TAKING CONTROL

Autonomy in Language Learning

Edited by
Richard Pemberton, Edward S.L. Li,
Winnie W.F. Or and Herbert D. Pierson

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Use and abuse of autonomy in computer-assisted language learning: some evidence from student interaction with *SuperCloze*

Vance Stevens

Introduction

Although the situation is steadily being corrected, it has often been noted that CALL (computer-assisted language learning) has so far developed well ahead of its research base (e.g. Dunkel 1991). The result is that developers of CALL often work on intuition alone and have little real idea what students actually do with their programs (Chapelle 1990). To compound this situation, what research there is on CALL effectiveness is often done using procedures where the researcher intrudes on the learner, thus possibly contaminating the autonomous aspects of the process under study.

Feldmann and Stemmer (1987) discuss the various cognitive limits that may interfere with concentration on the task under study when students are asked to "think aloud" about what they are doing. It follows that intrusive protocols could influence results in studies such as that of Windeatt (1986), who videoed screens as his subjects thought aloud while doing computer-based cloze exercises and found that there was little use of program help features. Stevens (1991a, 1991b, 1991c), on the other hand, finds through non-intrusively tracking students working under self-access conditions that they sometimes overuse, even abuse, help features rather than rely on their competence in the language to solve problems. Thus degree of intrusion may be a factor in the outcome of such studies.

Research into what students do with CALL in self-access should ideally be carried out non-intrusively, yet due to the intrusive nature of most studies of the medium, rarely is CALL studied in its pure self-access state. One reason for this is the difficulty in controlling variables in a process which the experimenter essentially observes without interference. Also, for ethical reasons, researchers who identify individual subjects must inform them prior to including them in a study, in effect saying: "You are subjects in an experiment but please carry on as if you weren't!" As this could render it impossible to study self-access with that set of subjects, one solution, as with the present experiment, is to use subjects anonymously; that is, record their key presses on computers but take no record of who the individuals were who made them. Although many data are accordingly lost, such as relative English proficiencies of subjects exhibiting certain performance behaviours, the process under study can at least be assumed to be in a virtually uncontaminated state.

Another issue in CALL is the degree to which giving students control in self-access affects their learning. As Chapelle and Mizuno pointed out, as of 1989, the issue of optimal degree of learner control over CALL "has not yet been investigated". However, Pederson (1986) compared two groups of students, one of which was allowed to refer at any time to a reading passage during the course of answering questions on that passage, and found that the passage-unavailable treatment resulted in significantly higher levels of comprehension because those students were forced to process the text when they had their one chance to read it. One purpose of the present study is to gain further insights into how control over help features affects the degree of engagement with the target language for the students in the study.

Although CALL is typically referred to as a generic entity, in fact its manifestations are many: word processing, simulation, concordancing, database exploration, and almost anything else where computers manipulate a human language or use one as an interface. Thus, as a study of 'CALL' would rank in scope with a study of 'the world', that scope must be narrowed down.

Suggestions such as Kleinmann's (1987) that CALL should provide high levels of comprehensible input make text manipulation programs an appealing mode of CALL delivery, as they can work off virtually any ascii text. It is also argued (in Cobb and Stevens 1996) that text manipulation programs can emulate the reading process, especially in light of the "reading as a psycholinguistic guessing game" paradigm (Goodman 1967; Smith 1971; updated for ESL in Grabe 1991) — even detractors from the theory (e.g. Perfetti 1985) qualify their remarks for reading in second languages. In so far as it may promote awareness of contextual help in restoring degraded messages (Jonz 1990), cloze seems particularly suitable as a medium for text manipulation.

This chapter reports on a project in which student use of computer-based cloze is studied from data collected using non-intrusive methods. Due to the non-intrusive methods employed in data collection, the chapter presents unique insights into the use of CALL as an autonomous learning tool.

Setting and subjects

The project was carried out in the self-access Student Resource Centre (SRC) at Sultan Qaboos University in Oman, where students use computers to augment their English language skills. One major component of CALL in the SRC is a large corpus of texts taken from language courses and authentic subject course materials the students are studying. A battery of text manipulation programs provides one mode of access to these texts. Two of the text manipulation programs, *Hangman-in-Context* (Stevens and Millmore 1992–1995) and *SuperCloze* (Stevens and Millmore 1990–1995), have been configured so that when students use the programs, their key presses are recorded, making possible inferences regarding strategies used.

The students who use the SRC are Arabic-speaking male and female university students, mainly in their first year, taking English courses concurrently with subject courses at a university where English is for the most part the language of instruction. They use the computers either during scheduled class hours (when they might be directed to do certain activities by the teacher in charge) or during self-access hours in the evenings, when use would be completely unmonitored. Whether or not they themselves choose to use a certain program, once selected, students work unsupervised. Neither they nor in most cases their teachers are aware that data are being collected as they work, or that research is being carried out in the SRC. Thus we are able to collect data non-intrusively on student use of these particular programs.

Students do not log on to the stand-alone computers in the SRC, and no records were ever made of who any individual was in the study. Because of this, it is impossible to say with absolute certainty who the subjects were. It can be assumed that the interactants were all students, as the data were collected in a location used almost exclusively by students fitting the above description. In all, 54 different subjects can be distinguished as having interacted with the program at distinct dates and times, but here again, it would be impossible to say for certain that each subject was a different student, although it would be highly coincidental if any two subjects turned out to be the same student.

Although it is impossible to know from the available data the ability level of these students, assumptions can again be made based on the texts the students chose. The menus on the computers in the SRC are arranged so that students can access texts according to the courses they are taking. Accordingly, the students choosing medical texts would likely be the highest in language proficiency, followed by the English specialists (students training to be English teachers), who were the most likely users of texts from Reading for Adults and Expanding Reading Skills in addition to those from their own menu area. At the opposite end of the spectrum there are the remedial students, obviously weak in English, and students from Arts and Education, whose courses outside the Language Centre are usually conducted in Arabic. The proficiency levels of students selecting texts from the other groups such as Engineering and Science vary, but tend to fall between those of the students just mentioned. Finally, there are readings of a general nature stored on the computer (jokes and fairy tales) which could have been accessed by any of the above students.

The research perspective: findings from prior studies

Before concentrating on the present state of the research being carried out with students using *SuperCloze*, it will be useful to consider prior research done using subjects similar to those described above. Initially, a study was conducted (Stevens 1991d) in which students were asked via questionnaires to assess their attitudes towards use of the CALL facility in the SRC, of which early versions the *Hangman* and cloze programs were a prominent component. Despite the fact that most of the students were using computers for the very first time in the SRC, they reported generally favourable attitudes; e.g. that the programs were easy to use and that they perceived them as effective in improving their English.

Next, a pilot study was carried out using *Hangman*, which was chosen for this phase of the project because its code was easier to work with than that of *SuperCloze*, and data could be collected and analyzed with fewer complications than with those deriving from *SuperCloze*. Thus we could concentrate more easily on the nuts and bolts of implementation. From that standpoint, the project went well, as much was learned that could be applied to the development of the data collection component for *SuperCloze*.

But more importantly, the data revealed that, in the way it was then implemented, *Hangman* may not have been what we had assumed it was: an effective CALL program. To gather these data, each student response to the program had to be characterized as either deriving from a competency-based effort to solve the linguistic puzzle or just a random key press. A competency-based effort might be, when confronted with the letters "whi--", typing in the letter 'c' even though the word in question might be *whisk*. Another competency-based effort might be to request a hint to reveal "whis-", and then use that as a basis for solving the problem. Non-competency-based efforts include, besides random and clustered key presses, using hints for more than half the letters in a word or invoking the 'See Solution' feature, which in *Hangman* essentially solves the problem for the student.

It was found that students were engaging more than half the time in non-competency-based behaviours, with only 47% of their keystrokes suggesting use of some strategy clearly utilizing linguistic competence in arriving at a solution to any given problem. These results suggested numerous improvements to the program and led to the development of a stand-alone module which we now call *Hangman-in-Context*. As the name suggests, *HMIC* strives to emphasize the most crucial aspect of text manipulation: its relationship to the curriculum as reflected in the text base. This relationship is highlighted in *HMIC* through provision of a portion of the text surrounding the target word; that is, the surrounding context as it occurs in the text from which that word was extracted, except that this context is masked until the student unmasks it as needed and at the cost of points.

In addition, *HMIC* encourages productive strategies in solving text manipulation puzzles by:

1. imposing limits on use of hints;
2. detecting use of clustered key presses and signalling this awareness to the student; and
3. tracking correct vs. incorrect key presses both in the point system and by display of a progress-at-a-glance graphic.

As to the present project, work on *Hangman* has suggested a pattern of development that is being applied to *SuperCloze*, and whose steps are (a) implementation of a prototype CALL program, (b) data collection and analysis during trial on students, and (c) development of an improved version of the program which can be shown to be more pedagogically sound than the original. This chapter reports work with *SuperCloze* as it proceeds through these steps.

The *SuperCloze* program and its relation to the text base

As noted previously, the corpus of texts on the computers in the SRC is broken down into numerous files accessible through a menu of courses the students are in, so that students using *SuperCloze* should in theory be working on texts relevant to what they are doing in their current coursework. Accordingly, our text manipulation programs were designed to work from ascii text, and so serve as templates acting on any of the files in the corpus.

As one of these computer-based template programs, *SuperCloze* generates cloze exercises from any text file the student selects. After selecting a text, students have the option of choosing how they want the cloze passage to appear. The default is for every 5th word to be targeted for deletion, but any deletion rate ranging from every word to every 9th word may be selected, as well as deletion by word lists (e.g. lists of prepositions, helping verbs, determiners etc., or all words containing *n* number of letters, or more than *n*, or less, etc.). Students may also select texts that have been 'marked'; that is, a teacher has indicated words in the text that are those most appropriately deleted, and the program targets these.

Once students have settled on how they want the cloze passage to appear, the program generates cloze exercises from the selected text one paragraph at a time. In these exercises, the cursor appears at the first letter of the first targeted word. When students type a letter, the cursor moves to the next character blank until a word is completed, at which point students press 'Enter' for the program to compare their answer with the original text. If correct, the word remains in the text and the cursor moves to the next blank; if not, the incorrect answer is erased and the student can try again. At any point, the student can move the cursor to another blank, or request a hint (the correct letter at the cursor position), or have a look at the original paragraph and then either return to the problem or request another.

When the program is configured for research, all student moves are recorded into a data file on the hard disk, as well as particulars about the problem, such as the passage as it appeared to the student, the length of each paragraph, and how many gaps and words there were. Although the program records all key presses, students are never asked to identify themselves, and no records are made as to identity of individuals.

Data analysis

Two areas of analysis are suggested in the data collected: items that can be tallied, and moves made by students which we can attempt to understand in light of inferred linguistic competence. The present analysis focuses on the quantitative results. These include:

1. how much of the available text students appear to be working on;
2. whether they approach the text linearly or holistically;

3. how many problems they attempt, and how many are correct and incorrect;
4. how much time they spend on the text; and
5. how often and to what extent they use the help features provided in the program.

Because 100 is both a robust sample and a convenient number for calculating percentages, student interactions with 100 paragraph-length cloze exercises were used in the study. These 100 interactions were taken at random from the hundreds of interactions recorded. That is, a data file was opened at random and the interactions recorded there were analyzed, another file was opened and its contents analyzed, and so on until 100 interactions had been studied.

The data are presented in accompanying tables with column headings described in a key in the Appendix. The tables are designed so that interactions by the 54 subjects in the study can be easily traced. Towards this end, all subjects #1 to #54 who worked more than one paragraph are assigned letter designations to order the different paragraphs attempted. For example, as can be seen in Table 1, the first subject listed, #1, worked two paragraphs, a and b, spending just over a minute with each one. Apparently a medical student, this student chose his/her second text from the general reading section, and on both texts, attempted a single gap in each (that is, pressed some key besides 'F9-Quit' or 'Enter') but got no problems right. Some subjects appear on all three tables. For example, subject #4, probably a remedial English student, took eight minutes to solve the first two gaps in the first two of seven sentences in the first paragraph worked (Table 2: 4a) but used 'See Solution' and hints extensively in the process (Table 3: 4a). The student then quit that paragraph and peered into four others (Table 1: 4b, 4c, 4d and 4e), using 'See Solution' once more (Table 3: 4d), before completing all seven gaps in a sixth paragraph successfully (Table 2: 4f).

Results and discussion

Computer-surfers prone to browsing know that it is not unusual to open a software application only to exit it after a few seconds. In light of this, it was not surprising to find in the data numerous instances of 'window-shopping'; in fact, almost half the interactions recorded in this study evidenced non-fruitful use of the program. Taken optimistically, this means that over half the interactions were fruitful, while a fifth of all sessions recorded were worked by students to the very end (i.e. Number of gaps solved = Number of gaps attempted), an encouraging finding indeed in a setting of pure self-access.

In all, a total of 333 minutes of interaction time were examined, which suggests that students spent on average approximately three and a half minutes on each paragraph. Of this time, 280 minutes (84% of the total time) were spent in productive work, for an average of 5.38 minutes per paragraph dealt with interactively. Further distinctions between fruitful and non-fruitful sessions are elaborated below.

Non-fruitful sessions

As just noted, almost half of the sessions initiated by students with the *SuperCloze* program resulted in interactions for which no language-learning behaviours could be inferred. These non-fruitful sessions are indicated in the data wherever there are low time values, zero (or perhaps one) problems attempted, and of course zero numbers of gaps solved correctly. In other words, these are sessions where students looked at a passage, but made negligible effort to solve any of it. The data for such sessions are recorded in Table 1.

Table 1: Non-fruitful sessions

Subject and paragraph number	Type of text chosen	Deletion option selected	Number of gaps attempted	Number of gaps solved	Time on passage (min.)	Time per gap attempted
1a	M	determiners	1	0	1.1	1.1
1b	G	helping verbs	1	0	1.1	1.1
2	A	default: 5th	0	0	0.8	–
3a:f	A	default: 5th	0	0	5.9	–
3g	A	default: 5th	0	0	0.3	–
3h	A	default: 5th	0	0	0.1	–
3i	A	default: 5th	1	0	0.8	0.8
4b	R	default: 5th	0	0	0.2	–
4c	R	default: 5th	0	0	0.1	–
4d	R	default: 5th	1	0	1.2	1.2
4e	R	default: 5th	0	0	0.3	–

Table 1: to be continued

Table 1: continued

Subject and paragraph number	Type of text chosen	Deletion option selected	Number of gaps attempted	Number of gaps solved	Time on passage (min.)	Time per gap attempted
5	Eng	default: 5th	1	0	1.3	1.3
6	G	default: 5th	0	0	0.2	–
10	ERS	default: 5th	0	0	0.1	–
11	A	default: 5th	0	0	0.3	–
12	R	default: 5th	0	0	1.2	–
14a:h	G	default: 5th	0	0	10.2	–
15	Eng	default: 5th	0	0	0.3	–
16	E	default: 5th	0	0	0.3	–
18a	AE	default: 5th	0	0	1	–
18b	AE	default: 5th	0	0	1.3	–
19	G	default: 5th	1	0	0.7	0.7
20b	G	default: 5th	0	0	0.1	–
20c	G	default: 5th	0	0	0.1	–
21	AE	default: 5th	1	0	0.9	0.9
22	G	default: 5th	0	0	0.7	–
23	E	default: 5th	0	0	1	–
24	Eng	default: 5th	0	0	2.5	–
26a	AE	all	0	0	0.3	–
28	AE	default: 5th	0	0	0.1	–
30c	Eng	default: 5th	1	0	0.2	0.2
30d	Eng	default: 5th	0	0	0.1	–
30e	Eng	default: 5th	0	0	0.1	–
30f	Eng	default: 5th	0	0	0.1	–
33	Eng	default: 5th	0	0	0.3	–
35	M	default: 5th	0	0	0.8	–
41	E	default: 5th	0	0	1.5	–

Table 1: to be continued

Table 1: continued

Subject and paragraph number	Type of text chosen	Deletion option selected	Number of gaps attempted	Number of gaps solved	Time on passage (min.)	Time per gap attempted
43	E	default: 5th	0	0	3	–
45b	Eng	default: 5th	0	0	2	–
45c	Eng	default: 5th	1	0	1.9	1.9
45d	Eng	default: 5th	1	0	1.1	1.1
46	S/M	default: 5th	1	0	3.3	3.3
47	Eng	default: 5th	0	0	0.1	–
50	Eng	default: 5th	0	0	0.1	–
51	Eng	default: 5th	1	0	0.6	0.6
52a	Eng	default: 5th	1	0	0.5	0.5
52b	Eng	default: 5th	1	0	1	1
53b	Eng	default: 5th	1	0	1.5	1.5
Total	–	–	15	–	52.7	17.2
Average	–	–	–	–	1.1	1.15

Key to text types			
A	Reading for Adults	G	General Reading
AE	Arts and Education	M	Medicine
E	English specialists	R	Remedial
Eng	Engineering	S	Science
ERS	Expanding Reading Skills		

In the data, there are 33 instances of zero problems attempted — a third of the interactions recorded (but only 35.5 minutes, or 10.66% of the students' time spent). Some of these might indicate that a student wanted to look the text over before attempting it, a possibility in the case of subject 14a:h (Table 1), who chose, looked at, and quit from eight passages in succession over ten minutes' time with no recorded interaction (i.e. no gaps attempted, or no keys pressed other than 'Enter' or 'F9-Quit' in response to a blank). Another such interaction is 3a through h (Table 1), which in fact represents a student's looking at eight paragraphs one after another via the 'See Solution' (as indicated in Table 3: 3a:g) and 'Next passage' option for over six minutes before finally requesting a single hint (Table 3: 3i) just prior to logging off (Table 1: 3i).

Interaction 3i is representative of another example of non-fruitful interaction, where the student performed some action (an 'attempt') regarding a gapped item, but without success (i.e. attempted a problem and got it wrong or, as in the present case, requested a hint, then quit). In my sample data, there are 15 such items, which appear to be variations on window-shopping.

In summary, of the 100 cloze passages examined, about half (33 + 15 = 48) got essentially nowhere. In these cases, the students either looked at one or more paragraphs but did nothing more, or made a single move towards solving a gap and then quit without success or follow-through.

As noted, the interactions in this study in which such behaviour was exhibited constituted only 16% of the total time spent with the program by all students in the study. It is furthermore possible, since only data on student interaction with *SuperCloze* are considered in this study, that these students might have gone on to something else in the SRC that was productive and more suited to them. Unfortunately, there are no data on whether they did or not, as student movements are not tracked throughout the SRC.

However, it should be kept in mind that the existence of 'window-shopping' does not necessarily imply that students ultimately wasted their self-access time. They may have simply been captured in an act of browsing at a time when they were not in the mood for the task they had wandered into, and they may have found something else to do in the SRC that sharpened their linguistic skills a week, a day or a moment later, in the same way that window-shopping in real life leads ultimately to buying something, somewhere, from someone.

Fruitful sessions

Although it is interesting to note the large number of students who failed to take advantage of the opportunity to improve their English using *SuperCloze*, the main interest in the present study is with the students who did utilize the program. It is encouraging to find that the remaining 52% of the interactions, comprising 84% of the time spent with the program, were in some way fruitful. In these 52 interactions, the following data emerge, as shown in Table 2:

Table 2: Fruitful sessions

Subject and paragraph number	Type of text chosen	Deletion option selected	Number of sentences addressed	Linear or non-linear	Total gaps in passage	Number of gaps attempted	Number of gaps solved	Time on passage (min.)	Time per gap attempted
4a	R	default: 5th	2 out of 7	linear	7	2	2	8.0	4.0
4f	R	default: 5th	all	linear	7	7	7	4.5	0.64
7a	E	every 3rd	all	linear	14	14	14	5.9	0.42
7b	E	–	2 out of 3	linear	14	8	8	3.3	0.41
8a	E	default: 5th	all	linear	10	10	10	1.3	0.13
8b	E	–	all	linear	27	27	27	5.8	0.21
8c	E	–	all	linear	6	6	6	1.9	0.32
9	ERS	default: 5th	1st only	linear	7	2	1	1.5	0.75
13	G	default: 5th	1st only	linear	21	5	4	2.0	0.4
17a	AE	default: 5th	all	linear	16	16	16	30.4	1.9
17b	AE	default: 5th	4 out of 14	linear	23	5	4	4.2	0.84
18c	AE	default: 5th	1st only	linear	18	2	1	2.5	1.25
20a	G	default: 5th	1st only	linear	12	2	1	2.3	1.15
20d	G	default: 5th	4 out of 7	linear	15	8	7	3.9	0.49
25	ERS	default: 5th	1st only	linear	8	2	0	1.2	0.6
26b	AE	default: 5th	1st only	–	13	1	1	0.8	0.8
27	ERS	determiners	global	non-linear	25	6	5	1.7	0.28
29a	S	default: 5th	2 out of 3	linear	15	5	4	1.8	0.36
29b	S	default: 5th	1st only	linear	29	3	2	0.6	0.2

Table 2: to be continued

Table 2: continued

Subject and paragraph number	Type of text chosen	Deletion option selected	Number of sentences addressed	Linear or non-linear	Total gaps in passage	Number of gaps attempted	Number of gaps solved	Time on passage (min.)	Time per gap attempted
30a	Eng	default: 5th	4 out of 14	linear	32	6	6	13.1	2.18
30b	Eng	default: 5th	1st only	linear	11	4	4	4.2	1.05
30g	Eng	default: 5th	global	non-linear	17	2	0	1.7	0.85
31a	E	marked text	all	linear	6	6	6	5.2	0.87
31b	E	marked text	all	linear	16	16	16	6.0	0.38
31c	E	marked text	all	linear	2	2	2	0.6	0.30
32a	G	default: 5th	1st only	–	20	1	1	1.6	1.60
32b	G	default: 5th	all	linear	20	20	20	4.8	0.24
32c	G	default: 5th	all	linear	12	12	12	3.2	0.27
34	M	default: 5th	all	linear	12	12	12	2.0	0.17
36a	ERS	default: 5th	2 out of 6	linear	12	3	2	5.4	1.80
36j	ERS	default: 5th	global	non-linear	8	3	1	1.6	0.53
36u	ERS	default: 5th	2 out of 2	linear	7	4	3	2.5	0.63
36v	ERS	default: 5th	1st only	linear	11	2	1	1.5	0.75
36x	ERS	default: 5th	1st only	–	3	1	1	1.1	1.10
37b	Eng	default: 5th	1st only	linear	11	4	4	2.0	0.50
38a	Eng	default: 5th	3 out of 5	linear	26	11	11	12.5	1.14
38b	Eng	default: 5th	all	linear	7	7	7	7.9	1.13
38c	Eng	default: 5th	all	linear	12	12	12	6.8	0.57

Table 2: to be continued

Table 2: continued

Subject and paragraph number	Type of text chosen	Deletion option selected	Number of sentences addressed	Linear or non-linear	Total gaps in passage	Number of gaps attempted	Number of gaps solved	Time on passage (min.)	Time per gap attempted
39b	Eng	default: 5th	all	linear	8	8	8	6.7	0.84
40	E	default: 5th	1st only	linear	10	3	2	0.8	0.27
42	AE	default: 5th	1st only	linear	12	3	2	2.3	0.77
44	R	default: 5th	1st only	linear	9	2	1	18.1	9.05
45a	Eng	default: 5th	1st only	non-linear	21	4	0	4.8	1.2
48a	ERS	default: 5th	1st only	linear	7	2	1	9.1	4.55
48b	ERS	default: 5th	all	non-linear	15	15	15	25	1.67
49a	M	default: 5th	all	linear	12	12	12	5.2	0.43
49b	M	default: 5th	all	linear	19	19	19	14.7	0.77
49c	M	default: 5th	all	linear	16	16	16	6.3	0.39
49d	M	default: 5th	3 out of 6	linear	23	12	11	11	0.92
52c	Eng	default: 5th	all	linear	22	9	6	1.6	0.18
53a	E	marked text	1st only	–	3	1	1	0.9	0.9
54	AE	helping verbs	all	non-linear	12	12	10	6.4	0.53
Totals	–	–	–	–	721	377	345	280.2	—
Averages	**–**	**–**	**–**	**–**	**13.87**	**7.25**	**6.63**	**5.39**	**0.74***

* Calculcated from total time on passage divided by total number of gaps attempted

1. In 19 of the sessions recorded, students correctly solved all of the blanks presented.
2. Thirty-four interactions with the program involved all or a substantial portion of the passage presented. Twenty-one subjects addressed blanks found in all the sentences in the passage.
3. In the remaining 18 of the 52 fruitful sessions examined, interaction was constrained to within the first sentence.
4. Of all cloze passages in the database in which more than one gap was addressed, only six were addressed in anything but a strictly linear, solve-one-gap, go-on-to-the-next manner.

Regarding the latter finding, the tendency for students to work linearly with CALL has been noted elsewhere (e.g. Edmondson et al. 1988). Windeatt (1986) also finds that his students working cloze went linearly from blank to blank instead of employing more holistic reading strategies. Considering that the range of choices possible with computers should promote more holistic approaches, the consistency of these findings suggests that student users of computers typically fail to realize this advantage. A practical purpose of studies such as this, then, is to identify such patterns of use and then reconfigure the courseware to channel students into optimally productive behaviours.

Along the same lines, another tendency of students (85% of all interactions) was to accept the default option of every 5th word deleted rather than experiment with the other settings. Again, if experimentation is to be encouraged, then it must be somehow proposed to the students rather than simply being available to them. In summary, although 18 of the students worked only within the first sentence of the cloze exercise, over a third of all interactants in the study (34) did substantial work with the program. In fact, almost a fifth (19) of all exercises attempted in this study were worked to completion.

Use, and abuse, of 'Help'

Both text manipulation programs referred to in these studies, *Hangman* and *SuperCloze*, had two help features: 'Hint' and 'See Solution'. In either program, a request for a hint reveals one letter. 'See Solution' works differently in each program. In *Hangman* it reveals the target word and then takes the student on to the next problem; whereas in *SuperCloze* it shows learners the paragraph intact, without any words blanked out, and then allows them to either return to the original gapped paragraph or skip to the next one. These help features are provided so that students can always in one way or another find a correct answer rather than become frustrated. However, the help features can be abused if students use the computer to feed themselves answers rather than think them through themselves. One purpose of this research, then, is to determine the extent of such abuse and then configure the program to counter it appropriately. In the pilot study using *Hangman*, there was found a high instance of abuse of the on-line help features, to the extent that just over half the interactions with the program favoured reliance on help over applying strategies based on an emerging competence in the target language (Stevens 1991a). In other words, a surprisingly large number of students engaged in random key presses, or had answers fed to them hint by hint until the problem was solved for them, or in some cases even saw one solution after another with no attempt at all to try on their own to discern the solution to the word puzzle.

If this behaviour were typical of students working text manipulation programs on computers during self-access sessions when they thought no one was looking over their shoulders, then it might be expected that work with *SuperCloze* would be similarly non-productive. Considering that student use of *SuperCloze* includes window-shopping activities which seemingly have no result, and that students engage in such behaviour in about half the log-ons to the program, perhaps there is a relationship here with the *Hangman* data. Perhaps the 50% of the students who would be expected to window-shop simply found it easier to wander around in *Hangman*, but had no more intention of buying than the 50% who paused at the door of *SuperCloze*, had a peek, and abruptly exited. On the other hand, such behaviour might be particular to *Hangman* or with that particular computer-based implementation of it, with *SuperCloze* being taken more seriously as a language-learning activity. In fact, the data show that abuse of help features was less predominant in *SuperCloze* than with *Hangman*, suggesting that students were by and large invoking competency-based strategies.

The hint feature in *SuperCloze* was, if anything, underutilized by most students, especially by those who had little or no interaction with the program. As can be seen from Table 3, there were only isolated incidents of heavy use of hints (see subjects #8 who used hints to solve approximately half the characters in the gaps presented in paragraphs b and c; #26b who solved a single word entirely through use of hints; and #30 who used hints to solve more than half the letters in all the words presented in paragraphs a and b).

'See Solution' appears to have been more widely abused. Twenty-five of the 34 passages in which there was significant interaction registered some use of 'See Solution', and some of this was exorbitant (e.g. #4a who used

Table 3: Use of hints and 'See Solution'

A	B	C	D	E	F	G	H
Subject and paragraph number	Number of times 'see Solution' requested	% of solutions seen per gaps solved correctly	Number of gaps for which hints requested	% of gaps for which hints requested per gaps attempted	Total number of hints requested in all gaps in the passage	Total number of characters in all words for which hints requested	% of hints in Column F per characters in Column G
3a:g	7	none solved	–	–	–	–	–
3i	–	–	1	100.0	1	7	14.3
4a	7	350.0	1	50.0	1	4	25.0
4d	1	none solved	–	–	–	–	–
7a	3	21.4	–	–	–	–	–
7b	4	50.0	–	–	–	–	–
8a	–	–	1	10.0	1	5	20.0
8b	–	–	7	25.9	16	28	57.1
8c	–	–	4	66.7	8	17	47.1
17a	5	31.3	1	6.3	1	3	33.3
17b	1	25.0	–	–	–	–	–
20a	1	100.0	–	–	–	–	–
20d	3	42.9	–	–	–	–	–
25	–	–	2	100.0	3	11	27.3
26b	–	–	1	100.0	3	3	100.0
30a	1	16.7	5	83.3	16	27	59.3
30b	3	75.0	3	75.0	13	23	56.5
30c	–	–	1	100.0	1	10	10.0
31a	1	16.7	1	16.7	1	3	33.3

Table 3: to be continued

Table 3: continued

A	B	C	D	E	F	G	H
31b	1	6.3	–	–	–	–	–
32b	3	15.0	–	–	–	–	–
32c	5	41.7	–	–	–	–	–
34	–	–	1	8.3	3	9	33.3
36a	–	–	2	66.7	3	8	37.5
36j	–	–	–	–	1	3	33.3
37b	1	25.0	1	25.0	1	2	50.0
38a	4	36.4	1	9.1	1	6	16.7
38b	4	57.1	6	85.7	6	31	19.4
38c	5	41.7	7	58.3	7	30	23.3
39b	4	50.0	3	37.5	3	15	20.0
42	1	50.0	–	–	–	–	–
45d	–	–	1	100.0	1	5	20.0
48a	1	100.0	–	–	–	–	–
48b	1	6.7	3	20.0	4	14	28.6
49a	1	8.3	–	–	–	–	–
49b	5	26.3	–	–	–	–	–
49c	2	12.5	–	–	–	–	–
49d	3	27.3	–	–	–	–	–
52a	–	–	1	100.0	1	5	20.0
52c	–	–	1	11.1	1	8	12.5
53b	–	–	1	100.0	1	9	11.1
Totals	78	33.3	56	34.8	98	286	34.27
Averages	**2.89**	–	**2.33**	–	**3.92**	**11.4**	–

'See Solution' 7 times to solve 2 gaps; and subject #30 who, in addition to abusing hints, used 'See Solution' in 3 of 4 gaps solved in paragraph b). In many cases, 'See Solution' appears to act in the manner of a drug — students try faithfully to solve gaps until they 'discover' the feature, at which point its frequency of use increases.

A signature strategy for at least two different subjects was to use a hint to expose a single letter in an unknown word, perhaps make an attempt at solving the problem, but failing that (or sometimes directly, without overt attempt at an answer) to use 'See Solution' to get the rest of the word. Still another pattern (3a:g, 4d) was to look at the solution, return to the problem, and still fail to solve the gapped item. The fact that hints were underutilized by students in window-shopping mode suggests that the existence of this and other features should be emphasized somehow to the casual user while access to these features should be limited for those engaged in the task. In the most recent version of *SuperCloze*, the number of hints available has in fact now been restricted to half the number of characters blanked in a given word, and the number of times a student can invoke 'See Solution' has been limited to two per paragraph.

Healthy use of hints and 'See Solution'

Perhaps the most encouraging finding in the study is that half the interactions with *SuperCloze* are fairly productive ones. Interaction 48b (Tables 2 and 3) is one example, in which the student solved all gaps, resorting occasionally to reasonable use of hints, and skipping but later cycling back through gaps not solved the first time around. 'See Solution' was used only at the very end of the session, to reveal the word *Mashona* (the name of an ethnic group in Southern Africa).

Numerous instances of this kind of competency-based problem solving in the data suggest that use of this and similar CALL programs can be healthy and warranted for language learning. The next stage of the analysis will be to examine more closely what is going on in these more productive interactions in the hope of isolating strategies that should be encouraged in order to revise the *SuperCloze* program accordingly.

Conclusion

This study has attempted to shed some light on how students approach CALL text manipulation in purely self-access mode. Although intrusive protocols such as introspection during problem solving or follow-on interviews can be revealing, such protocols can raise doubts about whether students are engaging in self-access when they know their behaviour is being monitored. Therefore, a non-intrusive protocol was used in the present study to increase chances of being able to observe the phenomenon under study, even though loss of individual data on the students means that explanations for some behaviour can only be inferred.

The findings of the present study and of the pilot one with *Hangman* suggest that students working in self-access mode tend to abuse help features more than CALL developers might realize, though this tendency was more marked with *Hangman* that with *SuperCloze*. With both programs, there is an element of 'window-shopping', with students dropping in on the program, just having a look, and perhaps going on to something else that will help them improve their linguistic abilities, or perhaps not. More optimistically, with both programs, half the interactions are serious ones with ample evidence that the students are using their budding linguistic competence in working towards solutions to the problems.

This paper is based on a quantitative analysis of certain elements in the data. It is hoped that more insights may be gained using a qualitative approach to the vast amounts of data being collected. This is action research, in that these insights are being directed towards improvements to the program that will make it an even more effective medium for fruitful, competency-based interaction with authentic texts in the study of second languages.

APPENDIX: Key to Tables

Table 1: Non-fruitful sessions

Subject and paragraph number	Numbers each subject in the study and assigns a letter to paragraph-long cloze exercises attempted (in the order attempted).
Type of text chosen	Gives the category of text each subject selected, from which inferences regarding student proficiency level can be made.
Deletion option selected	Records the deletion target option selected by each subject.
Number of gaps attempted	Gives the number of gaps in the passage which each subject attempted to solve.
Number of gaps solved	Records the number of gaps successfully solved by each subject (in non-fruitful sessions, this number is always zero).
Time on passage	Gives the amount of time in minutes each subject spent on each paragraph.
Time per gap	Computes the average time each subject spent on each gap attempted.

Table 2: Fruitful sessions

In addition to all of the elements in Table 1, Table 2 contains the following:

Number of sentences addressed	Records the number of sentences considered by each subject in working each cloze paragraph. The purpose of this measure is to quantify how much of the passage the student might have read as inferred from the position in the paragraph of gaps addressed. Notations are: "1st only" (the student appears to have looked only at the first sentence), "all" (students may have considered all the sentences in the paragraph), something like "2 out of 7" (the student addressed gaps found in the first two of the seven sentences in the passage), and "global" (the student attempted gaps at various places in the paragraph).
Linear or non-linear	Records whether the subject approached the gaps sequentially or not.
Total gaps in passage	Gives the number of gaps in that particular cloze exercise.

Table 3: Use of hints and 'See Solution'

A	Subject number	These are the same subjects as in Tables 1 and 2.
B	Number of times 'See Solution' requested	Gives the number of times the student saw the solution while viewing that paragraph.
C	% of solutions seen per gaps solved correctly	Relates the frequency of 'See Solution' use to the number of gaps solved; a high number here implies overuse of this feature.
D	Number of gaps for which hints requested	Gives the number of gaps in the passage which were addressed through some use of hints.
E	% of gaps for which hints requested per gaps attempted	Relates the figure in D to the number of gaps the subject attempted in the entire passage.
F	Total number of hints requested in all gaps in the passage	The total number of times the student in requested hints in a given paragraph irrespective of the number of gaps.
G	Total number of characters in all words for which hints requested	This is the sum of the number of letters in all the words where the student asked for the hints.
H	% of hints in Column F per characters in Column G	Gauges degree of reliance on hints by showing (on average) the percentage of characters revealed through use of hints in the words where hints were used.

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