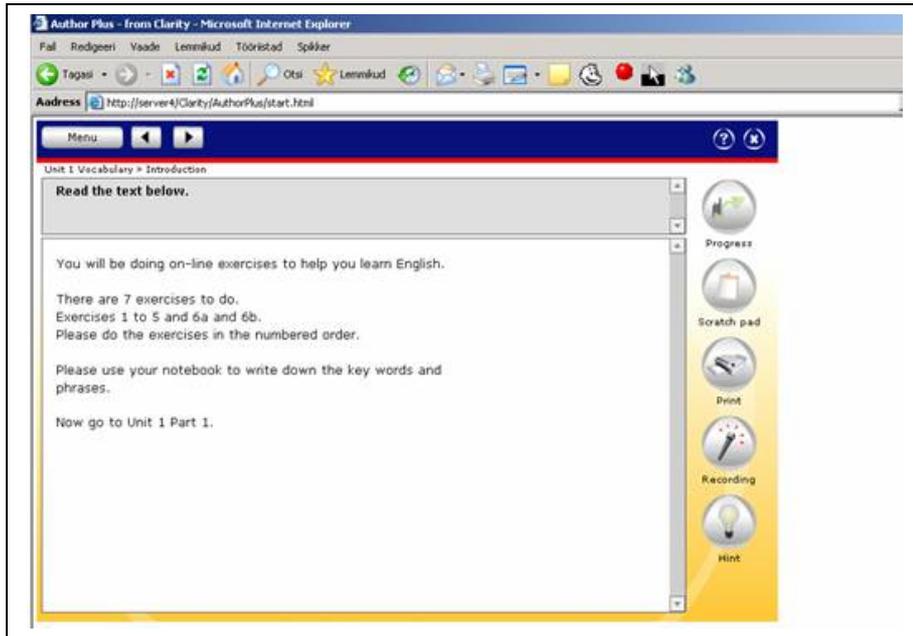
Appendix E Author Plus On-Line Exercise Types

Exercise	Overview
Multiple Choice	This is the traditional Multiple Choice exercise that is used for tests and exam preparation and practice. The teacher creates up to 10 questions consisting of one or more lines of text, with up to four different options per question. At least one of these options must be correct. The teacher can add a hint and feedback to each question.
Quiz	In this Exercise the teacher sets two possible answers, for example True/False, Past/Present, Possible/Impossible, Vertical/Horizontal, Traditional/Simplified, Masculine/Feminine etc. The teacher then sets up to 10 questions, each of which has one of the options as a correct answer. A hint and feedback can be attached to each question.
Dropdown	Dropdown enables the teacher to create a multiple choice exercise within a continuous text. The student sees the text with a number of gaps, each with a small triangle next to it. The student clicks on the triangle and a panel of options drops down below the line. When the student clicks on an option, it appears on the line, while the panel disappears. The student can therefore build up a complete text. The teacher can attach a hint and feedback to each question.
Drag and Drop	In Drag and Drop, the teacher creates up to 10 questions and removes a word, phrase or number from each question. When the student does the Exercise, the words that have been removed are represented by a line with a dot on top, and the words themselves are jumbled up in a non-scrolling bar at the top of the screen. The student has to drag each item down to the correct question. The Teacher can attach a hint, feedback and alternative correct answers to each question.
DragOn	In this Exercise, the teacher types or pastes a text into the text box. Up to 10 words, phrases, dates or facts of any kind can be removed from the text. When the students see the text they have to reconstruct it by dragging the missing items to the correct place. The teacher can add hints and feedback to each item removed.
Stopgap	This is a traditional question-based gapfill activity where one or more words are removed from up to 10 different sentences. The student answers the questions by filling in the gaps. The Teacher can add a hint, feedback and alternative correct answers to each question.
Cloze	The teacher types or pastes in a text, and has complete control over which words are removed and which remain. Each question can be supplemented with a hint, feedback and alternative correct answers.
Analyze	The student reads a text on the left hand side of the screen. On the right hand side are multiple choice questions relating to the text. The student answers these questions with the help of (optional) hints, and receives (optional) feedback at the end of the exercise. The teacher may also create links to external websites from within the text.
Countdown	This is a text reconstruction exercise. The teacher types or pastes in a text. When the student sees it, each word is represented only as a line. Students have to guess the words and build up the text. The more words they guess, the more use they can make of context to deduce the remaining words.
Presentation	This is a presentation or introduction screen where the teacher can type or paste in a text. This could be an explanation, a descriptive text, an extract from a textbook, a newspaper article or a website. Excellent for initial input or final summary.
Target Spotting	The teacher creates texts including words or phrases for the student to find or focus on.
Proofreading	The teacher creates text containing errors for the student to find and correct.

(http://www.clarityenglish.com/AuthorPlus/)
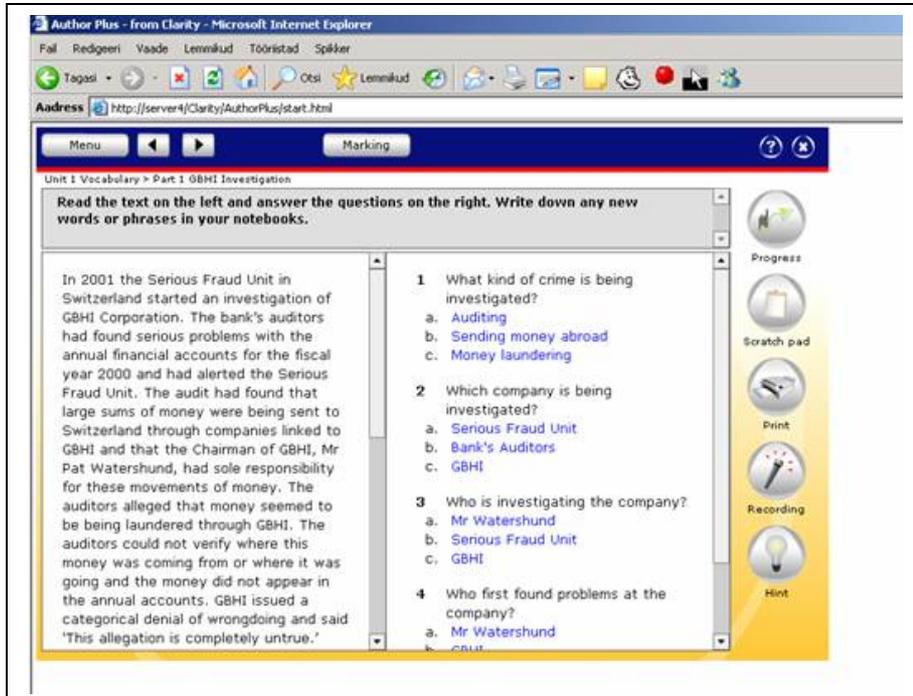
Appendix F Screen Shots of Author Plus Web-based Materials

Screen Shot 1 Introduction

Screen Shot 2 Part 1 Reading Text

Screen Shot 3 Vocabulary

Screen Shot 4 Word Families

Screen Shot 5 Vocabulary in Use

Screen Shot 6 Collocations

Screen Shot 7 Error Identification 1

Screen Shot 8 Error Identification 2

Web-based Learning Questionnaire
Küsitlus veebipõhisest õppest

Please take the time to answer these questions. There are 4 parts to the questionnaire and it should take 10 minutes to complete.

Palun vastake järgmistele küsimusrele. Küsimustik koosneb neljast osast ja selle täitmine võtab umbes 10 minutit.

Please answer all the questions unless otherwise indicated. Detailed instructions are given where necessary. In every question you will be asked place a tick or cross in the appropriate box.

Palun vasta igale küsimustele, kui ei ole teistmoodi kirjas. Mõne küsimuse juures on täpsemad selgitused. Küsimustele vastamiseks palun märkige vastavasse kasti linnuke või rist.

Part 1 Personal Information. *Isiklik informatsioon.*

1. Please indicate your gender. *Palun märkige oma sugu.*

Male/Mees ☐   **Female/ Naine** ☐

2. Please indicate your current age. *Palun märkige oma vanus.*

18-20	☐
21-25	☐
26-30	☐
31-35	☐
36-40	☐
Over/Üle 41	☐

Part 2 Experience of using computers. *Arvutikasutamise kogemus.*

1. Do you use computers for work?
   Kas te kasutate töö tegemiseks arvutit?   Yes / Jah ☐   No / Ei ☐

 2. Do you use computers for studying?
    Kas te kasutate arvutit õppetööks?   Yes / Jah ☐   No / Ei ☐

3. How would you describe your computer knowledge?
   Kirjeldage palun oma arvutialast kogemust

I am an expert user Võin ennast eksperdiks pidada		I know a lot about computers but I am learning all the time *Tean avrutitest palju, aga õpin kogu aeg*		I can do what I need but I could learn more *Ma saan arvutiga tehtud, mis vaja, aga võiksin parmini osata*		I am a basic user but I need to learn a lot more *Olen algaja arvutikasutaja ja pean veel palju õppima*		I have no experience *Mul puudub arvutikasutamise kogemus*	

4. Which of these programs do you **not** use well?
   *Millist neist programmides sa **ei** oska hästi kasutada?*

Word	
PowerPoint	
Excel	

5. How often do you do these using computers? *Kui sagely sa ..?*

	Several times a day *Mitu korda päevas*	Every day *Iga päev*	Two or three times a week *2-3 korda nädalas*	Once a week *Kord nädalas*	Less often *Harvem*	Never *Üldse mitte*
Use the internet *Kasutad internetti*						
Use e-mail *Kasutad e-maili*						

Part 3 Experience of learning English on-line *before* this experiment.
Inglise keele veebipõhise õppe kogemus enne käesolevat eksperimenti

1. Have you learnt English using these?
   Kas te olete õppinud inglise keelt kasutades ..?

	Yes *Jah*	No *Ei*
CD-ROMs *CD-ROMe*		
On-line exercises *On-line harjutusi*		

2. If 'yes' how often have you used these?
Kui vastasite eelmises küsimuses jaatavalt, siis, kui sageli olete neid õppemeetodeid kasutanud?

	Every day *Igapäev*	Once or twice a week *Kord paar nädalas*	Once or twice a month *Kord paar kuus*	Less than once a month *Harvemini kui kord kuus*
CD-ROMs *CD-ROM-id*	☐	☐	☐	☐
On-line exercises *On-line harjutusi*	☐	☐	☐	☐

Part 4 Attitude towards the exercises just done
Arvamus äsjatehtud harjutuse kohta

1. What did you think of the exercises you have just done? They were:
Mis te arvate äsjatehtud harjutustest? Kas need olid…?

Extremely useful *Eriti kasulik*	Very useful *Väga kasulik*	Useful *Kasulik*	Not very useful *MItte väga kasulik*	Not useful at all *Täiesti kasutu*
☐	☐	☐	☐	☐

2. Did you learn? *Kas te opposite..?*

More than 10 new words *Rohkem kui 10 uut sõna*	About 10 new words *Umbes 10 uut sõna*	About 5 new words *Umbes 5 uut sõna*	One or two new words *1-2 uut sõna*	Nothing Mitte midagi
☐	☐	☐	☐	☐

3. Were the exercises easy to use?
Kas harjutust oli lihtne kasutada?

Yes ☐   No ☐
Jah   *Ei*

4. Would you like to do more such exercises?
Kas te soovikiste veel selliseid

Yes ☐   No ☐
Jah   *Ei*

Thank you very much for taking the time to complete this questionnaire. The results will help us to improve teaching at the Academy.

Suur aitäh küsimustiku täitmisele kulutatud aja eest. Uuringu tulemused aitavad meil parandada õpetamist Akadeemias.

Learning Questionnaire
Küsitlus veebipõhisest õppest

Please take the time to answer these questions. There are 2 parts to the questionnaire and it should take 10 minutes to complete.

Palun vastake järgmistele küsimusrele. Küsimustik koosneb neljast osast ja selle täitmine võtab umbes 10 minutit.

Please answer all the questions unless otherwise indicated. Detailed instructions are given where necessary. In every question you will be asked place a tick or cross in the appropriate box.

Palun vasta igale küsimustele, kui ei ole teistmoodi kirjas. Mõne küsimuse juures on täpsemad selgitused. Küsimustele vastamiseks palun märkige vastavasse kasti linnuke või rist.

Part 1 Personal Information. *Isiklik informatsioon.*

1. Please indicate your gender. *Palun märkige oma sugu.*

Male/Mees ☐ **Female/ Naine** ☐

2. Please indicate your current age. *Palun märkige oma vanus.*

18-20	☐
21-25	☐
26-30	☐
31-35	☐
36-40	☐
Over/Üle 41	☐

Part 2 Attitude towards the exercises just done
Arvamus äsjatehtud harjutuse kohta

1. What did you think of the exercises you have just done? They were:
   Mis te arvate äsjatehtud harjutustest? Kas need olid…?

| Extremely useful *Eriti kasulik* | Very useful *Väga kasulik* | Useful *Kasulik* | Not very useful *MItte väga kasulik* | Not useful at all *Täiesti kasutu* |

2. Did you learn? *Kas te opposite..?*

| More than 10 new words *Rohkem kui 10 uut sõna* | About 10 new words *Umbes 10 uut sõna* | About 5 new words *Umbes 5 uut sõna* | One or two new words *1-2 uut sõna* | Nothing Mitte midagi |

3. Were the exercises easy to use?
   Kas harjutust oli lihtne kasutada?

Yes *Jah* No *Ei*

4. Would you like to do more such exercises?
   Kas te soovikiste veel selliseid

Yes *Jah* No *Ei*

Thank you very much for taking the time to complete this questionnaire. The results will help us to improve teaching at the Academy.

Suur aitäh küsimustiku täitmisele kulutatud aja eest. Uuringu tulemused aitavad meil parandada õpetamist Akadeemias.

Descriptive Statistical Tables

Appendix I Learning Styles Questionnaire Scores

Group		ACT	REF	SEN	INT	VIS	VRB	SEQ	GLO
One	M1	7	0	9	0	3	0	5	0
Web	M2	9	0	1	0	3	0	0	5
	M3	11	0	5	0	11	0	1	0
	M4	1	0	3	0	3	0	0	5
	M5	0	5	9	0	1	0	3	0
	M6	1	0	5	0	0	1	0	7
	M7	5	0	1	0	1	0	1	0
	M8	5	0	9	0	9	0	0	1
	M9	11	0	1	0	11	0	0	7
	F1	1	0	9	0	5	0	9	0
	F2	0	1	5	0	9	0	1	0
Two	M10	1	0	9	0	5	0	0	5
Paper	M11	0	9	0	9	3	0	0	5
	M12	1	0	0	3	5	0	5	0
	M13	7	0	9	0	7	0	0	1
	M14	1	0	1	0	5	0	0	3
	F3	7	0	0	3	5	0	5	0
	F4	7	0	0	3	7	0	0	11
	F5	5	0	0	1	0	3	0	3
	F6	1	0	7	0	0	9	1	0
	F7	9	0	0	5	9	0	0	1
Three	M15	7	0	11	0	3	0	9	0
Control	M16	0	1	7	0	1	0	0	1
	M17	3	0	1	0	5	0	1	0
	M18	0	1	7	0	5	0	7	0
	F8	9	0	3	0	11	0	0	3
	F9	5	0	1	0	9	0	1	0

Appendix J Pre-Test 35 Item Scores

Group		0	1	2	3	Total
One	**M1**	12	9	7	7	35
Web	**M2**	9	7	10	8	34
	M3	9	9	7	10	35
	M4	14	2	11	8	35
	M5	16	5	2	12	35
	M6	18	7	7	3	35
	M7	23	2	9	1	35
	M8	22	5	3	5	35
	M9	16	7	9	3	35
	F1	6	18	7	4	35
	F2	20	9	4	2	35
	Mean	15.09091	7.272727	6.909091	5.636364	34.90909
Two	**M10**	10	10	8	7	35
Paper	**M11**	27	2	2	4	35
	M12	8	8	14	5	35
	M13	16	7	7	5	35
	M14	9	11	12	3	35
	F3	16	6	7	6	35
	F4	15	5	4	11	35
	F5	16	7	8	4	35
	F6	4	16	10	5	35
	F7	12	8	10	5	35
	Mean	13.3	8	8.2	5.5	35
Three	**M15**	28	3	4	0	35
Control	**M16**	25	6	4	0	35
	M17	21	6	8	0	35
	M18	16	11	6	2	35
	F8	21	6	8	0	35
	F9	16	5	12	2	35
	Mean	21.16667	6.166667	7	0.666667	35

Appendix K Pre-Test 10 Item Scores

		0	1	2	3	Total
Group One	**M1**	1	2	4	3	10
Web	**M2**	2	1	4	3	10
	M3	1	2	2	5	10
	M4	1	0	6	3	10
	M5	4	1	0	5	10
	M6	3	3	3	1	10
	M7	8	1	1	0	10
	M8	5	0	1	4	10
	M9	4	1	2	3	10
	F1	2	5	3	0	10
	F2	5	1	2	2	10
	Mean	3.272727	1.545455	2.545455	2.636364	10
Group Two	**M10**	1	2	3	4	10
Paper	**M11**	5	2	0	3	10
	M12	3	0	5	2	10
	M13	2	3	2	3	10
	M14	2	2	4	2	10
	F3	2	1	3	4	10
	F4	2	2	1	5	10
	F5	4	2	2	2	10
	F6	2	3	3	2	10
	F7	0	2	5	3	10
	Mean	2.3	1.9	2.8	3	10
Group 3	**M15**	8	0	2	0	10
Control	**M16**	7	2	1	0	10
	M17	4	1	5	0	10
	M18	6	2	1	1	10
	F8	5	3	2	0	10
	F9	4	2	4	0	10
	Mean	5.666667	1.666667	2.5	0.166667	10

Appendix L Pre-Test Distracter Scores

Group		0	1	2	3	Total
One Web	M1	4	1	0	0	5
	M2	4	1	0	0	5
	M3	2	3	0	0	5
	M4	5	0	0	0	5
	M5	4	1	0	0	5
	M6	5	0	0	0	5
	M7	5	0	0	0	5
	M8	4	1	0	0	5
	M9	4	0	1	0	5
	F1	1	3	1	0	5
	F2	4	1	0	0	5
	Mean	3.818	1	0.18	0	5
Two Paper	M10	2	1	2	0	5
	M11	5	0	0	0	5
	M12	2	0	3	0	5
	M13	4	0	1	0	5
	M14	3	0	2	0	5
	F3	4	0	1	0	5
	F4	5	0	0	0	5
	F5	3	1	1	0	5
	F6	0	2	3	0	5
	F7	3	0	2	0	5
	Mean	3.1	0.4	1.5	0	5
Three Control	M15	4	1	0	0	5
	M16	5	0	0	0	5
	M17	5	0	0	0	5
	M18	4	1	0	0	5
	F8	4	1	0	0	5
	F9	5	0	0	0	5
	Mean	4.5	0.5	0	0	5

Appendix M Post-Test 10 Item Score

Group		0	1	2	3	Total
One Web	**M1**	0	0	1	9	10
	M2	0	0	0	10	10
	M3	0	0	0	10	10
	M4	0	0	4	6	10
	M5	0	0	1	9	10
	M6	0	0	4	6	10
	M7	2	0	7	1	10
	M8	2	1	2	5	10
	M9	2	0	1	7	10
	F1	3	0	1	6	10
	F2	0	0	1	9	10
	Mean	0.818182	0.090909	2	7.090909	10
Two Paper	**M10**	0	0	1	9	10
	M11	0	0	0	10	10
	M12	1	0	0	9	10
	M13	1	0	4	5	10
	M14	0	0	0	10	10
	F3	0	0	1	9	10
	F4	0	0	0	10	10
	F5	0	0	0	10	10
	F6	2	0	1	7	10
	F7	0	0	0	10	10
	Mean	0.4	0	0.7	8.9	10
Three Control	**M15**	10	0	0	0	10
	M16	7	0	3	0	10
	M17	5	1	2	2	10
	M18	5	2	1	2	10
	F8	4	4	2	0	10
	F9	5	2	3	0	10
	Mean	6	1.5	1.833333	0.666667	10

Appendix N Delayed Post-Test 35 Item Scores

Group		0	1	2	3	total
One Web	M1	10	7	8	10	35
	M2	4	5	14	12	35
	M3	5	11	6	13	35
	M4	9	8	8	10	35
	M5	12	3	9	11	35
	M6	9	10	13	3	35
	M7	25	3	7	0	35
	M8	21	9	1	4	35
	M9	13	3	16	3	35
	F1	10	11	9	5	35
	F2	2	20	7	6	35
	Mean	10.90909	8.181818	8.909091	7	35
Two Paper	M10	8	9	8	10	35
	M11	23	0	1	11	35
	M12	0	15	12	8	35
	M13	11	8	10	6	35
	M14	11	7	7	10	35
	F3	14	3	8	10	35
	F4	13	4	6	12	35
	F5	12	7	7	9	35
	F6	3	9	11	12	35
	F7	13	9	5	8	35
	Mean	10.8	7.1	7.5	9.6	35
Three Control	M15	26	0	9	0	35
	M16	22	2	6	5	35
	M17	20	6	5	4	35
	M18	17	8	6	4	35
	F8	17	10	6	2	35
	F9	19	9	6	1	35
	Mean	20.16667	5.833333	6.333333	2.666667	35

Appendix O Delayed Post-Test 10 Item Scores

Group		0	1	2	3	Total
One Web	**M1**	1	0	2	7	10
	M2	0	0	2	8	10
	M3	0	1	0	9	10
	M4	0	2	3	5	10
	M5	0	1	2	7	10
	M6	0	1	6	3	10
	M7	3	1	6	0	10
	M8	4	3	0	3	10
	M9	1	0	6	3	10
	F1	0	3	4	3	10
	F2	0	2	2	6	10
	Mean	0.818182	1.272727	3	4.909091	10
Two Paper	**M10**	0	0	3	7	10
	M11	0	0	0	10	10
	M12	0	1	4	5	10
	M13	0	2	4	4	10
	M14	0	0	4	6	10
	F3	0	0	2	8	10
	F4	1	0	1	8	10
	F5	2	1	0	7	10
	F6	0	1	0	9	10
	F7	2	2	1	5	10
	Mean	0.5	0.7	1.9	6.9	10
Three Control	**M15**	6	0	4	0	10
	M16	7	0	1	2	10
	M17	5	2	1	2	10
	M18	4	2	2	2	10
	F8	2	5	3	0	10
	F9	6	3	1	0	10
	Mean	5	2	2	1	10

Appendix P Delayed Post-Test Distracter Scores

Group		0	1	2	3	Total
One Web	**M1**	4	1	0	0	5
	M2	1	2	2	0	5
	M3	0	4	1	0	5
	M4	2	3	0	0	5
	M5	4	0	0	1	5
	M6	2	2	1	0	5
	M7	5	0	0	0	0
	M8	4	1	0	0	5
	M9	4	1	0	0	5
	F1	4	1	0	0	5
	F2	0	5	0	0	5
	Mean	2.888889	1.555556	0.444444	0.111111	5
Two Paper	**M10**	2	2	1	0	5
	M11	5	0	0	0	5
	M12	0	5	0	0	5
	M13	3	1	1	0	5
	M14	5	0	0	0	5
	F3	4	1	0	0	5
	F4	3	1	1	0	5
	F5	2	2	1	0	5
	F6	1	2	2	0	5
	F7	5	0	0	0	5
	Mean	3	1.4	0.6	0	5
Three Control	**M15**	5	0	0	0	5
	M16	5	0	0	0	5
	M17	4	1	0	0	5
	M18	4	1	0	0	5
	F8	4	1	0	0	5
	F9	5	0	0	0	5
	Mean	4.5	0.5	0	0	5

Appendix Q Questionnaire Results

Group		Age	**Part 2** 1	2	3	4a	4b	4c	5a	5b	**Part 3** 1a	1b	2a	2b	**Part 4** 1	2	3	4
One	M1	2	1	1	4			3	5		2	1		1	3	4	1	1
Web	M2	2	1	1	3		2		6	6	2	1		1	4	5	1	1
	M3	2	1	1	3		2	3	6	6	2	1		1	3	4	1	2
	M4	2	1	1	3			3	6	5	2	2			4	4	1	1
	M5	2	1	1	4				6	6	2	1		1	3	4	1	1
	M6	2	1	1	4			3	5	5	2	1		1	4	4	1	1
	M7	2	1	1	4			3	5	5	2	1		1	4	3	2	2
	M8	2	1	1	4				6	6	1	1	1	1	3	4	1	1
	M9	2	1	1	4			3	6	6	2	2			4	4	1	1
	F1	2	1	1	3			3	5	4	2	2			3	3	1	1
	F2	2	1	1	3			3	5	5	1	2	1	1	3	4	1	1
Two	M10	2													5	5	1	1
Paper	M11	2													3	3	1	2
	M12	2													4	4	1	1
	M13	2													5	4	1	1
	M14	2													3	3	1	1
	F3	1													4	4	1	1
	F4	2													5	3	1	1
	F5	2													4	4	1	1
	F6	2													4	4	1	1
	F7	1													3	4	1	1
Three	M15	2																
Control	M16	2																
	M17	2																
	M18	2																
	F8	1																
	F9	2																

Appendix R SPSS Report on Means of scores for QPT and10 Item Test, pre-, post- and delayed-post

group		Qpt score	pretest0	pretest1	pretest2	pretest3	posttest0	posttest1	posttest2	posttest3	deltest0	deltest1	deltest2	deltest3
1	Mean	38.9091	3.2727	1.5455	2.5455	2.6364	.8182	.0909	2.0000	7.0909	.8182	1.2727	3.0000	4.9091
	N	11	11	11	11	11	11	11	11	11	11	11	11	11
	Std. Deviation	9.54416	2.19504	1.43970	1.69491	1.74773	1.16775	.30151	2.14476	2.70017	1.40130	1.10371	2.23607	2.73695
2	Mean	41.1000	2.3000	1.9000	2.8000	3.0000	.4000	.0000	.7000	8.9000	.5000	.7000	1.9000	6.9000
	N	10	10	10	10	10	10	10	10	10	10	10	10	10
	Std. Deviation	6.62403	1.41814	.87560	1.61933	1.05409	.69921	.00000	1.25167	1.66333	.84984	.82327	1.72884	1.91195
3	Mean	28.6667	5.6667	1.6667	2.5000	.1667	6.0000	1.5000	1.8333	.6667	5.0000	2.0000	2.0000	1.0000
	N	6	6	6	6	6	6	6	6	6	6	6	6	6
	Std. Deviation	3.61478	1.63299	1.03280	1.64317	.40825	2.19089	1.51658	1.16905	1.03280	1.78885	1.89737	1.26491	1.09545
Total	Mean	37.4444	3.4444	1.7037	2.6296	2.2222	1.8148	.3704	1.4815	6.3333	1.6296	1.2222	2.3704	4.7407
	N	27	27	27	27	27	27	27	27	27	27	27	27	27
	Std. Deviation	8.75009	2.17208	1.13730	1.59683	1.69464	2.61706	.92604	1.71801	3.76216	2.23861	1.28103	1.88411	deltest3

Appendix S Anova analysis of vocabulary gain between Group 1 and 2

Within-Subjects Factors

Measure: MEASURE_1

gain	Dependent Variable
1	pretest3
2	posttest3
3	deltest3

Between-Subjects Factors

		Value Label	N
group	1	expweb	11
	2	exppaper	10

Descriptive Statistics

	group	Mean	Std. Deviation	N
pretest3	expweb	2.6364	1.74773	11
	exppaper	3.0000	1.05409	10
	Total	2.8095	1.43593	21
posttest3	expweb	7.0909	2.70017	11
	exppaper	8.9000	1.66333	10
	Total	7.9524	2.39742	21
deltest3	expweb	4.9091	2.73695	11
	exppaper	6.9000	1.91195	10
	Total	5.8571	2.53546	21

Multivariate Tests(c)

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power(a)
gain	Pillai's Trace	.882	67.265(b)	2.000	18.000	.000	.882	134.531	1.000
	Wilks' Lambda	.118	67.265(b)	2.000	18.000	.000	.882	134.531	1.000
	Hotelling's Trace	7.474	67.265(b)	2.000	18.000	.000	.882	134.531	1.000
	Roy's Largest Root	7.474	67.265(b)	2.000	18.000	.000	.882	134.531	1.000
gain * group	Pillai's Trace	.170	1.840(b)	2.000	18.000	.188	.170	3.679	.333
	Wilks' Lambda	.830	1.840(b)	2.000	18.000	.188	.170	3.679	.333
	Hotelling's Trace	.204	1.840(b)	2.000	18.000	.188	.170	3.679	.333
	Roy's Largest Root	.204	1.840(b)	2.000	18.000	.188	.170	3.679	.333

a Computed using alpha = .05
b Exact statistic
c Design: Intercept+group
      Within Subjects Design: gain

Mauchly's Test of Sphericity(b)

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon(a)		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
gain	.937	1.164	2	.559	.941	1.000	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.
b Design: Intercept+group
      Within Subjects Design: gain

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power(a)
gain	Sphericity Assumed	284.266	2	142.133	81.692	.000	.811	163.383	1.000
	Greenhouse-Geisser	284.266	1.882	151.033	81.692	.000	.811	153.755	1.000
	Huynh-Feldt	284.266	2.000	142.133	81.692	.000	.811	163.383	1.000
	Lower-bound	284.266	1.000	284.266	81.692	.000	.811	81.692	1.000
gain * group	Sphericity Assumed	8.329	2	4.165	2.394	.105	.112	4.787	.454
	Greenhouse-Geisser	8.329	1.882	4.425	2.394	.109	.112	4.505	.438
	Huynh-Feldt	8.329	2.000	4.165	2.394	.105	.112	4.787	.454
	Lower-bound	8.329	1.000	8.329	2.394	.138	.112	2.394	.312
Error(gain)	Sphericity Assumed	66.115	38	1.740					
	Greenhouse-Geisser	66.115	35.761	1.849					
	Huynh-Feldt	66.115	38.000	1.740					
	Lower-bound	66.115	19.000	3.480					

a Computed using alpha = .05

Tests of Within-Subjects Contrasts

118

Measure: MEASURE_1

Source	gain	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power(a)
gain	Linear	99.792	1	99.792	51.889	.000	.732	51.889	1.000
	Quadratic	184.473	1	184.473	118.515	.000	.862	118.515	1.000
gain * group	Linear	6.935	1	6.935	3.606	.073	.160	3.606	.438
	Quadratic	1.394	1	1.394	.896	.356	.045	.896	.147
Error(gain)	Linear	36.541	19	1.923					
	Quadratic	29.574	19	1.557					

a Computed using alpha = .05

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power(a)
Intercept	1952.047	1	1952.047	205.994	.000	.916	205.994	1.000
group	30.269	1	30.269	3.194	.090	.144	3.194	.396
Error	180.048	19	9.476					

a Computed using alpha = .05
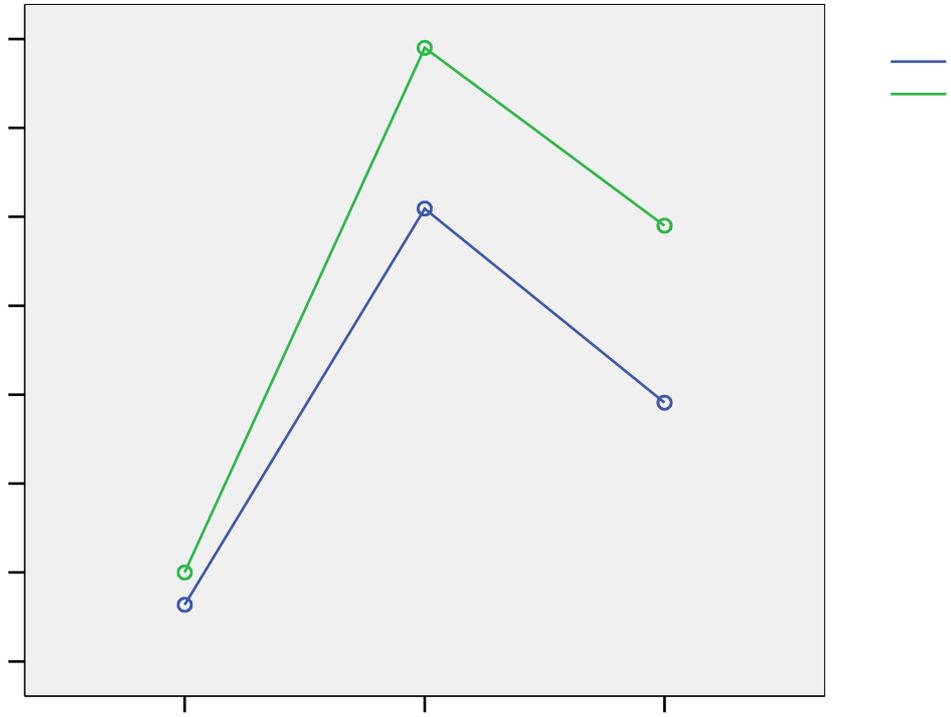
Appendix T Percentage of Maximum Gain Possible in Post-Test achieved

		Post test vocabulary gain	Maximum gain possible (10 minus pretest score)	% of maximum gain made
Group One Web	**M1**	6	7	85.7
	M2	7	7	100
	M3	5	5	100
	M4	3	7	42.8
	M5	4	5	80
	M6	5	9	55.6
	M7	1	10	10
	M8	1	10	10
	M9	4	7	57
	F1	6	10	60
	F2	7	8	87.5
			Mean	**62.6**
Group Two Paper	**M10**	5	6	83.3
	M11	7	7	100
	M12	7	8	87.5
	M13	2	7	28.6
	M14	8	8	100
	F3	5	6	83.3
	F4	5	5	100
	F5	8	8	100
	F6	5	8	62.5
	F7	7	7	100
			Mean	**84.52**
Group Three Control	**M15**	0	10	0
	M16	0	10	0
	M17	2	10	20
	M18	1	9	11.1
	F8	0	10	0
	F9	0	10	0
			Mean	**5.18**

Appendix U Vocabulary gain of Sample 1 and Sample 2 top five subjects in Group 1 and 2

Sample 1

Group 1	Number	Pre test	Post test	Vocabulary gain 1	Delayed	Vocabulary gain 2
	M1	3	9	6	7	4
	M2	3	10	7	8	5
	M3	5	10	5	9	4
	M5	5	9	4	7	2
	F2	2	9	7	6	4
	Mean	3.6	9.4	5.8	7.4	3.8
Group 2	M11	4	10	6	10	6
	M14	2	10	8	6	4
	F4	5	10	5	8	3
	F5	2	10	7	7	4
	F7	3	10	7	5	2
	Mean	3.2	10	6.6	7.2	3.8

Sample 2

NB In Group 1, 2 subjects shared the 5th place in the rankings. If these are excluded then the Group 1 mean would be 6.5.

Group 1 Web	Number	Pre test	Post test	Vocabulary gain 1	Delayed	Vocabulary gain 2
	M1	3	9	6	7	4
	M2	3	10	7	8	5
	M3	5	10	5	9	4
	M6	1	6	5	3	2
	F1	0	6	6	3	3
	F2	2	9	7	6	4
	Mean	2.3	8.3	6	6	3.7
Group 2 Paper	M11	3	10	7	10	7
	M12	2	9	7	5	3
	M14	2	10	8	6	4
	F5	2	10	8	7	5
	F7	3	10	7	5	2
	Mean	2.4	9.8	7.4	6.6	4.2

Appendix V QPT correlations

1. With Vocabulary Knowledge Pre-test scores (35 item)

		QPT score	Vocabulary Knowledge Pre-Test score (35 item)
QPT score	Pearson Correlation	1	.772(**)
	Sig. (1-tailed)		.000
	N	27	27
Vocabulary Knowledge Pre-Test score (35 item)	Pearson Correlation	.772(**)	1
	Sig. (1-tailed)	.000	
	N	27	27

** Correlation is significant at the 0.01 level (1-tailed).
Correlations

2. With post-test and delayed test gain scores

Correlations

		QPT score	Post test gain	Delayed test gain
QPT score	Pearson Correlation	1	.575(**)	.524(**)
	Sig. (1-tailed)		.001	.003
	N	27	27	27
Post test gain	Pearson Correlation	.575(**)	1	.757(**)
	Sig. (1-tailed)	.001		.000
	N	27	27	27
Delayed test gain	Pearson Correlation	.524(**)	.757(**)	1
	Sig. (1-tailed)	.003	.000	
	N	27	27	27

** Correlation is significant at the 0.01 level (1-tailed).

Appendix W Author Plus Statistics

Time taken to complete all exercises and average scores

	Total Time (mins)	Av. Score	
M1	34.36	93%	
M2	37.02	97%	
M3	29.01	60%	No marks for 1 and 2
M4	34.27	81%	
M5	21.22	98%	
M6	44.07	85%	
M7	50.11	70%	Did not complete 6b
M8	45.38	71%	
M9	48.31	72%	
F1	47.07	44%	
F2	44.01	84%	

Exercise Scores

Question	Lowest %	Highest %	Average %
1	25	100	68
2	60	100	72
4	30	90	59
6a	50	100	78.5
6b	75	100	86

Appendix X Report on analysis of scores of items known in 35-Item Tests (excluding words in 10 Item tests)

group		Pre-Test	Delayed Test
1.00	Mean	3.0909	2.0909
	N	11	11
	Std. Deviation	2.38556	1.97254
2.00	Mean	2.5000	2.7000
	N	10	10
	Std. Deviation	1.43372	.94868
3.00	Mean	.5000	1.6667
	N	6	6
	Std. Deviation	.83666	1.03280
Total	Mean	2.2963	2.2222
	N	27	27
	Std. Deviation	2.01561	1.47631

Appendix Y Correlations between vocabulary gain on post-test and perceived vocabulary gain.

Correlations

		Post test Level 3 vocabulary gain	Perceived vocabulary gain
Post test Level 3 vocabulary gain	Pearson Correlation	1	.156
	Sig. (2-tailed)		.499
	N	21	21
Perceived vocabulary gain	Pearson Correlation	.156	1
	Sig. (2-tailed)	.499	
	N	21	21

Learning style	ILS Design Features (Baldwin and Sabry, 2003)	Group 1 % preference	All % preference	Comments on Author Plus features
Active	For learner-content interactions, allow learner to apply what has been taught (eg through interactive self-assessment questions that allow for learner's response and provide correlated and meaningful feedback). For learner-learner and learner-tutor interactions, allow the use of discussion (bulletin) board and electronic mail for group assignments, discussions, brainstorming and problem-solving exercises.	82	81.5	For learner-content interactions, allows learner to apply what has been taught (eg through interactive self-assessment questions that allow for learner's response and provide correlated and meaningful feedback).
Reflective	Enable reflection through pauses through which the learner can do self-assessment questions, quizzes, use of synchronous (eg Internet relay chat) and asynchronous interactions (eg discussion boards) to help understanding and evaluation of subject.	18	18.5	Synchronous and asynchronous interactions not possible in Author Plus. Reflection can be prompted by self-assessment tasks and quizzes/tests
Sensing	Provide specific and explicit examples and case studies of the real world of IS/CS that explain how concepts apply in practice through the use of video, animation, sound etc. Also through brainstorming sessions using the chat or discussion board.	100	77.8	Vocabulary and grammar can be contextualized in sentences and longer texts and these can be real world examples. Video etc could be used to illustrate certain concepts and situations eg presentations, meetings etc. Brainstorming not possible.
Intuitive	Provide abstraction and conceptualization elements through the use of textual summaries and conceptual diagrams	0	22.2	Possible to present summaries and diagrams
Visual	Provide relevant visual representations such as animation, graphs, videos, images etc. Provide a concept map (eg listing key points in circles, arrows etc). Use of colour, and highlighting certain points.	91	88.9	Possible to use images and videos to support exercises: not used in these materials.
Verbal	Allow for written words, (textual presentation) as well as spoken words (sound). Provide summaries or outlines of course material. Also, allow learner to write points learned in own words. Group discussion using discussion board and Internet relay chat to write own understanding and see other's explanations.	9	11.1	Allows for written word and sound recording of instructions etc.\n\nAllows learners to make notes on a notepad and print out.
Sequential	Allow learners to take a linear approach through step-by-step progression of topics such as the use of structured-type presentation.	54.5	48.2	Materials are usually ordered in a linear manner.
Global	Allow the learner to see the big picture, and connections between the parts. For example, by providing a section on the screen that provides an overview of main topics in the module, once a topic is chosen a list (overview) of subtopics is presented in the section. Provide mind maps, menus, embedded pictures etc	46	51.8	Possible to provide overview of topic and exercises/tasks.

Appendix Z ILS Design Features (Baldwin and Sabry, 2003), Learning Index preferences and comments on Author Plus