The Reading Matrix © 2012
Volume 12, Number 1, April 2012

Effects of Learning Strategies on Student Reading Literacy Performance

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ABSTRACT

This study assesses the effects of the use of learning strategies on student literacy performance based on the 2002 Hong Kong Program for International Student Assessment. The descriptive statistics show that students use the memorization strategy almost as frequently as the elaboration strategy. Independent sample t-tests reveal that female students prefer to use more memorization strategies and less elaboration strategies than male students. The regression analysis demonstrates a positive relationship between learning strategy use and student reading performance. Results show that the memorization strategy has more strength in predicting students' reading performance than the elaboration strategy, and that girls are doing better in reading than boys. Based on the findings, a direct instruction approach is recommended in strategy training.

INTRODUCTION

Recent years have witnessed a growing interest in exploring the role of learning strategies in student learning (Bialystok, 1981; Huang & Van-Naersson, 1987; Lai, 2009; Macaro, 2001; Politzer & McGroarty, 1985; Wen & Johnson, 1997; Wen & Wang, 2004). It is believed that the effective use of learning strategies is an important factor for successful language learning, and that students may need a range of strategies to regulate their own learning (Marsh, Hau, Artelt, Baumert, & Peschar, 2009; Zimmerman & Martinez-Pons, 1990). Rather than mechanically applying learning strategies to language learning, researchers have found that students need to develop an understanding of when and how to use them to take control of their learning more efficiently (Palincsar & Brown, 1984). Zimmerman (2000) proposed that learning strategies should be incorporated into the framework of self-regulated learning (SRL), which refers to "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (p. 14). The use of learning strategies, therefore, can be viewed as a sub-construct of SRL.

Varieties of definitions of learning strategies have been proposed. Disputes seem to lie in whether the awareness of strategic process should be regarded as part of the strategic learning. Chamot (1987) defined learning strategies as "techniques, approaches or deliberate actions that students take in order to faciliatate the learning and recall of both linguistic and content area information" (p. 71). Cohen (1998) proposed that learning strategies are "those processes which are consciously selected by the learners and which may result in action taken to enhance the learning of a second or foreign language, through the storage, retention, recall, and application of information about that language" (p. 4).

According to Friedrich (1995), learning strategies can be classified into cognitive strategies, metacognitive strategies, and resource-management strategies. The cognitive and metacognitive strategies organize information processing while the resource-management strategies manage time and emotion. The cognitive strategies can be further classified into memorization strategies (e.g., repeatedly reading aloud text), elaboration strategies (e.g., integrating the new information to learners' existing knowledge) and transformation strategies (e.g., transferring information to another mode).

The association between the use of learning strategies and student learning outcomes has been examined (Gu & Johnson, 1996; Vann & Abraham, 1990; Wen & Johnson, 1997; Wenden, 1986), and although these studies have shed light in this research field, no consistent picture has emerged. For example, Politzer and McGroaty (1985) found no relationship between the use of learning strategies and learning outcomes. Politzer (1983) found only a weak relationship between the choice of learning strategies and the attainment; in contrast, Huang and Van-Naerssen (1987) reported that the association was strong. Lai (2009) revealed that more proficient learners used more learning strategies. Wenden (1986) reported that less successful learners used fewer strategies less frequently, while Chen (1990) found that low achievers used more learning strategies compared with high achievers. Bialystok (1981) found positive effects of the functional practice strategy on second language proficiency, while Wen (1993) and Wen and Wang (1996) found that both the formal practice strategy and the meaning-focused strategy (similar to functional strategy) have positive effects on students' English achievement.

The comparison of these findings becomes difficult due to the diversified measurements utilized on both the learning strategies used and student learning outcomes. Besides this, several other factors may also lead to the conflicting findings. First, the cultural factor may lead to the diversified results. The subjects in these studies come from different cultural and ethnic backgrounds. A given cultural context may affect both students' use of learning strategies as well as the strategy assessment (Oxford, 1996). For example, memorization is popular in Asian countries, a perception supported by a series of empirical studies reporting that Asian students generally prefer memorization strategies (Politzer & McGroarty, 1985). Second, types of strategies used in these studies were based on different theoretical models, which may influence the predictability of the use of learning strategies in student learning outcomes. Third, the relationship between strategies and outcomes may be moderated by student characteristics. The notion of differences in ability according to gender is controversial (Wen & Johnson, 1997; Zimmerman & Martinez-Pons, 1990). Finally, it should be noted that high frequency use, and more types of learning strategies do not necessarily lead to better academic achievement (Wen & Wang, 2004). The frequency of strategy use sometimes has to do with the difficulty of the learning task. High achievers may use certain types of strategies less often compared with low achievers simply because the task is easy for them to accomplish. High achievers may also use strategies automatically without being aware of it. Still, overuse of certain strategies may have a

negative effect on student learning outcomes. For example, in second language learning an overemphasis on the language form may impede the fluency in oral production. Therefore, due to the complex relationship between the use of learning strategies and language learning outcomes, findings should be interpreted with caution.

Studies concerning the use of learning strategies within the Hong Kong context on the basis of 15-year-old students are rarely seen. However, as these students approach the end of the compulsory education, an understanding of their strategy use will help us see how well they are prepared for SRL before they go into society. To tackle this issue, this study utilized the 2002 Hong Kong Program for International Student Assessment (HKPISA). The Program for International Student Assessment (PISA) was organized by the Organization for Economic Cooperation and Development (OECD) in 2000 (Ho, 2003). It assesses the cross-curricular competencies of 15-year old students in applying knowledge and skills, comparing and evaluating the effectiveness of the educational system of participating countries and regions. The 2000 PISA was conducted with 32 participating countries/regions, and another 11 non-OECD countries and regions participated in the program in 2002 (PISA+). Hong Kong joined PISA+ and collected data in February of 2002 (Ho, 2003). Both the 2000 PISA and PISA+ focused on literacy. Two cognitive strategies—memorization and elaboration strategies—were applied in PISA.

This study addressed the issue of how the use of learning strategies influenced the students' reading literacy performance. Specifically, the study related to the memorization and elaboration strategies in PISA, as memorization and elaboration strategies represent surface and deep processing approaches to reading. Memorization strategies are the methods or actions learners take to facilitate their memory and learning. One such item in PISA reads "I try to memorize everything that might be covered" (CC01Q01). Elaboration strategies refer to the conscious integration of new learning material into learners' existing knowledge. Another example in PISA reads "I try to relate new material to things I have learned in other subjects" (CC01Q09). The choice of these items is based on the assumption that learning strategies regulate how deeply information is processed. Given the possible cultural differences in strategy use, this study set out to investigate whether the theoretical constructs of learning strategies in PISA would apply to the Hong Kong sample. The study also examined how memorization and elaboration strategies influenced students' reading performance with gender as a moderator variable.

METHOD

A four-point Likert scale questionnaire format was used to collect student responses on strategy use. The items ranged from *almost never* (1 point), *sometimes* (2 points), *often* (3 points) to *almost always* (4 points). Ten items were utilized in this study to measure the aspects of the cognitive strategy (see Appendix). They were based on the PISA indicators of memorization (CC01Q1, 5, 10, and 15) and elaboration strategies (CC01Q9, 17, 21, and 25) with a slight modification. Questions CC01Q13 and 27 were added as a result of consideration that the item CC01Q13 was related to the memorization strategy and CC01Q27 to the elaboration strategy. A principal-components analysis with varimax rotation reduced these items to 2 separate factors with eigenvalues greater than 1. The two empirically coherent factors accounted for 58% of the variance in the strategy results. This indicated that the theoretical constructs of cognitive

strategies in PISA applied to the Hong Kong sample. We still labeled them memorization and elaboration strategies (Table 1).

Literacy in PISA is defined as the ability not only to understand, but also to use and reflect on written texts for functional purposes (OECD, 1999). Reading tasks were organized in the assessment in PISA along three dimensions: process, content, and context. A total of 141 reading tasks were designed for the 37 stimulus texts in the PISA assessment (Ho, 2003). Retrieving information, forming a broad understanding, developing an interpretation, and reflecting on content and form were associated with different levels of understanding in reading comprehension. Response formats consisted of multiple-choice questions, complex multiple-choice items, closed-constructed responses, short responses, and open-ended responses. Their scores on these responses established the reading performance.

Table 1. Factor Analysis for Learning Strategy Variables

	Factor 1	**Factor 2**
Elaboration Strategy		
CC01Q25	.820	.170
CC01Q21	.773	.248
CC01Q09	.744	.178
CC01Q17	.714	
CC01Q27	.649	.217
Memorization Strategy		
CC01Q05	.141	.772
CC01Q15	.102	.767
CC01Q10	.156	.736
CC01Q13	.283	.712
CC01Q01	.222	.654

Descriptive statistics were calculated for the frequency of the strategy use. Pearson's product moment correlation and a multiple regression were used to assess the relationship between learning strategies and student reading performance. As gender is a categorical variable, it was transformed into the dummy variable before the regression analysis by way of binary coding. The reference group is female (value = 0).

RESULTS AND DISCUSSION

Frequency of Learning Strategy Use

Table 2 presents the descriptive results of the frequency of learning strategy use in terms of the memorization and elaboration strategies. The results showed that the use of the memorization strategy by these students was almost as frequent as that of the elaboration strategy. There was no big difference in the central tendency between these two variables. Independent sample *t*-tests revealed that there was a significant difference between the female and male students in terms of the two learning strategies (memory strategy: $t = 5.758$, $p < .001$; elaboration strategy: $t = -4.265$, $p < .001$). Compared with boys, girls preferred to use more memory strategies and less elaboration strategies. This seemed to correspond to the popular belief that girls are better at memorization.

Table 2. Frequency of the Use of the Memorization and Elaboration Strategies

	Mean	Standard Deviation
Memorization Strategy	2.54	.61
Elaboration Strategy	2.35	.57

Relationship between Learning Strategy and Student Reading Literacy Performance

Pearson's product correlation coefficients were used as the first step to assess the relationship between learning strategies and student reading performance (Table 3). It can be seen that there was a significant correlation between two learning strategy variables, namely, memorization and elaboration strategies, and student reading literacy performance. Both the memorization and elaboration strategies were positively correlated with the reading performance.

Table 3. Correlations between Learning Strategies and Student Reading Literacy Performance

Learning Strategy Variables	Student Reading Performance
Memorization Strategy	.183**
Elaboration Strategy	.140**

Note: $^{**}p < .01$

Although the correlation coefficient is perhaps the most common inferential statistic used by researchers, it does not indicate a cause-effect relationship between the two variables. Based on the existing literature, it was reasonable to assume that these students have already developed their learning strategies and formed their own way of learning when they were tested. Hence, a multiple regression was adopted as the second step of the analysis to further examine the relationship between learning strategies and student reading performance. The memorization and elaboration strategies comprised the independent variables, and the students' reading performance was treated as the dependent variable. In order to clarify the role of gender in the effects of learning strategies on student reading performance, gender was adopted as the moderator variable in the regression analysis.

Results of the multiple regression analysis, shown in Tables 4 and 5, indicate that the two independent variables (memorization and elaboration strategies) and the moderator variable (gender) were all correlated significantly with the dependent variable of student reading performance. The R^2 of .059 suggested that the independent variables and the moderator variable accounted for 5.9% of the total variation in student reading performance, which indicated a small effect size. The limited proportion of the variance explained by the independent variables and the moderator variable seems to suggest that neither the two strategies nor the gender factor was a strong predictor of the students' reading abilities. One possible reason remains: Only two types of learning strategies were surveyed in this study. An increase of more types of learning strategies in the study may lead to a bigger contribution of the strategy use to student reading. Additionally, the weak or indirect relationship between learning strategy and reading performance also suggested that we have to take more factors into consideration in investigating students' learning. By considering the interactive effects of learning strategies with other variables in students' learning, a more thorough understanding of students' learning could be obtained.

Table 4. Regression Analysis: Model Summary

	R	R^2	Adjusted R^2	Std. Error of the Estimate
Model				
1	.084	.007	.007	17.776%
2	.243	.059	.058	17.308%

a Predictors: (Constant), gender
b Predictors: (Constant), gender, elaboration strategy, memorization strategy

Table 5. Regression Coefficients for the Learning Strategy Variables

		Un-Standardized Coefficients		**Standardized Coefficients**	***t***	**Sig.**
Model		**Beta**	**Std. Error**	**Beta**		
1	**(Constant)**	63.892	.383		166.929	.000
	Gender	-2.995	.542	-.084	-5.522	.000
2	**(Constant)**	63.807	.375		170.251	.000
	Gender	-2.828	.534	-.079	-5.295	.000
	Memorization Strategy	3.105	.266	.174	11.690	.000
	Elaboration Strategy	2.630	.265	.147	9.910	.000

According to Table 5, the variables memorization strategy, elaboration strategy, and gender all have unique and independent effects on the students' reading performance. The multiple-regression results corresponded to the finding of the correlation analysis in that both sets of analyses indicated that the memorization and elaboration strategies were correlated significantly with the students' reading performance. The positive standard coefficient Beta for the two strategy variables and student reading performance indicated that the use of these two strategies have a positive impact on reading. That is, the more frequently the students use these two strategies, the better their reading performance will be. It also implied that both memorization and elaboration strategies are important in reading.

The regression coefficients for memorization and elaboration strategies were 3.105 and 2.630 respectively. A comparison of the two regression coefficients for the two strategy variables revealed that the memorization strategy had more strength in predicting students' reading performance. However, this does not necessarily lead to a conclusion that the memorization strategy is more important than the elaboration strategy. The comparatively strong impact of memorization strategy on reading may possibly have to do with the cultural context. Asian culture puts great emphasis on heritage and tradition, and memorization is a traditional part of learning. Having grown up in such a context, students may inevitably use memorization frequently. However, the memorization strategy indicates only shallow information processing. It is the elaboration strategy that enables learners to process the information deeply and at a higher cognitive level. While a surface approach mainly focuses on the sign (the text itself), the deep approach (Marton & Saljo, 1976) stresses the *signified* (the meaning of the text). Readers who adopt elaboration strategies view the reading task as a means of gaining knowledge and new experiences. Through deep processing, learners are able to construct new knowledge structures

by integrating text information with their schemata and experiences, and therefore comprehend and internalize the knowledge more efficiently. As the elaboration strategy is more related to successful reading outcomes, its role in reading comprehension among Hong Kong students should be enhanced.

For the moderator variable gender, the regression coefficient –2.828 means that the expected student reading performance for the male students is 2.828 less than the average of female students. This seems to correspond to the popular belief that girls are doing better than boys in reading.

CONCLUSION

This study assessed the effects of learning strategies on student reading performance based on the 2002 Hong Kong Program for International Student Assessment. The findings indicated that students use the memorization strategy almost as frequently as the elaboration strategy. The multiple-regression analysis demonstrated a positive relationship between learning strategy use and student reading performance, and that the memorization strategy has more strength in predicting students' reading performance than the elaboration strategy. It also found that girls are doing better in reading than boys.

Since the elaboration strategy is more related to reading success, it is recommended that teachers encourage and train students to utilize more elaboration strategies. A direct instruction approach could be adopted for this (Chun, 1999): First, teachers could explain exactly what this strategy is, why it is effective, when and how to employ it. Second, teachers could use the think-aloud technique to demonstrate how the strategy can actually be employed when completing the reading task. Third, learners could practice these strategies in some reading tasks under the guidance of the teachers. It is probable that some difficulties may be encountered at the initial stage, in particular, in such a cultural context with a priority on the memorization strategy. However, students' learning ability and learning efficiency would be enhanced in the long run as the elaboration strategy would greatly facilitate students' reading literacy. For future studies, a more comprehensive analysis of students' use of learning strategies would provide more insights into the learning process of Hong Kong students.

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Appendix

Items for Learning Strategy Variables (OECD, 2002)

CC01Q01	I try to memorize everything that might be covered.
CC01Q05	I memorize as much as possible.
CC01Q09	I try to relate new material to things I have learned in other subjects.
CC01Q10	I memorize all new materials so that I can recite it.
CC01Q13	I force myself to check to see if I remember what I have learned.
CC01Q15	I practice by saying the material to myself over and over.
CC01Q17	I figure out how the information might be useful in the real world.
CC01Q21	I try to understand the material better by relating it to things I already know.
CC01Q25	I figure out how the material fits in with what I have learned.
CC01Q27	I look for additional information to clarify the point.