



Factor structure and predictive utility of the 2×2 achievement goal model in a sample of Taiwan students

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ABSTRACT

This study examined structure and predictive utility of the 2×2 achievement goal model among Taiwan pre-university school students (ages 10 to 16) who learned Chinese language arts. The confirmatory factor analyses of Achievement Goal Questionnaire—Chinese version provided good fitting between the factorial and dimensional structures with the data. The mastery-avoidance goals are distinctive perceived by Taiwan students but do not mediate between self-efficacy and Chinese performance while other three achievement goals are effective mediators. When examining the mediating effects of the dimensional goal structure, the approach-avoidance factors along the valence dimension seemed to be more successful than the mastery-performance factors along the definition dimension. Taken together, our data strongly supports that AGQ-C is a reliable and valid measure for the 2×2 achievement goals.

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1. Introduction

The past three decades have witnessed a strong effort to analyze achievement goals both theoretically and empirically (e.g., Nicholls, 1984; Elliot & Church, 1997; Ingles et al., 2011). Elliot and McGregor (2001) and Elliot and Murayama (2008) posit that a given achievement goal is thought to contain components from two independent competence dimensions: mastery versus performance and approach versus avoidance. Elliot and McGregor (2001) developed a 2×2 achievement goal framework with four achievement goals: mastery-approach, performance-approach, mastery-avoidance and performance-avoidance. Exploring the hierarchical model of achievement goals, Elliot et al. (Elliot & Church, 1997; Elliot & McGregor, 2001; Elliot & Murayama, 2008) found achievement goals, a mid-level construct, situated between general motivation (e.g., competence-relevant motives) and specific academic behaviors (e.g. learning outcome).

However, to our knowledge research on the 2×2 achievement goal model is still insufficient in two aspects. First, the factorial and dimensional structure of the 2×2 achievement goal model has only been tested in samples of American university students (e.g., Elliot & McGregor, 2001; Elliot & Murayama, 2008; Murayama, Zhou & Nesbit, 2009). Second, the utility of 2×2 achievement goals of highly pressure learning in nonwestern pre-university levels has rarely been established. Learning Chinese is critical for students in Taiwan to

prepare for highly competitive entrance examination and to become a well functioning citizen, so we decided to examine achievement goals in learning Chinese.

We also tested the predictive utility of the 2×2 achievement goals (with factorial and dimensional structures) that was viewed as the intermediate variables between a motive of competence expectancy (self-efficacy, Bandura, 1993) and an academic outcome (Chinese learning performance). On the one hand, Wigfield (1994) suggests that if goals are conceptualized in a narrower fashion (i.e., goals for engaging in a specific academic task as conceptualized by achievement goal theorists), then an individual's self-efficacy should have direct influences on their achievement goals. On the other hand, Chinese is the dominant language of Taiwan; we believe students have accumulated substantial learning experiences and thus formed self-efficacy and achievement goals in this domain.

2. Literature review

2.1. Achievement goals

In the 2×2 achievement goal framework (Elliot, 1999; Elliot & McGregor, 2001; Elliot & Murayama, 2008), performance-approach goals emphasize the demonstration of competency in relation to others; performance-avoidance goals focus on avoiding unfavorable judgments of competency; mastery-approach goals focus on developing knowledge and skills; mastery-avoidance goals, the least addition to achievement goal literature (Elliot, 1999; Pintrich, 2000), focus on avoiding the loss of one's skills, abilities, or knowledge. Elliot and Murayama (2008) suggest that mastery-avoidance goals seem to emerge from both positive sources of

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motivation (the need for achievement) and negative sources of motivation (fear of failure) and summarize that the overall effect of mastery avoidance goals remains vague.

Elliot and McGregor (2001) developed a 12-item Achievement Goal Questionnaire (AGQ). Elliot and McGregor (2001) and Elliot and Murayama (2008) have provided evidence to support the first-order factor structure and second-order dimensional structure (the valence dimension, mastery versus performance, is crossed with the definition dimension, approach versus avoidance, resulting in a second-order structure) of the 2×2 achievement goal model in samples of American university students.

2.2. Self-efficacy and achievement goals

Bandura (1986) defines self-efficacy as “people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances” (p. 391). Bandura (1986) and Schunk (1990) claim that students having low self-efficacy are more likely to form avoidance goals and spend limited effort while those perceiving themselves efficacious tend to form approach goals and participate in tasks at which they can succeed. Similarly, Elliot’s (1999) hierarchical model of achievement motivation suggests that self- and competence-based variables exert a direct effect on achievement goals, which in turn serve as a proximal precursor to achievement-related processes and outcomes. Pajares, Britner, and Valiante (2000) and Liem, Lau, and Nie (2008) find positive associations between self-efficacy and mastery-based goals and self-efficacy and performance-approach goals, but a negative association between self-efficacy and performance-avoidance goals with American and Singaporean secondary school student data.

2.3. Achievement goals and academic performance

Researchers consistently find performance-approach goals as positive predictors of academic performance whereas performance-avoidance goals are negative predictors of academic performance in college (Elliot & Church, 1997; Elliot & McGregor, 2001; Pintrich, Conley & Kempler, 2003) and in secondary school students (Cury et al., 2006). No effect of mastery-avoidance goals on academic performance is found by Elliot and McGregor (2001) in a group of American college students.

Results on the effects of mastery-approach goals on academic performance have been mixed, with Elliot and Church (1997), Elliot and McGregor (2001) and Elliot and Murayama (2008) reporting that college students’ mastery-approach goals have no significant effect on graded performance. In contrast, studies of middle and high school students show a positive relationship between mastery-approach goals and academic performance in various academic subjects (e.g., Cury et al., 2006; Chan, 2008; Kaplan, Lichtinger, & Gorodetsky, 2009). In a study of Taiwan sixth graders’ achievement goals and grades, Shih (2005) also indicates that both mastery-based goals and performance-approach goals had positive impacts on academic grades.

2.4. The present study

The present study tested the measurement properties of Chinese translation of AGQ (Elliot & McGregor, 2001) and the predictive utility of the first-order and second-order 2×2 achievement goal models with Taiwanese pre-university students. Confirmatory factor analytic techniques were adopted to examine the proposed factorial structure (4 first-order factors) and dimensional structure (first-order latent variables: 4 achievement goals; second-order latent variables: 4 factors of two competence dimensions). Moreover, we investigated the predictive utility of 2×2 achievement framework based on the first-order factor structure assuming that four goals are mediators between Chinese self-efficacy and Chinese performance. We also

investigated the predictive utility based on second-order achievement goals assuming that the four factors of the valence and definition dimensions are effective mediators. It was expected that both the first-order (factorial) 2×2 achievement goals and the second-order (dimensional) achievement goals would mediate the relationship between self-efficacy and Chinese performance.

3. Method

3.1. Participants and procedure

The sample consisted of 3137 Taiwanese pre-university students (ages 10 to 16; 934 fifth graders, 29.8%; 1074 seventh graders, 34.2%; and 1129 tenth graders, 36%) which is a part of a national dataset. To form this dataset, schools were randomly selected from all counties of Taiwan and one class was randomly selected from each school. The self-efficacy questionnaire was administered during the first week (middle of the semester), and the achievement goal questionnaire was administered two weeks later. Chinese grades were obtained at the end of the semester. Firstly, we tested whether models were invariant across three school levels using multi-group analysis of Structural Equation Modeling. The result showed that CFI and NNFI changes between the unconstrained model, the lambda constrained model, and the regression path constrained model did not indicate a meaningful change. The two model fit indices were recommended by Cheung and Rensvold (2002) and Chen, Sousa, and West (2009). We concluded the use of pooled sample ($n = 3137$) for the test of the hypothetical models was adequate.

3.2. Instruments

3.2.1. Scales

We translated and modified AGQ (Elliot & McGregor, 2001) and self-efficacy subscale (Pintrich & DeGroot, 1990) into Chinese. We invited an education measurement expert to back-translate the two scales. Reliability coefficients for the four achievement goal subscales were from 0.89 to 0.81 respectively. A Confirmatory factor analysis (CFA) of Chinese Self-Efficacy Scale was conducted using LISREL 8.80. The result showed all factor loadings were pretty high (0.75–0.83, $p < 0.01$) and each fit statistic showed a fair model fit: $\chi^2_{(20, N = 3141)} = 511.03$ ($p < 0.01$); RMSEA = 0.088; CFI = 0.99; GFI = 0.96. The reliability coefficients were 0.90.

3.2.2. Chinese performance

Grades (representing overall performance in Chinese) were requested from the school districts’ official student-record system. The grades were converted into T scores based on each class norm.

4. Results

Descriptive statistics and correlation among variables are presented in Table 1.

4.1. Factorial structure of achievement goals

A CFA was used to test the first-order factorial structure and the results fairly supported the hypothetical model in which all factor loadings were pretty high (0.68 to 0.92, $p < 0.01$); RMSEA = 0.040, CFI = 0.99, and GFI = 0.97 met the criteria for a good fitting model. Our large sample size possibly caused a significant Chi-Square value ($\chi^2_{(48, N = 3137)} = 294.15$; $p < 0.01$).

4.2. Dimensional structure of achievement goals

A CFA was used to test the second-order dimensional structure and the results supported the hypothetical model (Fig. 1) because each fit

Table 1
Descriptive statistics, alpha coefficients of and zero order correlations among Chinese self-efficacy, achievement goals, and Chinese performance ($N = 3137$).

	M	SD	1	2	3	4	5	6
1. Chinese self-efficacy	3.05	0.89	(0.90)					
2. Mastery-approach goals	3.57	0.97	0.44**	(0.85)				
3. Mastery-avoidance goals	3.01	1.03	-0.02	0.33**	(0.85)			
4. Performance-approach goals	3.31	1.03	0.47**	0.59**	0.26**	(0.89)		
5. Performance-avoidance goals	2.88	1.04	-0.08**	0.09**	0.30**	0.18**	(0.81)	
6. Chinese performance	50.00	9.84	0.32**	0.27**	0.02	0.26**	-0.11**	-

Alpha coefficients of internal consistency are in parentheses.

** $p < 0.01$.

statistic met the criteria for a good fitting model: $\chi^2_{(48, N = 3137)} = 294.15$ ($p < 0.01$); RMSEA = 0.040; CFI = 0.99; GFI = 0.97. In addition, we found the path coefficients from the second-order factors to the first-order goals ranged from small (0.17) to large (0.98), all reached significant level.

The results of the hypothetical second-order model showed that in each pair of paths from a second-order latent factor to the respective first-order goals, the path coefficient disparity within the pair was very large. For example, the path coefficient of the avoidance factor to mastery-avoidance goals ($\lambda = 0.29$) was obviously smaller than the path of the avoidance factor to performance-avoidance goals ($\lambda = 0.98$). We examined the path coefficient invariance by setting the paths from a second-order factor to its two respective goals as equal (Table 2). To test the differences between two path coefficients, we posited 4 alternative models.

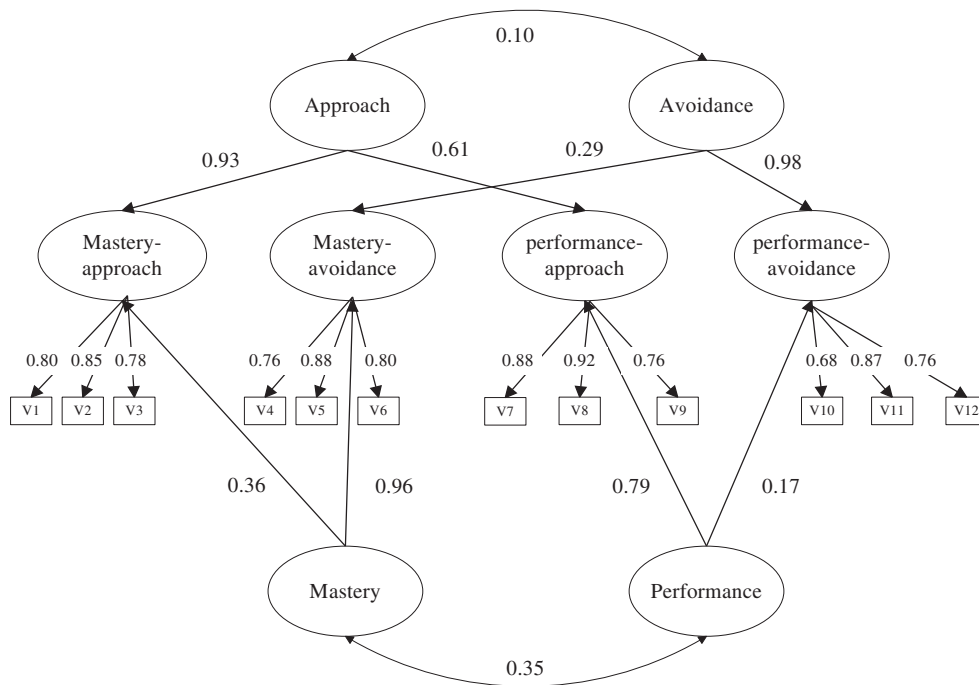
The results (Table 2) showed that the differences in chi-squares for the hypothetical second-order model and four constrained models ($\Delta\chi^2$ ($\Delta df = 1$) = 537.82, $p < 0.01$; $\Delta\chi^2$ ($\Delta df = 1$) = 1868.82; $p < 0.001$; $\Delta\chi^2$ ($\Delta df = 1$) = 1688.82, $p < 0.01$; $\Delta\chi^2$ ($\Delta df = 1$) = 780.15, $p < 0.01$) were all statistically significant. It indicated that, in Taiwan student sample, each pair of goals has nonequivalent contributions to the correspondent factors (Fig. 1). For the valence dimension, the

approach factor was mainly derived from the variance of mastery-approach goals (instead of from that of performance-approach goals) while the avoidance factor was mainly derived from the variance of performance-avoidance goals (instead of from that of mastery-avoidance goals). For the definition dimension, the mastery factor was principally derived from the variance of mastery-avoidance goals (instead of from that of mastery-approach goals); and the performance factor was mostly derived from the performance-approach goals (instead of from that of performance-avoidance goals).

4.3. Testing predictive utility of the first-order achievement goals

The proposed predictive model of first-order achievement goals speculated that four achievement goals would be effective mediators between the antecedent of Chinese self-efficacy and consequential Chinese performance. The fit indices were $\chi^2_{(125, N = 3137)} = 1452.63$ ($p < 0.01$); RMSEA = 0.058; CFI = 0.98; IFI = 0.98; GFI = 0.97, demonstrating a fairly acceptable fit between the model and data (Fig. 2).

Chinese self-efficacy was a positive predictor of mastery-approach goals and performance-approach goals which were in turn positive predictors of Chinese performance. Chinese self-efficacy was a negative predictor of performance-avoidance goals that was then a



$\chi^2_{(48, N = 3137)} = 294.15$ ($p < 0.01$), RMSEA = .040, CFI = .99, GFI = 0.97.

Fig. 1. The second-order measurement model of achievement goals – dimensional structure. Estimates are standardized. All coefficients are significant ($p < 0.01$). Error variables are not represented in order to simplify the presentation. V1 to V12 represent the individual items of the scale.

Table 2
Path coefficient invariance analyses of the constrained models nested under hypothetical second-order achievement goal model.

	χ^2 (df) p	$\Delta\chi^2$ (Δdf) p
The hypothetical second-order achievement goal model	294.15 (48) p=0.000	–
Constrained model 1 Set path _(approach to mastery-approach goals) = path _(approach to performance-approach goals)	831.97 (49) p=0.000	537.82 (1) p<0.01
Constrained model 2 Set path _(avoidance to mastery-avoidance goals) = path _(avoidance to performance-avoidance goals)	2162.23 (49) p=0.000	1868.08 (1) p<0.01
Constrained model 3 Set path _(mastery to mastery-approach goals) = path _(mastery to mastery-avoidance goals)	1074.30 (49) p=0.000	780.15 (1) p<0.01
Constrained model 4 Set path _(performance to performance-approach goals) = path _(mastery to performance-avoidance goals)	1982.71 (49) p=0.000	1688.56 (1) p<0.01

negative predictor of Chinese performance. Unexpectedly, no association was found between Chinese self-efficacy and mastery-avoidance goals while mastery-avoidance goals were negative predictors of Chinese performance.

4.4. Testing predictive utility of the second-order achievement goals

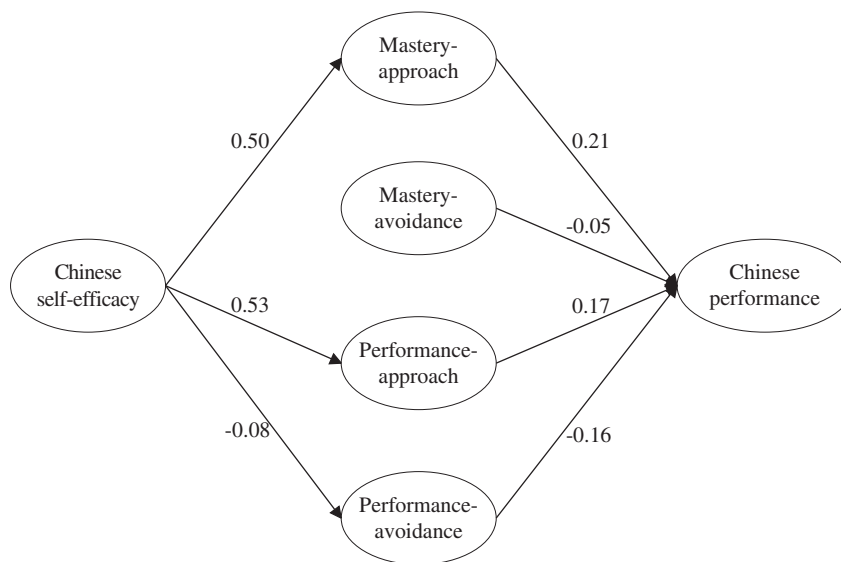
This model posited that the second-order factors would be successful mediators between Chinese self-efficacy and Chinese performance. The model fit indices (Fig. 3) were $\chi^2_{(124, N=3137)} = 1005.74$ ($p < 0.01$), RMSEA = 0.048, and CFI = 0.98; GFI = 0.96, demonstrating a fairly acceptable fit between the model and data.

Chinese self-efficacy was a positive predictor of the approach factor that was mainly derived from mastery-approach goals, and the approach factor was in turn a positive predictor of Chinese performance. Chinese self-efficacy was a negative predictor of the avoidance factor that was primarily derived from performance-avoidance goals, and the avoidance factor was sequentially a negative predictor of Chinese performance. Chinese self-efficacy was a positive predictor of the performance factor that was primarily derived from performance-approach goals, and the performance factor was in turn a positive predictor of Chinese performance. Finally, Chinese self-efficacy was not an effective predictor of the mastery factor that was mainly derived from mastery-avoidance goals, either the mastery factor was associated with Chinese performance.

5. Discussion

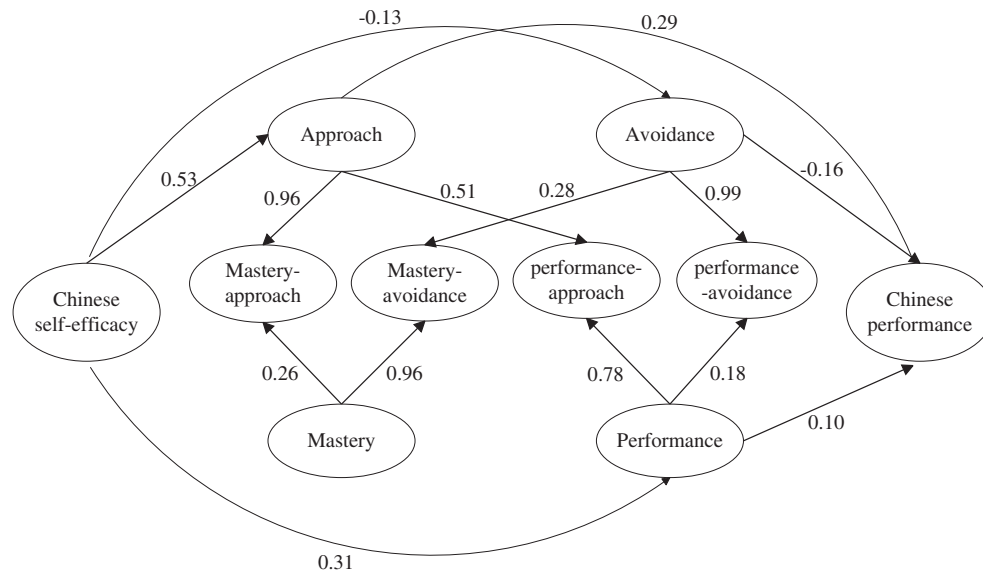
Our aim was to test the structural and predictive utility of a 2 × 2 achievement goal model measured by AGQ Chinese version in a non-western pre-university student sample. The results supported the factorial structure of AGQ-C and found that the four goals were distinct, perceived by Taiwanese students. Our results also supported the dimensional structure, indicating that in AGQ four achievement goals indeed represents a combination of two underlying competence dimensions, valence and definition. The above factor analytic results and the internal consistencies provide strong support for AGQ-C.

The results yielded that each pair of goals has nonequivalent contributions to the correspondent dimension factors. Taiwan students automatically regarded “approach” as performance-approach goals rather than mastery-approach goals. A possible reason was that Taiwanese students are socialized to value effort and to believe that hard-working facilitates outstanding attainment (Shih, 2005; Hwang, 2008). They recognized “avoidance” as performance-avoidance goals rather than mastery-avoidance goals. There appears to be widespread agreement that performance-avoidance goals are deleterious forms of regulation (Elliot & McGregor, 2001). Taiwanese students seem to perceive “performance” as performance-approach goals rather than performance-avoidance goals. They may predominantly consider “performance” as positively valenced as individuals actively trying to outperform others and demonstrating their competence. In contrast,



$\chi^2_{(125, N=3137)} = 1452.63$ ($p < 0.01$), RMSEA = .058, CFI = .98, GFI = 0.97.

Fig. 2. The structural model of factorial achievement goals with antecedent (Chinese self-efficacy), and learning outcome (Chinese performance). Estimates are standardized. All coefficients presented in the figure are significant ($p < 0.01$). Indicator variables and error variables are not represented in order to simplify the presentation.



$$\chi^2_{(124, N=3137)} = 1005.74 (p < .01), \text{RMSEA} = .048, \text{CFI} = .98, \text{GFI} = 0.96.$$

Fig. 3. The structural model of dimensional achievement goals with antecedent (Chinese self-efficacy) and learning outcome (Chinese performance). Estimates are standardized. All coefficients presented in the figure are significant ($p < .01$). Error variables are not represented in order to simplify the presentation.

Taiwan students surprisingly appear to instantly recognize “mastery” as mastery-avoidance goals rather than mastery-approach goals. Statistically, mastery-approach goals were connected with performance-approach goals to form a latent approach factor, but the variance of mastery-approach goals dominantly contribute to the approach factor. Taiwanese students may be lack of intrinsic motivation to strive for personal competence development.

In terms of predictive utility, Chinese self-efficacy was found to be the antecedent to achievement goals that was in turn the proximal predictors of Chinese performance. When the factorial structure was applied, Chinese self-efficacy had strong positive effects both on mastery-approach goals and performance-approach goals while it exerted a weak negative effect on performance-avoidance goals. The result was in line with previous studies about the effects of self-efficacy and achievement goals in the trichotomous achievement goal model (e.g., Liem et al., 2008; Pajares et al., 2000; Pintrich et al., 2003). Finally, we found that Chinese self-efficacy had no association with mastery-avoidance goals. It reveals that high as well as low self-efficacy people adopt mastery-avoidance goals sometimes. Elliot and Murayama (2008) suggest that mastery-avoidance goals could be strategic tools that are sometimes put to effective use by highly achievement-oriented individuals. We suspect that mastery-avoidance goals may be affected by some powerful external sources such as a classroom’s goal structure (Kaplan, Gheen, & Midgley, 2002). Goal structure describes the type of achievement goal emphasized by the prevailing instructional practices and policies within a classroom, school, or other learning environment (Wolters, 2004). Because mastery-avoidance goals are new additions to the model (Elliot & McGregor, 2001), further clarification of its conceptual definition and mediating effects between the other antecedents and learning outcomes is indeed necessary.

Regarding the predictive utility of the factorial goal structure on Chinese performance, mastery-approach and performance-approach goals were positive predictors of performance on the exam while mastery-avoidance goals and performance-avoidance goals were negative predictors. These results are in partial conflict with the findings of Elliot and McGregor (2001) and Elliot and Murayama (2008). They found that either mastery-approach or mastery-avoidance goals had significant effect on academic performance in western college students. The results of Cury et al. (2006) and Chan

(2008) investigation of the achievement goals of younger students were consistent with our results that suggest both mastery-approach goals and performance-approach goals were positive predictors of grades while performance-avoidance goals, negative predictors. Our results are also similar to Shih’s (2005) findings in Taiwan elementary school student samples indicating that both mastery-based goals and performance-approach goals had positive impacts on grades.

The results of examination of the mediating effects of four factors along two competence dimensions, our data showed that Chinese self-efficacy had strong positive effects on both the approach factor and the performance factor that in turn had positive proximal effects on Chinese performance. Self-efficacy had a negative effect on the avoidance factor that in turn had a negative effect on exam performance. These findings are in accordance with the claims of Social Cognitive theorists (Bandura, 1986, 1993; Bandura & Cervone, 1993; Schunk, 1990) that learners with high self-efficacy are more likely to form adaptive goals and consequently perform better. However, self-efficacy could not predict the mastery factor that in turn had no impact on Chinese performance possibly because the mastery factor was actually mildly negatively valenced (in our data the mastery factor were derived from mastery-avoidance goals). In terms of the mediating role between motivational antecedent and learning performance, approach-avoidance factors along the valence dimension seem to be more successful than mastery-performance factors along the definition dimension with regard to Chinese language acquisition.

In sum, the results confirm the structural validity and predictive utility, yield strong support for the AGQ-C, and also demonstrate cross-cultural generalizability of the 2×2 achievement goal framework to Taiwanese pre-university students in learning Chinese. The results suggested that approach-based goals (mastery-approach and performance-approach) and the approach factor were significant predictors of Chinese performance. Mastery-avoidance goals could not be predicted by self-efficacy, and in turn they had no effects on Chinese performance. The existence of mastery-avoidance goals was confirmed by Taiwan students though it is not associated with the precedent Chinese self efficacy or Chinese performance. The major limitation of this study was that Elliot and Murayama (2008) have developed an AGQ-Revised to resolve measurement problems of AGQ

(Elliot & McGregor, 2001). We started our project in the summer of 2007, and at that time the original AGQ was our best choice. We also look forward to making the most of the AGQ-Revised.

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