Comparing Theories of Language Learning Strategies: A Confirmatory Factor Analysis

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This study compared classification theories of language learning strategies. Results from confirmatory factor analysis (CFA) of the data measured by the ESL/EFL version of the Strategy Inventory for Language Learning and collected from 517 college EFL learners indicated that of the strategy theories examined, Oxford’s 6-factor strategy taxonomy is the most consistent with learners’ strategy use, although this model did not produce a fully adequate fit to the data. The findings suggest that other possible approaches to strategy classification should be considered. These approaches include (a) differentiating strategies for using a language (“language use strategies”) from strategies for learning it (“language learning strategies”), (b) recognizing the importance of the learning environment, (c) slightly modifying the prevalent strategy classification theories by reclassifying particular strategies, (d) ensuring that the language skills are obvious in each strategy item, and (e) creating a task-based strategy inventory. This study also illustrates how CFA can be applied to the comparison of current strategy theories.

SINCE THE 1970s, CONSIDERABLE RESEARCH attention in second or foreign language (L2) learning has been devoted to studying individual differences in language learners.1 One individual-difference variable, L2 learning strategies, has gained increasing popularity among researchers and teachers interested in understanding how languages are learned (Chamot, Barnhardt, El-Dinary, & Robbins, 1996; Cohen, 1998; Hsiao, 2001; MacIntyre & Noels, 1996; Oxford & Cohen, in press). Although important advances have been made in L2 learners’ strategy use, significant questions concerning how to enumerate and categorize these strategies remain.

Exactly how many strategies are available to learners to assist them in L2 learning and how these strategies should be classified are open to debate. Different classification systems based on contrasting criteria (see discussion in Oxford & Cohen, 1992) have been proposed (e.g., O’Malley & Chamot, 1990; O’Malley, Chamot, Stewner-Manzanares, Küpper, & Russo, 1985; O’Malley, Chamot, Stewner-Manzanares, Russo, & Küpper, 1985; Oxford, 1990; Rubin, 1981). Each existing classification system in and of itself involves an implicit theory about the nature of L2 learning strategies and even, to some degree, about L2 learning in general. For example, if a system contains separate, substantial categories for affective (emotion- and motivation-management) strategies and social learning strategies, the implicit theory suggests that these types of strategies are important and that student affect and social interaction play key roles in L2 learning.

As a result, teachers and researchers alike are often puzzled as to which classification system to follow when conducting strategy research, enhancing learner autonomy through learning strategies, engaging learners in strategy instruction, or developing syllabi and materials involving learning strategies. Whether certain classification theories are more representative of L2 learning
strategy use and whether all of the suggested strategy systems can adequately account for variability in strategy use have never before been systematically and empirically approached. The purpose of this study was to compare relevant measurement models of strategy classification that have been proposed in L2 research.

CONCEPTUAL FRAMEWORK AND RESEARCH REVIEW

Basic Principles and Research

Learning strategies are “behaviors or thoughts that a learner engages in during learning that are intended to influence the learner’s encoding process” (Weinstein & Mayer, 1986, p. 315). More specifically, learning strategies are “operations employed by the learner to aid the acquisition, storage, retrieval, and use of information . . . ; specific actions taken by the learner to make learning easier, faster, more enjoyable, more self-directed, more effective, and more transferable to new situations” (Oxford, 1990, p. 8). Learning strategies for L2s are “specific actions, behaviors, steps, or techniques—such as seeking out conversation partners, or giving oneself encouragement to tackle a difficult language task—used by students to enhance their own learning” (Scarcella & Oxford, 1992, p. 63). The term strategy implies conscious movement toward a goal. “Strategies must be controllable” (Pressley & McCormick, 1995, p. 28) because they are steps that learners take in order to manage their learning and achieve desired goals. Although the precise degree of consciousness has been debated, most researchers (see, e.g., Bialystok, 1978; Cohen, 1990, 1998; MacIntyre, 1994; Oxford & Cohen, 1992) agree on the necessity of some level of conscious intention in using L2 strategies. When a strategy is so habitual that it is no longer within the learner’s conscious awareness and control, it becomes a process (Cohen, 1998).

Learning strategies for L2s help build learner autonomy, which requires the learner to take conscious control of his or her own learning processes. Definitions provided by Holec (1981), Dickinson (1987), Allwright (1990), and Littlewood (1996) suggest the following comprehensive definition of L2 learner autonomy: (a) willingness to perform a language task with little or no assistance, with flexibility according to the situation, and with transferability to other contexts; and (b) relevant action, including the use of appropriate L2 learning strategies for accomplishing the task. Autonomy in the L2 field is closely allied with the concept of self-regulation in the field of psychology (Vygotsky, 1978; for specific applications to L2 learning, see Scarcella & Oxford, 1992). According to Vygotsky’s theory, certain metacognitive actions, such as planning and monitoring one’s learning, along with all higher-order cognitive functions, such as analyzing and synthesizing, are internalized via social interactions with more competent adults or peers who provide the learner with scaffolding, that is, assistance that is gradually removed when no longer needed by the increasingly independent, self-regulated learner. Social interaction implicitly requires the learner’s use of social strategies, such as asking questions for clarification or verification, asking for help, and collaborating with others via language. Social speech (talking with others), according to Vygotsky, is eventually internalized to guide action.

Strategy use in L2s is related to proficiency or achievement. Early research on good language learners (Naiman, Fröhlich, & Todesco, 1975; Rubin, 1975; Stern, 1975) suggested this link. More recently, many quantitative studies have underscored the significant relationship between L2 learning strategies and language proficiency (see, e.g., Bedell & Oxford, 1996; Chamot, Barnhart, El-Dinary, & Robbins, 1999; Cohen, 1998; Dreyer & Oxford, 1996; O’Malley & Chamot, 1990; Takeuchi, 1993).

Strategies used by learners at the early stages of their L2 development may be somewhat different from those used when these learners are more proficient. As Cohen (1998) stated, “With some exceptions, strategies themselves are not inherently good or bad, but have the potential to be used effectively” (p. 8) by various learners who do particular types of L2 learning tasks at different proficiency levels. More effective L2 learners intentionally, systematically select and combine strategies relevant to the language task at hand and to their own learning style preferences (Ehrman & Oxford, 1990, 1995). Less successful L2 learners grab for various strategies in a seemingly desperate, random way and do not pay sufficient attention to the relevance of a strategy to the task at hand (Abraham & Vann, 1987; Vann & Abraham, 1996).

Learning strategies can be taught to L2 learners (Chamot et al., 1999; Cohen, 1998; Feyten, Flaitz, & LaRocca, 1999; Oxford, 1990, 1996; Wenden, 1987). Such instruction has proved to be most successful when it is tied to the language tasks that students are normally expected to accomplish and when strategies are explicitly taught. Strategy instruction can be woven into
regular L2 instruction in an integrated, smooth, as-needed way (Chamot et al., 1999; Oxford & Leaver, 1996).

Issues of Definition and Classification

The L2 strategy field has experienced conflict regarding definition and classification (Oxford & Cohen, 1992). A first step in dealing with such issues is to compare existing strategy systems in detail by cross-indexing specific strategies in each system that relate to or are identical to those in other systems.

Direct and Indirect Strategies: Comparing Rubin’s and Oxford’s Systems. Rubin (1981) distinguished between strategies that contribute directly to L2 learning and strategies that are indirectly involved with language learning. She reported six direct strategies: (a) clarification/verification, (b) monitoring, (c) memorization, (d) guessing/inductive inferencing, (e) deductive reasoning, and (f) practice, along with two indirect strategies: (a) creating opportunities for practice and (b) production tricks. Each of these eight general strategies subsumes more specific strategies (see Rubin, 1981, for details).

Rubin’s (1981) direct/indirect dichotomy, along with the non-L2 work of Dansereau (1985) and others, led to Oxford’s (1990) direct and indirect L2 learning strategies, but with some major differences. In an attempt to make the operational definitions somewhat more concrete, Oxford defined the first type of L2 learning strategies as those that directly involve the language being learned. Subsumed under direct strategies are memory, cognitive, and compensation categories. Oxford defined indirect L2 learning strategies as those that, although not directly involving the target language, nevertheless are necessary or helpful for learning the language. Indirect strategies are subdivided into metacognitive, affective, and social categories (see Oxford, 1989, for a detailed definition of these six strategy groupings). According to Oxford (1990), direct and indirect strategies and these six strategy groupings function as a mutual support network within which various types of strategies support and enhance each others’ effects in order to improve L2 learning. Oxford’s model of strategy classification is reflected fully in her 1990 book.

A comparison between Rubin’s and Oxford’s placement of learning strategies into specific categories, as briefly summarized in Table 1, reveals a considerable degree of difference. This difference is to be expected, because Rubin’s and Oxford’s definitions of direct/indirect strategies differed from the start. Rubin’s clarification/verification and monitoring, which were classified as two of the direct strategies, find their counterparts in Oxford’s indirect strategies (asking questions for clarification/verification = social strategy; monitoring = metacognitive strategy). Production tricks (one type of Rubin’s indirect strategies) correspond somewhat to a subset of Oxford’s compensation strategies (among the direct strategies).

Further inspection of results in Rubin (1981) shows that Rubin’s classification results in overlapp-
ping of strategies. As O’Malley, Chamot, Stewner-Manzanares, Küpper, and Russo (1985) reported, this classification scheme “failed to produce mutually exclusive categories, i.e., some strategies appeared in more than a single grouping” (p. 32).

Comparing the O’Malley/Chamot System and the Oxford System. O’Malley and Chamot’s (1990) strategy system, which has received considerable attention since its appearance, distinguishes three broad types of learning strategies: cognitive, metacognitive, and socio-affective (or sometimes called socioaffective or social-affective). This classification grew primarily from Brown and Palincsar’s (1982) and Anderson’s (1985) cognitive psychological concepts. Table 2 contrasts O’Malley and Chamot’s (1990) system to Oxford’s (1990) system. It is clear that a considerable degree of overlap exists between the two strategy systems, although there are also many differences.

The cognitive strategies of O’Malley and Chamot roughly correspond to a combination of Oxford’s memory and cognitive strategies. However, Oxford’s strategy of guessing from context (inferencing), which she listed as a compensation strategy to make up for missing knowledge, is part of O’Malley and Chamot’s cognitive category. (See explanation below under compensation strategies.)

Unlike O’Malley and Chamot, Oxford intentionally separated memory strategies from the category of cognitive strategies because memory strategies appear to have a very clear, specific function that distinguishes them from many cognitive strategies. Naturally, memory strategies serve cognition. However, the actions included as memory strategies are particular mnemonic devices that aid learners in moving information to long-term memory for storage purposes and in retrieving it from long-term memory when needed for use. Most of the memory devices do not tend to contribute to deep processing of language information, although cognitive strategies do contribute to deep processing. For more on this distinction, see Ehrman (1996).

Oxford defined compensation strategies as techniques used by learners to compensate for missing knowledge. The reason that Oxford placed the guessing-from-context strategy into this category was that this strategy is essential to make up for inadequate knowledge while reading or listening. (In Oxford’s system, a number of other compensation strategies make up for missing information while the learner is speaking or writing. Note that compensation strategies for speaking are often called communication strategies; see Cohen, 1998. Communication strategies are not specifically included in the O’Malley and Chamot system.)

As is evident in Table 2, O’Malley and Chamot’s (1990) metacognitive strategies generally match those of Oxford (1990). The general function of this category is planning, organizing, and evaluating one’s own learning.

Both systems mention strategies dealing with affect and social interaction. Affective strategies are techniques whereby the learner manages his or her emotions, feelings, and motivational states.
Social strategies are techniques involving learning with other people. As Table 2 shows, O’Malley and Chamot grouped affective strategies and social strategies together to form a small category known as social-affective, socio-affective, or socioaffective strategies. In contrast, Oxford classified affective and social strategies as separate categories and listed many more affective and social strategies than did O’Malley and Chamot. The expressed reason was that affective and social strategies deserve significant attention as part of the “whole learner.” However, not all L2 learning strategy systems have included affective strategies (e.g., Rubin, 1981, who did not include affective strategies although her 1975 article emphasized the importance of affective aspects of L2 learning).

**Numbers of Factors.** It is interesting that empirical research on the underlying constructs of L2 learning strategies has reported neither the three-factor pattern theorized in O’Malley and Chamot nor the six-factor solution implied in Oxford. For example, Oxford and Nyikos (1989) and Nyikos and Oxford (1993) found a five-factor solution, based on data measured by an earlier version of the SILL that consisted of 121 items. Hsiao (1997) reported a five-factor solution of the SILL based on analysis of data collected from adult learners of English as a foreign language (EFL). Furthermore, using data sets gathered in many countries under similar conditions by Anderson (1993), Talbott (1993), Boraie, Kassabgy, and Oxford (1994), Green and Oxford (1993), Watanabe (1990), Yang (1992a), and Zhang (1994; as cited in Oxford & Burry-Stock, 1995), a nine-factor solution was reported for each of the six data sets because it allowed for comparisons across data sets.

**Summary of Conceptual Framework and Research Review**

In sum, strategies are the L2 learner’s tool kit for active, conscious, purposeful, and attentive learning, and they pave the way toward greater proficiency, learner autonomy, and self-regulation. However, many disagreements exist concerning L2 learning strategy classification. Although different strategy systems have been available for many years, they have rarely been explored systematically. The present investigation was conducted in order to address issues in these classification theories of L2 learning strategies, to determine whether all the proposed models successfully explain variability in learners’ strategy use, and, wherever possible, to provide directions for future L2 learning strategy research.

**METHOD**

**Participants**

The participants in this study were 534 undergraduate EFL students recruited from 12 intact classes at a university in Taiwan, at which the majority of the students majored in engineering, fisheries science, or maritime science. The final sample consisted of 517 students (males, 70%; females, 30%), after 17 students were rejected because their returned responses had missing values. The ages of the participants ranged from 18 to 20. At the time of this study, all participants were enrolled in a required first-year university English course that placed more emphasis on reading and listening skills than on speaking and writing skills. All of the students had already studied English for 6 years (during their junior and senior high school education) when the data were collected in the Spring term of 1998.

Because the participants’ fields of study were primarily in technical areas, the results of this study might not fully generalize to students from a larger set of disciplines or from different parts of the world. However, the reported frequency data for strategies used by these participants were not very different from those for students in other EFL studies involving a much wider range of technical and nontechnical academic majors elsewhere in the world. For example, in this study, the means, as measured on an 8-point scale, were 4.08, 4.50, 4.66, 4.39, 3.85, and 3.95 for Factors 1 (memory), 2 (cognitive), 3 (compensation), 4 (metacognitive), 5 (affective), and 6 (social), respectively. The overall mean for the 50 strategies was 4.28. These means are certainly in the medium range of strategy use. These data were, thus, consistent with those reported by Hsiao (1995).

**Procedure**

The participants completed a questionnaire consisting of items representing several individual-difference variables, including L2 learning strategies, motivation, and anxiety. Only data for L2 learning strategies, not for motivation and anxiety, were used in this study. All participants received uniform instructions on how to complete the survey. Prior to completing the survey, they learned that (a) the study was not a test, (b) there were no right or wrong answers, (c) the study was not associated with the instructor or the university, (d) they were not required to identify themselves in the survey, and, of utmost importance, (e) the obtained responses would be han-
dled with absolute confidentiality. Their respective language instructors administered the questionnaire in their classrooms. The entire procedure lasted about 50 minutes.

**Instrumentation**

The investigation used the ESL/EFL version of Oxford’s SILL to measure the students’ use of L2 learning strategies because the 50 items in it have a clear factor structure. It specifies that there are six strategy factors, each of which is represented by a specific set of strategy items: (a) memory strategies (items 1 to 9), (b) cognitive strategies (items 10 to 23), (c) compensation strategies (items 24 to 29), (d) metacognitive strategies (items 30 to 38), (e) affective strategies (items 39 to 44), and (f) social strategies (items 45 to 50). It also postulates that the factors are correlated rather than orthogonal. With this structure, Oxford’s six-factor strategy classification theory, together with those proposed by others (e.g., O’Malley & Chamot, 1990), can be directly tested.

All of the 50 strategy statements were translated from English into Chinese. The translated version was then compared with the Chinese version of the SILL in Yang’s (1992b) work. Some minor modifications were made in the wording of certain strategy items in order to ensure accuracy of translation. The respondents assigned a value to each item on an 8-point bipolar scale. (The original SILL entailed a 5-point scale.) On the left-hand side of the scale was the phrase *Never use it*, accompanied by the number 1, and on the right-hand side of the scale was *Often use it*, accompanied by the number 8. The numbers 2 through 7 were evenly spaced between the two phrases and had no descriptors. The instructions for how to respond to the questionnaire and the response choices were in Chinese.

Cronbach’s (1951) alpha coefficient was .94 for the whole questionnaire, and .75, .84, .69, .86, .68, and .78, respectively, for the six learning strategy categories. These reliability findings were consistent with the values reported in most other investigations using the ESL/EFL SILL.

The SILL also performed well in validity testing. By conducting a series of chi-square difference tests (Anderson & Gerbing, 1988) with the current data, we found that the six strategy factors possessed discriminant validity, indicating that it is valid to claim that there indeed are six types of L2 learning strategies. There is also evidence of the SILL’s criterion-related validity. One form of evidence is this instrument’s relationship with measures of L2 proficiency. As noted earlier, theorists expect the use of L2 learning strategies to be associated with proficiency. This association has been obtained in numerous SILL investigations. For instance, in Green and Oxford’s (2000) study, 78% of the variance in subtest scores on a standardized English proficiency test was explained by the SILL.

In other SILL studies, the amount of variance in proficiency explained by strategy use has ranged from the .30s to .68 (see Dreyer & Oxford, 1996; Ehrman & Oxford, 1995; Ku, 1995; Mullins, 1992). Claims of validity are also supported by evidence about the relationship between the SILL and certain constructs, such as general learning style preferences (broad approaches to learning or problem solving), selected personality factors, and beliefs. As theory would predict, the SILL has shown significant relationships to the following: Learning Style Profile, Myers-Briggs Type Indicator, Style Analysis Survey, Affective Survey, the Beliefs About Language Learning Inventory, and other measures (Dreyer & Oxford, 1996; Ehrman & Oxford, 1989, 1990; Oxford & Ehrman, 1995; Yang, 1992b). Additional support for the validity of the SILL is its lack of social desirability response bias. In other words, individuals tend to reply honestly to the SILL items. This honesty was demonstrated in large studies by Yang (1992b) and Ku (1995).

**Rival Models**

There were 15 strategy classifications derived from the research review presented earlier.

**The Null Model.** This model postulated that none of the 50 strategies involved in the questionnaire was correlated to any other strategy. This model was used as a baseline, as Bentler and Bonett (1980) have recommended, against which other models (e.g., Models 6 and 7) that are less restricted than the null model could be compared.

**Model 1.** This model, called the General Strategy Factor Model, postulated that a single common factor was sufficient to account for the correlations among the 50 strategies encompassed by the questionnaire.

**Model 2.** This model, the Two-Factor Oblique Model, derived from Oxford’s (1990) direct/indirect dichotomy of L2 learning strategies, rather than from Rubin’s (1981) proposed theory of direct/indirect strategies.
that Factor 1 (i.e., direct strategies) and Factor 2 (i.e., indirect strategies) were correlated and represented by strategies 1 through 29 and 30 through 50, respectively.

**Model 3.** This model, the Three-Factor Oblique Model, postulated that strategies 1 through 29, 30 through 38, and 39 through 50 constituted the correlated factors cognitive strategies, metacognitive strategies, and socioaffective strategies, respectively.

**Model 4.** This model, the Four-Factor Oblique Model, was derived from the Three-Factor Oblique Model, except that the third factor, socioaffective strategies, was further divided into two factors called affective strategies (Factor 3) and social strategies (Factor 4), represented by strategies 39 through 44 and 45 through 50, respectively.

**Model 5.** This model, the Five-Factor Oblique Model, was also derived from Model 3, except that the first factor, cognitive strategies, was further subdivided into three factors called memory strategies, cognitive strategies, and compensation strategies as in Oxford (1990), represented by questionnaire items 1 through 9, 10 through 23, and 24 through 29, respectively.

**Model 6.** This model, called the Six-Factor Oblique Model, was based in part on Oxford’s (1990) six-factor strategy classification theory. It was assumed that Factors 1 (memory), 2 (cognitive), 3 (compensation), 4 (metacognitive), 5 (affective), and 6 (social) were correlated with one another and were represented by questionnaire items 1 through 9, 10 through 23, 24 through 29, 30 through 38, 39 through 44, and 45 through 50, respectively.

**Model 7.** This model, called the Six-Factor Model with One Higher-Order Factor, is similar to Model 6, except that one higher-order factor represented by the six first-order factors in Model 6 was included.

**Model 8.** This model, called the Six-Factor Model with Two Oblique Higher-Order Factors, is also similar to Model 6, the difference being that two higher-order correlated factors called direct strategies and indirect strategies were included, with the former comprising three first-order factors called memory, cognitive, and compensation strategies and the latter comprising three first-order factors called metacognitive, affective, and social strategies.

In addition to the nine strategy classification models just formulated, six orthogonal models were also derived in which the factors within each model were assumed to be uncorrelated with one another. These models were Models 2U (U for uncorrelated), 3U, 4U, 5U, 6U, and 8U, which corresponded to Models 2, 3, 4, 5, 6, and 8, respectively.

**Hypotheses**

Seven hypotheses were tested in this study. Hypothesis 1 posited that all the models considered (e.g., Model 2) would explain more variability in learners’ use of the 50 strategies than the null model. Hypothesis 2 assumed that all the oblique (i.e., correlated) models (e.g., Model 2) would be significantly better than their orthogonal (i.e., uncorrelated) counterparts. For Hypothesis 3, Model 3 would account for more variance in the reported strategy use than Model 2. Regarding Hypotheses 4 and 5, Model 4 and Model 5, respectively, would be significantly better than Model 3 in explaining learners’ reported strategy use. Finally, Hypothesis 6 assumed that Model 6 would account for more variance in strategy use than Models 2, 3, 4, and 5. Hypothesis 7 posited that Models 7 and 8 would be significantly better than Model 6 in accounting for variance in learners’ reported strategy use.

**Analyses**

Analyses of data pertaining to the research hypotheses were performed with the aid of the Statistical Analysis System (SAS), Release 6.12, for Windows (SAS Institute Inc., 1989). The specific statistical method involved was confirmatory factor analysis (CFA) available in the SAS system’s Covariance Analysis of Linear Structural Equations (CALIS) procedure. CFA differs from and offers several advantages over the traditional exploratory factor analysis (Bollen, 1989; Long, 1983). In CFA, a measurement model, of which Model 6 is an example, describes the mutual relationship among the latent variables (e.g., Factors 1 and 2 in Model 6) and the causal relationship between the latent variables (e.g., Factor 1 in Model 6) and measured variables (e.g., strategy items 1 through 9 in Model 6). In this study, the maximum likelihood estimation method was used to test the rival models, and, as Cudeck (1989) has recommended, the testing processes were based on the covariance matrix rather than
on the correlation matrix. In order to address the scale indeterminacy problem, the variance for each factor within each model was fixed at one (Bentler & Chou, 1987; Long, 1983).

RESULTS

The results below are discussed in two parts. The first part deals with goodness of fit estimates, and the second part addresses the testing of each of the hypotheses noted above.

Goodness of Fit Estimates

Before proceeding with the comparisons of the rival models, it is necessary to report relevant fit indexes associated with each of the strategy classification models. This information appears in Table 3.

Reported in Table 3 are several statistics for determining whether a specific model of interest adequately fits the data. The chi-square statistic in CFA provides a test of the null hypothesis that a model of interest fitted the data. A significant chi-square value would indicate an unacceptable fit of the model to the data (Jöreskog, 1993). However, as noted by Bentler and Bonett (1980) and Marsh and Hocevar (1985), this statistic tends to increase in magnitude with sample size. In addition, because large sample sizes are almost always involved in CFA, significant chi-square values are usually found for virtually any model even when there are only trivial discrepancies between the model and the data (Marsh & Hocevar, 1985). Thus, a significant chi-square statistic does not necessarily imply an unacceptable model fit to the data. The chi-square statistic is reported here primarily for conducting chi-square difference tests (Anderson & Gerbing, 1988) for our stated research hypotheses.

Hypothesis Testing

The seven hypotheses were tested by using a series of chi-square difference tests. It should be noted that the difference between chi-square values for two nested models is asymptotically distributed as chi-square, with degrees of freedom equal to the difference in degrees of freedom for the two models under comparison (Anderson & Gerbing, 1988). This was done by subtracting the chi-square statistic value and degrees of freedom for a less restricted model (e.g., Model 6) from the chi-square statistic value and degrees of freedom for a more restricted model (e.g., Model 6U). With all the chi-square statistics reported in Table 3, the chi-square difference tests can be, and were, conducted, as reported in Table 4.

The information in Table 4 shows that all the reported differences in chi-squares were statistically significant far beyond the .01 level of confidence and indicates that six of the seven hypothe-

### TABLE 3

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<th>Model</th>
<th>Chi-Square</th>
<th>df</th>
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<th>NNFI</th>
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*Note. N = 517; df = degrees of freedom; CFI = Bentler’s Comparative Fit Index (1989, 1995); and NNFI = Bentler and Bonett’s Non-Normed Fit Index (1980).

*p < .01.
ses (i.e., Hypotheses 1–6) were supported. However, the evidence did not lend support to Hypothesis 7, because a larger chi-square in the context of CFA corresponds to a poorer fit of a model to the data.

Consistent information concerning the tests of the seven hypotheses can also be found from the associated goodness-of-fit indexes (i.e., Comparative Fit Index [CFI] and Non-Normed Fit Index [NNFI]) reported in Table 3. As noted in the preceding sections, the chi-square statistic is rarely used to judge whether a model adequately fits the data when the sample involved is not small (e.g., Marsh & Hocevar, 1985). Thus, the fact that all of the models considered in this study yielded significant chi-square values should not be interpreted as indicating an unacceptable fit of all of the models discussed. It is necessary to look at other indexes to assess a model’s fit. Two of the commonly used indexes that were also employed in this study include Bentler’s (1989, 1995) CFI and Bentler and Bonett’s (1980) NNFI (see also Bollen, 1989; Long, 1983, for other fit measures). In the context of CFA, both CFI (Bentler, 1989, 1995) and NNFI (Bentler & Bonett, 1980), unlike the chi-square statistic, are fairly independent of sample size (Bentler, 1995; Marsh, Balla, & McDonald, 1988). Both measures typically range from zero to one, with larger values indicating a better fit of a model to the data. Values of CFI and NNFI equal to or larger than .90 are indicative of an acceptable fit of a model.

Although CFI and NNFI measures as reported in Table 3 show that Oxford’s six-factor model of

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<th>Model</th>
<th>Null</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
<th>Model 8</th>
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<tbody>
<tr>
<td>Model 1</td>
<td>6675.29&lt;sup&gt;a&lt;/sup&gt; (50)</td>
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<tr>
<td>Model 2</td>
<td>6901.46&lt;sup&gt;a&lt;/sup&gt; (51)</td>
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<tr>
<td>Model 2U</td>
<td>6382.10&lt;sup&gt;a&lt;/sup&gt; (50)</td>
<td>519.36&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Model 3</td>
<td>6972.27&lt;sup&gt;a&lt;/sup&gt; (55)</td>
<td>70.81&lt;sup&gt;c&lt;/sup&gt; (2)</td>
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<tr>
<td>Model 3U</td>
<td>5997.98&lt;sup&gt;a&lt;/sup&gt; (50)</td>
<td>974.29&lt;sup&gt;b&lt;/sup&gt; (3)</td>
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<tr>
<td>Model 4</td>
<td>6999.13&lt;sup&gt;a&lt;/sup&gt; (56)</td>
<td>26.86&lt;sup&gt;d&lt;/sup&gt; (3)</td>
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<tr>
<td>Model 4U</td>
<td>5726.69&lt;sup&gt;a&lt;/sup&gt; (50)</td>
<td>1272.44&lt;sup&gt;b&lt;/sup&gt; (6)</td>
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<td>Model 5</td>
<td>7116.76&lt;sup&gt;a&lt;/sup&gt; (60)</td>
<td>144.49&lt;sup&gt;c&lt;/sup&gt; (7)</td>
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<td>5456.63&lt;sup&gt;a&lt;/sup&gt; (50)</td>
<td>1660.18&lt;sup&gt;b&lt;/sup&gt; (10)</td>
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<td>Model 6</td>
<td>7146.98&lt;sup&gt;a&lt;/sup&gt; (65)</td>
<td>245.52&lt;sup&gt;f&lt;/sup&gt; (14)</td>
<td>174.71&lt;sup&gt;f&lt;/sup&gt; (12)</td>
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<td>30.22&lt;sup&gt;f&lt;/sup&gt; (5)</td>
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<td>Model 6U</td>
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<td>1961.64&lt;sup&gt;b&lt;/sup&gt; (15)</td>
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<td>Model 7</td>
<td>7045.37&lt;sup&gt;a&lt;/sup&gt; (62)</td>
<td>101.61&lt;sup&gt;g&lt;/sup&gt; (3)</td>
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<td>35.91&lt;sup&gt;g&lt;/sup&gt; (2)</td>
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<td>Model 8U</td>
<td>6955.90&lt;sup&gt;a&lt;/sup&gt; (62)</td>
<td>515.17&lt;sup&gt;b&lt;/sup&gt; (1)</td>
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Note. N = 517. Models 1 and 7 were omitted from the heading because Model 1 was compared only with the null model, and Model 7 was compared only with the null model and Model 6. Null = The null model. The reported chi-square statistics were obtained from the associated chi-square difference tests. The values inside the parentheses are the degrees of freedom for the chi-square difference tests.

<sup>a</sup>For Hypothesis 1. <sup>b</sup>For Hypothesis 2. <sup>c</sup>For Hypothesis 3. <sup>d</sup>For Hypothesis 4. <sup>e</sup>For Hypothesis 5. <sup>f</sup>For Hypothesis 6. <sup>g</sup>For Hypothesis 7.

<sup>*</sup>p < .01.
strategy classification was better than other models in explaining learners’ reported use of the 50 strategies, it merits our attention that this model (i.e., Model 6) has not produced a fully adequate fit to the data.3

DISCUSSION AND CONCLUSIONS

This investigation systematically examined theories of L2 learning strategy classification and provided empirical evidence concerning how these theories compare. Fifteen rival models were compared, and seven research hypotheses were derived and tested. Statistical evidence supported six of these seven hypotheses. Results pertaining to the reported hypothesis tests are now discussed.

Statistical support for Hypothesis 1 indicates that L2 learning strategies can and should be classified in a systematic manner. The evidence uncovered justifies the L2 learning strategy classification theories proposed over the years, including those of O’Malley and Chamot (1990) and Oxford (1990). Specifically, O’Malley and Chamot’s discrimination among cognitive, metacognitive, and socioaffective strategies, Oxford’s (and Rubin’s) dichotomies between direct and indirect strategies, and Oxford’s six-factor strategy classification theory have made an important contribution to and have advanced our understanding of how strategies can be systematically categorized.

Empirical evidence in support of Hypothesis 2 suggests that learners’ use of certain L2 learning strategies can be seen as related to use of other L2 learning strategies. Although a causal relationship among these strategy constructs could not be established in this study, at least we are assured that they are related. This finding thus supports Oxford’s (1990) concept of a mutual support network among various kinds of L2 learning strategies. In other words, direct and indirect strategies benefit each other, and all six factors studied reinforce one another. This finding is also consistent with Brown and Palincsar’s (1987) theory and empirical finding that cognitive strategy instruction is more effective when it is supplemented with metacognitive strategy instruction. Therefore, when teaching students to use strategies to enhance L2 performance, teachers could consider the explicit integration of different strategies simultaneously.

Statistical support for Hypothesis 3 suggests that O’Malley and Chamot’s classification of strategies into cognitive, metacognitive, and socioaffective strategies is more consistent with learners’ use of strategies than the mere dichotomy of strategies between direct and indirect dimensions. As mentioned earlier, the two terms, direct and indirect strategies, are used somewhat differently by Rubin (1981) and Oxford (1990). Because of the overlapping of strategies between direct and indirect categories in Rubin’s theory, her theory was untestable in this study. Nonetheless, in light of the empirical evidence presented here, it appears that O’Malley and Chamot’s theory of classifying strategies in terms of three dimensions—as compared to just two dimensions of direct and indirect strategies—represents an important step toward a better theory of L2 learning strategies.

The fact that Hypothesis 4 received support indicates that affective strategies stand as distinct from social strategies and other categories of strategies. That is, although O’Malley and Chamot’s (1990) classification framework has been effective for categorizing strategies, their theory would have more explanatory power to account for how learners use strategies to facilitate learning if the socioaffective strategies were further differentiated into social and affective strategies. This finding is consistent with O’Malley and Chamot’s identification of affective strategies, such as self-talk and self-reinforcement, reported in their study of students of different foreign languages, at different levels, and for different language tasks. This finding also lends support to Rubin’s (1975) and Stern’s (1975) recognition of the importance of affective strategies in L2 learning.

Empirical evidence supportive of Hypothesis 5 shows that it may be preferable to subdivide O’Malley and Chamot’s (1990) cognitive strategies into memory, cognitive, and compensation dimensions than to consider cognitive strategies as a unitary dimension. This further differentiation may make this theory more consistent with students’ actual use of strategies for L2 learning.

The evidence reported here supports findings of previous empirical research (e.g., Nyikos & Oxford, 1993; Oxford & Burry-Stock, 1995) indicating memory, cognitive, and compensation strategies as distinct strategy constructs. The findings are also consistent with Purpura’s (1997) taxonomy of cognitive processing variables into three primary processes called comprehending processes, storing/memory processes, and using/retrieval processes. Thus, the evidence warrants our conviction that cognitive strategies are not a unidimensional construct.

Significant differences in support of Hypothesis 6 suggest that Oxford’s (1990) classification of
strategies into six broad dimensions is more consistent with the data than (a) the simple dichotomous distinction between direct and indirect strategies, (b) O’Malley and Chamot’s (1990) three-factor strategy classification theory, or (c) both the four-factor and five-factor models of strategy classification derived from O’Malley and Chamot’s tripartite classification system. The evidence thus supports the conclusion not only that should O’Malley and Chamot’s cognitive strategies be subdivided into memory, cognitive, and compensation components, as is evidenced in Hypothesis 5, but also that their socioaffective strategies should be separated into affective and social dimensions, as can be seen in the support of Hypothesis 4. It is of interest to note that because both Hypotheses 4 and 5 were already supported, one would expect Hypothesis 6 to be statistically supported, which indeed was the case.

Because the classification theory of O’Malley, Chamot, Stewner-Manzanares, Kipper, and Russo (1985) derived from the cognitive psychological theory of information-processing (Brown & Palincsar, 1982), the consistent findings reported here appear to suggest that L2 learning is different from the learning of other subject matters (e.g., math and science). If this were not true, we would not expect the six-factor model consisting of memory, cognitive, compensation, metacognitive, affective, and social strategies to explain more variation in strategy use than the three-factor model represented by cognitive, metacognitive, and socioaffective strategies.

Hypothesis 7 was not supported because both Models 7 and 8 provided a poorer fit to the data than Model 6. The results for the comparison between Models 6 and 7 show that, although it was plausible to posit a higher-order factor that would account for the correlations among the six first-order factors, this hypothesized model was not as consistent with the data as Model 6. Thus, it is undesirable to claim that there exists a general higher-order factor for accounting for correlations among the six first-order factors.

With respect to the comparison between Models 6 and 8, the finding does not support Oxford’s initial theory that the six dimensions of language learning strategies could be effectively subsumed under the two broad types of strategies called direct and indirect strategies. Stated differently, the result suggests that it is undesirable to view L2 learning strategies as a dichotomy between direct and indirect dimensions when six components of strategies have already been present for explaining learners’ variability in strategy use.

If Oxford’s original theoretical model of strategy classification theory is slightly modified, that is, if it is assumed that there exist only six strategy factors, without reference to the two higher-order strategy constructs, this modified theory should be more powerful in its ability to account for how learners reportedly use strategies to assist L2 learning. (As mentioned earlier, Oxford’s SILL never referred to direct and indirect strategies. Therefore, these two overarching categories have rarely been used in SILL research.)

In sum, results from hypothesis testing for the competing models of strategy classification have evidenced that the six-factor model without the two higher-order strategy constructs is more consistent with learners’ strategy use than other models. However, as CFI (Bentler, 1989, 1995) and NNFI (Bentler & Bonett, 1980) indexes have shown, this model has not yielded a fully acceptable fit to the data. Thus, it appears that there could be other approaches that might help to advance theories of strategy classification and explain variability in learners’ strategy use as well as or better than the six-factor strategy model.

**IMPLICATIONS: APPROACHES FOR THE FUTURE**

This study has implications for future assessments of L2 learning strategies by means of questionnaires or surveys. This section outlines five of the approaches that might be useful.

**Approach 1: Differentiating between L2 Learning and L2 Use Strategies**

A possible approach, as Ellis (1994) and Cohen (1998) have pointed out, is to differentiate between strategies for learning L2s and strategies for using them. This distinction is heuristically valuable as a reminder that L2 learning and L2 use are not identical. However, in actual practice it is often difficult or impossible to separate learning the L2 from using the L2. Does the learner stop learning when he or she puts the language into use while writing a letter in the L2, reading L2 newspapers, or conversing with a native speaker? One might argue that it is in precisely such instances that the alert learner might stand to learn the most, because normal L2-use situations provide the authentic context and motivation that are so greatly desired in communicative (though formal) L2-learning situations. We believe that the distinction between L2 learning and L2 use is a matter of emphasis; that both learning and use can occur simultaneously; and that in daily reality the strategies for L2 learning and L2
use overlap considerably, especially for beginning and intermediate learners. We speculate that the degree to which a given L2 learner actually learns from a particular L2-use situation depends on many factors: ability to multitask, which might be related to learning style; amount of interest; and, especially, degree of attentiveness.

The SILL has been developed primarily as a tool for assessing a broad range of general L2 learning strategies, and distinguishing between these two types of strategies—L2 learning and L2 use—is not the original aim of the SILL. Nevertheless, we continue to look at the learning versus use distinction to determine whether it has practical value for specific measurement purposes in the future.

Approach 2: Recognizing the Importance of Second Language versus Foreign Language Settings

A second possible approach is to recognize the importance of the environments—second language versus foreign language settings—in which L2 learning takes place. The 50-item SILL as a general instrument for identifying L2 learning strategies has been developed for ESL or EFL learners. In this study, which was conducted in a formal, academic EFL context, mismatches could occur between strategies that learners really employ and strategies that are included in the SILL. For instance, strategy item 46, “I ask English speakers to correct me when I talk,” would be more practical and more likely to be employed in a natural ESL setting than in an EFL context because the former provides more such opportunities than the latter. As Garner (1990) theorized, “A theory of settings reminds us that when context varies, the nature of strategic activity often varies as well” (p. 26).

Green and Oxford (1995) emphasized, on the basis of their empirical research, that ESL and EFL students might have different patterns of strategy use as a result of their learning environments. This possible difference in L2 learning contexts could have been involved in the amount of variance explained (or unexplained) by the current six-factor strategy classification model. In current SILL development efforts, the Learning Strategy Research Group, led by Rebecca Oxford, is dealing with measurement implications for second language versus foreign language settings. In its next wave of research, this group will conduct large-scale investigations in a number of varied ESL and EFL settings around the world in an attempt to uncover the influence of second language versus foreign language environments on strategy use.

Approach 3: Reclassifying Certain Specific Items

A third possible approach has to do with the method of classifying strategies into memory, cognitive, compensation, metacognitive, affective, and social dimensions. Although this approach to strategy classification has proved to be more consistent with the data collected for this study, problems nevertheless exist. These results are shown by the CFI (Bentler, 1989, 1995) and NNFI (Bentler & Bonett, 1980) indexes reported earlier. In addition, Oxford (1990) has cautioned from the first publication of her strategy taxonomy that particular strategies could be viewed as related to more than one strategy category and, as mentioned earlier in this article, that the strategy categories mutually support each other. These statements have been borne out by empirical research, because moderate intercorrelations exist among items in Oxford’s different strategy categories (Oxford & Ehrman, 1995). There will probably never be a strategy taxonomy in which intercorrelations among particular strategies are totally eliminated, because such a taxonomy would not reflect reality. Even so, reclassification of a few strategy items in a pilot version of a revised SILL has proven to be statistically useful in increasing the reliability of scales, according to the Learning Strategy Research Group, which continues to study the matter.

The theoretical frameworks of O’Malley and Chamot (1990) and Oxford (1990) have made important contributions to an understanding of L2 learning strategies or, at least, to what people report about using them (Ellis, 1994; Skehan, 1991). Properly modified through reclassifying certain strategies, these frameworks could contribute to a still more powerful theory of L2 learning strategies.

Approach 4: Ensuring That the Level of Specificity or Generality Is Consistent

As Cohen (1998) suggested, although strategies can refer to both general and more specific learning behaviors, practitioners and learners are encouraged to determine the abstractness or specificity of each strategy in order to make it useful. A close inspection of the SILL shows that some strategy items seem to convey different levels of specificity. For example, “I write notes, messages, letters, or reports in English” (item 17) differs in levels of specificity from “I try to find as many ways
as I can to use my English” (item 30). This difference may explain why participants of this study did not respond in a way that is systematic and consistent enough to establish fully the adequacy of the six-factor strategy classification system.

Fortunately, the most recent revision of the SILL, currently being undertaken by the Learning Strategy Research Group, handles this problem. The level of specificity or generality of each strategy item is being aligned to that of all the other items. The goal is to ensure that strategies are expressed as specifically as possible. One part of this specificity orientation is reflected in making sure that the particular skill involved (listening, reading, speaking, and writing) is made very clear in the wording of any strategy item. The revised SILL specifies in every instance which skill is involved for each strategy item, so that respondents can have the same context for and understanding of that item.

Efforts at reaching optimal strategy specificity also include constructing strategy inventories that are directly organized around the four major language skill areas of listening, reading, speaking, and writing. For instance, Cohen, Oxford, and others are currently developing a comprehensive, skill-based learning strategy questionnaire that includes many strategy items for learning each of these skills, as well as for learning grammar, vocabulary, and translation. Oxford and Park are designing a shorter, simplified, skill-based strategy inventory for lower-level L2 learners.

**Approach 5: Creating a Task-Based Strategy Survey**

The last approach concerns whether a strategy is related not just to a particular language skill, but to a particular L2 learning task. As a general L2 learning strategy instrument, the SILL upon which the six-factor model is based has the advantage of eliciting responses to a wide variety of strategies that learners use to handle different language learning tasks. Because most of the 50 strategies have intended to tap strategies for general L2 learning purposes, respondents may unconsciously judge some of these strategies as open to several possible interpretations dealing with different L2 tasks.

Classifying strategies by L2 learning tasks is conceptually more specific than using a generic strategy assessment tool that does not mention specific tasks and, thus, might lead to a better theory of L2 learning strategies. Chamot, Küpper, and Impink-Hernandez (1987, 1988) reported that types of learning tasks had an important impact on strategy use (cited in Ellis, 1994). Cohen (1998) and Oxford (1999) also called for the development of task-based strategy surveys. Cohen piloted task-based strategy measurement involving think-aloud interviews and written strategy questions.

The Learning Strategy Research Group recently conducted a study (Cho, Kim, & Leung, 2001) that considered the influence of the presence or absence of an actual language task in students’ reporting of their strategies. The performance of a reading task as the basis for responding to a strategy questionnaire (which was much shorter than the SILL and which focused only on reading) did cause some of the strategies to be reported with a different frequency, as compared with an earlier administration of the same survey with the same respondents when no reading task was required. However, overall, the reported frequencies of most of the strategies did not change across the task-absent and task-present conditions. For most of the strategy items, the reported frequencies stayed relatively the same with or without a reading task.

The fact that most of the items in the Cho et al. (2001) study did not change in frequency of use depending on task presence suggests that there is a continuing place for a general strategy survey such as the current SILL, which does not require the immediate performance of language tasks as the basis for responding and which is therefore easier to administer than a task-based survey. However, because the frequency of a few of the strategy items was affected by task presence in the Cho et al. study, there also seems to be some utility in developing a task-based SILL. The task-based SILL would complement, but not eliminate, the general SILL. The task-based approach, like some of the earlier approaches named, adds to the greater contextualization of learning strategies. Categorizing or cross-indexing strategies by learning tasks could be a very practical approach, providing immediate pedagogical benefits.

**Synthesis of Approaches**

The approaches recommended above—distinguishing between language use and language learning, dealing with differences in strategy use in EFL versus ESL settings, reclassifying particular strategies, ensuring that the strategy items are at the same level of specificity, and creating task-based strategy measurements—challenge currently existing strategy systems while at the same time offering opportunities to refine and advance them. These five approaches are being explored,
ACKNOWLEDGMENTS

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NOTES

1 In this article, the abbreviation “L2” represents either a second or a foreign language. An earlier version of this paper was presented by the first author at the American Association for Applied Linguistics Conference in Stamford, Connecticut, March 1999. Research questions, study design, data collection, statistical analysis, and interpretation of findings are the sole responsibility of the first author. The second author wrote much of the research background, conceptual framework, and implications section and contributed to the rest of the text in a number of ways.

2 As described in Anderson and Gerbing (1988, p. 416), one can assess discriminant validity for two constructs by setting the estimated correlation between them at 1.0 and then performing a chi-square difference test on the values obtained for two models of interest. A significantly lower chi-square for the model with the two constructs freely estimated (i.e., not constrained to unity) would suggest that discriminant validity is established. When this test was conducted, the obtained difference in chi-square values ranged from 11.81 to 185.54, all exceeding the critical chi-square value of 6.63 for statistical significance at the .01 level of confidence, with 1 degree of freedom. Discriminant validity for the six strategy factors was thus established.

3 The lack of an adequate fit to the data does not necessarily mean that the SILL and its six subscales are not valid or reliable. Numerous studies, as reported in the section on instrumentation, suggested that they were reliable and valid. Readers interested in conducting alternative analyses should contact the first author for the covariance matrix and needed descriptive statistics (e.g., means and standard deviations) used in this study.

REFERENCES


Chamot, A. U., Barnhardt, S., El-Dinary, P. B., & Rob-


