International Journal of Applied Linguistics, Vol. 13, No. 2, 2003 179

Student language learning strategies across eight disciplines[1]

Matthew Peacock and Belinda Ho
City University of Hong Kong

The research on which this article reports investigated the use of 50 common second language learning strategies by 1,006 EAP (English for Academic Purposes) students across eight disciplines – building, business, computing, engineering, English, maths, primary education, and science – in a university in Hong Kong. The study compared and contrasted strategy use across disciplines and also examined the relationships among strategy use, L2 proficiency, age, and gender. Initial data were collected through a standard questionnaire, Oxford's Strategy Inventory for Language Learning. In-depth interviews were also conducted with 48 students to explore why they did or did not use certain strategies. A positive association was found between 27 strategies and proficiency. English students used the most strategies, and computing the fewest. Different deficiencies in strategy use were found in different disciplines, for example the very low use of metacognitive strategies by computing students. Differences were also found by age and by gender: older students were strong in affective and social areas, and females in the use of memory and metacognitive strategies. Conclusions are that EAP teachers need to be aware of possibly sharp disciplinary differences in strategy use and to apply discipline-specific strategy training where appropriate.

Introduction

A number of important findings on student second language learning strategies have been generated by studies using Oxford's (1990) Strategy Inventory for Language Learning (SILL; see Appendix). SILL is a self-report questionnaire that has been widely used to collect and analyse information from large numbers of students.[2] It lists 50 strategies in six categories:

memory (remembering more effectively): e.g. "I think of relationships between what I already know and new things I learn in English."
cognitive (using all your mental processes): e.g. "I try to find patterns in English."
compensation (compensating for missing knowledge): e.g. "If I can't think of an English word, I use a word or phrase that means the same thing."
metacognitive (organising and evaluating learning): e.g. "I think about my progress in learning English."
affective (managing emotions): e.g. "I encourage myself to speak English even when I am afraid of making a mistake."
social (learning with others): e.g. "I ask for help from English speakers."

One aim of investigating such strategies is to gain insights into the cognitive, social and affective processes involved in language learning and through this help students who are having difficulties become better language learners (Chamot 2001). Research into strategies is also important because they are readily teachable (Oxford and Nyikos 1989: 291; Chamot 2001: 25). There are a number of reports of successful strategy training programmes, e.g. Sengupta (2000), Yang (1996), and Nunan (1996);[3] in addition, Cohen (1998) provides very comprehensive instructions for implementing strategy training. An alternative to direct training is to embed strategies in teaching tasks and materials.

Cohen's (1998: 4) definition of second language learning strategies is used in this study: processes consciously chosen by students that result in action "taken to enhance the learning or use of a second language . . . through storage, retention, recall, and application".

Mullins (1992) found high use of compensation, cognitive and metacognitive strategies and medium use of the social, memory and affective strategies among 110 Thai university EFL students. She reports a positive association between the use of compensation and metacognitive strategies and proficiency but does not report on gender and discipline differences.

Ehrman and Oxford (1995) studied 262 English native-speaker government employees studying different foreign languages at the U.S. Foreign Service Institute. They found that the most frequently used strategies were from the compensation category followed by social and cognitive, then metacognitive, memory and affective strategies. Only compensation strategies were associated (weakly) with proficiency. However, they did not report on gender or give separate results for individual strategies.

Green and Oxford (1995) surveyed 374 tertiary-level Puerto Rican ESL students split equally among three courses (prebasic, basic, and intermediate). They report significantly higher strategy use among more proficient students in the cognitive, compensation, metacognitive and social categories. Seventeen individual strategies were used significantly more often by more proficient students; one was used significantly less often.[4] They also report higher strategy use among females in the memory, metacognitive, affective and social categories. They did not investigate interdisciplinary results.

Bedell and Oxford (1996) report in their study of 353 secondary and tertiary students studying English in China that the most frequently used category was compensation. Memory strategies were used least (they do not present results on individual strategies, or proficiency data). Surprisingly, they also assert (p. 48) that "memorization is popular".

Ku (1997) used SILL with 335 college students in Taiwan. She reports that compensation strategies were the most frequently used, followed by cognitive, metacognitive, memory, social and affective. She reports higher strategy use overall among more proficient students and among females but does not report separate results for individual strategies or the statistical significance of her findings.

Goh and Foong (1997) researched 175 ESL students from China. Metacognitive and compensation strategies were the most used categories, and memory and social the least. Females used compensation and affective strategies significantly more often than did males.

Yang (1999), in a questionnaire survey of 505 university students in Taiwan, investigated the relationship between learner beliefs about language learning and strategy use (the latter using a modified version of SILL). As beliefs were the main focus of her study, she does not give detailed results for strategies, but her Pearson correlation results provide some indication of why students use certain strategies. The correlations suggest that there is a link between beliefs and strategy, e.g. between a belief in the importance of the need to practice a lot when learning an L2 and the strategies of practicing a lot and paying attention when someone is speaking. (She notes that Horwitz 1988 predicted the existence of such a link. See also Yang 1998). Her findings also indicate correlations between a belief in "the value . . . of spoken English" and "more frequent use of formal oral-practice strategies" (1999: 530). Yang also proposes that there are other links between learner beliefs and strategy use. Wen and Johnson (1997) found indications of one such link during interviews with ten L2 learners in China – high achievers disapproved of guessing as a vocabulary learning strategy as they assumed it would not work.

Rong (1999) investigated language learning strategy use among tertiary-level students in China and reports that compensation and metacognitive strategies were the most frequently used; memory and cognitive were used least. Frequency of strategy use was higher among more proficient learners. Students majoring in English (N = 87) used significantly more strategies in four categories (cognitive, compensation, affective and social) than did science students (N = 84). No significant differences were found by gender, and she does not report results for individual strategies.

Mochizuki (1999) reports that Japanese university students used compensation strategies most frequently and affective the least. Female students used strategies more frequently than males in all six categories. Students studying English (N = 113) used compensation strategies, social strategies and metacognitive strategies significantly more often than did science students (N = 44).

Bremner (1999) explored strategy use among 149 primary education students studying in a Hong Kong university. He found that compensation and metacognitive strategies were the most used, and affective and memory the least. Strategy use was significantly higher among more proficient learners for 11 out of 50 strategies (mostly cognitive).

Peacock (2001) used SILL with 140 science, maths and engineering students in a Hong Kong university. He reports that students always or frequently used 18 of the 50 strategies, primarily cognitive and compensation. The use of nine strategies was associated with proficiency. Physics students used significantly fewer cognitive strategies than students from the other two disciplines did, and maths students used significantly fewer metacognitive strategies. He does not report discipline differences for individual strategies. Peacock's results may be compared to those of the two earlier studies below which did not use the standard SILL. (See also Oxford 1989 for a useful review of previous work on the effect of career orientation and other factors on strategy use.)

Politzer and McGroarty (1985) used the previously untried Behavior Questionnaire to survey 37 university ESL students, half "engineering/science" and half "social science/humanities". They report that discipline affected strategy choice – engineering/science students avoided "positive" (i.e. useful) strategies. Oxford and Nyikos (1989) used an earlier 121-item version of SILL to survey 1,200 foreign language students in a US university, half from engineering/computer science/physical sciences, 35% social science/education/humanities, and 15% "business or other subjects". They do not report results for either individual strategies or strategy categories, but they did find that discipline affected strategy choice. Social science/education/humanities students used "functional practice" (language practice outside the classroom) and "resourceful, independent" strategies (memorising, planning, self-testing, and self-award) significantly more often than did students from other disciplines. They suggest that this finding reflects the fact that these students are better motivated to learn English than the others, and thus "take seriously" the need to practice outside the classroom.

Common findings in previous research, then, are:

1) The most frequently used categories are compensation, cognitive, and metacognitive.
2) There is often a positive association between strategy use and proficiency.
3) Frequency of strategy use is often higher for females.
4) Frequency of strategy use is often higher among humanities students than among science and engineering students.

However, research in certain areas is lacking. There appear to be almost no studies investigating age as a factor. Also, most previous research (with the notable exception of Green and Oxford 1995) is confined to describing the broad categories of strategies that students use rather than individual strategies. This is a weakness because, as Larsen-Freeman (2001: 23) points out, proficiency

varies with the use of *certain* strategies, not *all* strategies.[5] Also, not enough research seems to have investigated strategy use (particularly individual strategy use) across different academic disciplines. We suggest that there is an urgent need for further research in this area because of the very large number of EAP (English for Academic Purposes) students in English-medium universities around the world. It is important to investigate interdisciplinary strategy use among EAP students, because (a) there are indications that discipline affects strategy choice, and (b) better knowledge of interdisciplinary differences could be crucial for EAP teachers, who have to tailor courses to students in particular disciplines.

Finally, not enough seems to be known about *why* students use or do not use certain strategies. We suggest it is important to investigate the factors affecting student use of strategies so as to ensure greater success when teachers provide learning strategy training to students. SILL does not provide this valuable data, and part of our research plan was to conduct in-depth student interviews in order to investigate this important area.

Research method

SUBJECTS

A total of 1,006 Hong Kong Chinese learners in 55 City University EAP classes took part in this study, of whom 51% were male and 49% female. Their average age was 21, ranging from 18 to 39, and 90% were first- or second-year students and 10% third year. The 55 classes were selected so we could compare strategy use across eight disciplines. Each discipline was represented by a reasonable number of students (the smallest group was 60; see Table 1).

RESEARCH QUESTIONS

The project aimed to investigate the following six research questions:

1) What language learning strategies do EAP students use across eight disciplines?

Table 1. *Student disciplines*

Discipline	Number of students	% of total
Building and Construction	98	10
Business	340	34
Computer Studies	173	17
Engineering	79	8
English	81	8
Maths	68	7
Primary Education	60	6
Science	107	10
Total	**1,006**	**100**

2) Does strategy use differ by discipline?
3) What strategies are associated with higher levels of proficiency?
4) Does strategy use differ by gender?
5) Does strategy use differ by age?
6) What are the reasons behind student choice and frequency of use of specific strategies?

DATA COLLECTION

Two data-collection instruments were used: the SILL self-report questionnaire on language learning strategy use, and a semi-structured interview sheet for learners. SILL collected quantitative data, while the interview collected qualitative data. Data collection was broadened from the use of just SILL in order to help explain the results. Most studies using SILL have not done this.

The SILL learner self-report questionnaire

The prime data-collection instrument for researching learner use of strategies is the 50-item SILL (Oxford 1990),[6] which asks learners about the frequency of their use of 50 common strategies. It has a Likert-scale format: learners are asked to report on a scale of one to five how often they use each strategy. The choices are: never or almost never; usually not; somewhat; usually; always or almost always. The reliability and validity of SILL have been extensively assessed in a large number of studies and a wide range of contexts – Oxford and Burry-Stock (1995) provide a thorough review of the results. SILL has consistently scored above .90 using Cronbach alpha, indicating high internal reliability; its content validity, predictive validity for L2 performance, and construct validity have also all been found to be very high.

In our study, extra space was added at the top of the SILL questionnaire to collect data on the student's discipline, proficiency level, gender, and age. Proficiency was represented by the score that the students obtained in the Hong Kong Advanced Level Use of English examination. This is a series of six tests taking five hours 50 minutes: listening comprehension (18% of marks), writing (18%), reading (6%), speaking (18%), grammar (12%) and work and study skills in English (28%). A copy of SILL was given to 1,006 students during 2001/02. They were told that it was not a test and that there were no right or wrong answers. The response rate was 100% as questionnaires were filled out in class. The forms were not completed anonymously (students wrote their student numbers on the form) to allow us to contact certain students for an interview later.

Semi-structured interview sheet (selected learners)

The aim of these 15-minute interviews was to collect data to answer research question (6) about the reasons behind their use of strategies. The three students in each discipline with the highest and lowest use of all the SILL strategies that were associated with higher levels of proficiency (see Results below) were invited for interview. These 48 students were paid a small fee and were asked (in

Cantonese[7]) why they did not or did use certain strategies. All interviews were tape-recorded.

DATA ANALYSIS

Descriptive statistics were computed for all SILL items. Associations between strategy use and discipline, proficiency level, gender and age were checked via multivariate analysis of variance – the relationships among all variables were checked at the same time. Significance levels were set at $p < .05$. All interview data were transcribed, tabulated and categorised. The internal consistency reliability of SILL using Cronbach alpha was computed at .9265 based on the entire 1,006-person sample.

Results

Results for our six research questions will be discussed in order. The multivariate analysis of variance found no significant interaction among independent variables.

1) WHAT LANGUAGE LEARNING STRATEGIES DO EAP STUDENTS USE ACROSS EIGHT DISCIPLINES?

Among all students, the most frequently used strategies were the compensation category followed by cognitive and metacognitive, then social, memory and affective strategies. Only two strategies were usually used by all students: "To understand unfamiliar English words, I make guesses", and "If I can't think of an English word, I use a word or phrase that means the same thing" (items 24 and 29).

2) DOES STRATEGY USE DIFFER BY DISCIPLINE?

Disciplinary differences in overall strategy use

Students majoring in English reported the highest overall frequency of strategy use, followed by primary education, then business, maths, science, engineering, and building students. The lowest overall strategy use was reported by computing students.

Disciplinary differences by SILL category

A number of differences were found, as shown in Table 2. The most striking differences were that students majoring in English reported a much higher use of three strategy categories – cognitive, metacognitive, and social – than did students from other disciplines; and that computer studies students reported a much lower use of metacognitive strategies.

Disciplinary differences in the use of individual strategies

A number of differences were found, as shown in Table 3. Students majoring in English reported a higher or much higher use of 26 strategies than did students

Table 2. *Disciplinary differences in strategy use – SILL categories*

Discipline	Relative use of SILL categories
Building	***tendency to use*** more affective strategies
Business	***tendency to use*** more cognitive and compensation strategies
Computer studies	***much lower*** use of metacognitive strategies; ***lower*** use of memory and cognitive strategies
Engineering	***tendency to use*** more cognitive and metacognitive strategies
English	***much higher*** use of cognitive, metacognitive, and social strategies; ***higher*** use of compensation and affective strategies
Maths	***lower*** use of affective strategies; ***higher*** use of social strategies
Primary Education	***lower*** use of cognitive strategies; ***higher*** use of memory and affective strategies
Science	***lower*** use of compensation and social strategies; ***tendency to use*** more affective strategies

'Lower' and 'higher' use means significantly lower/higher compared to other disciplines ($p < .05$).
'Much lower/higher' means significantly lower/higher than the low/high use in other disciplines ($p < .05$).
'Tendency to use' means compared to other categories within that discipline.

from other disciplines (only the 11 with much higher use for English are shown in the table;[8] those associated with higher proficiency are in italics).

3) WHAT STRATEGIES ARE ASSOCIATED WITH HIGHER LEVELS OF PROFICIENCY?

Results indicate a statistically significant positive association between 27 individual strategies and proficiency.[9] No less than 59% of these strategies fall into just two categories, cognitive and metacognitive (none were from the affective category).[10] The 27 strategies are shown in Table 4 in rank order; that is, the first strategy is the one with the largest difference by proficiency.

Interestingly, further analysis showed that high proficiency learners[11] always or often use no less than 13 of these 27 'good' strategies, whereas mid- and low-proficiency learners always or often only used two or three of them – a sharp difference.

4) DOES STRATEGY USE DIFFER BY GENDER?

Females (N = 493) reported significantly higher use of all six strategy categories (memory, cognitive, compensation, metacognitive, affective, and social) than did males. They also report a much higher use of nine individual strategies (78% were from the memory or metacognitive categories). These nine are shown

Table 3. *Disciplinary differences in individual strategy use*

Discipline	Use level	Strategy
Building	higher	40 I encourage myself to speak English even when I am afraid of making a mistake
		44 I talk to someone else about how I feel when I am learning English
Business	higher	*13 I use the English words I know in different ways*
		18 I first skim an English passage (read over the passage quickly) then go back and read carefully
		20 I try to find patterns in English
		27 I read English without looking up every new word
Computing	lower	3 I connect the sound of a new English word and an image or picture of the word to help me remember the word
		8 I review English lessons often
		12 I practice the sounds of English
		17 I write notes, messages, letters or reports in English
		29 If I can't think of an English word, I use a word or phrase that means the same thing
		31 I notice my English mistakes and use that information to help me do better
		33 I try to find out how to be a better learner of English
		34 I plan my schedule so I will have enough time to study English
		36 I look for opportunities to read as much as possible in English
Engineering	higher	14 I start conversations in English
		19 I look for words in my own language that are similar to new words in English
		33 I try to find out how to be a better learner of English
		36 I look for opportunities to read as much as possible in English
English	lower	42 I notice if I am tense or nervous when I am studying or using English
	much higher	*8 I review English lessons often*
		11 I try to talk like native English speakers
		12 I practice the sounds of English
		15 I watch English language TV shows spoken in English or go to movies spoken in English
		30 I try to find as many ways as I can to use my English

Table 3. (*cont'd*)

Discipline	Use level	Strategy
(English)	(much higher)	*33 I try to find out how to be a better learner of English*
		34 I plan my schedule so I will have enough time to study English
		38 I think about my progress in learning English
		47 I practice English with other students
		49 I ask questions in English
		50 I try to learn about the culture of English speakers
Maths	lower	42 I notice if I am tense or nervous when I am studying or using English
		44 I talk to someone else about how I feel when I am learning English
	higher	*45 If I do not understand something in English, I ask the other person to slow down or say it again*
		47 I practice English with other students
Primary education	lower	*13 I use the English words I know in different ways*
		15 I watch English language TV shows spoken in English or go to movies spoken in English
		17 I write notes, messages, letters or reports in English
Science	lower	*24 To understand unfamiliar English words, I make guesses*
		27 I read English without looking up every new word
		47 I practice English with other students
	higher	39 I try to relax whenever I feel afraid of using English
		42 I notice if I am tense or nervous when I am studying or using English

'Lower' and 'higher' use means significantly lower/higher compared to other disciplines ($p < .05$).
Strategies in italics are most strongly associated with higher proficiency.

in rank order in Table 5 (seven were associated with higher proficiency – they are in italics).

5) DOES STRATEGY USE DIFFER BY AGE?

Mature students (aged 23 and over; N = 112, i.e. 12% of students in our sample) reported a significantly higher use of four of Oxford's six strategy

Table 4. *The 27 strategies most strongly associated with higher proficiency*

Rank		Strategy	Type
1	12	I practice the sounds of English	B
2	50	I try to learn about the culture of English speakers	F
3	32	I pay attention when someone is speaking English	D
4	11	I try to talk like native English speakers	B
5	13	I use the English words I know in different ways	B
6	36	I look for opportunities to read as much as possible in English	D
7	33	I try to find out how to be a better learner of English	D
8	16	I read for pleasure in English	B
9	22	I try not to translate word-for-word	B
10	31	I notice my English mistakes and use that information to help me do better	D
11	27	I read English without looking up every new word	C
12	15	I watch English language TV shows or go to movies spoken in English	B
13	49	I ask questions in English	F
14	20	I try to find patterns in English	B
15	17	I write notes, messages, letters or reports in English	B
16	8	I review English lessons often	A
17	29	If I can't think of an English word, I use a word or phrase that means the same thing	C
18	2	I use new English words in a sentence so I can remember them	A
19	19	I look for words in my own language that are similar to new words in English	B
20	21	I find the meaning of an English word by dividing it into parts that I understand	B
21	1	I think of relationships between what I already know and new things I learn in English	A
22	45	If I do not understand something in English, I ask the other person to slow down or say it again	F
23	24	To understand unfamiliar English words, I make guesses	C
24	30	I try to find as many ways as I can to use my English	D
25	38	I think about my progress in learning English	D
26	28	I try to guess what the other person will say next in English	C
27	9	I remember new English words or phrases by remembering their location on the page, on the board, or on a street sign	A

A = memory strategies B = cognitive strategies C = compensation strategies
D = metacognitive strategies F = social strategies

categories – memory, metacognitive, affective, social – than did younger students. They reported a higher use of 13 individual strategies plus a much higher use of seven others than did younger students (75% of these 20 strategies are either from the memory, metacognitive, or social categories; seven were

Table 5. *The 9 strategies used much more frequently by females (N = 493)*

Rank		Strategy	Type
1	*8*	*I review English lessons often*	A
2	*9*	*I remember new English words or phrases by remembering their location on the page, on the board, or on a street sign*	A
3	3	I connect the sound of a new English word and an image or picture of the word to help me remember the word	A
4	35	I look for people I can talk to in English	D
5	*32*	*I pay attention when someone is speaking English*	D
6	*29*	*If I can't think of an English word, I use a word or phrase that means the same thing*	C
7	*33*	*I try to find out how to be a better learner of English*	D
8	*38*	*I think about my progress in learning English*	D
9	*27*	*I read English without looking up every new word*	C

A = memory strategies C = compensation strategies D = metacognitive strategies
Strategies in italics are most strongly associated with higher proficiency.

Table 6. *The 7 strategies used much more frequently by mature students (N = 112)*

Rank		Strategy	Type
1	48	I ask for help from English speakers	F
2	*30*	*I try to find as many ways as I can to use my English*	D
3	34	I plan my schedule so I will have enough time to study English	D
4	46	I ask English speakers to correct me when I talk	F
5	*45*	*If I do not understand something in English, I ask the other person to slow down or say it again*	F
6	3	I connect the sound of a new English word and an image or picture of the word to help me remember the word	A
7	4	I remember a new English word by making a mental picture of a situation in which the word might be used	A

A = memory strategies D = metacognitive strategies F = social strategies
Strategies in italics are most strongly associated with higher proficiency.

associated with higher proficiency). The seven most frequently used strategies[12] are listed in rank order in Table 6 (the two associated with higher proficiency are in italics).

6) WHAT ARE THE REASONS BEHIND STUDENT CHOICE AND FREQUENCY OF USE OF STRATEGIES?

The 48 student interviews provided very useful data. Once we had identified the 27 strategies associated with higher proficiency (see Table 4), we invited for interview the three students from each discipline with the lowest and the three with

highest use of those strategies. This appears to be an innovation in research into learning strategies. The students with the lowest use were asked why they did not use these strategies; those with the highest use were asked why they did use them.

Looking first at overall findings, there were sharp differences between these two groups. By far the commonest answer from the low-use group was that they did not enjoy English and/or they were not interested in English. Other very common answers (in order of frequency) were that they did not need English; that they neither needed nor enjoyed the foreign culture; and/or that they did not have time for English (or that it was a low priority). This group also tended to say that reading did not help their English, that English was too difficult, and that they were not confident in English. High-use students, on the other hand, expressed a strong motivation to learn English, and it was clear that English was important to them. Other common answers (in order of frequency) were that they enjoyed English; that watching L2 TV and movies helped their oral skills; that they liked foreign culture and/or it helped them learn English; and that they learned a lot of English through reading. A few students also said that paying more attention to English meant more learning, and that they needed more input than they received in the classroom.

We shall now turn to disciplinary results.

Building

Low-use students tended to say they were too busy to spend much time on English, that it was a low priority for them, and that they would rather "just follow the teacher". High-use students made few comments but did believe that paying attention when someone is speaking English and focussing on their progress were useful strategies.

Business

Low-use students expressed a strong lack of interest in English, particularly for reading outside class and for reviewing lessons, and that English was not an important subject for them. High-use students believed that watching foreign movies taught them both listening and speaking skills, and that paying a lot of attention when someone is speaking English was a valuable strategy.

Computer studies

Low-use students said they only need Chinese words because they only read Chinese books, that it was up to the teacher (not themselves) to assess or reflect on their progress, and that they had neither time nor the inclination to learn either English or about the L2 culture. The high-use students, on the other hand, said guessing unfamiliar words and using synonyms was an essential communication strategy, and that noticing their mistakes would help them learn.

Engineering

Low-use students said that because they did not need English they would not benefit from thinking about their progress, reading outside class, or learning

another culture. High-use students, however, believed that it was important to pay attention when someone was speaking and to read English for pleasure.

English

These students expressed a much stronger desire to do well in English and also awareness of the importance of focussing on language learning strategies; interviewees said (among other things) that they needed to use words in various ways to learn them better, that paying close attention was essential, reading for pleasure improved their vocabulary, and that thinking about their progress in English was very important. A couple of low-use students, however, expressed a lack of confidence in learning English.

Maths

Low-use students said they were not interested in English and just wanted to use simple words to express themselves. High-use students commented that feedback from classmates helped them learn, and that they studied English outside class and tried to find better ways to improve.

Primary education

Low-use students said that they did not focus on patterns because they did not need to know them, and that because they were very busy, reading more for pleasure was neither necessary nor helpful. High-use students, on the other hand, said that they needed to improve because they did not want to stay at the same level, and that paying close attention to English speakers was a useful strategy for them.

Science

Low-use students said that their other subjects were more important, and that predicting what the other person would say next was too difficult and not helpful; high-use students, however, said that English was very necessary for them and that they needed to think hard about their progress.

Discussion

While our findings regarding *overall* student use of Oxford's six categories are broadly similar to certain previous studies (Mullins 1992; Green and Oxford 1995; Bedell and Oxford 1996; Ku 1997), we have also been able to go beyond previous research in certain areas. We have found some sharp differences between disciplines in the use of strategy categories and also individual strategies. As we investigated eight disciplines, our results can not be directly compared to those of Rong (1999) and Mochizuki (1999), who only used English and science students (except that we also found that students majoring in English used significantly more strategies than did science students). Our findings are broadly similar to those of two previous studies who used students from more disciplines

(Politzer and McGroarty 1985; Oxford and Nyikos 1989) in that strategy use was higher among humanities students than among science and engineering students, but differ from Peacock (2001) in that our maths students used more social and fewer affective strategies, whereas his used fewer in the metacognitive category.

Our results indicate that for the 1,006 students in this study, there are 27 individual strategies associated with higher L2 proficiency (Green and Oxford 1995 found 17; no less than 12 of these are in common with ours). These 27 strategies are mostly in the cognitive and metacognitive categories (some are in the compensation and memory categories). This suggests that for these EAP students, the active learning strategies of paying close attention when someone is speaking English, seeking exposure to English for pleasure outside the classroom, and focussing on progress in English are the most useful – affective and social factors appear to be less important. This is supported by the comments made by the high-use students during interviews.

The use of certain strategies, then, seems to be important in L2 acquisition. Yet we found deficiencies in strategy use in some disciplines, the most serious perhaps being the low or very low use of all strategies, particularly the important metacognitive and cognitive categories (also memory), by computer studies students. Table 3 shows nine strategies for which these students reported significantly lower use – and the use of no fewer than seven of these is associated with higher L2 proficiency. Our interview data indicate that the reason for this seriously low use of important strategies by computing students is that they do not take a very active role in pursuing English in class, they lack interest in English and do not see English as a high priority. These findings reflect the suggestions of Yang and Horwitz that there is a link between student beliefs about language learning and strategy use. The lack of student motivation and relatively poor attitude to English that we found in this discipline and others may well have serious effects on language learning – a considerable amount of research supports the effects of attitude and motivation on second language acquisition (see e.g. Dornyei 2001; Cook 2001; Tudor 1996).

Science students also show a low overall use of strategies (particularly compensation and social strategies). Interview data indicate that this is because these students do not see English as an important or enjoyable subject. Two other notable disciplines with low overall use of strategies are engineering and building (particularly the latter). Common remarks by students from these disciplines in interviews were that because they did not need English or enjoy the L1 culture, it was a low priority for them. Finally, primary education students appear to neglect cognitive strategies. The reason for this seems to be that they lacked time to do the necessary extra work outside the classroom.

The results on age as a factor in strategy use provide a preliminary indication that the older students in this study are reasonably strong in the affective and social areas of L2 learning, particularly learning and using English with other students. The strategy areas in which they are strong also lead us to speculate that they may be somewhat better at seeing connections, relationships

and patterns in English; at thinking about their progress; and are less afraid of making mistakes than are younger students. Our findings on gender appear to corroborate those from previous research (Green and Oxford 1995; Ku 1997; Goh and Foong 1997; Mochizuki 1999). The females in our study were particularly strong in the use of the memory and metacognitive strategies of reviewing lessons and practising English, perhaps a sign that they give L2 study a slightly higher priority than do males.

IMPLICATIONS FOR TEACHING EAP

The finding of this study that students in different disciplines use different language learning strategies has clear implications for teaching EAP. We suggest that teachers need to know the deficiencies and strengths regarding strategy use in the particular discipline that they teach and use this knowledge to train students (if appropriate) in the importance and the use of these strategies. We noted above that such strategies are readily teachable and that a number of strategy training programmes have been successful. An alternative to direct strategy training is to embed language learning strategies in teaching tasks and materials, that is, to modify discipline-specific activities and materials to overcome learning strategy deficiencies in the discipline being taught. For example, for computer studies students, instruction in the value and the use of strategies number 8, 12, 17, 29, 31, 33, and 36 (see Tables 3 and 4) may be very helpful to their L2 acquisition: these are the seven strategies associated with higher proficiency for which they reported lower use. Specific strategy training may also be particularly important for students from the other three disciplines with lower strategy use – science (compensation and social strategies), engineering, and building.

In a more general sense, both our interview data from low-use students and other data lead us to propose that it may be desirable for EAP teachers to try to promote a more positive attitude and approach to English among their students.[13] It may be possible to encourage the following ideas among students:

1) English can be an interesting subject.
2) English is an important subject for you: make it a higher priority.
3) The L2 culture can be enjoyable and is also an important part of learning English.
4) Reading and watching L2 TV and movies will help your English.
5) More attention means more learning.
6) You need more input than you receive in the classroom.

Finally, our findings on age are a preliminary indication that more mature L2 students perhaps need less help from the teacher in affective and social areas, and more work in other areas, e.g. compensation and cognitive strategies. Our findings on gender indicate to us that more work may be needed with male students in memory and metacognitive areas.

Conclusion

In this study we have been able to go beyond previous research in several areas, particularly regarding our description of the use of strategy categories and individual strategies across eight disciplines, where we found a number of sharp differences. Our findings on the association between various individual strategies and proficiency lend support to Larsen-Freeman's suggestion (mentioned earlier) that proficiency varies with the use of *certain* strategies, not *all* strategies. The interviews conducted for this study provide valuable data that help to explain the disciplinary differences found and the variation in student motivation and attitudes behind them. We have also been able to investigate age as a factor and collect information on gender differences in individual strategy use. However, we did not conduct separate interviews with mature students, and this may provide valuable further information on age as a factor. More interviews with students are also desirable to gain a wider sample – we only interviewed six from each discipline. Other questions for further research are: What strategies do students use in other disciplines? Does the effectiveness of strategy training vary by discipline?

We will close with the suggestion that perhaps it is no longer possible to treat EAP students from all disciplines as one body regarding either strategy use or strategy training.

Notes

1. This project was supported by Research Grant number 7001249–660 from the City University of Hong Kong.
2. Oxford and Burry-Stock (1995: 4) report that 40 to 50 studies, many unpublished, involving more than 8,000 learners have used SILL. Also see Rubin (1987), Kern (1989), Oxford and Crookall (1989), Vann and Abraham (1990), Chamot and Rubin (1994), LoCastro (1994), Gu (1996), Park (1997) and Khaldieh (2000).
3. See also O'Malley (1987), Kern (1989), Oxford et al. (1990), Chamot (1993), Rees-Miller (1993), Dornyei (1995), and Bejarano et al. (1997). Ellis and Sinclair (1989) give further detailed and useful suggestions for training.
4. The 17 strategies used significantly more often were items 11, 12, 13, 14, 15, 16, 17, 22, 27, 28, 29, 35, 36, 37, 40, 47 and 49; the one used significantly less often was 42. (See the Appendix for the full list of numbered SILL strategies.) A further nine strategies were used frequently by students at all course levels – that is, 50% or more of students reported high use of them: items 1, 3, 4, 9, 31, 33, 38, 45 and 48. Usage of these did not vary by proficiency. Five were used infrequently (i.e. fewer than 20% of students reported high use) – items 5, 6, 7, 34 and 43.
5. There have been many calls for more research into the use of individual strategies, e.g. Green and Oxford (1995: 267): "Few largescale SILL studies . . . have looked at variation in the level of use of individual items."
6. This is not surprising because, as Chamot (2001: 40) points out, "behavioral observation is not an effective way to identify internal mental processes".
7. One student chose to use English in the interview.
8. The other 15 strategies were items 2, 10, 13, 14, 16, 17, 18, 19, 20, 22, 27, 29, 31, 32 and 35 (see Appendix).

9. This means that the students who used these strategies more frequently were significantly more proficient than those who used them less.
10. There was a positive association between five strategy categories (memory, cognitive, compensation, metacognitive, and social) and proficiency. However, we consider this result to be less useful than the results for individual strategies.
11. For this further analysis only, students were divided into three groups (high-, mid- and low-proficiency).
12. The other 13 strategies were items 1, 6, 10, 16, 26, 32, 33, 35, 37, 38, 40, 44 and 47.
13. This may be especially true with computer studies, science, engineering, and building students.

References

Bedell, D.A. and R.L. Oxford (1996) Cross-cultural comparisons of language learning strategies in the People's Republic of China and other countries. In R. Oxford, *Language learning strategies around the world: cross-cultural perspectives*. University of Hawaii at Manoa: Second Language Teaching and Curriculum Center. 47–60.

Bejarano, Y., T. Levine, E. Olshtain and J. Steiner (1997) The skilled use of interaction strategies: creating a framework for improved small-group communicative interaction in the language classroom. *System* 25.2: 203–14.

Bremner, S. (1999) Language learning strategies and language proficiency: investigating the relationship in Hong Kong. *Canadian Modern Language Review* 55.4: 490–514.

Chamot, A.U. (1993) Student responses to learning strategy instruction in the foreign language classroom. *Foreign Language Annals* 26.3: 308–21.

—— (2001) The role of learning strategies in second language acquisition. In M.P. Breen, *Learner contributions to language learning*. Harlow, England: Longman. 25–43.

—— and J. Rubin (1994) Comments on Janie Rees-Miller's 'A critical appraisal of learner training theoretical bases and teaching implications'. *TESOL Quarterly* 28.4: 771–81.

Cohen, A.D. (1998) *Strategies in learning and using a second language*. London: Longman.

Cook, V.J. (2001) *Second language learning and language teaching* (3rd edition). London: Arnold.

Dornyei, Z. (1995) On the teachability of communication strategies. *TESOL Quarterly* 29.1: 55–85.

—— (2001) *Motivational strategies in the language classroom*. Cambridge University Press.

Ehrman, M.E. and R.L. Oxford (1995) Cognition plus: correlates of language learning success. *Modern Language Journal* 79.1: 67–89.

Ellis, G. and B. Sinclair (1989) *Learning to learn English*. Cambridge University Press.

Goh, C.C.M. and K.P. Foong (1997) Chinese ESL students' learning strategies: a look at frequency, proficiency, and gender. *Hong Kong Journal of Applied Linguistics* 2.1: 39–53.

Green, J.M. and R. Oxford (1995) A closer look at learning strategies, L2 proficiency, and gender. *TESOL Quarterly* 29.2: 261–97.

Gu, P.Y. (1996) Robin Hood in SLA: what has the learning strategy researcher taught us? *Asian Journal of English Language Teaching* 6: 1–29.

Horwitz, E.K. (1988) The beliefs about language learning of beginning university foreign language students. *Modern Language Journal* 72.3: 283–94.

Kern, R.G. (1989) Second language reading strategy instruction: its effects on comprehension and word inference ability. *Modern Language Journal* 73.2: 135–49.

Khaldieh, S.A. (2000) Learning strategies and writing processes of proficient vs. less-proficient learners of Arabic. *Foreign Language Annals* 33.5: 522–34.

Ku, P.Y.N. (1997) Predictors of strategy choice by EFL students in Taiwan. Paper presented at RELC Seminar, Singapore, April 1997.

Larsen-Freeman, D. (2001) Individual cognitive/affective learner contributions and differential success in second language acquisition. In M.P. Breen, *Learner contributions to language learning*. Harlow, England: Longman. 12–24.

LoCastro, V. (1994) Learning strategies and learning environments. *TESOL Quarterly* 28.2: 409–14.

Mochizuki, A. (1999) Language learning strategies used by Japanese university students. *RELC Journal* 30.2: 101–13.

Mullins, P. (1992) *Successful English language learning strategies of students enrolled in the Faculty of Arts, Chulalongkorn University, Bangkok, Thailand*. Unpublished doctoral dissertation, United States International University, San Diego, CA.

Nunan, D. (1996) Learner strategy training in the classroom: an action research study. *TESOL Journal* Autumn: 35–41.

O'Malley, J.M. (1987) The effects of training in the use of learning strategies on learning English as a second language. In A. Wenden and J. Rubin, *Learner strategies in language learning*. Englewood Cliffs, NJ: Prentice Hall. 133–43.

Oxford, R.L. (1989) Use of language learning strategies: a synthesis of studies with implications for strategy training. *System* 17.2: 235–47.

—— (1990) *Language learning strategies*. Boston: Heinle and Heinle.

—— and J.A. Burry-Stock (1995) Assessing the use of language learning strategies worldwide with the ESL/EFL version of the Strategy Inventory for Language Learning (SILL). *System* 23.1: 1–23.

—— and D. Crookall (1989) Research on language learning strategies: methods, findings, and instructional issues. *Modern Language Journal* 73.4: 404–19.

—— and M. Nyikos (1989) Variables affecting choice of language learning strategies by university students. *Modern Language Journal* 73.3: 291–300.

——, D. Crookall, A. Cohen, R. Lavine, M. Nyikos and W. Sutter (1990) Strategy training for language learners: six situational case studies and a training model. *Foreign Language Annals* 22.3: 197–216.

Park, G.-P. (1997) Language learning strategies and English proficiency in Korean university students. *Foreign Language Annals* 30.2: 211–21.

Peacock, M. (2001) Language learning strategies and EAP proficiency: teacher views, student views, and test results. In J. Flowerdew and M. Peacock, *Research Perspectives on English for Academic Purposes*. Cambridge University Press. 268–85.

Politzer, R.L. and M. McGroarty (1985) An exploratory study of learner behaviors and their relationship to gains in linguistic and communicative competence. *TESOL Quarterly* 19.1: 103–23.

Rees-Miller, J. (1993) A critical appraisal of learner training: theoretical bases and teaching implications. *TESOL Quarterly* 27.4: 679–89.

Rong, M. (1999) Language learning strategies of a sample of tertiary-level students in the P.R. China. *Guidelines* 21.1: 1–11.

Rubin, J. (1987) Learner strategies: theoretical assumptions, research history and typology. In A. Wenden and J. Rubin, *Learner strategies in language learning*. Englewood Cliffs, NJ: Prentice/Hall. 15–29.

Sengupta, S. (2000) An investigation into the effects of revision strategy instruction on L2 secondary school learners. *System* 28.1: 97–113.

Tudor, I. (1996) *Learn-centredness as language education*. Cambridge University Press.

Vann, R.J. and R.G. Abraham (1990) Strategies of unsuccessful language learners. *TESOL Quarterly* 24.2: 177–98.

Wen, Q. and R.K. Johnson (1997) L2 learner variables and English achievement: a study of tertiary-level English majors in China. *Applied Linguistics* 18.1: 27–48.

Yang, N-D. (1996) Effective awareness-raising in language learning strategy instruction. In R. Oxford, *Language learning strategies around the world: cross-cultural perspectives*. University of Hawaii at Manoa: Second Language Teaching and Curriculum Center. 205–10.

Yang, N-D. (1998) Exploring a new role for teachers: promoting learner autonomy. *System* 26.1: 127–35.

—— (1999) The relationship between EFL learners' beliefs and learning strategy use. *System* 27.4: 515–35.

[Received 19/7/02; revised 15/1/03]

Matthew Peacock and Belinda Ho
Department of English and Communication
City University of Hong Kong
83 Tat Chee Avenue
Kowloon
Hong Kong
China
e-mail: enmatt@cityu.edu.hk and enwankann@cityu.edu.com

Appendix – The 50 strategies in the SILL (Oxford 1990)

Memory strategies

1. I think of relationships between what I already know and new things I learn in English.
2. I use new English words in a sentence so I can remember them.
3. I connect the sound of a new English word and an image or picture of the word to help me remember the word.
4. I remember a new English word by making a mental picture of a situation in which the word might be used.
5. I use rhymes to remember new English words.
6. I use flashcards to remember new English words.
7. I physically act out new English words.
8. I review English lessons often.
9. I remember new English words or phrases by remembering their location on the page, on the board, or on a street sign.

Cognitive strategies

10. I say or write new English words several times.
11. I try to talk like native English speakers.
12. I practice the sounds of English.
13. I use the English words I know in different ways.
14. I start conversations in English.
15. I watch English language TV shows spoken in English or go to movies spoken in English.
16. I read for pleasure in English.
17. I write notes, messages, letters or reports in English.
18. I first skim an English passage (read over the passage quickly) then go back and read carefully.
19. I look for words in my own language that are similar to new words in English.
20. I try to find patterns in English.
21. I find the meaning of an English word by dividing it into parts that I understand.
22. I try not to translate word-for-word.
23. I make summaries of information that I hear or read in English.

Compensation strategies

24. To understand unfamiliar English words, I make guesses.
25. When I can't think of a word during a conversation in English, I use gestures.
26. I make up new words if I do not know the right ones in English.
27. I read English without looking up every new word.
28. I try to guess what the other person will say next in English.
29. If I can't think of an English word, I use a word or phrase that means the same thing.

Metacognitive strategies

30. I try to find as many ways as I can to use my English.
31. I notice my English mistakes and use that information to help me do better.
32. I pay attention when someone is speaking English.
33. I try to find out how to be a better learner of English.
34. I plan my schedule so I will have enough time to study English.
35. I look for people I can talk to in English.
36. I look for opportunities to read as much as possible in English.
37. I have clear goals for improving my English skills.
38. I think about my progress in learning English.

Affective strategies

39. I try to relax whenever I feel afraid of using English.
40. I encourage myself to speak English even when I am afraid of making a mistake.
41. I give myself a reward or treat when I do well in English.
42. I notice if I am tense or nervous when I am studying or using English.
43. I write down my feelings in a language learning diary.
44. I talk to someone else about how I feel when I am learning English.

Social strategies

45. If I do not understand something in English, I ask the other person to slow down or say it again.
46. I ask English speakers to correct me when I talk.
47. I practice English with other students.
48. I ask for help from English speakers.
49. I ask questions in English.
50. I try to learn about the culture of English speakers.