Language Learning ISSN 0023-8333

Toward a Model of Motivated Vocabulary Learning: A Structural Equation Modeling Approach

Wen-Ta Tseng

National Taiwan Normal University

Norbert Schmitt

University of Nottingham

This study presents a structural model that integrates vocabulary knowledge and motivation with six latent variables: the initial appraisal of vocabulary learning experience, self-regulating capacity of vocabulary learning, strategic vocabulary learning involvement, mastery of vocabulary learning tactics, vocabulary knowledge, and postappraisal of the effectiveness of vocabulary learning tactics. The model suggests that motivated vocabulary learning follows a developmental mode and functions as a cyclic process. The model supports the importance of motivation in the vocabulary learning process and the division of strategic behavior into two components: one frequency-based and metacognitive in nature and the other focusing on the mastery of individual strategies (i.e., how well they are used).

Keywords expertise; motivation; self-regulation; strategy use; structural equation modeling; vocabulary knowledge

Vocabulary knowledge is a multidimensional and complex construct (Read, 2000). Knowing a word involves numerous types of word knowledge, such as meaning, word form, collocation, and register (Nation, 2001). All of these types of word knowledge are likely to be learned in an incremental fashion. This

The initial report of this article was presented at the 14th World Congress of Applied Linguistics, Madison, Wisconsin, USA, July 24–29, 2005. The authors would like to thank Zoltán Dörnyei for very useful discussions of the issues involved during the course of this research, Robert DeKeyser and the three anonymous reviewers for their helpful comments on the article, and Cees van der Eijk for his very helpful comments and suggestions on the recursive nature of the model.

Correspondence concerning this article should be addressed to Wen-Ta Tseng, Department of English, National Taiwan Normal University, 162, He-ping East Road, Section 1, Taipei 106, Taiwan. Internet: wttseng@ntnu.edu.tw

means that just as vocabulary size increases bit-by-bit, so does one's depth of knowledge about words (Schmitt, 2000). The mental lexicon contains individual lexical items, but they interrelate in complex ways, as word association research has shown (e.g., Meara, 1983, in press; Postman & Keppel, 1970). Moreover, the lexical items consist of both individual words and various types of formulaic sequence (Nattinger & DeCarrico, 1992; Wray, 2002). Mastering all of these dimensions takes time and is certainly not straightforward.

Given the complex nature of vocabulary knowledge, it is reasonable to assume that the process of learning this knowledge might have its own complexities. Thus, it is not surprising that we currently have no generally accepted theory of vocabulary acquisition. There are many theories/explanations that address specific elements of vocabulary acquisition (e.g., Carey, 1978; de Bot, Paribakht, & Wesche, 1997; Jiang, 2000), but it seems safe to say that no theory to date has been able to capture all of the complexities of the acquisition process. This article will take an initial step toward addressing this gap by looking at the vocabulary learning process with reference to an important affective variable in second language (L2) learning and developing an empirically-based model of that process.

Vocabulary and Motivation

To truly understand the vocabulary learning process, we must step outside purely lexical issues and address factors that affect L2 learning in general. Among the factors that could influence the outcome of L2 learning, motivation has been widely embraced by both practitioners and researchers as a critical determinant of success in language learning, and this belief is strongly supported by a wide range of studies on L2 motivation in the past three decades (Clément, Gardner, & Smythe, 1977; Clément & Kruidenier, 1985; Csizér & Dörnyei, 2005; Dörnyei & Csizér, 2002; Elley, 1989; Ely, 1986; Gardner, 1985; Gardner & MacIntyre, 1991; Lukmani, 1972; Noels, Clément, & Pelletier, 1999; Schmidt & Watanabe, 2001; Tremblay & Gardner, 1995). Hence, it is logical to assume that motivation also facilitates vocabulary learning; however, it has been noted that neither the theoretical nor the empirical literature of motivation has so far shed enough light on the field of L2 vocabulary learning (Laufer & Hulstijn, 2001). Thus far, only a small number of studies have been undertaken to examine the role of motivation in vocabulary learning (Elley; Gardner & MacIntyre). These studies provide both indirect and direct evidence of the motivation/vocabulary link. For instance, Elley found that teaching materials that raised learners' interest and motivation led to better word learning. Gardner

and MacIntyre demonstrated that both integrative motivation and instrumental motivation can facilitate vocabulary learning. Indeed, given the significant role that motivation plays in language learning, further research needs to be undertaken to systematically examine its effect on the vocabulary learning process.

More than three decades of L2 motivation research has, however, unanimously indicated that motivation proper is a complex and composite construct and can be approached and addressed via different lines of inquiry (Csizér & Dörnyei, 2005; Dörnyei, 2001a). Before 1990, L2 motivation was solely researched under a social psychological approach (Gardner, 1985; Gardner & Lambert, 1959, 1972). Motivation at that time was usually operationalized to subsume three components: desire, intensity (effort), and attitude (Gardner). In the 1990s, researchers furthered the understanding of L2 motivation by referring to mainstream motivational theories that are essentially cognitively oriented. The construct of L2 motivation was then broadened to acknowledge and embrace such concepts as self-efficacy belief (Bandura, 1986), attributional style (Weiner, 1986), intrinsic/extrinsic motivation (Deci & Ryan, 1985), expectancy of success/incentive value (Atkinson, 1957; Wigfield & Eccles, 2000), and goal properties (Ames, 1992; Ames & Archer, 1988; Locke & Latham, 1990). Each of the competing motivational theories makes its own claims, which appear supportable within the limited perspective of the particular theory.

However, most of the aforementioned motivational theories consider motivation as a static attribute and fail to adequately take into account its dynamic and fluctuating temporal nature (Dörnyei, 2000, 2001a, 2001b; Dörnyei & Ottó, 1998; Ushioda, 2001; Williams & Burden, 1997). Research has shown that learners' initial motivation to learn an L2 is difficult to sustain and often declines over time (Dörnyei & Csizér, 2002; Gardner, Masgoret, Tennant, & Mihic, 2004; Inbar, Donitsa-Schmidt, & Shohamy, 2001; Tachibana, Matsukawa, & Zhong, 1996). Hence, it is clear that "motivation is more than simply arousing interest. It also involves sustaining that interest and investing time and energy into putting in the necessary effort to achieve certain goals" (Williams & Burden, p. 121). In summary, research has not only found that motivation is multidimensional in nature but also that it rarely remains constant in practice, instead going through a number of interconnected processes in terms of initiating, maintaining, and reflecting upon acts of learning in a task (Dörnyei & Ottó; Dörnyei, 2000, 2001a, 2001b; Pintrich & Schunk, 2002; Williams & Burden).

This dynamic perspective of motivation is particularly relevant to vocabulary study, as learners will have to study over an extended period of time to

learn both enough lexical items to function in a language (i.e., attain an adequate vocabulary *size*) and to learn those items well enough to be able to use them appropriately in a variety of contexts (i.e., acquire adequate *depth of knowledge* about each item). It is highly likely that learners' motivation to learn vocabulary will ebb and flow over such an extended period. A realistic educational model of the vocabulary learning process therefore needs to consider how that process is affected by a learner's ever-changing motivational state. To this end, in this study we explore the process of how vocabulary learning behaviors are initiated, maintained, and evaluated during the course of learning. More specifically, we examine how motivation as a process is integrated with vocabulary learning and the extent to which a heuristic model of motivated vocabulary learning can be constructed.

Elements of the Model

We will use structural equation modeling (SEM) to develop our model of motivated vocabulary learning. SEM is a modern multivariate statistical technique that allows a set of relationships to be examined simultaneously. SEM is a confirmatory procedure rather than an exploratory one. Typically, researchers specify a hypothesized model based on an examination of literature and then submit the model to be empirically tested. Thus, our first step was to determine the elements that are likely to be a part of motivated vocabulary learning. Our understanding of the literature, combined with our previous research (Tseng, Dörnyei, & Schmitt, 2006), led us to hypothesize six elements, which are traditionally referred to as latent variables in SEM:

1. Initial appraisal of vocabulary learning experience
2. Self-regulating capacity in vocabulary learning
3. Strategic vocabulary learning involvement
4. Mastery of vocabulary learning tactics
5. Vocabulary knowledge
6. Postappraisal of vocabulary learning tactics

The model of motivated vocabulary learning will be developed from a process-oriented point of view, operationalized as the process whereby strategic behaviors are instigated, sustained, and evaluated. It will have a strong emphasis on motivation, as the model draws on work undertaken by Dörnyei (2001a, 2001b, 2005) on the stages of motivation. Dörnyei (2005) suggested that motivational processes can be broadly sectioned into three phases: preactional, actional, and postactional. The preactional phase is referred to as choice

motivation, which deals with how motivation is generated. The actional phase is also called executive motivation, whose function is to protect and regulate the motivation generated in the first phase. The postactional phase has to do with motivational retrospection, which helps learners evaluate the process of learning, thus exerting further influence on learners' willingness to carry on the same learning activity.

In the model, the outcome of the preactional phase (i.e., the instigation phase) is an initial appraisal of one's previous and current vocabulary learning experiences. The actional phase of sustaining and realizing the initial motivation is further sectioned into three stages: self-regulating capacity in vocabulary learning, strategic vocabulary learning involvement, and mastery of vocabulary learning tactics. In the model, it is hypothesized that self-regulating capacity is an important learning mechanism that functions to maintain learners' intention to learn and to generate support for the implementation of learning behaviors, whereas the mastery and use of learning tactics lead to vocabulary knowledge. Finally, vocabulary knowledge and postappraisal of vocabulary learning tactics represent the postactional phase, where evaluation of the learning process occurs.

Initial Appraisal of Vocabulary Learning Experience

The latent variable "initial appraisal of vocabulary learning experience" (IAVLE) is conceptualized as the initial motivational level of vocabulary learning, which can be indicated by value, interest, effort, or desire. The motivation generated at this stage (i.e., choice motivation) has to do with goal-setting, intention formation, and initiation of intention enactment (Dörnyei, 2001a, 2001b). Moreover, research has shown that choice motivation influences the use of learning strategies (Biggs, 1988, 2003; Garcia, McCann, Turner, & Roska, 1998; Gardner, Tremblay, & Masgoret, 1997; MacIntyre & Noels, 1996; Schmidt & Watanabe, 2001). MacIntyre and Noels referred to motivation as desire plus effort and found that more motivated learners used learning strategies more often. In a similar vein, Gardner et al. (1997) defined motivation as comprised of attitude, intensity, and desire and found that motivation directly explained a large portion of strategy use (23%) in a full structural model with seven latent variables examined simultaneously. Specifically, Schmidt and Watanabe found that cognitive and metacognitive strategies were most strongly affected by learners' motivational factors, such as value and intention.

Additionally, Biggs (1988, 2003) clarified the relation between motivation and strategy by distinguishing between surface learning and deep learning. Surface learning can be observed when learners use the strategies of rote learning

to meet the external demands imposed by institutions, whereas deep learning is observed when learners use the strategies of organizing, connecting concepts together and making connections with their prior knowledge system or experiences to serve their intrinsic interest in the subject matter. To enhance the quality of learning, it is deep learning rather than surface learning that is encouraged in school contexts (Biggs, 1988, 2003). Hence, it seems clear that motivation might influence not only the frequency of strategy use (MacIntyre & Noels, 1996; Gardner et al., 1997) but also the types of strategy use (Biggs, 1988, 2003; Schmidt & Watanabe, 2001).

Based on the potential causal relationships between initial motivation state and strategy use, we formulate the first part of our model as shown in Figure 1. It is important to note that we have divided strategy use into two stages: *strategic vocabulary learning involvement* and *mastery of vocabulary learning tactics*. This is because we believe that in order to understand fully the role of strategy use in language learning, the use of learning strategies should include both quantity and quality dimensions. Although motivation might influence the quantity aspect of strategy use in terms of frequency and type, it is not yet clear whether motivation also influences the quality aspect in terms of using strategies *well*. (See below for more discussion.)

Self-regulating Capacity in Vocabulary Learning (SRCvoc)

The current view of the nature of self-regulating capacity is that it is an aptitude (Winne & Perry, 2000). Moreover, it is viewed as developable and can be influenced by experience:

> [Self-regulated learning] is now modeled as a "developable" aptitude—an aptitude that changes incrementally with experience and instruction—for dynamically adapting how one changes with tasks. (Winne, 1996, p. 330)

Thus, it seems that learners' previous learning experience can have an effect on the developmental level of self-regulating capacity. Our model therefore hypothesizes that the magnitude of self-regulating capacity will be dependent on the instigation of the initial appraisal of vocabulary learning experience, with its related motivational state. Research has provided some evidence to support this type of model. Garcia et al. (1998) found that although choice motivational factors such as task value, self-efficacy, and intrinsic goal orientation have positive effects on strategy use, self-regulating capacity acts as an important mediator between motivation and learning strategies. The results of their study indicated that the indirect effects of choice motivation on self-testing strategies through self-regulating capacity (choice motivation → self-regulating capacity

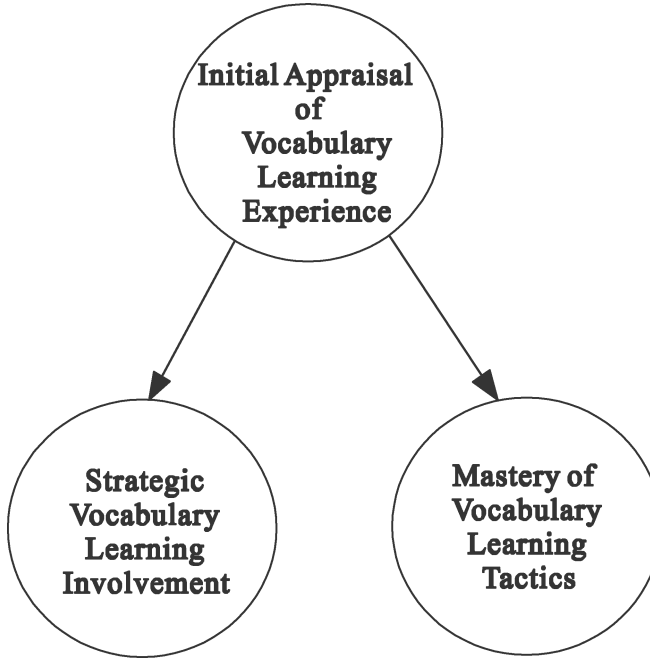


Figure 1 The hypothesized causal relations between initial appraisal of vocabulary learning experience, strategic vocabulary learning involvement, and mastery of vocabulary learning tactics.

→ learning strategies) were three to six times greater than the direct effects (choice motivation → learning strategies). Additionally, it was also found that self-regulating capacity could directly influence the use of learning strategies.

These results suggest that the use of learning strategies is affected not only by choice motivation but also by self-regulating capacity. However, in their study, Garcia et al. (1998) did not make a distinction between quantity (how often) and quality (how well) dimensions of learning strategy use. Accordingly, further research is required to examine whether self-regulating capacity can act as a mediator for simply quantity or quality alone or both dimensions of strategy use. To pursue this, in the present study, self-regulating capacity in vocabulary learning is conceptualized to function as a mediating role between initial motivation and strategy use, with strategy use divided into separate frequency and mastery components (Corno, 1993; Garcia et al., 1998). The causal relations among the four variables are hypothesized in Figure 2.

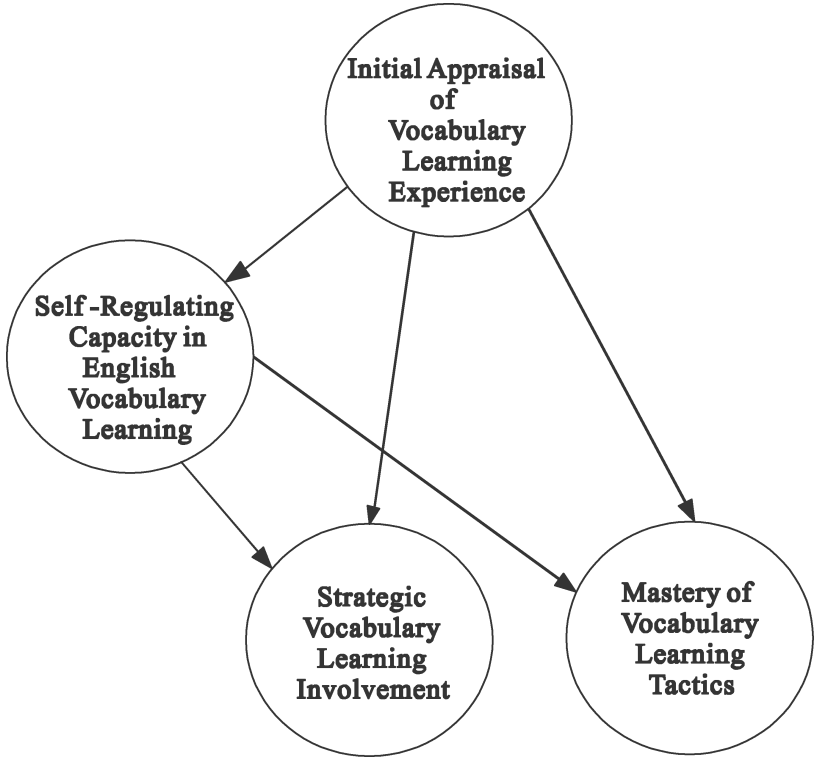


Figure 2 The hypothesized causal relations between initial appraisal of vocabulary learning experience, SRCvoc, SVLI, and MVLT.

Vocabulary Learning Strategy Use: Strategic Vocabulary Learning Involvement and Mastery of Vocabulary Learning Tactics

As mentioned earlier, in this study we divide vocabulary learning strategy use into two components: *strategic vocabulary learning involvement* (SVLI) and *mastery of vocabulary learning tactics* (MVLT). The former refers to the quantity dimension of strategy use, which concerns effortful covert or overt acts to discover or improve the effectiveness of particular tactics. The latter refers to the quality dimension of strategy use, which concerns mastering specific or special covert or overt learning methods to acquire vocabulary knowledge.[1] The rationale for such a distinction between quantity and quality of strategy use is derived not only from the concern, as discussed earlier, for the role of self-regulating capacity in strategy use but also from the concern regarding the inadequate psychometric properties of currently available strategy scales. Much

previous work on measuring language learning strategies has focused on measuring the *frequency of usage* of strategies. For example, the Strategy Inventory for Language Learning (SILL) (Oxford, 1990) and the Vocabulary Learning Strategies Inventory (VOLSI) (Stoffer, 1995) both use questionnaire items that indicate the frequency of use of specific strategic behaviors. Generally, in the two scales, the psychometric assumption is that more usage is considered better. However, it has been argued that the two frequency-based scales fail to reflect *how well* individuals can use the language learning strategies, either in general or in a more specific language domain (e.g., vocabulary learning strategies; Tseng et al., 2006). Frequent use of strategies does little good unless those strategies are effective for a particular learner. Therefore, frequent strategy use does not necessarily point to resourceful and adaptive strategy use.

Evidence favoring the necessity of a "quality of use" dimension has been found in a causal study involving the variables of strategy use and L2 proficiency (Gardner et al., 1997). Using the SILL, they found that a higher frequency use of strategies led to lower L2 achievement in a learning English as a second language context (path coefficient $= -.29$). In other words, a more frequent use of language learning strategies resulted in a lower level of L2 proficiency. This finding suggests that to achieve higher L2 achievement, it is better to use strategies in a parsimonious but methodological way, rather than in a frequent but unorganized manner (Ellis, 1994). As Mayer (1999) suggested, "[e]xperts and novices may differ *quantitatively*—in terms of how much they know—as well as *qualitatively*—in terms of what they know" (p. 240). Thus, it is likely that an expert strategy user might not simply have a larger repertoire of learning strategies but actually understand how to use the strategies better than a novice user in his/her subject domain.

These findings led us to formulate a distinction between quantity and quality dimensions of strategy use. The quantity dimension (SVLI) is the learner's overall involvement with vocabulary learning and the attempts made to pursue it. This includes several elements: how frequently a learner is involved in vocabulary learning behaviors, the range of vocabulary learning behaviors a learner is involved with, and having a metacognitive awareness of how to best enhance the effectiveness of vocabulary learning tactics. One might think of SVLI as a learner's general experience with, and understanding of, their vocabulary learning behaviors. On the other hand, the quality dimension (MVLT) is about using specific vocabulary learning behaviors effectively. Reaching the mastery level entails developing an awareness of what learning tactics to use and when and how to use them effectively.

We further hypothesize that having a wide range of vocabulary learning involvement and experience helps organize a learner's strategic options and helps learners gain mastery over the learning tactics that prove useful; that is, in the model, it is hypothesized that SVLI has a direct and positive impact on the mastery level of the vocabulary learning tactics used (MVLT). Presumably, the repeated appropriate usage of tactics (as governed by SVLI) eventually also leads to mastery over those tactics (MVLT). This two-component view of strategic behavior seems essential, as simply using tactics frequently is not sufficient and in some cases been shown to lead to poorer learning (Gardner et al., 1997). A successful learner must eventually learn to use the tactics appropriately and well. As Ellis (1997) remarked, "[s]uccessful learners use sophisticated metacognitive knowledge to choose cognitive learning strategies appropriate to the task of vocabulary acquisition" (p. 138). Indeed, it appears that what makes a learner successful is more than a quantitative concern. To become an expert/successful vocabulary learner, therefore, both quantity and quality aspects of strategy use need to be considered. Figure 3 illustrates the assumed causal relationship between the quantity and quality aspects of strategic learning behavior and the relationships between those two aspects and vocabulary knowledge.

Vocabulary Knowledge (VOCkno)

As suggested in the introduction, the construct of vocabulary knowledge is actually quite complex. However, it has often been conceptualized in terms of vocabulary size and vocabulary depth. It is clear from a wide range of research that certain vocabulary sizes are necessary to do certain things in language (e.g., Adolphs & Schmitt, 2003; Hazenberg & Hulstijn, 1996; Laufer, 1988; Nation & Waring, 1997). The lexical requirements for English can be summarized as follows:

- 2,000–3,000 word families for basic everyday conversation (chat)
- 3,000 word families to begin reading authentic texts
- 5,000–9,000 word families to independently read authentic texts
- 10,000 word families, a wide vocabulary, to allow most language use

Although it is unclear what gains in general language proficiency accrue from vocabulary sizes in excess of 10,000 word families, it is clear that below this level (the state of most ESL [English as a second language] learners), the more vocabulary the better. As a result, vocabulary size is a key indicator of lexical ability.

Of course, vocabulary size does not tell the whole story. A learner must be able to use the vocabulary they have. This can be considered the depth or

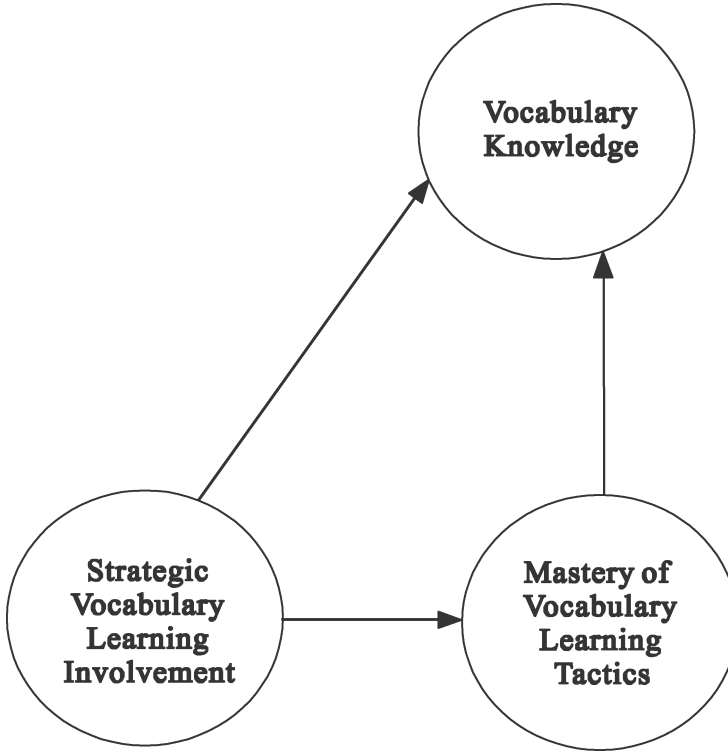


Figure 3 The hypothesized causal relations between SVLI, MVLT, and vocabulary knowledge.

quality of vocabulary knowledge. Because the quality of vocabulary knowledge increases gradually (Schmitt, 2000), it follows that learners will have different levels of mastery of individual lexical items. This mastery can be conceptualized along a *developmental* scale or as mastery of the different *dimensions* of word knowledge (Read, 2000). This study will operationalize depth of knowledge as a combination of three factors: knowledge of the different possible meanings of a word (polysemy), knowledge of its collocational constraints, and knowledge of its spelling. Thus, we tap into a word's meaning, collocation, and form constraints.

The model hypothesizes that gains (or lack of gains) in vocabulary size and depth will directly influence vocabulary learners' retrospection of task performance (i.e., the use of vocabulary learning tactics; Dörnyei, 2001b). That is to say, learners, depending on the outcome of vocabulary learning, might

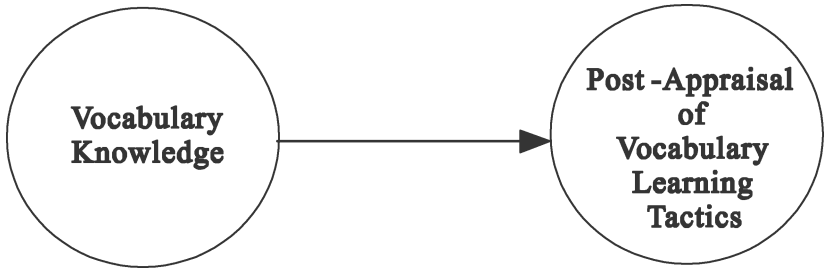


Figure 4 The hypothesized causal relation between vocabulary knowledge and PAVLT.

critically evaluate the whole event process, have positive or negative reactions to the performance outcome, and make attributions for the performance outcome (Pintrich, 2000). The causal relationship between vocabulary knowledge and postappraisal of vocabulary learning tactics is hypothesized in Figure 4.

Postappraisal of Vocabulary Learning Tactics

Finally, we hypothesize that the *postappraisal of vocabulary learning tactics* (PAVLT) can affect future vocabulary learning. This phase of the model denotes the period of self-reflection of task processes when the task is completed. According to Dörnyei (2001b), this phase is very important in that such a "critical retrospection contributes significantly to accumulated experience, and allows the learner to elaborate his or her *internal standards* and the repertoire of *action-specific strategies*" (emphasis original, p. 91). In particular, it has been found that learners' causal attributions as a result of task retrospection exert a critical influence on subsequent expectancy for success, self-efficacy belief, achievement behaviors, and emotional responses (Dörnyei, 2001b; Pintrich & Schunk, 2002; Weiner, 1986, 1992).

Hence, it seems that not only does initial motivational state influence the processes of task performance, but also a retrospection of task performance is likely to in turn influence this state. (In our model, we use the term "*initial* motivational state," although this should be understood as the *current* motivational state in the subsequent recursive stages of the evaluation process.) On the one hand, learners who possess an affirmative initial motivational state regarding high self-efficacy, positive task value, and low learning anxiety are more likely to form the intention to learn and thus implement strategic behaviors to achieve this goal (Garcia et al., 1998; Gardner et al., 1997; MacIntyre & Noels, 1996; Schmidt & Watanabe, 2001). Furthermore, in a cyclical manner, learners who perceive that they have achieved the learning goal and make proper attributions

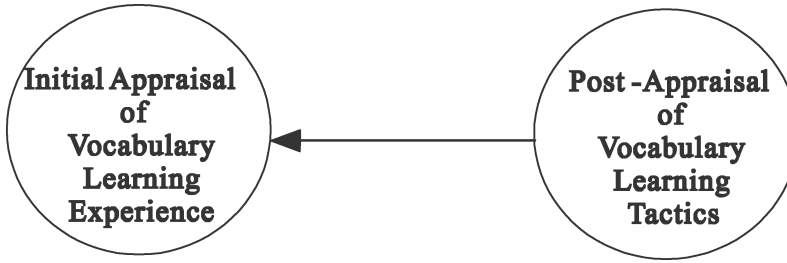


Figure 5 The hypothesized causal relations between PAVLT and IAVLE.

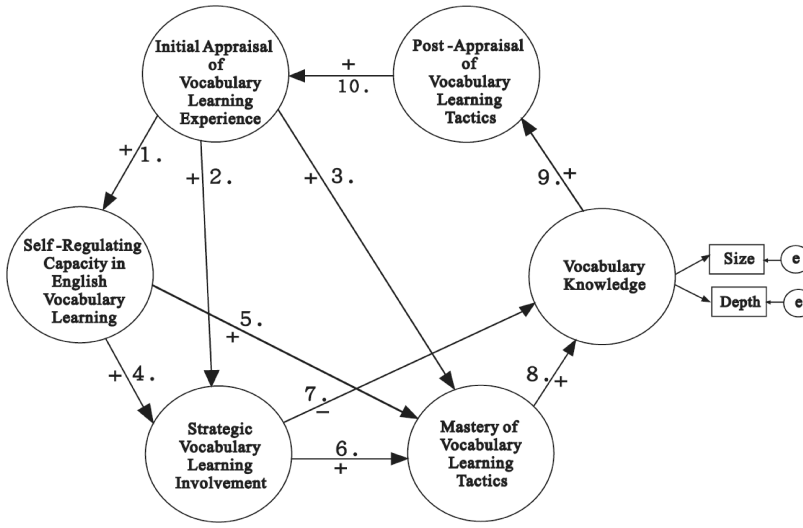


Figure 6 The hypothesized model with six latent variables.

for their success are also more likely to sustain their high self-efficacy, positive attitude, and emotional climate for the subsequent task execution (Dörnyei, 2001b; Pintrich & Schunk, 2002; Weiner, 1986, 1992). The above discussion posits the evaluation stage of the model as assumed in Figure 5.

The Hypothesized Model

Based on the above discussion, the six latent variables and the hypothesized relationships among them form a cyclic model of motivated vocabulary learning. The complete hypothesized model is presented in Figure 6 as a structural

equation diagram. All of the hypothesized paths between variables are assigned a number to indicate how the processes of the model might develop. Similarly a "+" sign or a "−" sign is also assigned to the causal paths, explicitly indicating whether a positive influence or neutral/negative influence is assumed in a particular path. Note that all paths are hypothesized as positive, except Path 7, which is listed as neutral/negative to indicate that vocabulary involvement alone is unlikely to lead directly to vocabulary knowledge but needs to be directed through the latent variable MVLT (Gardner et al., 1997).

Method

Measures

Scales were developed to measure each of the six latent variables. The scale development involved item analysis, reliability, validity, and unidimensionality analysis. Two kinds of item analysis procedure were administered: extreme group method and corrected item-total correlation (Tseng et al., 2006). Reliability analysis was based on internal consistency (i.e., Cronbach's Alpha). Both validity and unidimensionality were confirmed using principal axis factoring. The details of the development of each scale are discussed below. Samples of each measure can be found in the appendix.

The measures of IAVLE were made up of three indicators: vocabulary learning anxiety, vocabulary learning attitude, and vocabulary learning self-efficacy. All the three indicators adopted a 6-point Likert scale ranging from 1 = "strongly disagree" to 6 = "strongly agree."[2] The reason for choosing learning anxiety and self-efficacy as the indicators of the latent variable is that the two indicators comprehensively represent learners' overall self-confidence (Dörnyei, 1994). Measuring both learners' learning anxiety and self-efficacy in vocabulary learning can reflect learners' perceptions of achievement in this learning task. Learning attitude serves as the third because it not only captures learners' perceptions of vocabulary learning but can also serve to represent a theoretical integration between psychology-based (i.e., Ajzen's Theory of Planned Behavior; Ajzen, 1988) and language-based (i.e., Gardner's social-psychological approach; Gardner, 1985) motivational theory. The scales for these three indicators were formed by referring to existent scales. Vocabulary learning anxiety was formed by referring to the Foreign Language Classroom Anxiety Scale (FLCAS) (Horwitz, Horwitz, & Cope, 1986). Vocabulary learning attitude was formed by referring to a subscale "Attitudes toward learning French" as designed by Gardner. Likewise, vocabulary learning self-efficacy

was formed by referring to a subscale "Self-Confidence" as adopted by Gardner et al. (1997). The total scale for IAVLE numbered 30 items.

The measure of SRCvoc was made up of five indicators: (a) commitment control, (b) metacognitive control, (c) satiation control, (d) emotion control, and (e) environment control. These five indicators were based on Dörnyei's (2001a) self-regulating system, which draws on a volitional view of self-regulation. This scale has been validated using confirmatory factor analysis, proving to be both valid and reliable (Tseng et al., 2006). This measure does not target any specific behavioral patterns but aims to measure the underlying capacity to regulate the strategic learning behaviors of vocabulary. Consequently, self-regulating capacity will be conceptualized more like aptitude than as a series of discrete events (Winne & Perry, 2000). The scale takes the form of a 6-point Likert scale ranging from 1 = "strongly disagree" to 6 = "strongly agree." If an individual obtains an average score above 4 (slightly agree) in any control dimension of self-regulating capacity, this suggests that he/she might possess a greater control in that self-regulating dimension. Additionally, the summation of the scores of all the items represents an individual's overall evaluation of his/her self-regulating capacity in vocabulary learning. This means that the higher the scores in the scale, the greater the self-regulating capacity should be in exercising personal control in vocabulary learning.

Measures for SVLI and PAVLT were developed by the lead author based on his understanding of the relevant literature. This was necessary because no existent scales were available as references in designing the scales measuring the two constructs. Twenty-two items were generated for SVLI, and 18 items were generated for PAVLT. To determine the underlying structures of the two constructs, principal axis factoring was used. The results showed that PAVLT could be represented by three factors: Satisfaction (SATIS), Helplessness (HELP), and Skillfulness (SKILL). This scale also used a 6-point Likert scale ranging from 1 = "strongly disagree" to 6 = "strongly agree."

For SVLI, five factors could be identified as indicators. Factor 1 includes the items that concern the covert or overt acts to apply or improve the newly learned tactics, so it is called Self-Initiating Behaviors of the Newly-Learned Vocabulary Learning Tactics (SIB). Factor 2 loads heavily on the items that have to do with the covert or overt acts to proactively learn vocabulary, thus called Self-Activating Behaviors of Learning Vocabulary (SAB). Factor 3 is directed by the items that are concerned with the overt acts to evaluate the effectiveness of the learned vocabulary learning tactics, thus named Self-Experimenting Behaviors of Vocabulary Learning Tactics (SEB). Factor 4 obtained substantial

loadings from the items that concern the efforts made to adjust or change the inappropriate tactics, hence referred to as Self-Improving Behaviors of Vocabulary Learning Tactics (SIMB). Finally, factor 5 is dominated by the items in relation to learners' proactive efforts to learn more words; as a result, the factor is referred to as Self-Surpassing Behaviors of Learning Vocabulary (SSB). This scale adopted a 7-point Likert scale ranging from 1 = "never" to 7 = "always."[3] The categories of this ordered rating scale are exactly the same as the ones used in Gardner et al.'s study (1997) in order to test and replicate the effect of strategy use as frequency on language learning.

Measures for MVLT were developed based on two systems of vocabulary learning strategies. The first source was Schmitt's taxonomy (Schmitt, 1997), consisting of 58 items. The second reference was Gu and Johnson's (1996) taxonomy of 91 items. After comparing the two systems, 32 items were selected, which, although not comprehensive, were representative of the typical vocabulary learning strategies discussed in the literature. It was necessary to limit the number of strategies because too many items on the final survey could produce fatigue effects on the participants. The eventual list of the items encapsulates the tactics that are concerned with either the access to word meanings (e.g., using monolingual and bilingual dictionaries) or the acquisition of the depth of vocabulary knowledge such as *word parts* and *associations*.

Again, principal axis factoring was performed to determine the underlying structure of the construct. It was found that MVLT was made up of six factors. Factor 1 is named Linking Tactics (LINK), the items of which are strongly associated with the tactics using sense relations such as coordination, synonymy, or antonymy. Factor 2 is referred to as Comprehending Tactics (COMP), because learners with high scores on this factor might use such tactics as analyzing part of speech or guessing from context. Factor 3 is broadly associated with Highlighting Tactics (HILIT) because the items of the factor load noticeably on two fields: verbal/written repetition and note-taking. Factor 4 is referred to as Imaging Tactics (IMAG) on the grounds that the tactics of this factor have to do with using pictures/imagery. Factor 5 obtained significant loadings on the items that are relevant to interacting with teachers or peers. Factor 5, therefore, is labeled as Social Tactics (SOCI). Finally, factor 6 concerns overt acts such as making word cards and put labels on physical objects and, hence, is labeled Hands-On Tactics (HAND).

This scale used a 5-point Likert scale ranging from 1 = "never used" to 5 = "yes, and with lots of mastery."[4] This 5-point ordered rating scale is designed in such a way that the increments between each category can be equal in magnitude.[5] Moreover, the results of the pilot study indicated that interviewees showed

no difficulty differentiating the five categories of the scale and responded that the 5-point rating scale was a useful approach to helping them understand how well they were using the various tactics.

Measures for Vocabulary Knowledge tap into both size and depth aspects. The size aspect is indicated by the combined scores of the 2,000, 3,000, and 5,000 levels from Schmitt, Schmitt, and Clapham's (2001) Vocabulary Levels Test (VLT). Schmitt et al. have provided validity and reliability evidence for the VLT, and it has been widely used in L2 vocabulary research. The depth aspect is indicated by the combined scores of a collocation test, polysemy test, and prompted productive written form test.[6] The target words for these three tests were drawn from the VLT, which allowed us to sample from different frequency bands and word classes. The purpose of the collocation test is to measure learners' capacity to recognize the syntagmatic co-occurrence of words. The polysemy test is designed to tap into learners' capacity to identify different meaning senses of the same word. The prompted productive written form test, on the other hand, attempts to measure learners' capacity to produce the written forms of target words. All of the above measures are summarized in Table 1, including information about the number of items, reliability indexes, and scales for the respective measures.

Participants

The participants included 49 university students from a Taiwanese university and 210 participants from a Chinese university (130 males, 129 females). All were undergraduate freshmen majoring in a wide range of disciplines, including Business and Management, Geology, Chemical Engineering, Computer Science, and Applied Foreign Languages. Before participating in the study, the two groups of learners had received English education for more than 6 years. It is likely that this large group of participants had developed a range of motivational patterns regarding vocabulary learning over this period of time. This makes it possible to investigate the motivational phenomenon in conjunction with vocabulary learning.

Although both Chinese and Taiwanese speak the same language (i.e., Mandarin), the two populations are different in some ways. First, the written forms of the language are different in the two populations. Chinese learners used a simplified version of the writing system, whereas Taiwanese learners are taught the more traditional version. Second, certain spoken and written expressions are also quite different between the two populations. These two language concerns led the lead author to generate two different versions of the research instruments for the two groups of participants.

Table 1 Summary of the measures of the hypothesized model

Latent variables	Indicators	No. of Items	Reliability (α)	Scales
Initial appraisal of vocabulary learning experience (IAVLE)	Vocabulary learning self-efficacy (EFF)	10	.82	6-Point Likert scale ranging from 1 = "strongly disagree" to 6 = "strongly agree"
	Vocabulary learning anxiety (ANX)	10	.84	
	Vocabulary learning attitude (ATT)	10	.81	
Self-regulating capacity in vocabulary learning (SRCvoc)	Commitment control (COM)	4	.76	6-Point Likert scale ranging from 1 = "strongly disagree" to 6 = "strongly agree"
	Metacognitive control (META)	4	.80	
	Satiation control (SAT)	4	.73	
	Emotion control (EMOT)	4	.74	
	Environment control (ENV)	4	.71	
Strategic vocabulary learning involvement (SVLI)	Self-initiating behaviors of the newly-learned vocabulary learning tactics (SIB)	6	.82	7-Point Likert scale ranging from 1 = "never" to 7 = "always"
	Self-activating behaviors of learning vocabulary (SAB)	7	.77	
	Self-experimenting behaviors of vocabulary learning tactics (SEB)	3	.78	
	Self-improving behaviors of vocabulary learning tactics (SIMB)	3	.80	
	Self-surpassing behaviors of learning vocabulary (SSB)	3	.68	

(*continued*)

Table 1 (Continued)

Latent variables	Indicators	No. of Items	Reliability (α)	Scales
Mastery of vocabulary learning tactics (MVLT)	Linking tactics (LINK)	8	.84	5-Point Likert scale ranging from 1 = "never used" to 5 = "yes, and with lots of mastery"
	Comprehending tactics (COMP)	7	.76	
	Highlighting tactics (HILIT)	4	.78	
	Imaging tactics (IMAG)	3	.80	
	Social tactics (SOCI)	6	.74	
	Hands-on tactics (HAND)	4	.68	
Vocabulary knowledge (VOCkno)	Size of vocabulary knowledge (SIZE)	90 Items (30 items from 2,000, 3,000, and 5,000 level of Vocabulary Levels of Tests, respectively)	2000 Level: .71 3000 Level: .72 5000 Level: .70	Matching
	Depth of vocabulary knowledge (DEPTH)	90 Items (30 items each from Collocation, Polysemy, and Written Form Tests, respectively)	Collocation: .74 Polysemy: .78 Written Form: .79 .92	Collocation: Multiple choice Polysemy: Multiple choice Written Form: Blank-filling 6-point Likert scale ranging from 1 = "strongly disagree" to 6 = "strongly agree"
Post-appraisal of vocabulary learning tactics (PAVLT)	Satisfaction (SATIS)	8	.81	
	Helplessness (HELS)	6	.78	
	Skillfulness (SKILL)	4		

Most of the Chinese students had passed Band 4 of the College English Test, a national English examination that measures about 4,000 word families. In general, Taiwanese students have a similar vocabulary size to Chinese students (Tseng, 2000), so we can assume a vocabulary size of about 4,000 word families for the entire participant population.

Procedure

A pilot study was carried out, and as a result, amendments were made to various measures. The main study was administered in early December 2004. The procedures used for participant recruitment and administration of the study in both Chinese and Taiwanese research sites were the same. First, the purpose of the study was explained to the participants, and consent forms were collected. Then they were all invited to complete the study at a time when they had at least 3 hr available. The tests were administered to groups of participants who were available at the same time. The vocabulary tests were administrated first, followed by the psychometric scales. Most students completed the study within 2.5 hr. When the participants completed the study, Chinese participants received $10 REM and Taiwanese participants received $150 NT dollars for joining the project.

A SEM analysis was then implemented with Amos 4.0 to determine the compatibility of the hypothesized model with the actual data. All of the latent variables and the hypothesized paths were analyzed simultaneously, which provides a measure of the strength of each hypothesized path while taking account of all other paths in the model. This procedure produces a set of model fit indexes that shows how well the hypothesized model is supported.

Results

Construct Validity for the Six Latent Variables

The hypothesized model contains six latent variables, each with a number of construct indicators. However, there is the possibility that an indicator might be linked to another variable than that assumed by the model, especially if all indicators are taken into account simultaneously. In order to confirm that the latent variables have no crossover with each other and that the indicators were loading solely on the expected variable, a principle axis factoring analysis was performed. The results are shown in Table 2. We find that the outcome patterns exactly mirror the individual constructs. In other words, the indicators load on the expected variables, and the results fall cleanly into six factors that can be

Table 2 Varimax rotation of six-factor solution for 24 indicators

	Factor[a]					
	1	2	3	4	5	6
Comprehending tactics	.716					
Linking tactics	.688					
Hands-on tactics	.649					
Social tactics	.593					
Highlighting tactics	.502					
Imaging tactics	.476					
Metacognitive control		.785				
Commitment control		.673				
Emotion control		.655				
Satiation control		.608				
Environment control		.393				
Self-initiating behaviors of the newly-learned vocabulary learning tactics			.761			
Self-experimenting behaviors of vocabulary learning tactics			.704			
Self-improving behaviors of vocabulary learning tactics			.614			
Self-activating behaviors of learning vocabulary			.596			
Self-surpassing behaviors of learning vocabulary			.473			
Satisfaction				.734		
Helplessness				−.704		
Skillfulness				.636		
Vocabulary learning anxiety					−.804	
Vocabulary learning self-efficacy					.643	
Vocabulary learning attitude					.551	
Size of vocabulary knowledge						.815
Depth of vocabulary knowledge						.685

[a]Factor 1: MVLT; Factor 2: SRCkno; Factor 3: SVLI; Factor 4: PAVLT; Factor 5: IAVLE; Factor 6: Vocabulary knowledge.

explained by the six variables. Hence, the original theoretical division of six latent variables is strongly supported.

This confirmation of the latent traits and indicators allowed us to proceed with the main SEM analysis. Technically, a hypothesized model produces an *estimated population covariance matrix*, whereas a set of empirically collected data produces a *sample (observed) covariance matrix* (Hair, Anderson, Tatham, & Black, 1998). The purpose of SEM is therefore to examine the extent to which the proposed estimated population covariance can fit into the sample covariance matrix. The closer the two matrixes, the better the hypothesized model. SEM, therefore, is a confirmatory and theory-driven technique (Kaplan, 2001).

However, before the hypothesized model is evaluated, the identifiability of the hypothesized model needs to be checked. To this end, two steps need to be taken. First, the regression coefficient from a factor to one of its indicators should be fixed to a value of 1. This helps set the scale of the latent variable (Byrne, 2001; Kaplan, 2001; Tabachnick & Fidell, 2001). Hence, we fixed the regression coefficient of the first indicator of each latent variable to 1. Thus, the path predicting vocabulary learning efficacy from initial appraisal of vocabulary learning experience, the path predicting commitment control from self-regulating capacity in vocabulary learning, the path predicting self-initiating behaviors of the newly-learned vocabulary learning tactics from strategic vocabulary learning involvement, the path from mastery of vocabulary learning tactics to hands-on tactics, the path from vocabulary knowledge to size of vocabulary knowledge, and the path from postappraisal of vocabulary learning tactics to satisfaction were all fixed to 1 to establish the scales of the six latent variables.

Second, it is necessary that the data points outnumber the parameters to be estimated in the model (Byrne, 2001; Kaplan, 2001; Tabachnick & Fidell, 2001). The data points refer to the variances and covariances of the observed variables (i.e., indicators; Byrne). With 24 factor indicators, the number of data points (variances and covariances) in the hypothesized model could be calculated as $[24(24 + 1)]/2 = 300$. Also, the hypothesized model in total included 58 parameters (28 unfixed path coefficients, 24 measurement error variances, and 6 residual error terms); therefore, the hypothesized model could be identified and tested with 242 degrees of freedom ($300 - 58 = 242$). In short, the two conditions concerning identifiability were fulfilled.

Model Evaluation

The results of model evaluation showed that five out of eight structural model fit indexes as shown in Table 3 supported the suitability of the hypothesized model.

Table 3 Model fit indexes for the hypothesized model

	Model fit indexes							
	χ^2/df	GFI	AGFI	CFI	TLI	IFI	NFI	RMSEA
Acceptable fit	<3	>.9	>.9	>.9	>.9	>.9	>.9	$.05 < x < .08$
Hypothesized model	1.92	.86	.83	.92	.90	.92	.84	.06

The chi-square/*df* ratio ($\chi^2 = 464.64$, $df = 242$, $p < .01$), the comparative fit index (CFI), the Tucker-Lewis index (TLI), the incremental fit index (IFI), and the root mean square error of approximation (RMSEA) all reached or exceeded acceptable fit thresholds. The three fit indexes that did not meet the acceptable fit thresholds (the goodness-of-fit index [GFI], the adjusted goodness-of-fit index [AGFI], and the normed fit index [NFI]) all approached those thresholds. In SEM, it is normal for some indexes to not conform to the majority trend, so there is strong case that the hypothesized model had a good overall fit with the empirical data. (See Tseng et al., 2006, for more detailed discussion of SEM and fit indexes.)

An examination of the strengths of the causal relationships among the six latent variables, however, suggested that some modifications were necessary to improve the hypothesized model (Figure 7). The initial appraisal of the vocabulary learning experience had virtually zero predictive power over SVLI ($\beta = -.01$, $p > .05$) and MVLT ($\beta = -.02$, $p > .05$). Similarly, SVLI had no meaningful predictive power over vocabulary knowledge ($\beta = .07$, $p > .05$). Although SRCvoc had a direct impact on MVLT ($\beta = .17$, $p > .05$), it was not strong enough to reach a significant level. In other words, all of the causal relationships inside the model "ring" were weak and failed to reach significance. In comparison, the relationships on the "ring" were relatively robust, and all reached significance. This result suggests that the processes of motivated vocabulary learning mainly go through this loop.

It seemed possible, therefore, that a structural model consisting of only the pathways on the ring might be more parsimonious than the hypothesized model. We revised the model along these lines and ran another SEM analysis. The results for the "revised model" are illustrated in Figure 8.

Table 4 compares the two models in terms of eight types of structural model fit measures. The results revealed that the revised model seemed to slightly outperform the hypothesized model; that is, comparing the fit indexes of the two models, the revised model had a lower value of χ^2/df ($\chi^2 = 464.94$,

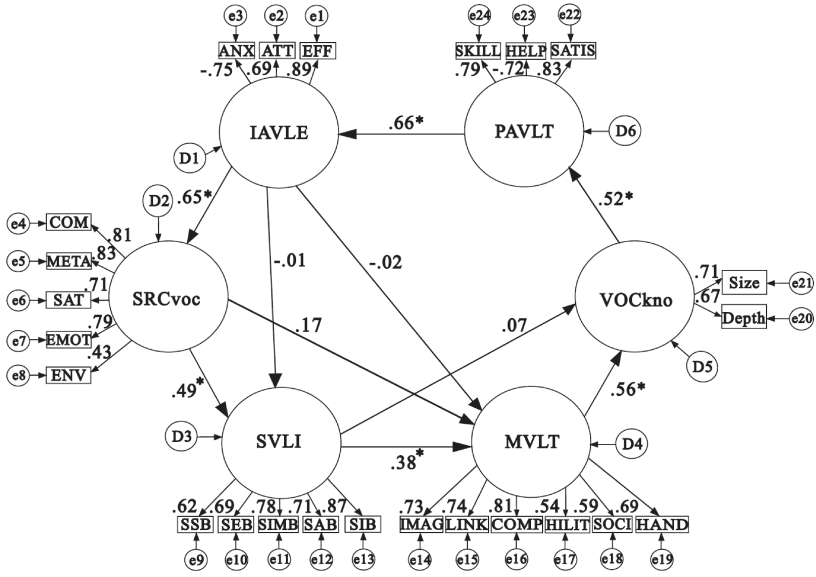
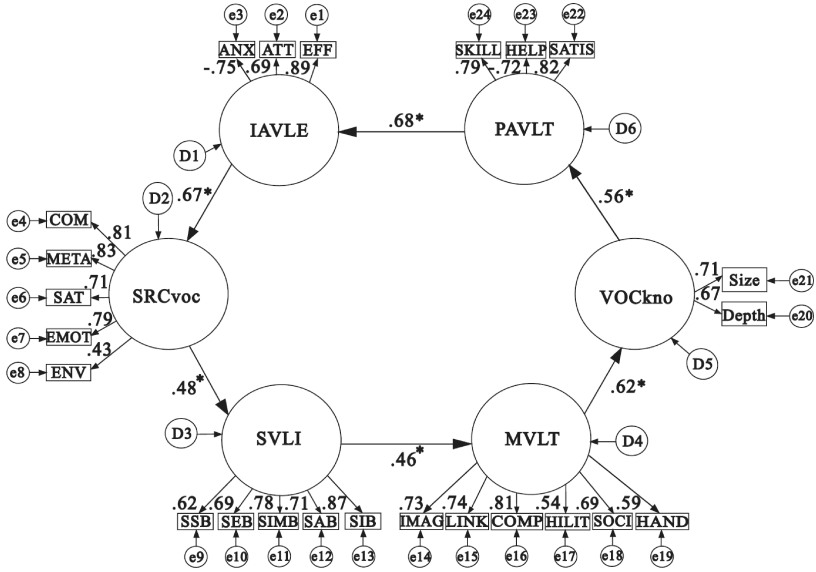


Figure 7 Results of the hypothesized model; see Figure 8 for abbreviations. *Standardized path coefficients, $p < .05$.

$df = 246$, $p < .01$), suggesting that the revised model had a greater degree of parsimony in comparison to the hypothesized model. Additionally, comparing the three incremental fit indexes (i.e., IFI, CFI, and TLI), although the two models had the same values of IFI and CFI, it was found that the revised model had a higher value of TLI than that of the hypothesized model. This information suggested that the revised model had a slightly improved fit over the hypothesized model.[7] Similarly, the revised model also had a lower value of RMSEA (.05) than that of the hypothesized model (RMSEA = .06). A model with lower RMSEA means the model has a better approximation to the proposed model (Hox & Bechger, 1998). As such, this information indicated that the revised model acquired a better and closer approximate fit than did the hypothesized model.

The results suggest that the four insignificant paths inside the model ring do not contribute meaningfully to the process of motivated vocabulary learning and that deleting them helps to generate a more parsimonious model: The revised model not only retained the significant paths on the model ring, but most of the causal relationships among the variables were also strengthened, sometimes to a great degree. The path coefficient from initial appraisal of



Latent variables: IAVLE = initial appraisal of vocabulary learning experience; SRCvoc = self-regulating capacity in vocabulary learning; SVLI = strategic vocabulary learning involvement; MVLT = mastery of vocabulary learning tactics; VOCkno = vocabulary knowledge; PAVLT = postappraisal of vocabulary learning tactics. **Indicators**: EFF = vocabulary learning self-efficacy; ANX = vocabulary learning anxiety; ATT = vocabulary learning attitude; COM = commitment control; META = metacognitive control; SAT = satiation control; EMOT = emotion control; ENV = environment control; SIB = self-initiating behaviors of the newly-learned vocabulary learning tactics; SAB = self-activating behaviors of learning vocabulary; SEB = self-experimenting behaviors of vocabulary learning tactics; SIMB = self-improving behaviors of vocabulary learning tactics; SSB = self-surpassing behaviors of learning vocabulary; LINK = linking tactics; COMP = comprehending tactics; HILIT = highlighting tactics; IMAG = imaging tactics; SOCI = social tactics; HAND = hands-on tactics; DEPTH = depth of vocabulary knowledge; SIZE = size of vocabulary knowledge; SATIS = satisfaction; HELP = helplessness; SKILL = skillfulness.

Figure 8 Results of the revised model. *Standardized path coefficients, $p < .05$.

vocabulary learning experience to SRCvoc has increased moderately from .65 to .67. Likewise, the relationship between vocabulary knowledge and PAVLT is moderately strengthened from .52 to .56 and the relationship between PAVLT and IAVLE increased from .66 to .68. However, the path coefficients from SVLI to MVLT and from MVLT to vocabulary knowledge have increased sharply from .38 to .46 and from .56 to .62, respectively. The only exception to this

Table 4 Comparison of model fit indexes for the hypothesized and the revised model

	Model fit indexes							
	χ^2/df	GFI	AGFI	CFI	TLI	IFI	NFI	RMSEA
Acceptable fit	<3	>.9	>.9	>.9	>.9	>.9	>.9	.05 < *x* <.08
Hypothesized model	1.92	.86	.83	.92	.90	.92	.84	.06
Revised model	1.89	.87	.83	.92	.91	.92	.84	.05

trend of improvement is the path coefficient from SRCvoc to SVLI, and it only decreased negligibly from .49 to .48. Overall, the revised model outperforms the hypothesized model, providing a good fit to the empirical data. On balance, the present study would accept the revised model as an appropriate model that can best explain the empirical data. The revised model has a greater degree of parsimony than that of the hypothesized model; therefore the revised model can serve as the model that is more capable of capturing the process of motivated vocabulary learning.

Discussion

The revised model of the vocabulary learning process marks an attempt to integrate some of the most important strands of L2 acquisition research into one large-scale causal study. Previous research on vocabulary acquisition has looked at rather narrow segments of the whole acquisition picture. For example, Waring (1997) researched cross-association effects when learning words with similar meanings, Pressley, Levin, and Miller (1982) looked at the effectiveness of the mnemonic keyword method, and Schmitt (1997) explored learners' use of vocabulary learning strategies. These types of study are of course very valuable, and the narrow focus allows effective research to be conducted. Such studies, however, inevitably suffer from the problem of not showing how the focused-upon aspects related to the wider learning process. Some scholars have taken a wider view, such as Laufer and Hulstijn (2001), who argued that vocabulary learning involves three motivational and cognitive dimensions: Need, Search, and Evaluation. Also looking more broadly, Henriksen (1999) tried to capture the fuller extent of vocabulary knowledge by proposing three distinct dimensions: partial-precise knowledge, depth of knowledge, and receptive-productive knowledge. This broader thinking is useful, but even here the scope is relatively limited, at least in terms of all of the possible factors involved in vocabulary development.

Although we do not claim that our model is comprehensive, it does take into account some of the recent thinking on the dynamic role of motivation on language learning (Dörnyei, 2001a, 2001b). Motivation appears to be involved in all stages of learning (instigating, sustaining, and evaluating), thus permeating the whole process. Another aspect taken into consideration is the necessity for the learners to self-regulate their learning. Learners need to understand the way they learn best and be proactive in pursuing methods of learning that are effective for themselves. In terms of vocabulary knowledge, knowing a word means more than just being able to answer a multiple-choice meaning test item correctly (Read, 2000), and so combining measures of both size and depth of knowledge allows the model to draw upon a better estimate of the learners' true lexical abilities.

We would argue that much of the value of the revised model is that it begins to show the relationship among all of these learning-based variables. We would be surprised if this proves to be the "final" model of the vocabulary learning process, but the strength and consistency of the fit indexes show that the revised model (hereafter "model") reflects the empirical data to a notable degree. Thus, the model is clearly tapping into something in the real world. The problem, of course, is understanding what that is. We have considered the model and believe that the following interpretations are supportable.

The Vocabulary Learning Process Is Systematic and Cyclic

The model suggests that the mechanism of motivated vocabulary learning functions as a cyclic process, going through a series of different learning stages. Moreover, the rejection of any of the links "within the ring" suggests that the vocabulary learning process proceeds in a systematic manner around the ring, with each of the stages being essential for movement to the next stage. It is well known that vocabulary is not learned in a linear manner; rather, it is learned incrementally through multiple exposures. The requirement for multiple exposures fits in well with the recursive nature of this model.

In this study, motivation is operationalized neither as the cause nor as the effect of the achievement; it permeates the whole system through a series of different motivational processes. Therefore, motivation is not just an "initial state" factor; it is an integral part of the whole system that drives the vocabulary learning cycle along.

Initial Motivation and Self-regulation Both Have Important Parts to Play in the Vocabulary Learning Process

The model suggests that the construct of involvement in vocabulary learning activities is under the direct influence of a learner's self-regulating capacity,

which, in turn, is influenced by the initial motivation of the learner. That means that strategic behaviors involve both self-regulating capacity and initial motivational appraisal. When learners master a set of vocabulary learning tactics, they possess not only the skill (driven by metacognitive control and self-regulation) but also the will that is necessary for achieving their learning goals. This "will" comes from motivation, which originates with the initial appraisal of vocabulary learning experience.

However, choice motivation does not directly affect the strategy use; it must be channeled through self-regulation. This is shown by the almost nonexistent pathway loadings between the initial motivation construct (IAVLE) and the two strategy use constructs (SVLI: −.01; MVLT: −.02) in the original hypothesized model. Hence, self-regulating control acts as a mediator between initial motivational state and use of learning strategies. Garcia et al.'s study (1998) supports this mediating role, but it also suggests a direct link between motivation and learning strategy use. This discrepancy might be attributed to the fact that our model theorized the concept of learning strategies use into two distinct stages (i.e., quantity and quality stages of strategy use). It is possible that this splitting might have reduced the direct impact of choice motivation compared to a conceptualization that holds strategic behavior as a single construct.

As it stands, our model suggests that the initial motivational state has an indirect but still very meaningful impact on learners' involvement of relevant vocabulary learning activities (indirect effect = .32; i.e., .67 × .48) but only a relatively minor effect on the mastery level in terms of using vocabulary learning tactics (indirect effect = .15 [.67 × .48 × .46]). Similarly, the model indicates that learners' self-regulation can directly impact on the involvement of vocabulary learning activities (direct effect = .48) but only indirectly on the mastery of using vocabulary learning tactics (indirect effect = .22 [.48 × .46]). This suggests that some mechanism separate from choice motivation and self-regulation is in charge of the process developing mastery over vocabulary learning tactics. This mechanism is the successful functioning of metacognitive regulation and involvement, such as implementing conditional knowledge,[8] planning, monitoring, and evaluation (Ellis, 1997). (See next subsection for more on strategic behavior.)

Overall, the model suggests that the use of learning strategies—both quantity and quality dimensions—are contingent on learners' self-regulation and initial motivational state. It can thus be argued that it is critical for learners to develop a positive sense of the antecedents of motivation and self-regulation. For example, learners holding a higher sense of self-efficacy in a particular task are more likely to participate in the task. Similarly, learners who believe that

the possibility of doing a particular task is high and that the value of doing the task is positive are also more likely to participate in the task. In this way, the tendency to initiate the mechanism of self-regulation can be increased.

Metacognitive Control of Vocabulary Learning Tactics Is Necessary for Efficient Learning

The model shows that strategic vocabulary learning involvement influences MVLT and that MVLT, in turn, leads to increased vocabulary knowledge. However, SVLI does *not* directly lead to vocabulary knowledge; rather, SVLI has to go through the stage of MVLT in order to have an effect on vocabulary knowledge.

This finding has important theoretical implications relating to the concept of strategic competence. A scrutiny of the items as used in the SVLI scale shows that they are not dissimilar to those as used in the SILL (Oxford, 1990). The items of SVLI can therefore, in effect, be considered as "metacognitive" strategies that control general learning (e.g., *I try to make a vocabulary study plan for myself*, *I try to improve the newly learned methods that I try out*, and *I try to create opportunities to apply a newly-learned vocabulary learning method*). Similarly, the items of SVLI, like the items of SILL, are measured by frequency ranging from "never" to "always." The psychometric nature of SVLI, therefore, is reflected by the concept of quantity instead of quality.

It is traditionally argued in the literature that the more types of and the more often the strategies are used, the better proficiency will be (Oxford, 1989; Oxford & Crookall, 1989). However, the model suggests that this is not the case. The results show that SVLI (compiled from frequency-based indicators) fails to have a direct and positive influence on the achievement of vocabulary knowledge. Thus, there is something in addition to frequency of use in play in strategic vocabulary learning behavior. That "something" is *mastery* over that behavior.

Learners might perform a wide range of vocabulary learning behaviors but still fail to develop the expertise and the rationale of appropriately deploying the necessary vocabulary learning tactics on targeted words:

> The general assumption that effective strategy use involves frequent strategy use is also questionable. It is likely that it is not so much how often learners use strategies as when and with what purpose they use them (Ellis, 1994, p. 559).

It seems that it is more critical to acquire the knowledge of when and why to use specific learning tactics in different vocabulary learning tasks than to just attempt to frequently use strategies in general. A similar argument against

using the notion of frequent strategy use as an approach to measuring strategic competence has also been proposed in a recent study by Nisbet, Tindall, and Arroyo (2005), who observed that

> [T]he SILL measures self-reported behavior on the part of the language learner. However, the SILL does not measure autonomy at the psychological level (i.e., the inner capacity for self-direction or self-regulation of learning). (p. 105)

The idea is that the mere quantity of vocabulary learning strategies is not sufficient in its own right. What is further required for learning strategy use to have a direct impact on vocabulary achievement is that learners need to progress from the stage of an active involvement with related vocabulary learning activities to the stage at which they are able to demonstrate the capacity to flexibly apply appropriate learning tactics to different learning contexts and to learn the various properties of vocabulary knowledge, such as meaning, form, collocation, and register. This later stage represents a quality aspect of using vocabulary learning tactics. This mastery stage can be considered as the hallmark of able tactic use, suggesting that a personalized mastery of certain vocabulary leaning tactics has been achieved. Such a mastery stage, therefore, echoes the views of Ellis (1994) and Nisbet et al. (2005) on strategic capacity and the views of Mayer (1999) on the distinction between expert and novice.

Overall, it seems that a conceptualization of strategic behavior requires two stages, a stage that controls involvement, i.e., *which* strategies are used and *how frequentl*y, and another stage that involves mastery, i.e., *how well* those selected strategies are used. The stages are distinct, but both are necessary: the involvement stage does not directly lead to vocabulary knowledge, and so must work through the mastery stage. Vocabulary learning tactics cannot be mastered efficiently without metacognitive oversight. This perspective can offer a possible explanation for Gardner et al.'s (1997) finding of higher frequency use of strategies leading to lower L2 achievement: The participants in that study might have had adequate strategic learning involvement but failed to use the learning strategies in question effectively.

Postlearning Evaluation Is Important to the Learning Process

In the final part of the "loop," the model suggests that for most efficient vocabulary learning, learners need to engage in a phase of reflecting critically on the success of the vocabulary learning process. This, unsurprisingly, is most influenced by their performance in improving their vocabulary knowledge (direct

effect = .56). In the model, the critical reflection is measured by three indicators: skilled feeling of using vocabulary learning tactics, helpless feeling of using vocabulary learning tactics, and satisfied feeling of using vocabulary learning tactics. As a result, good performance leads to feelings of satisfaction with the skilful approach that led to vocabulary knowledge improvement, whereas poor performance leads to the feelings of helplessness.

It thus seems that this posttask critical reflection can help learners to reconsider the appropriateness of their on-task vocabulary learning tactics. The strong influence of PAVLT on initial appraisal of vocabulary learning experience (.68) supports the notion that posttask evaluation can indeed enhance initial motivation and attitudes toward learning, and in so, "closing the loop" starts the learning process again at an enhanced level. In fact, nearly half of the variance of the initial motivational state (46%; i.e., .68 squared) is explained by the posttask evaluation. As one would expect, a satisfied feeling of having used vocabulary tactics skillfully appears to lead to a more positive attitude toward vocabulary learning, an enhanced efficacy belief in the learning task, and a reduction in any previously held learning anxiety.

Apart from exercising direct influence on the posttask critical reflection, vocabulary learning performance also appears to influence the initial motivational state indirectly. It is found that the indirect effect of vocabulary knowledge on the initial appraisal of vocabulary learning experience is .38. This effect is moderately strong, suggesting that the result of learners' vocabulary learning performance can explain 15% (.38 squared) of the variance of the initial motivational state. Arguably, this finding suggests that the ebb and flow of the ensuing initial motivational state of vocabulary learning can be indirectly influenced by vocabulary learning performance.

Promoting Autonomous Learning of Vocabulary

Learning vocabulary is a long-term task. Nation (2001) therefore suggested that learners have to take control of this learning task and be autonomous. The model gives some guidance regarding the essential elements and processes of being autonomous in vocabulary learning. Motivation forms a significant part of the model, and as Ushioda (1996, p. 2) remarked, "[a]utonomous language learners are by definition motivated learners." Learners with intrinsic motivation to learn vocabulary, for instance, are more willing to take control and responsibility for this learning task. Rather than focusing on the influence of external regulation, the dynamic, evolving, and cyclic characteristics of our model highlight the importance of exercising effective individual control over a series of internally mediated processes.

We recognize that becoming autonomous in vocabulary learning is not an easy task. As Nation (2001, p. 404) suggested, "Taking personal control of learning is a challenge . . . for the learner to gain the attitude, awareness and capability required for control." Part of the taking control also entails that the vocabulary learning process is engaged over time, so that a degree of fluency and comfort develops:

> Learners need to not only know about strategies and understand what they involve, but they need to become very comfortable with their use. Until they reach a satisfactory level of comfort with a strategy it is unlikely that they will truly experience its effectiveness and find it as easy to use as their default strategies. (Moir & Nation, 2002, p. 32)

Clearly, Moir and Nation's (2002) suggestion about using strategies *comfortably* highlights the fact that mastering vocabulary learning tactics takes time and deliberate practice. For instance, Moir and Nation suggested that mastering the keyword technique needs practice at least 20 times over several weeks. Last but not least, taking control requires that learners learn how to make self-protective and adaptive attributions of their failures in achieving satisfactory vocabulary learning performance and using vocabulary learning tactics. Only by analyzing why something went wrong can it be fixed.

Arguably, all of the above analyses suggest that teachers need to help learners to become *self-motivated experts* in vocabulary learning. To do this, they need to help learners acquire the relevant expertise in the different phases identified by the model. The expertise required is summarized as follows:

1. Self-motivated vocabulary learning experts need to know how to change their negative attitudes, low-efficacy beliefs, and high learning anxiety. This means that a positive initial motivational state needs to be established and maintained.
2. Self-motivated vocabulary learning experts need to develop sufficient self-regulating capacity to support themselves in controlling and managing their vocabulary learning behaviors. Specifically, learners need to possess effective control techniques with reference to the self-regulating system that is proposed in the current study. Self-motivated vocabulary learning experts not only form a strong intention to learn but also maintain and protect that intention in order to reach their learning goals.
3. Self-motivated vocabulary learning experts need to master a set of vocabulary learning tactics and be able to use them comfortably, spontaneously, and effectively. Self-motivated vocabulary learning experts know how to

discover effective vocabulary learning tactics from a variety of learning activities. They understand what vocabulary learning tactics suit them best. They not only know how to use the tactics but also know when and how the tactics need to be adopted.

4. Self-motivated vocabulary learning experts demonstrate a critical awareness and evaluation of their vocabulary learning performance. They also know how to adaptively attribute their vocabulary learning success or failure to its proper cause.
5. Self-motivated vocabulary learning experts understand that vocabulary knowledge is multidimensional. They know that vocabulary learning is more than a process of acquiring the meanings of words. Self-motivated vocabulary learning experts endeavor to establish a large, well-structured mental lexicon by improving both their vocabulary size and depth of knowledge about individual lexical items. (See Tseng & Schmitt, in preparation, for a SEM analysis of vocabulary size and depth.)

This expertise system of motivated vocabulary learning should be viewed as a developing and evolving construct, which grows continually as learners' vocabulary knowledge develops through time. In other words, acquiring the expertise system of vocabulary learning is a dynamic process that grows in parallel with learners' vocabulary knowledge.

Conclusion

Although the outcome model is constructed with cross-sectional rather than longitudinal data, it can be said that the model provides a snapshot of the ongoing dynamics of the motivated vocabulary learning process. We believe the results of the model can serve as a heuristic point of departure in the realm of exploring the dynamics of motivated vocabulary learning over time.

Conceptualizing motivated vocabulary learning as a developing expertise system contributes to learners' view of themselves as proactive agents in vocabulary learning. This conceptualization stresses the need for learners to develop self-regulating capacity by proactively generating personal control of vocabulary learning. Additionally, this dynamic and developing expertise system also makes it necessary for learners to possess personalized self-regulated techniques and vocabulary learning tactics. Finally, this cyclic and dynamic expertise system underlines the value of adaptive and strategic attributions of learners' success or failure in vocabulary learning.

Revised version accepted 31 July 2007

Notes

1 Despite the terminological confusion of the term *strategy* in the literature (Dörnyei & Skehan, 2003; Tseng et al., 2006), it is argued that a distinction should be made between quantity dimension and quality dimension of strategy use. None of the existing research, to our knowledge, has examined the parallel influences of the two concepts on vocabulary learning.

2 In comparison to using a 5-point Likert scale, adopting such a marking system can avoid the disadvantage of having a noncommittal choice of the middle category such as "neutral" or "not sure" (Dörnyei, 2003). It has been suggested that in any survey research, roughly 20% of the respondents might avoid making a real choice by ticking the middle category. In the current study, a 6-point ordered rating sale was adopted to prevent respondents from making such a choice.

3 This 7-point rating scale marking system is designed in such a way that the increments between each stage can be equal in magnitude. It is argued that the middle category *sometimes* does not act like a neutral answer such as "not sure," but it acts as an indispensable indicator to represent a middle point in a frequency continuum. It should be noted that the statements of this scale are, in essence, general learning behaviors. The response categories of this 7-point rating scale do not involve any indications of agreement but rather the indications of frequency level of the manifestation of general vocabulary learning behaviors. Thus, the summation of the scores of the items represents the individual's degree of involvement in vocabulary learning.

4 This 5-point rating scale is a variation of Likert scale. The response categories of a standard Likert scale should indicate the degree of agreement such as "strongly disagree" to "strongly agree." However, the response categories of this 5-point rating scale do not involve any indications of agreement but rather the indications of mastery level of vocabulary learning tactics. Although the item statements of this scale are specific vocabulary learning behaviors, these vocabulary learning behaviors reflect the nature of vocabulary learning (e.g., using monolingual and bilingual dictionaries). Learners often need to refer to a dictionary, either a monolingual or a bilingual one, to understand the meaning of an unknown word or to consolidate the meaning of a partially learned word. A number of vocabulary learning behaviors (e.g., analyze affixes and roots, analyze parts of speech, and associate the word with its coordinates) included in the scale are, in essence, identical to acquiring depth of vocabulary knowledge, such as *word parts* and *associations*. Hence, specific vocabulary learning behaviors like these can be observed in most of the English as a foreign language learners. The summation of the scores of all the items in this instrument, therefore, indicates the degree of individuals' personal control in using vocabulary learning tactics.

5 The confirmations of this five-category scale structure and equal distance between categories were achieved via the analysis of Rasch modeling. The results of Rasch

modeling showed that all of the fit indexes (both infit and outfit mean square statistics) of the five categories centered around the expected value 1, which indicates a perfect fit between observed data and model-expected outcome. This suggests that the five-category scale structure is a meaningful one: None of the categories should be excluded or collapsed into becoming a scale structure with fewer categories. In addition, the results of Rasch modeling also demonstrated that the average measures of the five categories are −2.17, −1.05, .07, 1.09, and 2.29, respectively. It is found that the five category measures not only increase monotonically but also can be equally spaced with "1 logit" distance between any two adjacent categories. The term *logit* means log-odds unit, a standardized score computed by Rasch modeling.

6 This test was adapted from Laufer and Nation's The Productive Vocabulary Levels Test (PVLT) (Laufer & Nation, 1999).

7 The CFI, NFI, TLI, and IFI are the model fit indexes that center on the comparison between the empirical model and the null model (i.e., independence model). An independence model refers to the baseline model, which assumes that the relationships among variables are uncorrelated.

8 Conditional knowledge refers to the knowledge of when and why to employ forms of declarative and procedural knowledge. Winne (2001, p. 162) argued for a significant role for conditional knowledge in learning by remarking that "[t]he more discriminating one's conditional knowledge, the greater the capacity to regulate one's approaches to learning."

References

Adolphs, S., & Schmitt, N. (2003). Lexical coverage of spoken discourse. *Applied Linguistics, 24*, 425–438.

Ajzen, I. (1988). *Attitudes, personality and behavior*. Chicago: Dorsey Press.

Ames, C. (1992). Classrooms, goals, structures and student motivation. *Journal of Educational Psychology, 84*, 267–271.

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. *Journal of Educational Psychology, 80*, 260–267.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review, 64*, 359–372.

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice Hall.

Biggs, J. (1988). The role of metacognition in enhancing learning. *Australian Journal of Education, 32*, 127–138.

Biggs, J. (2003). *Teaching for quality learning at university* (2nd ed.). Buckingham, UK: Open University Press.

Byrne, B. M. (2001). *Structural equation modeling with AMOS*. Mahwah, NJ: Lawrence Erlbaum Associates.

Carey, S. (1978). The child as word learner. In M. Halle, J. Bresnan, & G.A. Miller (Eds.), *Linguistic theory and psychological reality* (pp. 264–293). Cambridge, MA: MIT Press.

Clément, R., Gardner, R. C., & Smythe, P. C. (1977). Motivational variables in second language acquisition: A study of francophones learning English. *Canadian Journal of Behavioral Science, 9*, 123–133.

Clément, R., & Kruidenier, B. G. (1985). Aptitude, attitude and motivation in second language proficiency: A test of Clément's model. *Journal of Language and Social Psychology, 4*, 21–37.

Corno, L. (1993). The best-laid plans: Modern conceptions of volition and educational research. *Educational Researcher, 22*, 14–22.

Csizér, K., & Dörnyei, Z. (2005). The internal structure of language learning motivation and its relationship with language choice and learning effort. *Modern Language Journal, 89*, 19–36.

de Bot, K., Paribakht, T., & Wesche, M. (1997). Towards a lexical processing model for the study of second language vocabulary acquisition: Evidence from ESL reading. *Studies in Second Language Acquisition, 19*, 309–329.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Dörnyei, Z. (1994). Motivation and motivating in the foreign language classroom. *The Modern Language Journal, 78*, 273–284.

Dörnyei, Z. (2000). Motivation in action: Towards a process-oriented conceptualisation of student motivation. *British Journal of Educational Psychology, 70*, 519–538.

Dörnyei, Z. (2001a). *Motivational strategies in the language classroom*. Cambridge: Cambridge University Press.

Dörnyei, Z. (2001b). *Teaching and research motivation*. Harlow, UK: Pearson Education Ltd.

Dörnyei, Z. (2003). *Questionnaire in second language research: Construction, administration, and processing*. Mahwah, NJ: Lawrence Erlbaum Associates.

Dörnyei, Z. (2005). *The psychology of the language learner*. Mahwah, NJ: Lawrence Erlbaum Associates.

Dörnyei, Z., & Csizér, K. (2002). Motivational dynamics in second language acquisition: Results of a longitudinal nationwide survey. *Applied Linguistics, 23*, 421–462.

Dörnyei, Z., & Ottó, I. (1998). Motivation in action: A process model of L2 motivation. *Working Papers in Applied Linguistics (Thames Valley University, London), 4*, 43–69.

Dörnyei, Z., & Skehan, P. (2003). Individual differences in second language learning. In C. J. Doughty & M. H. Long (Eds.), *The handbook of second language acquisition* (pp. 589–630). Oxford: Blackwell.

Elley, W. (1989). Vocabulary acquisition from listening to stories. *Reading Research Quarterly, 24*, 174–187.

Ellis, N. C. (1997). Vocabulary acquisition: Word structure, collocation, word-class, and meaning. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition, and pedagogy* (pp. 122–139). Cambridge: Cambridge University Press.

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

Ely, C. M. (1986). Language learning motivation: A descriptive and causal analysis. *The Modern Language Journal, 70*, 28–35.

Garcia, T., McCann, E. J., Turner, J. E., & Roska, L. (1998). Modeling the mediating role of volition in the learning process. *Contemporary Education Psychology, 23*, 392–418.

Gardner, R. C. (1985). *Social psychology and second language learning: The role of attitudes and motivation*. London: Edward Arnold.

Gardner, R. C., & Lambert, W. E. (1959). Motivational variables in second language acquisition. *Canadian Journal of Psychology, 13*, 266–272.

Gardner, R. C., & Lambert, W. E. (1972). *Attitudes and motivation in second language learning*. Rowley, MA: Newbury House.

Gardner, R. C., & MacIntyre, P. D. (1991). An instrumental motivation in language study: Who says it isn't effective? *Studies in Second Language Acquisition, 26*, 57–72.

Gardner, R. C., Masgoret, A.-M., Tennant, J., & Mihic, L. (2004). Integrative motivation: Changes during a year-long intermediate-level language course. *Language Learning, 54*, 1–34.

Gardner, R. C., Tremblay, P. F., & Masgoret, A.-M. (1997). Towards a full model of second language learning: An empirical investigation. *The Modern Language Journal, 81*, 344–362.

Gu, Y., & Johnson, R. K. (1996). Vocabulary learning strategies and language learning outcomes. *Language Learning, 46*, 643–679.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed). Upper Saddle River, NJ: Prentice Hall.

Hazenberg, S., & Hulstijn, J. H. (1996). Defining a minimal receptive second language vocabulary for non-native university students: An empirical investigation. *Applied Linguistics, 17*, 145–163.

Henriksen, B. (1999). Three dimensions of vocabulary development. *Studies in Second Language Acquisition, 21*, 303–317.

Horwitz, E. K., Horwitz, M. B., & Cope, J. (1986). Foreign language classroom anxiety. *Modern Language Journal, 70*, 125–132.

Hox, J. J., & Bechger, T. M. (1998). An introduction to structural equation modeling. *Family Science Review, 11*, 354–373.

Inbar, O., Donitsa-Schmidt, S., & Shohamy, E. (2001). Students' motivation as a function of language learning: The teaching of Arabic in Israel. In Z. Dörnyei & R.

Schmidt (Eds.), *Motivation and second language acquisition*. Honolulu: University of Hawaii, Second Language Teaching & Curriculum Center.

Jiang, N. (2000). Lexical representation and development in a second language. *Applied Linguistics, 21*, 47–77.

Kaplan, D. (2001). *Structural equation modeling*. Thousand Oaks, CA: Sage.

Laufer, B. (1988). What percentage of text-lexis is essential for comprehension? In C. Laurén & M. Nordmann (Eds.), *Special language: From humans to thinking machines* (pp. 316–323). Clevedon, UK: Multilingual Matters.

Laufer, B., & Hulstijn, J. (2001). Incidental vocabulary acquisition in a second language: The construct of task-induced involvement. *Applied Linguistics, 22*, 1–26.

Laufer, B., & Nation, I.S.P. (1999). A vocabulary-size test of controlled productive ability. *Language Testing, 16*, 33–51.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall.

Lukmani, Y. M. (1972). Motivation to learn and language proficiency. *Language Learning, 22*, 261–273.

Maclntyre, P. D., & Noels, K. A. (1996). Using social-psychological variables to predict the use of language learning strategies. *Foreign Language Annals, 29*, 373–386.

Mayer, R. (1999). *The promise of educational psychology*. Upper Saddle River, NJ: Prentice Hall.

Meara, P. (1983). Word associations in a foreign language. *Nottingham Linguistic Circular,* 11, 29–38.

Meara, P. (in press). *Connected words*. Amsterdam: John Benjamins.

Moir, J., & Nation, I. S. P. (2002). Learners' use of strategies for effective vocabulary learning. *Prospect, 17*, 15–35.

Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.

Nation, P., & Waring, R. (1997). Vocabulary size, text coverage and word lists. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition, and pedagogy* (pp. 6–19). Cambridge: Cambridge University Press.

Nattinger, J. R., & DeCarrico, J. S. (1992). *Lexical phrases and language teaching*. Oxford: Oxford University Press.

Nisbet, D. L., Tindall, E. R., & Arroyo, A. A. (2005). Language learning strategies and English proficiency of Chinese university students. *Foreign Language Annals, 38*, 100–107.

Noels, K. A., Clément, R., & Pelletier, L. G. (1999). Perceptions of teachers' communicative style and students' intrinsic and extrinsic motivation. *Modern Language Journal, 83*, 23–34.

Oxford, R. (1989). Use of language learning strategies: A synthesis of studies with implications for strategy training. *System, 17*, 235–247.

Oxford, R. L. (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*, 404–419.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 452–502). San Diego: Academic Press.

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, research, and applications*. Upper Saddle River, NJ: Merrill Prentice Hall.

Postman, L., & Keppel, G. (1970). *Norms of word association*. New York: Academic Press.

Pressley, M., Levin, J. R., & Miller, G. E. (1982). The keyword method compared to alternative vocabulary learning strategies. *Contemporary Educational Psychology, 7*, 50–60.

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

Schmidt, R., & Watanabe, Y. (2001). Motivation, strategy use, and pedagogical preferences in foreign language learning. In Z. Dörnyei & R. Schmidt (Eds.), *Motivation and second language acquisition* (pp. 313–359). Honolulu: University of Hawaii, Second Language Teaching Center.

Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 199–227). Cambridge: Cambridge University Press.

Schmitt, N. (2000). *Vocabulary in language teaching*. Cambridge: Cambridge University Press.

Schmitt, N., Schmitt, D., & Clapham, C. (2001). Developing and exploring the behaviour of two new versions of the Vocabulary Levels Test. *Language Testing, 18*, 55–89.

Stoffer, I. (1995). *University foreign language students' choice of vocabulary learning strategies as related to individual difference variables*. Unpublished doctoral dissertation, University of Alabama.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Needham Heights, MA: Allyn & Bacon.

Tachibana, Y., Matsukawa, R., & Zhong, Q. X. (1996). Attitudes and motivation for learning English: A cross-national comparison of Japanese and Chinese high school students. *Psychological Reports, 79*, 691–700.

Tremblay, P., & Gardner, R. C. (1995). Expanding the motivation construct in language learning. *Modern Language Journal, 79*, 505–518.

Tseng, W. T. (2000). *A survey of university students' vocabulary knowledge in Taiwan*. Unpublished master's thesis, The University of Nottingham.

Tseng, W. T., Dörnyei, Z., & Schmitt, N. (2006). A new approach to assessing strategic learning: The case of self-regulation in vocabulary acquisition. *Applied Linguistics, 27*, 78–102.

Tseng, W. T., & Schmitt, N. (in preparation). Modeling vocabulary knowledge. Manuscript in preparation.
Ushioda, E. (1996). *Learner autonomy 5: The role of motivation*. Dublin: Authentik.
Ushioda, E. (2001). Language learning at university: Exploring the role of motivational thinking. In Z. Dörnyei & R. Schmidt (Eds.), *Motivation and second language acquisition* (pp. 93–125). Honolulu: University of Hawaii, Second Language Teaching Center.
Waring, R. (1997). The negative effects of learning words in semantic sets: A replication. *System, 25*, 261–274.
Weiner, B. (1986). *An attributional theory of motivation and emotion*. New York: Springer.
Weiner, B. (1992). *Human motivation: Metaphors, theories, and research*. Newbury Park, CA: Sage.
Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology, 25*, 68–81.
Williams, M., & Burden, R. (1997). *Psychology for language teachers*. Cambridge: Cambridge University Press.
Winne, P. H. (1996). A metacognitive view of individual differences in self-regulated learning. *Learning and Individual Differences, 8*, 327–353.
Winne, P. H. (2001). Self-regulated learning viewed from models of information processing. In B. Zimmerman & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (2nd ed., pp. 153–189). Mahwah, NJ: Lawrence Erlbaum Associates.
Winne, P. H., & Perry, N. E. (2000). Measuring self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 531–599). San Diego: Academic Press.
Wray, A. (2002). *Formulaic sequences and the lexicon*. Cambridge: Cambridge University Press.

Appendix

Sample Items of the Six Latent Variables

1. Initial Appraisal of Vocabulary Learning Experience:
   Vocabulary Learning Self-Efficacy –
   – I feel I can memorize words faster than other people.
   – I feel my vocabulary is larger than others.
   Vocabulary Learning Anxiety –
   – I am often worried about doing poorly in memorizing vocabulary.

– I feel learning vocabulary is a heavy burden for me.

Vocabulary Learning Attitude –

– Learning vocabulary is important.
– Learning vocabulary is a waste of time.

2. Self-Regulating Capacity in Vocabulary Learning

Commitment Control –

– When learning vocabulary, I believe I can achieve my goals more quickly than expected.
– When learning vocabulary, I persist until I reach the goals that I make for myself.

Metacognitive Control –

– When learning vocabulary, I think the methods of controlling my concentration are effective.
– When it comes to learning vocabulary, I have my special techniques to prevent procrastination.

Satiation Control –

– During the process of learning vocabulary, I feel satisfied with the ways I eliminate boredom.
– When feeling bored with learning vocabulary, I know how to regulate my mood in order to invigorate the learning process.

Emotion Control –

– When I feel stressed about vocabulary learning, I know how to reduce this stress.
– When I feel stressed about vocabulary learning, I simply want to give up.

Environment Control –

– When learning vocabulary, I am aware that the learning environment matters.
– When I study vocabulary, I look for a good learning environment.

3. Strategic Vocabulary Learning Involvement

Self-Initiating Behaviors of the Newly-Learned Vocabulary Learning Tactics–

– I check the progress I make when using a new vocabulary learning method.
– I try to improve the newly learned methods that I try out.

Self-Activating Behaviors of Vocabulary Learning Tactics –

– I try to find new vocabulary learning methods
– I try to think about different ways to learn new words.

Self-Experimenting Behaviors of Vocabulary Learning Tactics –

- I try out vocabulary learning methods that are different from those taught by my English teacher.
- I try to replace inappropriate vocabulary learning methods with new ones.

Self-Improving Behaviors of Vocabulary Learning Tactics–
- I try to improve the vocabulary learning methods that I try out.
- Once I realize that my current vocabulary learning method is not good enough, I try to find a better one.

Self-Surpassing Behaviors of Learning Vocabulary–
- I think about how to learn more words.
- I learn additional words to those taught by my English teacher.

4. Mastery of Vocabulary Learning Tactics

Linking Tactics–
- Associate the word with its coordinates
- Use Antonyms to memorize words

Comprehending Tactics–
- Analyze part of speech
- Guessing from textual context

Highlighting Tactics–
- Put special mark before important words
- Take important notes in class

Imaging Tactics–
- Study word with a pictorial representation of its meaning
- Connect word to a personal experience

Social Tactics–
- Ask classmates for how to use a word
- Ask classmates to test myself

Hands-On Tactics–
- Making word cards
- Put English labels on physical objects

5. Post-Appraisal of Vocabulary Learning Tactics

Satisfaction–
- I like the vocabulary learning tactics that I am using.
- I believe that I am adopting the right vocabulary learning tactics.

Helplessness–
- I feel my vocabulary learning tactics are ineffective.
- I just have no ideas of how to memorize words.

Skillfulness–
- I feel using my vocabulary learning tactics can retain the learned words longer than others.

– I feel using my vocabulary learning tactics can learn more words than others.

6. Vocabulary Knowledge

Size Dimension–

2000 Level

1 copy 2 event 3 motor 4 pity 5 profit 6 tip	_____end or highest point _____this moves a car _____thing made to be like another

3000 Level

1 bull 2 champion 3 dignity 4 hell 5 museum 6 solution	_____formal and serious manner _____winner of a sporting event _____building where valuable objects are shown

5000 Level

1 analysis 2 curb 3 gravel 4 mortgage 5 scar 6 zeal	_____eagerness _____loan to buy a house _____small stones mixed with sand

Depth Dimension-

Collocation Test

– We need to protect the village from_____-scale development.
(A) large (B) huge (C) great (D) big

– Always use good quality paper, especially for the_____draft of a composition.
(A) final (B) terminal (C) ultimate (D) closing

Polysemy Test
– The video showed that the bat just tipped the ball.
(A) hit strongly (B) hit gently (C) very wealthy (D) very long
– He said that he was willing to champion the poor.
(A) improve (B) support (C) change (D) pay for
Prompted Productive Written Form Test
– L_____ of rain led to a shortage of water in the city. (缺乏)
– Soldiers usually swear an o_____ of loyalty to their country. (誓言)