

A student's contributions to second language learning. Part I: Cognitive variables

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Introduction

This is the first part of a two-part article dealing with individual difference correlates of second language learning. The second part will appear in the next issue, January 1993. In its entirety, the two-part article aims to present a conceptual integration of how various characteristics of individuals influence second language learning. In this part, however, attention is directed toward a basic theoretical overview of the language learning process, and a review of cognitive variables in this context.

In 1978, V. J. Cook published an article in *Language Teaching* in which he provided a comprehensive survey of the research conducted to that time on various factors associated with second language learning. His review covered three main categories – the learner's development in a second language, the learner's contribution to second language learning, and the learner's situation. In closing, he noted:

One obvious conclusion from this research is the complexity of second-language learning; any model has to account not just for grammatical development but also for the contributions made by the learner and by the learner's environment, not to mention the individual differences between learners, and the effects of learning a second language on the learner, a field too vast to include here (p. 83).

Cook's review demonstrates that there was obviously considerable research under way at the time. Since then, however, research activity has mushroomed. There are now very many more journals concerned with research devoted to second language acquisition, and many books devoted to

the subject. Among those that have influenced our discussion in this article are Gardner (1985), Horwitz & Young (1991), Krashen (1981), Oxford (1990), Spolsky (1989), and Stern (1983). The complexity of second language learning that Cook noted is still very much in evidence, but it is becoming more and more difficult to attempt as comprehensive a review as that undertaken by him. For that reason, we have decided to focus our attention on only one of the topics reviewed by Cook – namely, *the learner's contributions to second language learning*. Such a focus is consistent with our training and research interests. We are psychologists, not language teachers nor linguists, and our own research is concerned with the role of individual differences in second language learning. [The term 'second language' is used throughout this article to refer to any language other than the native language. Thus, it is synonymous with 'foreign language'.] Such a focus is not intended to denigrate the importance or the research activity in the other areas, but rather is a strategy needed to limit the survey to a manageable task.

When attention is directed to those characteristics of the individual that influence how well he or she will learn a second language, the existing research literature appears to focus on at least 10 major attributes. These variables tend to group themselves into three broad categories. The first category comprises Cognitive Variables. These involve different aspects of cognition from intelligence to language aptitude, to language learning strategies, to previous language training and experience. The second category is Affective Variables – those attributes that involve individuals' reactions to any situation. These can refer to attitudes and motivation, to language anxiety, to feelings of self-confidence about the language, to personality attributes, to learning styles. A final miscellaneous category would include factors like age, or socio-cultural experiences which could have either cognitive or affective implications.

All of these variables can be incorporated into the socio-educational model of second language acquisition (Gardner, 1985). This model has developed over the years and attempts to provide a comprehensive interpretation of language learning. It derived initially from a social psychological model of second language acquisition proposed by Lambert (1963, 1967, 1974). The formal model was initially very similar to that outlined by Gardner and Lambert (1972), but it has evolved over the years as

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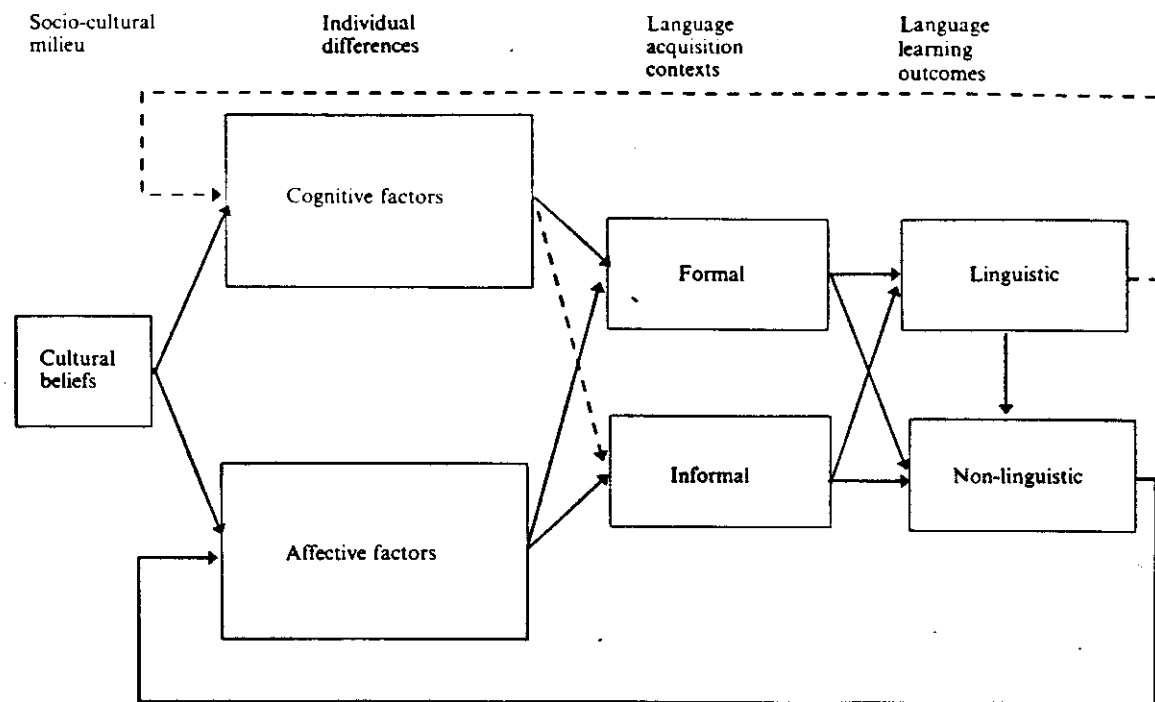


Figure 1. Schematic representation of the socio-educational model of second language acquisition.

new data were obtained. Much of this development is documented in Gardner (1985).

A schematic representation of a version of this model is presented in Figure 1. As can be seen, there are four major parts of the model, the Socio-Cultural Milieu, Individual Differences, Language Acquisition Contexts and Language Learning Outcomes. In this model, the nature of the socio-cultural milieu is seen as playing an important role in determining those factors that influence language acquisition. This is shown as operating through cultural beliefs extant in the community concerning issues associated with learning the language. The nature of these beliefs will determine the extent to which cognitive and affective variables will influence language learning. This is indicated in the model by the solid arrows linking cultural beliefs to both the cognitive and affective factors.

In some contexts, the target language may be very dominant, in others it may be relatively scarce. In some, it will be the language of commerce, in others, a language to maintain cultural distinctiveness. In some, it will be the language of an enemy, in others, the language of a valued neighbour. Obviously, the dynamics associated with the acquisition of a language will differ in these different contexts, and thus the Cultural Beliefs will differ. The situation faced in the acquisition of English by a recent child immigrant to England will be different from that of his/her parents, and different for that same child learning and maintaining competence in her/his native language. And similarly, the task will be different for an English school child learning French than that for one learning Urdu. The

context will not only determine the availability of the language, but it will also determine society's reaction to the language. It will also influence the individual learner's own perceptions of what it means to learn the language.

There are probably as many factors that might account for individual differences in achievement in a second language as there are individuals, however, they may be grouped into one of the two classifications of cognitive or affective variables. As indicated above, there are a number of possible cognitive variables. In this review, we plan to focus on only three of them, 'intelligence', 'language aptitude', and 'language learning strategies'. There are also a number of possible affective variables, but in Part II of this article we will again focus on only three, 'attitudes and motivation', 'language anxiety' and 'self-confidence'. Depending upon the socio-cultural context, it is meaningful to expect that these types of variables might play roles of differing importance.

In the model, the individual difference variables are viewed as having an influence through their interaction with both formal and informal language acquisition contexts. Formal contexts refer to those situations that involve direct instruction in the language, as in the formal classroom situation. The model assumes that both cognitive and affective variables would be directly involved in such contexts, and this is indicated by the solid arrows linking both Cognitive and Affective factors to the Formal language acquisition context. It is proposed that cognitive variables facilitate learning by making for the smooth transmission of learned material.

Affective variables play their role by influencing the individual's reactions to the learning environment.

Informal contexts, on the other hand, refer to all those other situations where an individual can acquire some knowledge or practice in the language. The major characteristic of the informal context is that it is voluntary. Individuals can either participate or not in informal language acquisition contexts. Because of this voluntary nature, it is anticipated that only motivation would play a direct role in informal contexts, in that it will determine whether or not the individual even enters into that situation. This is indicated in the figure by the solid arrow linking Affective factors to Informal language acquisition contexts. Once an individual enters the informal context, however, other variables such as cognitive individual difference variables would then come into play. The broken arrow in the model linking cognitive factors to Informal language acquisition contexts depicts that this link is indirect, depending as it does on the motivation to enter the context.

Both formal and informal language acquisition contexts are anticipated to have both linguistic and non-linguistic outcomes, shown by the solid arrows linking both contexts to both outcomes. As a result of experiencing the language, individuals will develop some change in their competence, knowledge, and skill in some aspect of the language (linguistic outcomes), as well as in their reactions to the language, the situation, and/or factors associated with the language (non-linguistic outcomes). Successful, positive experiences will result in improved levels of linguistic outcomes, and quite likely improved levels of non-linguistic outcomes. Unsuccessful negative experiences will result in a lack of linguistic development and quite likely in unfavourable non-linguistic outcomes. Note that this model places considerable emphasis on what happens in formal and informal contexts having an effect on the student. Many of the non-linguistic outcomes are the very affective variables hypothesized to play a role in language acquisition. Thus the model is dynamic, with cognitive and affective variables influencing the individual's level of achievement in the language. In turn, the student's level of achievement and experiences are seen as having an influence on the individual primarily on affective attributes, though it could also influence language learning strategy use. These latter influences are shown in the model by a solid arrow from non-linguistic outcomes to Affective factors, and a broken arrow from linguistic outcomes to Cognitive factors, and a solid arrow from linguistic outcomes to non-linguistic outcomes.

This model has clear implications for both teachers of a second language and researchers interested in second language acquisition. For teachers, it shows that the experience provided in the classroom can

influence not only students' levels of achievement, but also their feelings and motivation about current and future language learning. For researchers, it provides a structure for analysing how variables can operate in the language learning process. Much of the following article will discuss aspects of this model, from the perspective of the different classes of variables.

It should be emphasised that although this model was developed in the context of second language acquisition, it has its roots in a number of other theoretical models. As indicated above, it began as a development of the social psychological model of second language learning that was initially proposed by W. E. Lambert (1963, 1967, 1974). It also, however, has direct links with J. B. Carroll's (1962) educational model of second language learning, and his model of school learning (Carroll, 1963). Carroll's models emphasise four classes of variables, Ability, Motivation, Quality of Instruction and Quantity of Instruction, whereas the socio-educational model is more general in the types of variables it subsumes. Moreover, although the socio-educational model does not explicitly refer to instructional variables, they are certainly considered through inclusion of the formal language learning context. The current model also has links to a number of school learning models such as those by Bloom (1976), Bruner (1966) and Glaser (1976). All of these models discuss factors such as ability and motivation, but emphasise somewhat different concepts and processes. The socio-educational model is unique, however, in that it focuses primarily on the acquisition of a second language, and is based on research concerned directly with this topic. This model, therefore, has a wide theoretical basis in general school learning models. It also can be shown to have empirical roots as well. Lalonde and Gardner (in press) have demonstrated, using causal modelling procedures, that it generalises to the learning of statistics by students in psychology.

Cognitive factors in second language acquisition

As indicated above, there are at least three major classes of cognitive variables considered in the socio-educational model, Intelligence, Language Aptitude and Language Learning Strategies. For the purpose of discussion, Language Aptitude and Intelligence will be grouped together.

Language Aptitude/Intelligence

Language aptitude and Intelligence are two different but related concepts that have been viewed as important contributors to the learning of a second language. In his model of language learning, Carroll (1962) proposed that intelligence was an important

variable in school learning because it influences how well and how quickly a student will understand a teacher's instruction (cf. Spolsky, 1989). On the other hand, he viewed language aptitude in terms of the amount of time needed by the individual to learn the material or develop the skill. Operationally, language aptitude is assessed in terms of a set of abilities that facilitate the acquisition of linguistic material. In this section, most attention is directed to the concept of language aptitude, because in recent years the bulk of the research on cognitive factors has centred on language aptitude.

In an early review of predictors of second language achievement, Henmon (1929) noted that initial investigations focused on intelligence, but that by the 1920's, attention was being directed away from this, to the development of 'special prognosis tests' with which to predict achievement in a second language. Examples of such tests were the Iowa Foreign Language Aptitude Examination (Stoddard & VanderBeke, 1925), the Luria-Orleans Modern Language Prognosis Test (Luria & Orleans, 1928), the Barry Prognostic Language Test (Rice, 1929), the Todd Linguistic Aptitude Test (Todd, 1929), the George Washington University Language Aptitude Test (Hunt, Wallace, Doran, Buynitzky, & Schwarz, 1929) and the Foreign Language Prognosis Test (Symonds, 1930). These tests used translation exercises, artificial language learning tasks, knowledge of English, and the like, in order to predict potential achievement in a second language.

This active enthusiasm to develop tests to predict second language achievement gave way to a 20-year period of relative lack of interest in such measures. In the 1950s, however, interest was rekindled by the research of J. B. Carroll on language learning abilities. In an initial study, he factor analysed a large battery of ability tests administered to military personnel enrolled in language learning programmes (Carroll, 1958), and obtained a number of factors that he identified as abilities which underlay the successful acquisition of a second language. This and other research led Carroll (Carroll, 1962, 1990; Carroll & Sapon, 1959) to propose that language aptitude was comprised of four components, (a) phonetic coding ability, (b) grammatical sensitivity, (c) memory abilities, and (d) inductive language learning ability. At about this time, the Modern Language Aptitude Test (MLAT) was published (Carroll & Sapon, 1959), and this has become the touchstone measure of language aptitude.

The MLAT is comprised of five subtests, Number Learning, Phonetic Script, Spelling Clues, Words in Sentences, and Paired Associates. These are presumed to assess the four different components of language aptitude, in varying degrees, and thus to provide a reasonable estimate of the ability to learn languages. The MLAT is now, however, more than

30 years old, and many researchers and educators (cf. McLaughlin, 1990; Spolsky, 1989; and Skehan, 1989) have proposed that advances in language pedagogy and psychological assessment procedures require changes in aptitude assessment. Skehan (1991) argues, for example, that current linguistic theory and practice provides many new avenues for aptitude research, and that research on the measurement of language aptitude should be conducted in a greater variety of learning contexts. In an interesting article focusing on measures of second language achievement, Bachman (1988) shows how current developments in language teaching and language testing have resulted in new dimensions of achievement that have implications for research in the area of second language acquisition. In replying to these calls for new measures of language aptitude, Carroll (1990, p. 12) responds with the questions, 'What's wrong with present methods? Do they require just "fine tuning," or is some more radical change called for?'

Carroll (1990) does suggest some minor changes to the MLAT. He feels that an alternate form would be useful, and that the vocabulary elements in the Number Learning test should be changed to remove an alphabetic correspondence between them and the numbers they represent. He feels too that the difficulty level of the Phonetic Script test should be raised to eliminate a negative skew in the distribution of scores on this test, and that the instructions for the Spelling Clues Test be modified to emphasise the speeded nature of the test.

Carroll (1990) does feel that the measurement of language aptitude can be improved, but that the resulting prediction of achievement may not improve all that much. Referring to research by Wesche (1981), he notes that auditory abilities, varying from auditory acuity to the ability to ignore distractions might represent important sources of variation that may be only partially tapped by the MLAT. In his concluding remarks, Carroll (1990, p. 27) states:

While I remain somewhat sceptical about the possibilities for greatly improving foreign language aptitude predictions beyond their present levels, I have tried to offer suggestions concerning: (1) 'fine tuning' of currently available tests and procedures; (2) expansion of test instruments in several domains of foreign language aptitudes by capitalising on recent developments in the study of cognitive abilities; and (3) further study of the cognitive operations involved in foreign language learning, and attempts to develop tests and other procedures (e.g., work sample tasks) that would better capture the essences of these cognitive operations.

There are other measures of language aptitude, but these are conceptually very similar to the MLAT. For children ages approximately 8 to 11 years old, there is the Elementary Form of the Modern Language Aptitude Test (EMLAT) (Carroll & Sapon, 1967). This test consists of four subtests. Hidden Words, Matching Words, Finding Rhymes,

and Number Learning, only the third of which does not correspond to one in the MLAT. Another test of language aptitude was published by Pimsleur (1966). The Language Aptitude Battery (Pimsleur, 1966) consists of six sections, the first two of which rely on verbal reports of the student's latest grade point average in selected courses and a rating of her/his interest in studying a foreign language. The remaining sections include a Vocabulary test, a Language Analysis test, a Sound Discrimination test, and a Sound Symbol test. These measures are comparable to those in the MLAT, and in fact, Pimsleur (1966) reports being influenced by Carroll in the development of this language aptitude battery. To Pimsleur, however, the ability to learn a second language depends upon 'verbal intelligence', 'motivation', and 'auditory ability', each of which he felt were assessed by his test. The terminology is somewhat different, but clearly there is considerable overlap in the concepts proposed by Carroll and those by Pimsleur.

There have been two more recent developments in the measurement of language aptitude, but to date there is little published information available on these measures. One, the Defense Language Aptitude Battery (Petersen & Al-Haik, 1976), consists of four parts, some with multiple sections. The various parts require subjects to (a) deduce the appropriate language forms from language material paired with pictures, (b) recognise foreign language sounds, (c) form associations between sounds and symbols, and (d) apply new grammatical rules to a translation task. A second test battery, called VORD (the word for 'word' in the artificial language making up this test) is described by Parry and Child (1990). This test combines a language learning task with a language analysis one. The language itself is 'based on a grammatical system similar to that of Turkish' (Parry & Child, 1990, p. 30). The test consists of four subtests, Nominal Morphology, Verbal Morphology, Phrase and Sentence-Level Syntax, and Text Completion. Data for one sample presented by Parry and Child (1990) show that 14 of the 20 correlations between the subtests of VORD and those of the MLAT are significant, indicating that the two sets of subtests share considerable variance in common. This is an initial step in the investigation of this test, but it is possible that it might suggest a new approach to the assessment of language aptitude.

There is some variation, of course, but in general these various measures of language aptitude correlate with indices of achievement in a second language (see, for example, Carroll & Sapon, 1959, 1967; Parry & Child, 1990; Petersen & Al-Haik, 1976; Pimsleur, 1966). Thus, it is very reasonable to conclude that achievement in a second language is facilitated by an aptitude for languages. Language aptitude, however, is not a unitary dimension. As

indicated by Carroll's (1958) original study, there are a number of independent factors that go to make up language aptitude.

This is also demonstrated by Gardner and Lambert (1965) who factor analysed the correlations among the subtests of the MLAT, and the Primary Mental Abilities Test (Thurstone & Thurstone, 1941), as well as a number of measures of French achievement. They obtained seven orthogonal factors, identified as Linguistic Reasoning, French Vocabulary Knowledge, School French Achievement, Oral French Reading Skill, Relative French Sophistication, Intelligence, and Verbal Knowledge. Measures of French achievement contributed to five of the factors, indicating that there were relatively independent components of French achievement that could be identified. Moreover, each of these factors shared variance in common with one or more of the subtests of the MLAT, indicating that these various components of achievement were associated with different language learning abilities. Furthermore, the factor compositions conformed quite closely to the structure of abilities proposed by Carroll. Finally, the two factors associated primarily with the subtests of the Primary Mental Abilities Test were relatively independent of the MLAT and the measures of French achievement.

Research makes it clear that in the long run language aptitude is probably the single best predictor of achievement in a second language. What is not clear are the reasons for this. One possible reason why language aptitude facilitates language acquisition is positive transfer. To the extent that one possesses a skill or knowledge that a new skill or knowledge can be associated with, it is reasonable to assume that the new material will be acquired more quickly. That is, language aptitude can be viewed as a type of *cognitive sponge*; where a given ability is appropriate to a new skill being learned, that skill will be attracted to that ability. If the ability is well developed in the individual, the skill will be acquired quickly; if not, more time will be needed to make the skill part of the individual's repertoire. This type of interpretation is supported in a general sense by research conducted by Wesche (1981), and Skehan (1986). Wesche made use of aptitude measures and interviews to classify language learners into three groups, one with high analytic abilities, one with high memory ability, and one with matched abilities. The groups were then trained with methods appropriate to their unique abilities. Tailoring training with ability resulted in superior language learning. That is, to the extent that there was a match between the individual's abilities and the material to be acquired, learning was facilitated. In like manner, Skehan (1986) demonstrated that different students can make use of their own strengths to learn language material. Admittedly, these studies link abilities with methodology or

strategy, rather than with specific achievements, but the general process is the same as that proposed here.

The perspective that language aptitude operates as a type of cognitive sponge would suggest that if one wished to search for aspects of language aptitude, one should investigate the actual process of second language acquisition to determine what skill or knowledge is to be acquired in what context (a form of job analysis). Then by identifying abilities that are associated with these skills, and measuring them, predictions of achievement could be improved. This perspective helps to clarify the distinction between intelligence and language aptitude. Intelligence is viewed as being important because it influences how well a student will understand directions and explanations, or will make inferences about them from the content of any given learning experience (cf. Carroll, 1962). Language aptitude, on the other hand, is important because it promotes positive transfer of new skills onto old. This perspective makes it clear that both intelligence and language aptitude could play a role in both formal and informal language learning contexts. Finally, this perspective would also account for a correlation between measures of intelligence and language aptitude in that they share variance in common skills, but would permit relatively independent dimensions to be obtained in factor analytic studies that have sufficient markers to identify the independence (cf. Gardner & Lambert, 1965).

Having made such a distinction, one might raise the question of the origins of language aptitude. Carroll (1967) found no consistent relation between time of starting a foreign language and MLAT subtest scores, suggesting that prior training in another language did not influence language aptitude. Such a conclusion seems quite justified considering the make-up of most tests of language aptitude, that tend to focus on first (English) language skills, memory, or language analysis, etc. Moreover, the basic abilities identified by Carroll – phonetic coding, memory, grammatical sensitivity, and inductive language learning ability – do not appear to be easily modified simply by training in another language. Skehan (1986) shows also that language aptitude appears to have its roots in first language competencies. He found that students who developed faster in their first language, who had superior vocabularies as children, and who came from better educated homes tended to score higher on indices of language aptitude than students lower on these first-language advantages. Such results demonstrate very clearly that there is an aptitude for languages which would be expected to have its effect in any type of language learning context (cf. Skehan, 1991) and which is traceable to early environmental and quite likely genetic factors.

This analysis of intelligence and language aptitude helps to clarify their roles in the language learning

process. Both would be expected to facilitate the acquisition of a second language in both formal and informal language acquisition contexts. They would thus play direct roles in formal contexts, but indirect roles in informal contexts because the voluntary nature of these contexts is such that individuals may avoid them if they wish. In either context where material is presented in less than optimal conditions, both factors would be expected to account for differences in achievement. If the intellectual requirements were reduced by clarity of materials and instruction, intelligence would be expected to be less influential. If ability requirements were reduced by facilitating transfer of skills onto existing ones by improving lesson plans, providing ample opportunity and practice, etc., the role of aptitude would be reduced. But in any event, both aptitude and intelligence would be expected to correlate to some extent with achievement.

Language Learning Strategies

Language learning strategies usually refer to an individual's attempt to structure his/her learning environment in ways that facilitate learning (Oxford, 1990). Teachers and administrators may also make specific adjustments in language courses in order to facilitate learning (Cope-Powell, 1991). This characterisation has led to a formulation of three types of strategies, namely, direct, indirect, and institutional. Direct strategies are often referred to as cognitive strategies that attempt to apply principles of learning to make the acquisition of vocabulary and grammar easier. Indirect strategies are affective strategies that attempt to enhance the positive emotional reactions that are associated with language learning and reduce the negative reactions as far as possible. Institutional strategies are undertaken by language departments to assist language students; these consist of decisions to modify the curriculum, create drop-in centres, and the like. The general purpose of a language learning strategy is to assist the student in learning the second language. It is considered a cognitive variable, regardless of type, because it represents a cognitive plan to promote language acquisition.

There is no shortage of research on language learning strategies. Starting with the initial investigations and observations by Rubin (1975) and Stern (1975) and later by Bialystok (1984) and Reiss (1985), a vast body of research exists using assessment techniques ranging from intuitive speculation, to ethnographic analysis, to self-report, to structured interviews and questionnaires, to experimental studies. Much has been learned about the natural use of strategies and how to teach them to those not already disposed to their use. The efficacy of specific procedures to promote second language acquisition has also been studied in well-controlled laboratory

settings (see, for example, Atkinson & Raugh, 1975; Paivio & Desrochers, 1981; Pressley, Levin & Delaney, 1982).

Learning strategies used by individuals have been defined as 'steps taken by the learner to facilitate the acquisition, storage, retrieval, or use of information' (Oxford & Crookall, 1989, p. 404). The sheer number of strategies that have been identified precludes a detailed description. Further, the inconsistency in terminology sometimes makes comparisons across studies difficult (Oxford & Crookall, 1989). Oxford (1990) lists almost 200 specific instances of strategy use that may be applied when speaking, listening, writing, and reading the second language. (The number of distinct strategies is less than 200, since a given strategy might be used in more than one context.) Oxford-Carpenter (1989) has developed a taxonomy for the classification of strategies that is useful in delineating the various types.

According to Oxford's (1990) model, direct language learning strategies are those that operate specifically on the second language material to facilitate its storage and recall from memory. These strategies assist with the learning of vocabulary and grammar rules and with the assembly of second language messages. Direct strategies sometimes involve compensating for unknown words or phrases. Such activities as repetition, using imagery to remember vocabulary, and guessing at word meanings would be considered as direct learning strategies.

Indirect strategies are those that do not operate on the second language itself, however, they are important to language learning. These strategies are used by students to place themselves in beneficial, positive situations. Indirect strategies include attempts to structure the learning process, create positive affect, and seek social support and approval. Specific activities such as keeping a diary, seeking practice opportunities, asking for error correction, etc., would be included in this group.

A recent review of the literature on strategy use (Oxford & Crookall, 1989) lists 16 conclusions under the heading 'What We Think We Know' about strategies. The results of the studies reviewed generally suggest that (a) strategies are used by students at all instructional levels, (b) more proficient students employ strategies that are different from those used by less proficient ones, (c) strategy use is associated with several other variables, including motivation, gender, ethnicity, cognitive style, and other personality variables, (d) strategies can be taught, with the effectiveness of strategy training depending on learner variables, and (e) neither teachers nor students are fully aware of the strategies that are being used or could be used.

Strategies are believed to be useful because they engage the learner with the second language material

at a deeper cognitive level (Nyikos, 1990). It has been well established that verbal learning improves under these conditions (Anderson, 1980). This is fairly obvious in the case of direct strategies because their purpose is to improve memory and comprehension processes, however, it applies equally well in the case of indirect strategies. For example, it has been found that language anxiety consumes cognitive resources that might otherwise be applied to the task at hand (MacIntyre & Gardner, 1989), thus when a strategy reduces anxiety, it allows for the more efficient use of the student's existing cognitive resources.

More proficient students use strategies that are different from less proficient ones (Marrie and Nettan, 1991). While strategies aid in learning, they may simply reflect the level at which the student is able to operate. If a given strategy involves drawing upon previous knowledge, then the advanced student will be better able to employ that strategy. The most effective strategies are those that allow students to fully process information (Rost & Ross, 1991; Corbeil, 1990), however, this is only possible when a broad base of experience and knowledge already exists.

The links between strategies and other constructs have been explored in some recent studies. Bacon and Finnemann (1990) found that willingness or unwillingness to use a strategy was an important predictor of its use. It would appear that many variables such as attitudes and motivation, anxiety, and personality interact to produce a willingness or unwillingness to employ strategies. This is demonstrated in a study by Oxford and Nyikos (1989), who used the Strategy Inventory for Language Learning (SILL) in a large study of strategy use among approximately 1200 university students. The students were language learning novices, and about 70 per cent of them were fulfilling a degree requirement. The study identified several types of strategies. The most commonly used were those considered most appropriate to traditional classrooms and discrete-point testing as opposed to those strategies used for independent communication. The study also examined 'background' variables, including sex, years of study, degree programme (major), self-rated proficiency, and motivation. All of these variables were related to strategy use in the anticipated manner. Females tended to use strategies more often than males, particularly communicative strategies, increased years of study led to more extensive use of strategies, those who rated themselves most proficient used strategies most frequently, and highly motivated students used more strategies than less motivated ones. Of all these variables, motivation was the best correlate of strategy use.

Oxford and Nyikos (1989) integrate the findings in a form of causal spiral wherein motivation leads

to the use of strategies that increases self-rated proficiency and self-esteem leading to better motivation, the use of more strategies and so on. This is a reasonable proposal, one that captures the developmental nature of language study and postulates reciprocal causation between language performance and learner characteristics. A similar motivational foundation is adopted by Rost and Ross (1991), who propose a cognitive-social paradigm in which the decision to use a strategy to clarify a misunderstanding is preceded by a social decision to respond in the first place. That is, the use of any given strategy begins with a willingness to admit having difficulty and through motivation and self-confidence, etc., results in asking an overt question.

Vann and Abraham (1990) note that there are conflicting results, methods and conclusions in the study of strategy use, and that even the basic issue of the teachability of strategy use is debatable. One reason for these difficulties is that much research has focused on the strategy used by good language learners and assumes that unsuccessful ones simply do not use them. Vann and Abraham even argue that the methods of data collection may have skewed the results. They compared two language learners, one successful and one unsuccessful, and found that the better student used a larger variety of strategies and spent more time on the tasks (possibly a motivational difference). Vann and Abraham also investigated two women who used strategies quite often yet were not successful in learning a second language. They concluded that the women's inflexible approach to language learning tasks appeared to be the problem because they lacked the higher-order, metacognitive strategies that would help them to analyse task demands and assign priority to the more appropriate strategies.

The research to date is clear in demonstrating that the effective use of strategies is associated with high levels of achievement in a second language. There are, however, difficulties in interpretation that must be considered, and as usual with individual difference research, causal relations are complex. Marrie and Nettan (1991) found, for example, that the use of strategies by younger students is similar to that of older students indicating a lack of age differences. They found too that a similar number of strategies was used by effective and ineffective communicators but that the types of strategies were different. The more effective strategies were used by the more effective students. Similarly, Corbeil (1990) noted differences in strategy use by students varying in levels of proficiency. She examined seven successful and seven unsuccessful language learners and found that the better students used more elaborate strategies to understand error correction than did the poorer ones. The more successful students processed the information more fully, expended more effort.

became more engaged in their material, and treated the correction more positively than did the unsuccessful students. Unsuccessful students were only willing to fully process a very specific correction and often avoided the correction altogether. It is possible, however, that the observed difference partially reflects the unsuccessful students' more limited base of knowledge, making the use of more elaborate strategies less possible. Such results could suggest that strategy use facilitates acquisition, or that successful acquisition promotes the development of strategy use, or that some other factor accounts for both strategy use and successful acquisition.

Similar ambiguity exists over the interpretation of such things as sex differences in strategy use. Oxford, Nyikos and Erhman (1988) reviewed 80 studies and found only four that examined sex differences. In general, women were found to use a greater variety of strategies than men. Various factors were offered as explanations, such as women having greater verbal ability in the first language, women being more socially oriented, and women having personality attributes that favour authentic communication and natural language use.

One study (Nyikos, 1990) generated a more complex interpretation. The study began with the hypothesis that men and women are equal in language learning potential but that socialisation and social forces work to produce differences in language achievement. Situations will involve a preference for a given type of strategy, however, in order for verbal learning to occur, students must become engaged with the material. Nyikos proposed that psychosocial variables help determine the degree of engagement and the use of appropriate strategies. The study involved four groups, each exposed to a different learning aid (colour, drawings, both, or neither, the last group serving as a control group). In the first two 'imposed' strategies, women showed higher levels of learning, however, in the group that used both colour and drawings, men performed better. The fourth group used rote memorisation and males and females performed at very similar levels. Thus, an interaction emerged between situational variables and gender indicating that gender socialisation may predispose strategy use.

Other research demonstrates that sex-related differences may be reversed. Tran (1988) found that older Vietnamese men tended to use more strategies and had better linguistic acculturation than a comparable sample of females. In no case did women use more strategies than men. Tran notes that socio-economic factors may produce these differences since the men went to work more often, and the workplace was the prime source of contact with the English language and English speaking people.

As this review indicates, language learning strategies can play a rather pervasive role in second language learning, and research has progressed beyond simply counting the number of strategies used. From a process point of view, strategies play one of two roles for the learner. Direct strategies are used to assist in the storage and retrieval of second language material and thus operate at a cognitive level. Indirect strategies are used to structure the learning environment to facilitate learning, and thus have affective implications. Both, however, involve deliberate plans used by the individual, and thus both are cognitive variables that influence learning. Unlike the other two cognitive variables discussed in this article, intelligence and language aptitude, language learning strategies themselves are best seen as having an affective origin. That is, affective attributes are quite likely responsible for the use of both direct and indirect strategies. Although it is possible that intelligence and language aptitude might correlate with specific strategy use or even the number of strategies used, it is unlikely that they are actual causes of strategy use in the same sense that affective variables are.

Summary and conclusions

As this review indicates, there is ample evidence to justify the conclusion that cognitive variables play a very definite role in second language acquisition. This review has focused on three such variables, intelligence, language aptitude and language learning strategies. Based on the research that has been conducted, it is proposed that they each play a different role in second language acquisition. Intelligence would appear to be important because it influences how well and how quickly students will understand instruction. Language aptitude is important in that students with existing language abilities will be able to transfer new incoming language material to these abilities. That is, the existing abilities act like a type of cognitive sponge, taking on the new language material. Finally, language learning strategies are important because they provide means by which students can facilitate the acquisition of language material.

The foundations of intelligence and language aptitude have not been investigated in the context of second language learning, but it is probably the case that they have both biological and experiential antecedents. Language learning strategies, on the other hand, would be expected to develop from prior experience, and clearly have a motivational basis. That is, the use of language learning strategies requires that the individual is first motivated to learn the second language. Moreover, in the process of learning the language, motivated individuals develop strategies to promote further second language learning.

There are undoubtedly other cognitive variables that might correlate significantly with indices of second language achievement, but future research could profit by determining their relationship to the basic factors of intelligence, language aptitude and language learning strategies. It might very well be that these three variables reflect the major cognitive components underlying second language achievement, and that other potential cognitive correlates simply reflect variation in these components.

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References

- ANDERSON, J. R. (1980). *Cognitive psychology and its implications*. San Francisco: W. H. Freeman and Company.
- ATKINSON, R. C. & RAUGH, M. R. (1975). An application of the mnemonic keyword method to the acquisition of Russian vocabulary. *Journal of Experimental Psychology: Human Learning and Memory*, 104, 126-33.
- BACHMAN, L. F. (1988). Language testing - SLA research interfaces. *Annual Review of Applied Linguistics*, 9, 193-209.
- BACON, S. M. & FINNEMANN, M. D. (1990). A study of the attitudes, motives, and strategies of university foreign language students and their disposition to authentic oral and written input. *Modern Language Journal*, 74, 459-73.
- BIALYSTOK, E. (1984). Strategies in interlanguage learning and performance. In A. Davies, C. Cuper & A. P. R. Howett (eds.), *Interlanguage*, pp. 37-48. Edinburgh University Press.
- BLOOM, B. S. (1976). *Human characteristics and school learning*. New York: McGraw-Hill.
- BRUNER, J. S. (1966). *Toward a theory of instruction*. New York: Norton.
- CARROLL, J. B. (1958). A factor analysis of two foreign language aptitude batteries. *Journal of General Psychology*, 59, 3-19.
- CARROLL, J. B. (1962). The prediction of success in intensive language training. In R. Glaser (ed), *Training research and education*, pp. 87-136. Pittsburgh Press.
- CARROLL, J. B. (1963). A model of school learning. *Teachers College Record*, 64, 723-33.
- CARROLL, J. B. (1967). The foreign language attainments of language majors in the senior year: a survey conducted in U.S. colleges and universities. Cambridge, Mass.: Harvard University Press.
- CARROLL, J. B. (1990). Cognitive abilities in foreign language aptitude: then and now. In T. S. Parry & C. W. Stansfield (eds.), *Language aptitude reconsidered*, pp. 11-29. Englewood Cliffs, N.J.: Prentice Hall Regents.
- CARROLL, J. B. & SAPON, S. M. (1959). *Modern Language Aptitude Test (MLAT)*. New York: Psychological Corporation.
- CARROLL, J. B. & SAPON, S. M. (1967). *Modern Language Aptitude Test, Elementary form*. New York: Psychological Corporation.
- COOK, V. J. (1978). Second-language learning: A psycholinguistic perspective. *Language Teaching and Linguistics: Abstracts*, 11, 73-89.
- COPE-POWELL, J. (1991). Foreign Language Classroom Anxiety: institutional responses. In E. K. Horwitz & D. J. Young (eds.), *Language anxiety: from theory and research to classroom implications*. Englewood Cliffs, N.J.: Prentice Hall.
- CORBELL, G. (1990). Successful and less successful language learners: differences in how they process information. *Journal of the Atlantic Provinces Linguistic Association*, 12, 131-45.

- GARDNER, R. C. (1985). *Social psychology and second language learning: the role of attitudes and motivation*. London: Edward Arnold Publishers.
- GARDNER, R. C. & LAMBERT, W. E. (1965). Language aptitude, intelligence, and second-language achievement. *Journal of Educational Psychology*, 56, 191-9.
- GARDNER, R. C. & LAMBERT, W. E. (1972). *Attitudes and motivation in second language learning*. Rowley, Mass.: Newbury House.
- GLASER, R. (1976). Components of a psychology of instruction: toward a science of design. *Review of Educational Research*, 46, 1-24.
- HENMON, V. A. C. (1929). Prognosis tests in the modern foreign languages. In V. A. C. Henmon (ed.), *Prognosis tests in the modern foreign languages*, pp. 3-31. New York: MacMillan.
- HORWITZ, E. K. & YOUNG, D. J. (1991). *Language anxiety: from theory and research to classroom implications*. Englewood Cliffs, N.J.: Prentice Hall.
- HUNT, T., WALLACE, F. C., DORAN, S., BUYNITZKY, K. C. & SCHWARZ, R. E. (1929). *George Washington University Language Aptitude Test*. Washington: Center for Psychological Services.
- KRASHEN, S. D. (1981). *Second language acquisition and second language learning*. New York: Pergamon.
- LALONDE, R. N. & GARDNER, R. C. (in press). Statistics as a second language? A model for predicting performance in psychology students. *Canadian Journal of Behavioural Science*.
- LAMBERT, W. E. (1963). Psychological approaches to the study of language. Part II: On second language learning and bilingualism. *Modern Language Journal*, 14, 114-21.
- LAMBERT, W. E. (1967). A social psychology of bilingualism. *Journal of Social Issues*, 23, 91-109.
- LAMBERT, W. E. (1974). Culture and language as factors in learning and education. In F. E. Aboud & R. D. Meade (eds.), *Cultural factors in learning and education*. Bellingham, Washington: Fifth Western Washington Symposium on Learning.
- LURIA, M. A. & ORLEANS, J. S. (1928). *Luria-Orleans Modern Language Prognosis Test*. Yonkers: World Book Co.
- MACINTYRE, P. D. & GARDNER, R. C. (1989). Anxiety and second language learning: toward a theoretical clarification. *Language Learning*, 39, 251-75.
- MARRIE, B. & NETTAN, J. E. (1991). Communication strategies. *Canadian Modern Language Review*, 47, 442-62.
- McLAUGHLIN, B. (1990). The relationship between first and second languages: language proficiency and language aptitude. In B. Harley, J. Allen, J. Cummins & M. Swain (eds.), *The development of second language proficiency*, pp. 158-74. Cambridge: Cambridge University Press.
- NYIKOS, M. (1990). Sex-related differences in adult language learning: socialisation and memory factors. *Modern Language Journal*, 74, 274-87.
- OXFORD, R. (1990). *Language learning strategies: what every teacher should know*. New York: Newbury House.
- OXFORD, R. & CROOKALL, D. (1989). Research on language learning strategies: methods, findings, and instructional issues. *Modern Language Journal*, 73, 404-19.
- OXFORD, R. & NYIKOS, M. (1989). Variables affecting choice of language learning strategies by university students. *Modern Language Journal*, 75, 292-300.
- OXFORD, R., NYIKOS, M. & EHRMAN, M. (1988). Vive la différence? Reflections on sex differences in use of language learning strategies. *Foreign Language Annals*, 21, 321-9.
- OXFORD-CARPENTER, R. (1989). A new taxonomy of second language learning strategies. *Dialog on Language Instruction*, 5, 1-17.
- PAIVIO, A. & DESROCHERS, A. (1981). Mnemonic techniques in second language learning. *Journal of Educational Psychology*, 73, 780-95.
- PARRY, T. S. & CHILD, J. (1990). Preliminary investigation of the relationship between VORD, MLAT, and language proficiency. In T. S. Parry & C. W. Stansfield (eds.), *Language aptitude reconsidered*, pp. 30-66. Englewood Cliffs, N.J.: Prentice Hall Regents.
- PETERSEN, C. R. & AL-HAIK, A. R. (1976). The development of the Defense Language Aptitude Battery (DLAB). *Educational and Psychological Measurement*, 36, 369-80.
- PIMSLEUR, P. (1966). *Pimsleur Language Aptitude Battery*. New York: Harcourt Brace Jovanovich.
- PRESSLEY, M., LEVIN, J. R. & DELANEY, H. D. (1982). The mnemonic keyword method. *Review of Educational Research*, 52, 61-91.
- REISS, M.-A. (1985). The good language learner: another look. *Canadian Modern Language Review*, 41, 511-23.
- RICE, G. A. (1929). The Barry Prognostic Language Test. In V. A. C. Henmon (ed.), *Prognosis tests in the modern foreign languages*. New York: MacMillan.
- ROST, M. & ROSS, S. (1991). Learner use of strategies in interaction: typology and teachability. *Language Learning*, 41, 235-73.
- RUBIN, J. (1975). What the good language learner can teach us. *TESOL Quarterly*, 9, 41-51.
- SKEHAN, P. (1986). Cluster analysis and the identification of learner types. In V. Cook (ed.), *Experimental approaches to second language acquisition*, pp. 81-94. Oxford: Pergamon.
- SKEHAN, P. (1989). *Individual differences in second language learning*. London: Arnold.
- SKEHAN, P. (1991). Individual differences in second language learning. *Studies in Second Language Learning*, 13, 275-98.
- SPOLSKY, B. (1989). *Conditions for second language learning*. Oxford, England: Oxford University Press.
- STERN, H. H. (1975). What can we learn from the good language learner? *Canadian Modern Language Review*, 31, 304-18.
- STERN, H. H. (1983). *Fundamental concepts of language teaching*. Oxford: Oxford University Press.
- STODDARD, G. D. & VANDERBEKE, G. E. (1925). *Iowa Placement Examinations, Series FA-1, Revised, Foreign Language Aptitude*. Extension Division, State University of Iowa.
- SYMONDS, P. M. (1930). *Foreign Language Prognosis Test*. Teachers College Press, Columbia University.
- THURSTONE, L. L. & THURSTONE, T. (1941). *The Chicago Tests of Primary Mental Abilities, Ages 11 to 17, Manual*. Washington, D.C.: American Council on Education.
- TODD, J. W. (1929). The psychological fundamentals of linguistic achievement. In V. A. C. Henmon (ed.), *Prognosis tests in the modern foreign languages*. New York: MacMillan.
- TRAN, T. V. (1988). Sex differences in English language acculturation and learning strategies among Vietnamese adults aged 40 and over in the United States. *Sex Roles*, 19, 747-58.
- VANN, R. J. & ABRAHAM, R. G. (1990). Strategies of unsuccessful language learners. *TESOL Quarterly*, 24, 177-98.
- WESCHE, M. B. (1981). Language aptitude measures in streaming, matching students with methods, and diagnosis of learning problems. In K. C. Diller (ed.), *Individual differences and universals in language learning aptitude*, pp. 119-39. Rowley, MA: Newbury House.