

The Relationship among Reading Habit, Learning Strategies, and Academic Achievement of Taiwan Secondary School Students

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Abstract

Using the data of Taiwan Assessment of Student Achievement (TASA) 2010, this study aims to explore the possible links between the 8th grade students' reading habit/engagement, learning strategies, and their academic achievement. Students participated in TASA survey received a common questionnaire and assessments in 5 subjects -- Chinese, English, Math, Science, and Social study. The measured constructs of reading habit in the TASA common questionnaire involve literacy activity engagement frequency and outside-reading time spent. The constructs of learning strategies include memory, control and elaboration. The relationship among reading habit, learning strategies, and the scores of each subject are explored with different statistic analysis such as regression analysis or T-test. The results show that: (1) The girls have better reading habit than the boys with much higher frequency of engaging literacy activities, more amount of reading time and exposure of reading resources; (2) The girls are better in employing memory and control strategies than the boys; (3) The students' reading habit is correlated with learning strategies; (4) Memory strategy and reading habit can best predict 8th grade students' performance of Chinese and English, whilst control and memory strategies can predict learning outcomes of Math and Science. Overall, elaboration strategy is not suitable for predict the academic achievement of the students and which does not match the finding of PISA 2009. A continuous endeavor through education in encouraging students' reading habit, particularly the boys, and more efforts in promoting higher level learning strategies in the Taiwanese classrooms are called. Suggestions for instruction and learning, TASA assessment improvement and education policy are also provided in this paper.

Keywords: reading habit, learning strategies, student achievement, TASA

1 Introduction

Under the influence of Outcome-based Education and Evidence-based Practice, student learning achievement has become one of the key indicators of the educational quality and competitiveness of a country (Biesta, 2007, 2009; Davis, 2003; Kirsch, Lennon, von Davier, Gonzalez, & Yamamoto, 2013; Ritzen, 2013). It is argued that reading literacy lays the foundation for the learning of other subject areas and therefore it is commonly considered a cause of multiple subject achievement of students at different school levels (Burns, Griffin, & Snow, 1999; Hung & Tsang, 2001). Studies have indicated that students' reading habit may play a significant role in their academic achievements (Cunningham & Stanovich, 2003; Leppänen, Aunola, & Nurmi, 2005). Among the factors that affect student learning, personal factors such as learning motivation and learning strategies are also important variables that must be considered when undertaking research into academic achievement (Lee & Shute, 2010). In International Large-scale assessments such as Program for International Student Assessment (PISA), students' reading engagement and learning strategies are included as factors of analyzing achievement. In addition, the impact of gender on reading engagement, the use of learning strategies is examined. In response to the trend, the present study aims to explore the relationship among the variables of gender, reading habit, learning strategies, and student achievement.

Taiwan Assessment of Student Achievement (TASA) is a database that evaluates the learning achievement of elementary school students in the fourth and sixth grades, junior high school students in the eighth grade, and students in their second year at senior high school or senior vocational school. This database is being built up through stratified sampling of all students in Taiwan, to produce quantified data that can be made available to both domestic and international researchers to undertake in-depth study of issues relating to students' learning achievement (TASA, 2014).

An overview of research on reading habit and learning strategies shows that, in the past, the main focus

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has been on their impact on the performance of specific subjects, with the most of the sample data used being based on regional samples (Applegate & Applegate, 2004; Benevides & Peterson, 2010; Chou, Huang, & Huang, 2011; Cunningham & Stanovich, 2003; Eshel & Kohavi, 2003; Pintrich & DeGroot, 1990; Stanovich, Cunningham, & West, 1998; Wei & Huang, 2009). Such data cannot be extrapolated to examine the situation in a whole country, or to compare learning strategies across different disciplines. By contrast, the TASA database covers five subjects -- Chinese, English, mathematics, social studies and natural science -- And the population on which the sampling is based includes all schoolchildren in Taiwan. The results obtained in analysis of the TASA data can thus be considered to be representative of the situation in Taiwan as a whole. The present study therefore uses the TASA database as its basic data source. The latest TASA data -- Specifically data for students who were in the 8th grade in 2010 -- Is used to explore the relationship between 8th grade students' academic performance and their learning strategies. It was anticipated that analysis of quantified data would provide a basis for offering useful suggestions to students, teachers and those involved in the setting of education policy.

The purpose of the present study can thus be summarized as follows (Figure 1):

- (1) To determine if there were any significant differences in the reading habit adopted by male and female 8th grade students.
- (2) To determine if there were any significant differences in the learning strategies adopted by male and female 8th grade students.
- (3) To explore the relationship between 8th grade students' learning strategies and their reading habit.
- (4) To examine the relationship among eighth grade students' reading habit, learning strategies, and learning outcomes in relation to different school subjects, and to put forward recommendations to for teachers to help students improve their learning outcomes.

2 Literature Review

2.1 Definition of Reading Habit and Learning Strategies

2.1.1 Reading Habit

Researchers believe that reading is essential to the learning of other subject domain for reading fosters not only basic literacy skills, but also logical and analytical modes of thought and critical attitudes (Cunningham & Stanovich, 2003; Stanovich et al., 1998). Although reading is considered a cause of multiple subject achievement, it is dubious which attribute of reading, for instance, reading skills, or the exposure to reading materials has an impact on literacy performance and subject achievement, and to what extent does it influence achievement.

Many studies have been carried out to examine the impact of reading habit on literacy acquisition and performance. In some of these studies, *reading habit* is defined as the amount of time spent or degree of engaging in leisure/out-of-school reading (Applegate & Applegate, 2004; Benevides & Peterson, 2010; Cunningham & Stanovich, 2003; Lee, 2003); whilst in some studies, reading habit is defined as exposure to print/digital materials or constant literacy experiences (Leppänen et al., 2005; Stanovich, Cunningham, & West, 1998). Unlike previous research choosing single construct or dimension, PISA, however, adopts multiple constructs of reading habit. In the framework of PISA 2009, reading habit is referred to as *reading engagement* which includes enjoyment, a sense of control over, and involvement in frequent reading practices (OECD, 2010a, p. 37). Specific components of reading habit that OECD determined in PISA 2009 are

- reading for school;
- enjoyment of reading;
- time spent reading for enjoyment;
- diversity of reading materials; and
- diversity of on line reading activities (OECD, 2010a, p. 26).

The varied definitions and constructs of reading habits in different studies are summarized in Table 1.

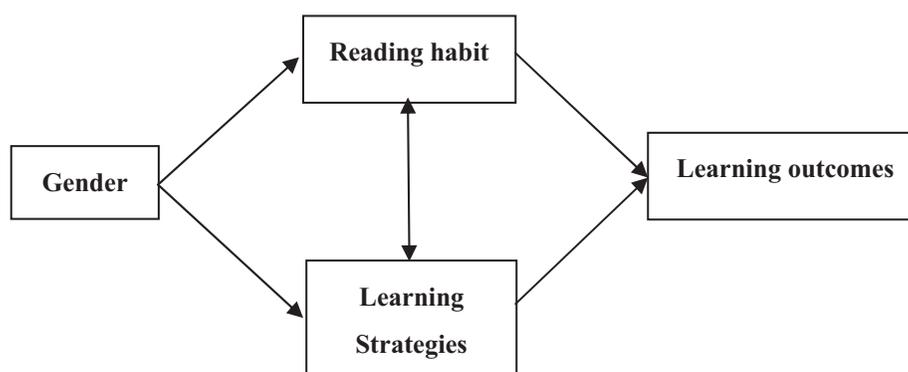


Figure 1 Research Framework of This Study

Table 1 Types of Reading Habit Constructs

Study	Constructs of reading habit
Applegate & Applegate (2004); Benevides & Peterson (2010); Kuo & Liu (2009); Lee (2003); OECD (2010b)	<p><i>Free-choice</i> reading on a <i>regular</i> basis</p> <ul style="list-style-type: none"> • Engagement in literacy activity/events • Engagement in personal reading • Choosing reading as a pastime/for enjoyment • Motivation for reading
Benevides & Peterson (2010); Ku (2005); Stanovich et al. (1998)	<p>The <i>amount of time</i> spent</p> <ul style="list-style-type: none"> • Frequency of reading • Time spend on out-of-school reading • Accumulation of reading experience
Cunningham & Stanovich (2003); Ku (2005); Leppänen, Aunola, & Nurmi (2005); OECD (2010b); Stanovich et al. (1998)	<p>The <i>amount of volume</i> read</p> <ul style="list-style-type: none"> • How much book reading they did • Extent of exposure to reading material • Diversity of reading materials

The present study defines reading habit as, according to the framework of PISA 2009 and previous studies: (1) The frequency of engaging in reading/literary activities; (2) The amount of time spent on out-of-school reading; and (3) The amount of reading resources exposure. Therefore the questions of TASA survey regarding the students' reading habits include: (1) How often the students go to the libraries, book fairs, or bookstores; (2) How much time per week the students spend on outside reading after school; and (3) How many books (textbook and reference book are not included) do students have at home.

2.1.2 Learning Strategies

The term "learning strategy" can be used to refer to any behavior or plan used to obtain, retain, search for or use information (Wenden & Rubin, 1987). Different classification systems that scholars have proposed in relation to the definition of learning can be divided into four basic approaches: (1) Cognition, meta-cognition and resource management strategy (Pokay & Blumenfeld, 1990); (2) Cognition, meta-cognition and motivation (Mayer, 1998); (3) Cognitive adjustment and volitional control (Pintrich & DeGroot, 1990); (4) Cognition, meta-cognition, motivation and behavior strategies (Lee & Shute, 2010).

Cognitive strategies are techniques that help the learner to implement internalization and complete complex tasks; they include techniques frequently used in learning such as summarizing, application, deduction, inspection, practice, organization and elaboration (Lee & Shute, 2010). Mega-cognitive strategies involve the learner being able to identify, monitor and evaluate the strengths and weaknesses of the cognitive processes that they have been employing; in other words, with meta-cognition the learner determines when, where, why and how to adopt appropriate strategies for solving problems (Hattie, Biggs, & Purdie, 1996). The techniques that can be used to enhance meta-cognitive

strategies fall into four broad categories: (1) Knowing, and monitoring, what one is thinking; (2) Adjusting the nature of one's learning activities; (3) Reviewing those objectives that one has already achieved; (4) Evaluating how to achieve those goals that one has not yet realized (Cardell-Elawar, 1992).

In recent years, the outcomes of major international assessment programs have drawn more attention and become the change agent of education policy (Ritzen, 2013). The student background questionnaire of PISA, for instance, has given some attention to student learning strategies since the 2003 assessment, with learning strategies being divided into three basic concepts: Memory strategies, elaboration strategies, and control strategies (Table 2). Taking PISA 2003 which focused on mathematics for example, the learning strategy questions included in the background questionnaire asked respondents whether they make use of repeated practice to help them solve mathematics problems (Table 1). The present study employs data from the TASA database collected through TASA background questionnaire framework, and therefore focuses on the use of three types of cognitive and meta-cognitive strategies, involving *memory*, *control*, and *elaboration*. Students making use of memory strategy remember the learning content without processing the information further. Students using control strategy are aware of the key points of learning content or aware of whether they can catch up the points. Whereas, students who are able to elaboration means they applies the knowledge they learnt to other subjects or situations. Thus the three strategies are considered hierarchical with memory as the basic strategy.

2.2 Gender, Reading Habit and Learning Strategies

A gender difference in student learning outcomes was found in large-scale assessments such as PISA since the turn of the new century. With a focus on reading

Table 2 Questions Regarding Learning Strategies in PISA

Memory Strategies
Memory strategies refer to the memory of text and contents in all their details and repeated reading.
Items of the index of memory strategies
When I study, I try to memorize everything that is covered in the text.
When I study, I try to memorize as many details as possible.
When I study, I read the text so many times that I can recite it.
When I study, I read the text over and over again.
Control Strategies
Control strategies mean to formulate control questions about the purpose of a task or a text and its main concepts. It also means to self-supervised current study activities, particularly whether the reading material was understood.
Items of the index of Control Strategies
When I study, I start by figuring out what exactly I need to learn.
When I study, I check if I understand what I have read.
When I study, I try to figure out which concepts I still haven't really understood.
When I study, I make sure that I remember the most important points in the text.
When I study and I don't understand something, I look for additional information to clarify this.
Elaboration Strategies
Elaboration Strategies refer to the transfer of new information to prior knowledge, out-of-school context and personal experiences.
Items of the index of Elaboration Strategies
When I study, I try to relate new information to prior knowledge acquired in other subject.
When I study, I figure out how the information might be useful outside school.
When I study, I try to understand the material better by relating it to my own experiences.
When I study, I figure out how the text information fits in with what happens in real life.

Source: OECD (2010a)

proficiency, the results of PISA 2009 showed that girls outperform boys in reading in all participated countries, with an average advantage of 39 PISA score points (OECD, 2010a, 2010c). According to OECD, the difference is over half a proficiency level and roughly the equivalent of an average school year's progress. The results revealed the gender gap in reading performance of Taiwan (Chinese Taipei) students; girls outperform boys by an average of 37 score points (514 vs. 477) (OECD, 2010a). Although PISA does not measure causation, it suggests that most of the gender gap can be explained by boys being less engaged in reading than girls (OECD, 2010b). PISA 2009 reported that the gap "could be predicted to shrink by 14 points if boy approached learning as positively as girls, and by over 20 points if they were as engaged as girls" (OECD, 2010b, p. 13).

In addition, PISA also revealed another gender disparity in students' preference in reading materials. Girls are found more likely than boys to read fiction and magazines, whilst more boys choose to read newspapers regularly. 27% of boys report that they are keen comic readers while only 18% of girls do so. In fact, a study conducted by Ku (2005) in Taiwan observed consistent findings. Ku examined 3rd to 6th grade primary school children's reading motivation and habits in the Southern region of Taiwan. She found

that pupils averagely spend less than one hour per day on reading, and that the average frequency girls participated in literacy activities (such as outside reading, journal-writing, visiting libraries) is higher than the frequency of boys. In addition, girls tend to read more fiction and materials in Arts and Language, whereas boys prefer comics and materials about Science, Sports, and History, which are of less continuous texts and of more graphical abstract or tables.

As to the concern of gender differences in the utilizing of learning strategies, some researchers have addressed the issue along with the main findings. Lin (2007) explored the relationship between junior high school students' learning motivation with respect to mathematics, their learning strategies for mathematics, and their scholastic achievement in mathematics, and found a significant positive correlation between learning strategies and scholastic achievement in this subject ($r = 0.593$, $p < .01$, $N = 837$). This study also found no significant disparities between male and female students in terms of the learning strategies used for mathematics. Wei and Huang (2009) examined the relationship between the learning strategies and scholastic achievement of first-year university students. Their results showed a correlation between superior academic

performance and the adoption of superior learning strategies. They also found that female first-year university students made more effective use of learning strategies than their male counterparts, particularly in terms of attitude, motivation, time management, learning support techniques and overcoming challenges to learning.

Given a review of gender differences in reading and learning strategies, the concern that whether the TASA data indicate a similar result, that is, there are gender differences in reading habit and the use of learning strategies of Taiwanese secondary students, will be addressed in this study.

2.3 Reading Habit, Learning Strategies, and Student Achievement

There are several studies indicated the relationship between reading habit and students' literacy or academic achievement. A longitudinal study was conducted by Leppänen et al. (2005) to follow Finnish children from 1st to 2nd grade of primary school. Their study shows that children's reading habit, i.e., the amount of reading outside school, is highly correlated with their literacy performance and skills, including word recognition, word level analysis, and sentence comprehension. The study of Benevides and Peterson (2010) provides consistent result that avid readers have higher achievement in reading comprehension and writing. In addition, researchers have also found a link between reading competence and subject matter achievement. Low achievement in mathematics is found related to reading difficulties and disability (Jordan, Hanich, & Kaplan, 2003; Kulak, 1993). On the other hand, it is demonstrated that reading competencies can predict the outcome of natural science achievements (including physics, chemistry, biology, and practical work) (Bulcock, Clifton, & Beebe, 1978).

Empirical studies have also pointed out the existence of the relationship between learning strategies and academic performance. Pintrich and DeGroot (1990) found a positive correlation between the practice, elaboration and organization strategies used by 7th grade students and their performance in reading and natural science ($r = 0.20$, $p < .01$, $N = 173$). Wolters (1999) found that in the case of 9th grade and 10th grade students, there was a significant correlation between utilization of the practice strategy and scholastic performance ($r = 0.30$, $p < .01$, $N = 88$). A study by Eshel and Kohavi (2003) found a positive correlation between students' use of cognitive strategies involving organization and practice and their academic achievement ($r = 0.24$, $p < .01$, $N = 320$). In a recent study, Chou et al. (2011) also found a significant positive correlation between senior high school students' self-efficacy with respect to English, their English learning strategies, and their learning achievement with respect to English.

In the framework of PISA 2009, both reading engagement and learning strategies are included as predict variables of students' achievement. The PISA 2009 result showed that both reading engagement and learning strategies are predictors of the students' reading performance (OECD, 2010b). In addition to investigating the respective relationship between reading performance and the two variables, however, there was no further analysis done in the report that which factor can better predict student achievement or any relation between reading engagement and learning strategies.

Yet there are a few studies conducted to explore the relationship between reading habit and learning strategies. In their research in the impact of reading instructions on pupils' literacy engagement, Guthrie et al. (1996) found that there is a positive correlation between pupils' motivation in literacy engagement and their development in higher level learning strategies, such as understanding, interpreting, summarizing, and applying. They also found that those who engage inactively in reading have little or none development in learning strategies. In a study of investigating the possible effect of strategy instructions on university EFL students' reading strategy and reading comprehension, Salataci and Akyel (2002) found that during the process of enhancing reading strategies, reading engagement and strategies can influence each other. That is, exposure to reading enhances students' reading strategies, whilst their utilizing strategies improving their reading comprehension and therefore their active reading engagement. When examining French primary school children's knowledge of meta-cognitive learning strategies (such as monitoring or evaluating comprehension), Eme, Puustinen, and Coutelet (2006) found that those children who are aware and able to apply meta-cognitive strategies are highly confident in comprehension task and literacy acquisition.

Although studies have found that reading habit and learning strategies are both predictors of learning achievement or have effect on learning, there are relatively few researches in the relationship between the two variables and even among reading habit, strategies, and academic performance. Thus the present study aims to explore the possible link of the three aspects and whether reading habit and learning strategies have an impact on each other bi-directionally.

3 Method

Using the data collected through TASA 2010, this study explores the possible relationships among variables of secondary school students' gender, reading habit, learning strategies, and academic performance. Details of

the participants, measures, and analysis procedure are as follows.

3.1 Participants

The 8th grade student data for TASA 2010 was collected using two-stage random sampling. The first stage made use of stratified-cluster sampling, while the second stage used simple random sampling of the individual students at the schools selected in the first stage. To avoid causing students too much stress and exhaustion (because of the relatively long length of the tests), each individual student was tested in only two of the subjects applicable to their grade, for example Chinese and Mathematics, or Chinese and Natural Science, or Mathematics and Natural Science, etc. Based on the data for 8th grade students included in the TASA database, the number of students taking the TASA test in each of the five subjects can be determined to have been as shown in Table 3 below.

3.2 Measures

Three questions related to reading habit in 2010 TASA common questionnaires are selected, the outcomes of which are then compared with student achievement in five academic subjects. The first question asks students how often do they go to a library, surf a bookstore, or attend a book fair. The second question asks how much time do students usually spend on outside-reading after school during weekdays. The third question asks students how many books (textbook and reference book are not included) do students have. Therefore the constructs of measuring reading engagement and habit in this study are (1) Frequency of participating in reading activity; (2) Time spent on out-of-school reading; and (3) Exposure amount of outside reading resources.

The learning strategies related questions from the TASA 2010 student questionnaire that displayed similarity to the learning strategy related questions included in PISA 2009 were identified and collated. Memory strategy refers to the memory of text and contents in all their details and repeated reading. It is composed of 4 items and an example of question is “When I study, I try to memorize everything that is covered in the text. Control strategy mean to formulate control questions about the purpose of a task or a

text and its main concepts. It also means to self-supervised current study activities, particularly whether the reading material was understood. It is composed of 5 items and an example of question is “When I study, I start by figuring out what exactly I need to learn.” Elaboration Strategy refers to the transfer of new information to prior knowledge, out of school context and personal experiences. It is composed of 4 items and an example of question is “When I study, I try to relate new information to prior knowledge acquired in other subject.”

By summing together the students’ selected responses for each question and then dividing by the total number of questions, four scores can be obtained for each student for reading habit, memory strategy, control strategy and elaboration strategy respectively.

3.3 Procedure

The data used in this study comprises the TASA 2010 student questionnaire questions and the students’ responses to these questions. For the student responses in TASA 2010, the three-parameter logistical item response theory model was used, with Bilog-MG software used to obtain measurements of students’ academic performance (mean value = 250; standard deviation = 50) (TASA, 2014). With regard to questionnaire data reliability, Cronbach’s Alpha was calculated as a means of examining the internal consistency. As regards validity, the structural equation model (SEM) was employed to verify the theoretical framework of learning strategy; the software used for this was Mplus 6.0. Finally, SPSS 17 was used to perform the regression analysis and T-test, to explore the relationship between a dependent variable (academic performance of each subject) and independent variables(reading habit and learning strategies), and whether there is any significant difference relating to different background variables.

4. Results and Discussion

4.1 Preliminary Analysis

The TASA 2010 background questionnaire for 8th grade students included 3 questions relating to reading habit and 10 questions relating to learning strategies. The reliability index for the reading habit is 0.94, indicating a high degree of internal reliability within the reading habit questionnaires. The content validity for reading habit has been proofed by domain experts with extensive discussions.

Since the learning strategies related questions from the TASA 2010 are similar with the learning strategy related questions included in PISA 2009, the internal reliability and validity of the learning strategies for TASA 2010 were retested. The reliability index for the learning strategy is 0.88 and the sub-scale (memory, control, and elaboration) reliability index was 0.72 or higher in all cases. In general,

Table 3 No. of Participants Tested in Each Subject in TASA 2010

Subject	No. of participants
Chinese	8,658
Mathematics	8,034
Natural Science	8,289
Social	8,260
English	8,247

values reflected a high degree of internal reliability within the learning strategies questionnaires.

Taking the PISA2009 learning strategy theoretical framework as the foundation, confirmatory factor analysis is implemented with respect to the TASA 2010 learning strategy theoretical framework outlined in Figure 2. In the term of the model fit index, the present study followed PISA 2009 in using the root mean square error of approximation (RMSEA), the standardized root mean square residual (Standardized RMR), and the comparative fit index (CFI) (OECD, 2010a). All five subjects had a CFI value of .95 or higher, and in all cases the RMSEA and SRMR values were lower than .05. For all five subjects, the factor loading is .4 or higher. The results of confirmatory factor analysis indicated that the learning strategy framework for all five subjects confirmed to the PISA learning strategy theoretical framework, and that the questionnaire used in the present study displays a high level of validity.

4.2 The Reading Habit Adopted by Male and Female 8th Grade Students

Table 4 showed the analysis of disparity in reading habit in terms of gender; the scores obtained by female students for the frequency of participating in reading activity ($t = -10.71, p < .001$), for the time spent on out-of-school reading ($t = -10.69, p < .001$), and for exposure amount of outside reading resources were significantly higher than the corresponding scores for male students. For overall, female students outperformed male students in terms of reading habit ($t = -11.44, p < .001$).

The results indicated that the 8th grade female students are more engaged in reading in terms of participating literacy activities and spending time on reading after school, which echo the findings of Ku's (2005) study and the results of PISA since 2000 to 2009. What can not be further investigated in the present study is the gender disparity in students' preference of reading materials and

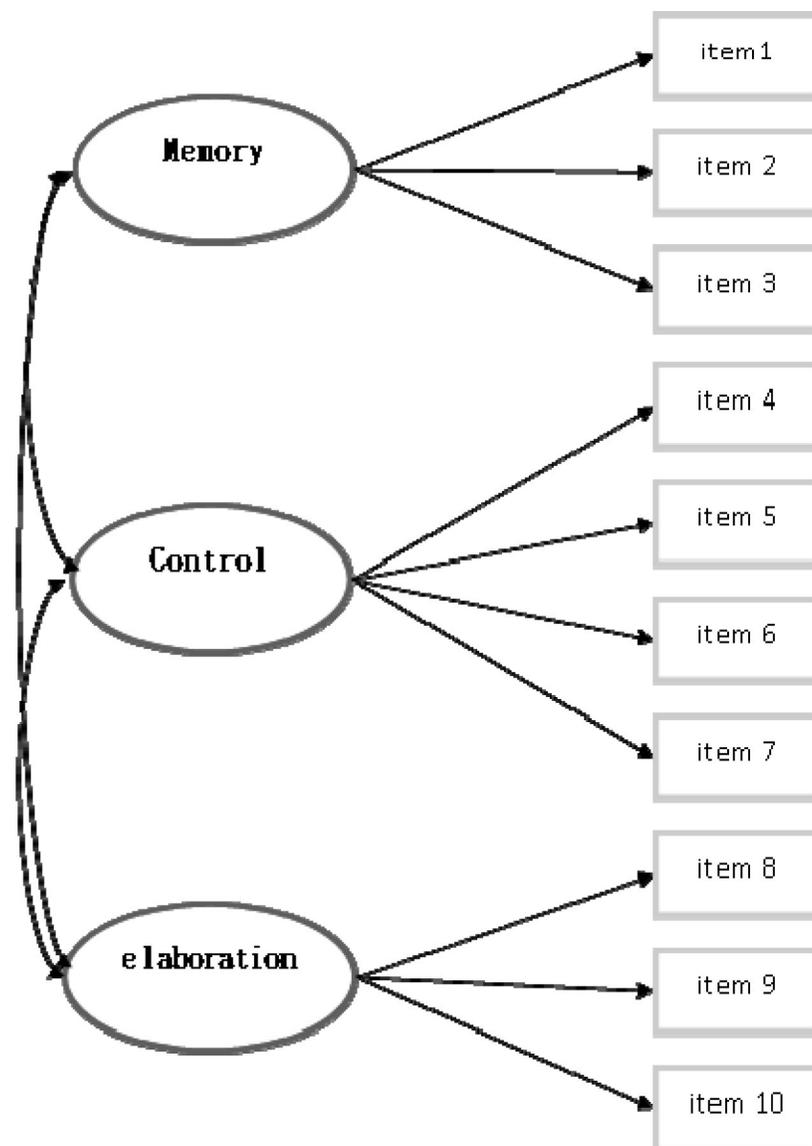


Figure 2 TASA 2010 Learning Strategy Theoretical Framework

Table 4 Results of Gender Difference in Reading Habit

Construct	Group	Number	Mean	S.D.	T-test
Frequency of participating in reading activity	Male	4,530	1.89	0.63	-10.71*
	Female	4,114	2.04	0.68	
Time spent on out-of-school reading	Male	4,481	2.31	1.11	-10.69*
	Female	4,083	2.57	1.13	
Amount of outside reading resources	Male	4,525	2.80	1.32	-5.05*
	Female	4,109	2.94	1.28	
Reading habit	Male	4,476	2.33	0.76	-11.44*
	Female	4,078	2.51	0.71	

Note: * represented $p < .001$.

types of reading, which is also found related to student academic performance. In addition, whether the gender gap in reading habit has been increased and reading engagement level among males has reduced, as reported in PISA, can be an interesting issue for further exploration by comparing released TASA data from 2008 to 2010.

4.3 The Learning Strategy Adopted by Male and Female 8th Grade Students

Table 5 showed the analysis of disparity in learning strategy in terms of gender. The data in Table 4 showed that the scores obtained by female students for the memory strategy ($t = -14.64, p < .001$) and for the control strategy ($t = -7.37, p < .001$) are significantly higher than the corresponding scores for male students, while for the elaboration strategy male students have a higher average score than female students, but not significantly.

The results indicated that 8th grade female students are better than male students in the same age group at using memory and control strategies for learning. This finding is not in conformity with the results obtained in Lin (2007), who found that there was no significant difference between the learning strategies used by male students and female students at junior high school level. One possible explanation for the difference in the studies' findings is that Lin defined learning strategies as including time management, information processing, reading comprehension, problem-solving, test-taking strategies and attitude to learning, which is a different definition from that used in the present study. A further possible explanation is that Lin's sample consisted mainly of students from junior high schools in New Taipei City (formerly Taipei County) in North Taiwan; the sample did not cover the whole of Taiwan, and so it is questionable how representative the sample was of students in Taiwan as a whole. The findings of the present study in relation to gender-based differences in learning strategy echo those of Wei and Huang (2009), who found that female first-year college students displayed more effective use of problem-solving as a learning

strategy than male first-year college students; the definition of problem-solving as a learning strategy used by Wei and Huang was similar to the definition of the control strategy used in the present study. However, as the Wei and Huang study examined college students, the results cannot be compared directly with the present study's findings.

4.4 The Relationship among Learning Strategies and Reading Habit

Table 6 presented the correlations among reading habit and learning strategies with Pearson correlation coefficient. Table 5 indicated that the reading habit and memory strategy, control strategy, and elaboration strategy respectively were significant moderately correlated. This finding is consistent with the results obtained in Salataci and Akyel (2002). The study indicated that reading engagement and strategies can influence each other during the process of enhancing learning strategies. In other words, exposure to reading fosters students' reading strategies, whilst approaching reading with more strategies raise their motivation for engaging in reading. As the present study analyzed the data of large-scale database, the results can only reveal the positive correlation between reading habit and learning strategies. The process of how these two variables influence learning outcomes still needs to be investigated.

4.5 The Relationship among Reading Habit, Learning Strategies, and Learning Outcomes

The present study used step-wise regression analysis to explore the relationship among reading habit, the three types of learning strategy -- Memory, control and elaboration -- And academic performance in each subject. The study took reading habit, memory strategy, control strategy and elaboration strategy as the predictor variables, and the assessment scores for learning achievement in each subject as the dependent variable. The regression analysis results were shown in Table 6 and Table 7.

Table 5 Results of Gender Difference in Learning Strategy

Construct	Group	Number	Mean	S.D.	T-test
Memory	Male	4,490	2.24	0.78	-14.64*
	Female	4,094	2.48	0.75	
Control	Male	4,476	2.71	0.63	-7.37*
	Female	4,086	2.79	0.53	
Elaboration	Male	4,471	2.41	0.77	1.77
	Female	4,084	2.38	0.71	

Note: * represented $p < .001$

Table 6 Correlation for Reading Habit and Learning Strategies

	Memory	Control	Elaboration
Reading habit	0.34*	0.34*	0.34*

Note: * represented $p < .001$

In the case of Chinese (Table 7), the reading habit, memory strategy and control strategy proved to be most able to predict learning performance in Chinese, with R-square of .24, indicating that 24% of the variation in Chinese performance could be explained by the reading habit, memory strategy and control strategy. The standardized coefficient of the reading habit was higher than that of the memory and control strategies (at .25 for the reading habit, .21 for the memory strategy, and .20 for the control strategy respectively). It indicated that reading habit could effectively predict performance in Chinese. This result is consistent with the findings obtained in previous research such as Leppänen et al. (2005), Benevides et al. (2010), and PISA 2009 (OECD, 2010b), which all indicated that reading engagement is highly correlated with literacy competence.

With regard to Mathematics, the control strategy, reading habit, and memory strategy were best able to predict academic performance, with an R-square of .20, indicating that 20% of the variation in mathematics performance could be explained by the control strategy, reading habit, and memory strategy. The control strategy had the highest standardized coefficient (.23), suggesting that, in the case of mathematics, the better use students are able to make of the control strategy, the better their learning performance will be.

For Natural Science, the control strategy and memory strategy were best able to predict performance, with an R-square of .19, indicating that 19% of the variation in natural science performance could be explained by the control strategy and memory strategy. The control strategy had the highest standardized coefficient (.24), a similar result to that seen with mathematics.

In the case of Social, the reading habit, control strategy and memorization strategy were able to predict performance. However, with an R-square of .005,

indicating that almost 0% of the variation in social science performance could be explained by these independent variables. It showed that the reading habit, control strategy and memorization strategy could not effectively predict performance in Social.

For English, the memorization strategy, reading habit and control strategy were best able to predict performance, with an R-square of .23, indicating that 23% of the variation in English performance could be explained by the memorization strategy, reading habit and control strategy. The standardized coefficient of the memorization strategy (.25) was higher than that of reading habit (.23) and the control strategy (.17) respectively, indicating that, in the case of English, the better use students are able to make of the memory strategy, the better their performance will be.

Overall, reading habit and learning strategy could explain around 19 ~ 24% of the variation in students' scholastic performance. The report of PISA 2009 indicated that 18% of the variation in Taiwanese students' reading performance could be explained by the control strategy (OECD, 2010a). In the present study, the memory strategy was found to be an effective predictor of performance for all four subjects; here again, this is in conformity with the findings of PISA 2009, according to which every increase of one unit score in the use of the memory strategy by Taiwanese students was accompanied by a 20.7 point improvement in reading performance (OECD, 2010a). As the scoring scales used in PISA and TASA are different, the regression model data from the two projects cannot be compared directly. Nevertheless, it does appear that both the results obtained in both PISA and TASA indicated that use of the memory strategy by Taiwanese students helps to improve their academic performance. The memory strategy and control strategy appeared to be more able to predict performance for arts and humanities subjects such as Chinese, and English, while for Science subjects such

Table 7 Results of Regression for Reading Habit and Learning Strategies on Academic Performance

subject	Independent variable	Standardized coefficient	R-square
Chinese	Reading habit	.25	.24
	Memory	.21	
	Control	.20	
	Elaboration	-0.04	
Mathematics	Control	.23	.20
	Reading habit	.17	
	Memory	.17	
Natural science	Control	.24	.19
	Memory	.19	
	Reading habit	.05	
	Elaboration	.05	
Social	Reading habit	.05	.005
	Elaboration	-.13	
	Memory	.09	
English	Memory	.25	.23
	Reading habit	.23	
	Control	.17	
	Elaboration	-.04	

as Mathematics and Natural Science, the control strategy is the best predictor of performance. The finding that the control strategy can function as an effective predictor of performance across all subjects is in conformity with the results of PISA 2009, which found that 18% of the variation in the reading performance of Taiwanese students could be explained by the control strategy, a figure surpassed only by South Korea (with 19%). The disparity between the performance of those Taiwanese students who made good use of the control strategy and those who made poor use of this strategy was 90 points (the average PISA score is 500 points, with standard variation of 100 points) (OECD, 2010a).

The results presented in Table 6 also show that reading habit is less able to predict the performance in Science and Social study, with both standardized coefficient of .05. By comparison, the standardized coefficients of reading habit for Chinese (.25), English (.20), and Mathematics (.17) indicate that reading habit is a stronger predictor of Language subjects and Mathematics. The result that reading habit is highly correlated with Language subject performance echoes previous research findings, nevertheless, observed inconsistently in the relation with Science and Math, which can be further explored.

The present study found that the elaboration strategy was not particularly effective as a predictor of academic performance; This result is not consistent with the results

obtained in PISA 2009, which found that 10% of the variation in Taiwanese students' reading performance could be explained by the use of the elaboration strategy, a higher percentage than for any of the other countries assessed (OECD, 2010a). This disparity may be due to the fact that the TASA evaluation content focuses mainly on academic performance in individual subjects, whereas the elaboration strategy relates to students' ability to apply knowledge to different scenarios or subjects; this may make the elaboration strategy less effective as a predictor for TASA.

5 Conclusion

TASA constitutes an important database for gaining a better understanding of the academic performance of Taiwan's schoolchildren. The present study used the TASA 2010 database to examine reading habit and learning strategies utilization by 8th grade students in Taiwan, as well as the disparities in reading habit and learning strategy utilization between male and female students, and to analyze the relationship among reading habit, learning strategies and academic performance. On the basis of the results outlined above, the following conclusions are drawn, and a number of suggestions are put forward.

First, this study found that the 8th grade female students are more engagement in reading than male students. Girls participated in literacy activities more frequently and spend

more time on reading after school during weekdays (Boys spend 2.33 hr.; Girls, 2.51 hr.). The amount of exposing to outside reading resources is also higher than the boys. Therefore raising reading engagement level among Taiwan male students is becoming one of the main concerns for improving learning and academic performance.

Second, this study found that the 8th grade female students make better use of the memorization strategy and control strategy than 8th grade male students. The results obtained in the present study showed that, of the three types of learning strategy, girls had significantly better scores than boys in both the memorization strategy and control strategy. This result was found consistently across all five subjects: Chinese, mathematics, natural science, social studies and English, showing clearly that female 8th grade students in Taiwan make more effective use of the memorization strategy and control strategy than boys the same age.

Third, the results of this study revealed that there is a positive correlation exists between reading habit and the three types of learning strategy. This means reading and using strategies in learning may influence each other; with more exposure to reading students' awareness of learning strategies may be raised and therefore increase reading comprehension, which leads to higher motivation in reading engagement. As a consequence, it is suggested in this study that teachers could enhance students' knowledge in applying different learning strategies when teaching reading, and at the same time encourage students' regular reading engagement for enjoyment.

Finally, with step-wise regression analysis, this study explored the relationship among reading habit, the three types of learning strategy, and academic performance in 5 subjects. The result revealed that reading habit and learning strategies can explain 19 ~ 23% of the variation in learning achievement, except which in Social studies. The effect size of the results obtained in this study is higher than the results of PISA 2009. Overall, memory strategy can predict most effectively learning achievement, which shows that Taiwan students may still depend much on using memory in learning, or the questions of the assessment in TASA require memory strategy. When concerning learning filed, control strategy can predict Science and Math performance most effectively, and memory and reading habit are both strong predictors of learning achievements in Chinese and English. Notably, in contrast to the findings of PISA 2009, the results in this study revealed that higher level learning strategy (e.g., control and elaboration) can hardly predict the achievement of Taiwan students, which may mean that the 8th grade students have not develop the skills of or even awareness of those higher level strategies. Therefore it is a

salient aspect that how students can develop their awareness and skills in applying different levels of learning strategies through their classroom learning. In addition, TASA should develop questions relevant to the use of learning strategies in the subject assessments to lead the teaching and learning in schools.

Given the summary and discussion of the results, this study proposes some suggestions in regard to teacher instruction, student learning and education policy. Due to the significant correlation between reading habit and academic achievement found in previous research as well as this study, the gender gap in reading habit is worth more attention of effective ways to increase male students' reading interest at school or at home. In addition to improving reading engagement level, the types of reading materials and contents should also be considered in facilitating students' learning in reading. The TASA survey should also include relevant questions concerning preference of reading materials other than the current ones on reading time amount and frequency, so that the teachers, parents and communities have ideas of how to help building students' reading habit.

To enhance the students' learning achievement by utilizing learning strategies, teachers should provide students guidance in identifying key points of learning content, methods of summarizing, or ways of tracing learning process, and offer the students the opportunity to solve problem and make their own learning (Cremin, Burnard, & Craft, 2006). In addition to learning guidance, students should also be provided with individual consultation regarding learning strategies, whilst teachers should be provided with training courses in effective teaching of learning strategies. Again, the questions in TASA assessments should reflect the learning trend and need of incorporating learning strategies into teaching and learning. For instance, the five subject assessments can involve real-life context questions to know whether students can apply knowledge in problem-solving or in learning other subjects.

Each student may have different learning needs, which should be reflected through teaching, assessment, and learning resources (OECD, 2010c). This study examined the gender gap of reading habit and learning strategy utilization, and the relationships among reading habit, learning strategies, and academic achievement. The results provide teachers and parent a better understanding of Taiwan students' learning needs and their performance by comparing to the findings of international studies. The suggestions proposed in this study may also help school leaders and policy makers in Taiwan more aware of strategies for improving quality in teaching, learning resources and education policies.

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