

Learning with Implicit Belief: Structural Model of Implicit Belief of Intelligence, Social Achievement Goals, Academic Achievement Goals and Learning Strategies of Hong Kong University Students

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Abstract

The purpose of this study is to explore the influences of implicit belief of intelligence on learning strategies through the mediating effects of social achievement goals and academic achievement goals. Convenience sampling was used to collect primary data. A total of 245 participants of university students in Hong Kong were invited to complete a set of questionnaire. It is found that academic achievement goals are significantly associated with implicit belief of intelligence. However, social achievement goals are marginal significantly related with implicit belief of intelligence, but both of them have significant association with learning strategies. There is an indirect effect of implicit belief of intelligence on students' learning strategies through academic achievement goals. Results of structural equation modeling reveal that the proposed model fit the data very well. Besides, it indicates that implicit belief of intelligence has larger effect on academic achievement goals than social achievement goal ($\beta = .32$ vs. $.16$). Since the study has adopted cross-sectional design, it may have limitation in the generalization of result, and be less effective for external validation. However, the main contribution for the present study is that it attempts to confirm the association between implicit belief of intelligence and social achievement goals, and such relationship may not have been examined before. It also provides practical implications to Hong Kong university educators to fully aware the importance of the complex structural relationships among students' implicit belief of intelligence, academic achievement goals, social achievement goals and learning strategies, such that tailored undergraduate curriculum could be implemented to enhance more desirable and quality achievement behaviors and outcomes.

Keywords: Implicit belief of intelligence, Social achievement goals, Academic achievement goals, Learning strategies

Introduction

Indeed, each student has his or her own learning strategy. In recent years while releasing results of public examinations in Hong Kong, news reporters must report successful students' sharing of their unique and effective learning strategy to attain outstanding public examination results. It is founded that there is a relationship between learning motivation and learning strategy in terms of cognition (Duncan & McKeachie, 2005). Some people think that their intelligence is inborn, but some of them think that intelligence can be increased through learning and hard work. With different beliefs of intelligence qualities, people have different goal orientations. Basically, there are two achievement goals which are learning goal and performance goals in achievement situations. Is there significant association between perception of intelligence and achievement goals?

The present study is going to examine the relationship among implicit belief of intelligence, social achievement goals, academic achievement goals, and learning strategies. The aims of this study were a) to examine the direct relationship among implicit belief of intelligence, academic achievement goals, social achievement goals, and learning strategies, b) to explore the possible indirect effect of implicit belief of intelligence on learning strategies, c) to investigate whether the related western theories and measure instruments can be applied to Hong Kong university students.

Theoretical Contribution

Base on the findings of the present study, it is expected for us to have a better understanding of student's perception of intelligence, academic achievement goals, social achievement goals, and learning strategies. We hoped this study could contribute to the literature by extending the research of implicit belief of intelligence to study their direct effect on social achievement goals, and the effect of social achievement goals on learning strategies, which is an understudied question but can make important contributions to research.

Practical Contribution

The findings of the present study could help students develop better learning strategies which relate to their belief of intelligence and achievement goal orientations. Through better understanding of students' belief of intelligence and corresponding social achievement goals, teachers and educators can develop better teaching strategies and learning environment as well as find better corresponding learning strategies for different types of university students who have different achievement goals, last but not least, develop suitable curriculum to fit the beliefs and needs of different students in the future.

Literature Review

Implicit Belief of Intelligence & Academic Achievement Goals

Dweck and other researchers (Dweck, 1999; Dweck, Chiu, & Hong, 1995; Dweck & Leggett,

1988; Nicholls, 1984) have conducted studies about implicit theories of intelligence and achievement goals. Implicit theories of intelligence are cognitive beliefs to predict achievement goals. Students who hold entity belief believe that they are endowed with fixed and unchangeable intelligence, and they tend to seek for performance-approach or performance-avoidance goal; while those who hold incremental theory believe that they are endowed with malleable and changeable intelligence which can be increased through efforts, and they tend to seek for learning goal (Bandura & Dweck, 1985; Dweck & Leggett, 1988; Elliot, 1999). These two theories indicate differences among people in the aspects of judgments and reactions patterns (Dweck, Chiu, & Hong, 1995).

In studies of Dweck & Leggett (1988) and Faria (1996), different orientations of implicit theories of intelligence make students tend to specific goal, and in turn construct different patterns in terms of cognitive, affective, and behavioral. Individuals with performance goals focus on getting positive judgments of competence and avoiding negative judgments, and those with learning goal focus on improving competence. Incremental belief of intelligence is associated with learning goal. Performance-oriented students tend to have negative cognitions, affective and performance. They focus on ability and easy tasks. Also, they see challenge as a threat to self-esteem and feel anxious. Learning-oriented students tend to have constructive cognitions, positive emotion and effective strategies of problem solving. They see challenge as an opportunity to learn new things and increase or maintain self-esteem. In terms of stereotypes, Dweck (1999) indicated that people who hold entity belief of intelligence tend to construct stereotypes to others while those hold incremental intelligence do not.

Implicit Belief of Intelligence & Social Achievement Goals

Considering social motivation, the study from Goetz and Dweck (1980) have found that performance-oriented children are more likely to use new strategies than learning-oriented children while encountering social rejection. The study brings out trend to examine implicit theories predict social goals, and in turns social behavior. Ryan and Shim (2008) claimed that people hold different social achievement goals imply their own beliefs. Thus, implicit belief of intelligence may be one kind of the beliefs that may imply an individual's social achievement goal orientation.

Academic Achievement Goals & Learning Strategies

Our patterns of cognition, affect, and behavior can be predicted by achievement goals (Kaplan & Maehr, 1999). Learning strategies are kinds of cognition and behavior which means, orientations of achievement goals are related to learning strategies (Ames & Archer, 1988; Dweck & Elliot, 1988). Learning goal and performance goals are the two distinct goal orientations (Ames & Archer, 1988; Dweck & Leggett, 1988; Nicholls, 1984). There were many studies which conclude that academic achievement goals are related significantly to learning strategies (Greene & Miller, 1996; Meece, et al., 1988; Middleton & Midgley, 1997; Nolen, 1988). They found that there was a strong positive

correlation between learning goals and deep cognition strategies, self-regulated learning and metacognitive strategies, while performance goals are positively related to surface cognition strategies. Moreover, learning goal is oriented to intrinsic motivation and self-regulated in learning, persistence on tasks, deep cognition, and adaptive pattern of attribution (Ames, 1992; Greene & Miller, 1996; Greene, Miller, Crowson, Duke, & Akey, 2004; Linnenbrink, 2005; Roeser, Midgley, & Urdan, 1996; Wolters, 2004). Performance goals is oriented to prefer easy tasks, judge failure to competence, surface cognition, and less persistence on difficult tasks (Ames, 1992; Dweck & Leggett, 1988). Regarding those two types of performance goals, performance-approach goal is related to more positive – persistence on studying, high performance and intrinsic motivation, and less negative – anxiety and surface cognition (Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997), whereas, performance-avoidance goal is related to disorganized learning, less self-regulated learning strategies, surface cognition, feel anxious, poor performance, and less intrinsic motivation.

Social Achievement Goals & Learning Strategies

According to Wentzel (1994), there are few researches connecting social goals to academic social ability. Academic prosocial goals (assist peers who have studying problems) are positively associated with peer acceptance; academic responsibility goals (follow classroom rules) are positively associated with teacher acceptance but negatively with peer acceptance. Needs of relatedness and social support in social domain are related to academic results of students (Goodenow, 1993). In the past, social goals include social approval, social responsibility, social status, prosocial goals (Urdan & Maehr, 1995). Considering setting goals in social domain only, Meece et al. (1988) found that social goals are positively related to both active and surface cognition. Based on the previous researches examined goal-orientation in social situations (Erdley, Cain, Loomis, Dumas-Hines, & Dweck, 1997; Goetz & Dweck, 1980), and consider to link social motivation and social goals to achievement domain (Dowson & McInerney, 2003; Wentzel, 1998), few researches relating social motivation to learning strategies were done (Ryan & Shim, 2006, 2008).

Ryan and Shim (2006, 2008) developed three social achievement goals which link social goals to academic achievement. Social development goal is related to social adjustment in academic fields; social demonstration-approach goal is unrelated to both adaptive and maladaptive adjustment; social demonstration-avoid goal is associated with maladjustment. They found that academic behaviors of students are affected by their goal setting in social domain. In short, they indicated that social achievement goals have effect to predict students' learning strategies or behaviors.

Research Question

What are the structural relationships, in terms of magnitude and direction of the path coefficients, connecting implicit belief of intelligence, achievement goals (both academic achievement

goals and social achievement goals) and learning strategies?

Hypotheses

H₁: There are significant relationships between implicit belief of intelligence and achievement goals (academic achievement goals and social achievement goals) at the $p = .05$ level. Entity belief of intelligence would have significantly positive relationship with performance-avoidance goal and social demonstration-avoid goal respectively, whereas incremental belief of intelligence would have significantly positive relationship with learning goal and social development goal respectively.

H₂: There are significant relationships between achievement goals (academic achievement goals and social achievement goals) and learning strategies at the $p = .05$ level. Social development goal and learning goal would have significantly positive relationship with learning strategies; social demonstration-approach goal and performance-approach goal would have positive relationship with learning strategies; social demonstration-avoid goal and performance-avoidance goal would have negative or no significant relationship with learning strategies.

Method

Participants

Participants were 245 Chinese university students in Hong Kong. Participants were recruited from Faculties of Arts, Social sciences and Business from the same university in Hong Kong, with the majority majoring in Psychology (68.9%). The mean age of the sample is 21.35 ($SD = 1.387$). Twenty-two percent ($N = 54$) of the sample were male and 78% ($N = 191$) of them were female.

Instrumentation

Theories of Intelligence Scale. This scale was measured by the Theories of Intelligence Scale – Self form for Adults. It was developed by Carol Dweck (1999) and was adapted and translated into Chinese for use in the present study. This instrument measures participants' perception of how changeable or unchangeable their intelligence is. It contains 2 subscales, entity belief and incremental belief, with 4 items tapping into each belief (Braten & Stromso, 2005). Participants were asked to rate on the scale from 1= "strongly agree" to 6 "strongly disagree"(Dweck, 1999). From the findings from Dweck, Chiu, & Hong (1995), there is a high internal consistency (alpha value = .96) and test-retest reliability ($r = .80$) for the scale of implicit belief of intelligence. The Theories of Intelligence Scale has high reliability and validity to measure implicit belief of intelligence.

Social Achievement Goals Scale. This scale, being developed by Ryan & Shim (2006), was adapted and translated into Chinese to be used in the present study. This instrument measures pursuit

of different kinds of goals in students, namely social development goal, social demonstration-approach goal, and social demonstration-avoid goal. There are 12 items in total, with 4 items measuring each type of goal respectively. Each item is rated on a 5-point Likert scale ranging from 1 = “Strongly disagree” to 5 = “Strongly agree” (Mouratidis & Sideridis, 2009). For this scale, factor loading of the items ranged from .47 to .82. The internal consistencies of the subscale of the social development goal, social demonstration-approach goal, and social demonstration-avoid goal are .69, .71, and .72 respectively (Mouratidis & Sideridis, 2009). The findings from Ryan & Shim (2006) showed that the social achievement goal scale has good internal consistency (Cronbach’s alpha values is greater than .80).

Academic Achievement Goals Scale. This scale, being developed by Ryan & Shim (2006) was adapted and translated into Chinese to be used in the present study. This instrument measures students’ academic achievement goal orientations. Items of learning goal, performance-approach goal, and performance-avoidance goal from the revised PALS (Midgley et al., 1997) are included in this scale. Items of learning goal focus on academic ability; items of performance-approach goal focus on comparing high academic ability with others; items of performance-avoidance goal focus on avoiding low academic ability when comparing with others. Ryan & Shim (2006) deleted two items from the PALS performance-avoidance scale as the items cannot differentiate between academic and social causes, producing a 13-item scale. Each item was rated on a 5-point Likert scale ranging from 1 = “Strongly disagree” to 5 = “Strongly agree” (Ryan & Shim, 2006). For the internal consistency of the scale, Ryan and Shim (2006) found that the Cronbach values of the scale range from .77 to .83, which is considered to have high internal consistency. Generally, Cronbach’s alpha value of the subscale of learning goal is always greater than .80 and that of the subscale of performance-approach goal is always greater than .60 (Midgley et al., 1998). In Middleton & Midgley (1997)’s study, the internal consistency of the scale measured by Cronbach’s alpha is .84. In the study of Elliot & church (1997), it is found that the correlation between the performance-avoidance goal and performance-approach goal is .38.

Self-Regulated Learning Strategies Scale. This scale is measured by the instrument from the Motivated Strategies for Learning Questionnaire (MSLQ). It was developed by Paul Pintrich in the early 80s. MSLQ is used to measure students’ general abilities on self-regulation in academic learning (Pintrich, 2004). The scale from Duncan & McKeachie (2005) was adapted in the present study and passed through the revision and translation. MSLQ included 81 items with 9 learning strategies subscales. In the present study, the researcher adapted 31 items from 5 learning strategies subscales—rehearsal, organization, elaboration, critical thinking, and metacognitive self-regulation. Each item was rated on a 5-point Likert scale ranging from 1 = “Strongly disagree” to 5 = “Strongly agree” (Duncan & McKeachie, 2005). The Cronbach’s alpha coefficients subscales of rehearsal, organization, elaboration, critical thinking, and metacognition is .69, .64, .75, .80, and .79 respectively, indicating a

moderate to high internal consistency. It is suggested that MSLQ has high validity on assessing students' patterns of learning strategies (Duncan & McKeachie, 2005).

Procedure

Participants were recruited by convenience sampling method and data was collected from self-reported questionnaires. A pilot test was conducted with 33 university students. It aimed to check the validity and reliability of the items in the questionnaires and further modify the scales for local use. Afterwards, a total of 245 participants were recruited from one of the universities in Hong Kong. All measures used in the study were originally in English and were translated into Chinese. Questionnaires were administered in Chinese to participants. Before completing the questionnaire, the participants signed an informed consent form. Then they completed a 62-item questionnaire, which cost them about 5 to 7 minutes to complete. The questionnaire is divided into four parts, which are implicit belief of intelligence, academic achievement goals, social achievement goals, and self-regulated learning strategies. Participants were given a debriefing note after the study.

Methodology of Data Analysis

Means and standard deviations of different variables were computed to give a general descriptive picture of basic statistics of the constructs under study. In order to establish desirable psychometric properties of the instruments being employed, reliability analysis and confirmatory factor analysis would be conducted. Corresponding to the testing of hypotheses, path analysis of observed variables and structural equation modelling would be carried out.

Results

Descriptive Statistics and Correlational Analysis

The mean, standard deviations and correlations of implicit belief of intelligence, social achievement goals, academic achievement goals and learning strategies are indicated in Table 1.

Table 1

Descriptive Statistics and Correlation between Different Variables (N = 245)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Entity Belief of Intelligence	-												
2. Incremental Belief of Intelligence	.58**	-											
3. Social Development Goal	.07	.14*	-										
4. Social Demonstration Approach Goal	.04	.09	.46**	-									
5. Social Demonstration Avoid Goal	-.06	-.03	.39**	.39**	-								
6. Learning Goal	.16*	.19**	.29**	.12	.06	-							
7. Performance-Approach Goal	.03	.08	.27**	.24**	.29**	.35**	-						
8. Performance-Avoidance Goal	-.13*	-.07	-.04	.23**	.18**	.07	.28**	-					
9. Rehearsal	.09	.07	.14*	.19**	.13*	.12	.29**	.12	-				
10. Elaboration	.22**	.15*	.31**	.22**	.22**	.41**	.41**	.07	.49**	-			
11. Organization	.16*	.15*	.29**	.24**	.18**	.36**	.32**	.05	.60**	.77**	-		
12. Critical thinking	.19**	.25**	.27**	.10	.07	.46**	.39**	.07	.27**	.71**	.61**	-	
13. Metacognitive Self-Regulation	.23**	.19**	.25**	.17**	.20**	.42**	.30**	.07	.38**	.73**	.65**	.65**	-
<i>M</i>	3.28	3.62	4.05	3.49	3.62	3.48	3.69	2.85	3.60	3.69	3.77	3.49	3.37
<i>SD</i>	.83	.82	.75	.73	.61	.74	.66	.90	.65	.54	.54	.56	.43

Note: * $p < 0.05$, ** $p < 0.01$

Reliability Analysis

In the pilot test, 1 item out of the original 12 items from the Social Achievement Goal Orientations Scale, and 1 item out of the original 31 items from the Self-Regulated Learning Strategies Scale, was discarded because of unsatisfactory reliability. Table 2 shows the reliabilities of the scales used in the study. The internal consistencies of the 2 subscales of implicit belief of intelligence were good, ranging from .82 to .83. The internal consistencies of the 3 subscales of social achievement goals were satisfactory to good, ranging from .71 to .88. For academic achievement goals, the internal consistencies of the 3 subscales were good, ranging from .83 to .86. For learning strategies, the internal consistencies of the 5 subscales were satisfactory, ranging from .63 to .77.

Table 2

Reliability Cronbach's Alphas for Implicit Belief of Intelligence, Social Achievement Goals, Academic Achievement Goals and Learning Strategies

Scales	Cronbach's Alpha
Implicit Belief of Intelligence	
Entity Belief of Intelligence	.83
Incremental Belief of Intelligence	.82
Social Achievement Goals	
Social Development Goal	.88
Social Demonstration-Approach Goal	.77
Social Demonstration-Avoid Goal	.71
Academic Achievement Goals	
Learning Goal	.86
Performance-Approach Goal	.83
Performance-Avoidance Goal	.84
Learning Strategies	
Rehearsal	.63
Elaboration	.77
Organization	.65
Critical thinking	.73
Metacognitive Self-Regulation	.75

Confirmatory Factor Analysis

For the scale of implicit belief of intelligence, the chi-square value and fit indices of the data: $\chi^2(19) = 75.19$, RMSEA = .11, CFI = .96, GFI = .92. For the scale of academic achievement goals, the chi-square value and fit indices of the data: $\chi^2(41) = 147.76$, RMSEA = .10, CFI = .94, GFI = .90. For

the learning strategies, the factor structure of the data: $\chi^2 (220) = 528.13$, RMSEA= .07, CFI = .95, GFI = .84. For the scale of social achievement goals, the chi-square value and fit indices of the data: $\chi^2 (41) = 148.54$, RMSEA= .09, CFI = .94, GFI = .91.

Path Analysis

A path model between implicit belief of intelligence, academic achievement goals, and learning strategies, another path model between implicit belief of intelligence, social achievement goals, and learning strategies, have been examined and the two path diagrams were shown as Figure 1 and Figure 2 respectively.

In Figure 1, the result revealed that incremental belief of intelligence was positively related to learning goal ($\beta = .17, p < .05$) significantly, whereas, no significant association between entity belief of intelligence and both performance-approach goal and performance-avoidance goal were found. But there was marginal significant association between entity belief of intelligence and performance-avoidance goal ($\beta = -.15, t = 1.88$). Furthermore, the result indicated that learning goal was a significant predictor of learning strategies of elaboration ($\beta = .32, p < .01$), organization ($\beta = .29, p < .01$), critical thinking ($\beta = .37, p < .01$), and, metacognitive self-regulation ($\beta = .37, p < .01$). Whereas, performance-approach goal was a significant predictor of learning strategies of rehearsal ($\beta = .26, p < .01$), elaboration ($\beta = .31, p < .01$), organization ($\beta = .23, p < .01$), critical thinking ($\beta = .29, p < .01$), and, metacognitive self-regulation ($\beta = .18, p < .05$). There was no significant relationship between performance-avoidance goal and any indicators (rehearsal, elaboration, organization, critical thinking, and, metacognitive self-regulation) of learning strategies.

In Figure 2, the result showed that there was no significant relationship between entity belief of intelligence and social development goal, social demonstration-approach goal, and, social demonstration-avoid goal. Also, there was no significant relationship between incremental belief of intelligence and social development goal, social demonstration-approach goal, and, social demonstration-avoid goal, too. However, there was marginal significant association between incremental belief of intelligence and social development goal ($\beta = .14, t = 1.82$). On the other hand, the result revealed a significant positive association between social development goal and learning strategies of elaboration ($\beta = .25, p < .01$), organization ($\beta = .22, p < .01$), critical thinking ($\beta = .29, p < .01$), and, metacognitive self-regulation ($\beta = .18, p < .01$). While social demonstration-approach goal was positively related to learning strategies of rehearsal ($\beta = .14, p < .05$) and organization ($\beta = .12, p < .01$). No significant relationship between social demonstration-avoid goal and any elements (rehearsal, elaboration, organization, critical thinking, and, metacognitive self-regulated learning strategies) of learning strategies were found.

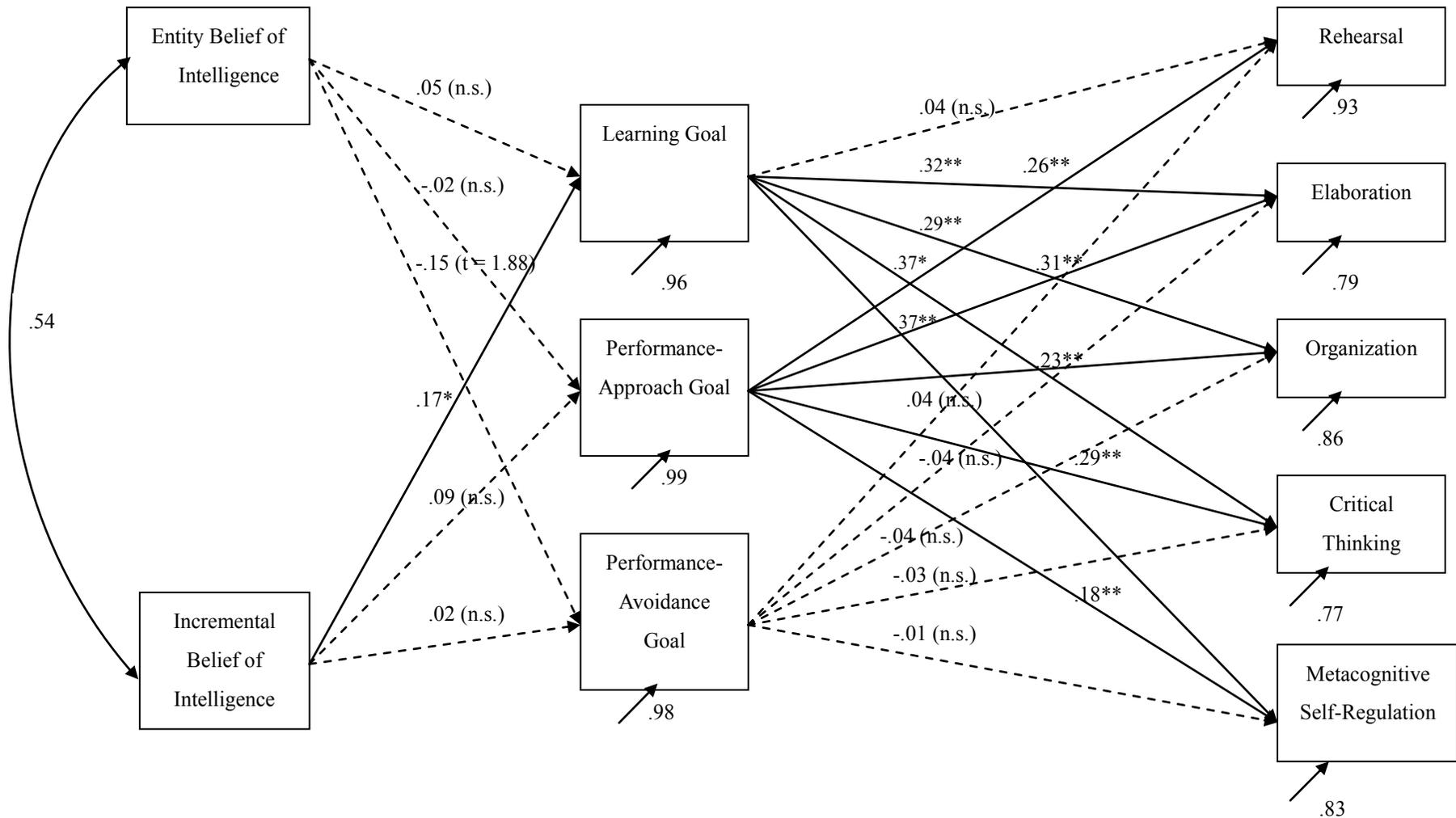


Figure 1. The path model showing the relationship between implicit belief of intelligence, academic achievement goals and learning strategies
 Notes: Coefficients with * refers to significant level of $p < .05$, ** refers to significant level of $p < .01$, those insignificant β values are presented with dotted lines, t refers to t value, and n.s. refers to β -value which is not significant.

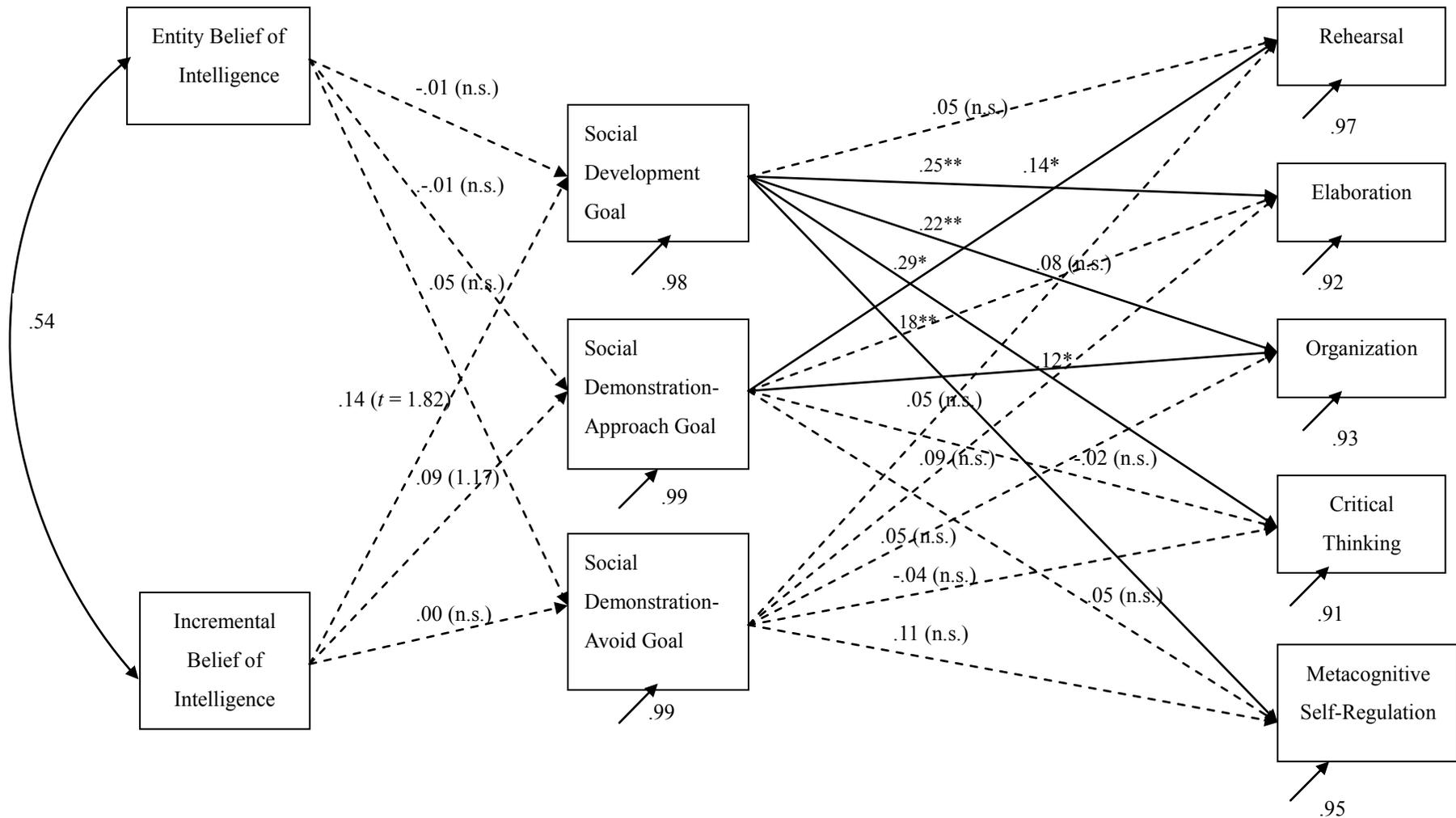


Figure 2. The path model showing the relationship of implicit belief of intelligence, social achievement goals and learning strategies

Notes: Coefficients with * refers to significant level of $p < .05$, ** refers to significant level of $p < .01$, those insignificant β values are presented with dotted lines, t refers to t value, and n.s. refers to β -value which is not significant.

Structural Equation Modelling

Structural equation modelling was also conducted. Results revealed the model fit the data: $\chi^2(61) = 203.61$, $\chi^2/df = 3.3$, RMSEA = .10, CFI = .92, GFI = .88. The structural model was shown in figure 3.

Direct Effects. In the structural model, implicit belief of intelligence was positively associated with academic achievement goals ($\beta = .32, p < .01$). Marginal significant association between implicit belief of intelligence and social achievement goals was revealed ($\beta = .16, t = 1.77$). On the other hand, the findings showed that academic achievement goals is significantly related to learning strategies ($\beta = .69, p < .01$), while social achievement goals also is significantly related to learning strategies ($\beta = .22, p < .01$). Furthermore, the coefficients related to academic achievement goals were greater than that of social achievement goals, implying that academic achievement goals played a more important role than social achievement goals in the model on learning strategies.

Indirect Effects. Analysis of SEM revealed that there was a significant indirect effect between implicit belief of intelligence and learning strategies ($\beta = .22, p < .01$), and this indirect relationship was mediated by academic achievement goals.

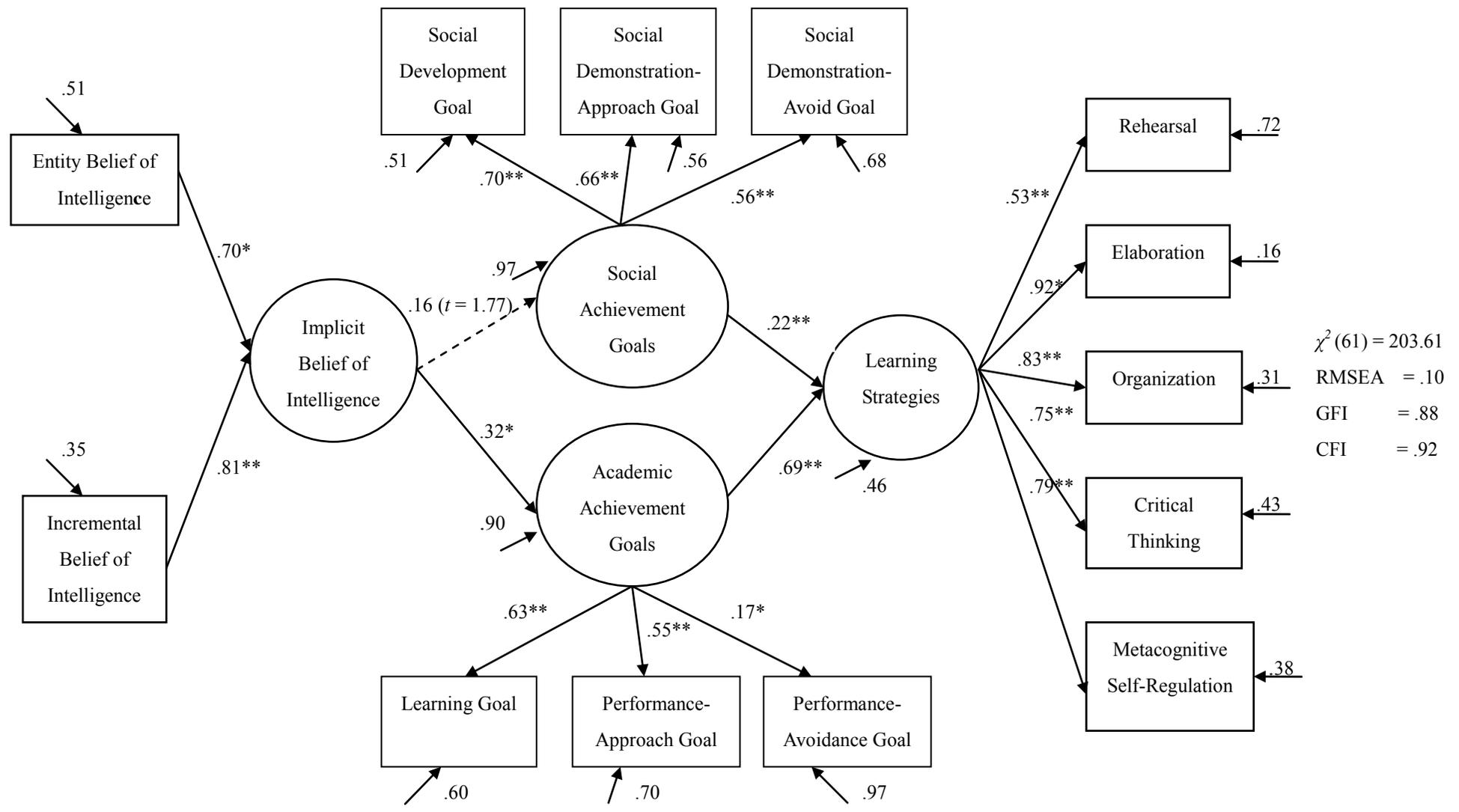


Figure 3. The structural equation model of the relationship between implicit belief of intelligence, social achievement goals, academic achievement goals and learning strategies. Note: RMSEA = Root Mean Square Error of Approximation; GFI = Goodness of Fit Index; CFI = Comparative Fit Index. Coefficients with * refers to significant level of $p < .05$, ** refers to significant level of $p < .01$, those insignificant β values are presented with dotted lines, t refers to t value, and n.s. refers to β -value which is not significant.

Discussion

The present study extended the literature by relating Hong Kong Chinese university students' social achievement goals and academic achievement goals to implicit belief of intelligence and learning strategies. Consistent with the hypotheses, it is found that implicit belief of intelligence was positively associated with academic achievement goals. On the other side, implicit belief of intelligence had marginal significant relationship with social achievement goals. Learning strategies were significantly related to both academic achievement goals and social achievement goals. In other words, apart from goal setting in academic domain, goals setting related to academic area in social domain were also related to students' learning strategies. Considering the structural equation model, implicit belief of intelligence was indirectly related to learning strategies through mediation of academic achievement goals only, but not through social achievement goals.

Previous researchers (Bandura & Dweck, 1985; Dweck & Leggett, 1988; Elliot, 1999) indicated that incremental belief holders tend to seek for learning goal. It is consistent with the present findings that incremental belief of intelligence was significantly associated to learning goal in Hong Kong university students. As found in a previous study (Dweck & Leggett, 1988), those who believed their intelligence was malleable, which can be increased through efforts. Based on this belief, the students tended to construct patterns of learning goal in terms of cognition.

In the present study's hypothesis, there was significant relationship between implicit belief of intelligence and social achievement goals. However, this relationship was only marginally significant (incremental belief of intelligence was marginally significantly associated with social development goal). Thus, their association is debatable. This marginally significant relationship can be attributed to the composition of social achievement goals in the present study, which involved both elements of social domain and academic achievement domain. According to Ryan and Shim (2008), people hold different social achievement goals according to their own beliefs. In Ryan and Shim's study, they did not include implicit belief of intelligence in studying the effect on social achievement goals. Thus, it explained the present result that implicit belief of intelligence was not a strong predictor to Hong Kong university students' social achievement goal orientations. Also, the result implied academic goals setting in social domain may not be related to students' perception of intelligence.

On the contrary, students' perception of intelligence is positively related to the goals in academic domain. In other words, students would take perception of intelligence into account when setting goals in academic area. The significant relationship between implicit belief of intelligence and academic achievement goals but only marginal significant relationship with social achievement goals may be explained by issues related to confidence. Confidence in intellectual ability is related to academic achievement (Henderson & Dweck, 1990), and, confidence is more important in academic domain than social domain (Erdley, et al., 1997). Therefore, implicit belief of intelligence which

involves confidence in intellectual ability was not significantly related to social achievement goals which involve confidence to a large extent.

The present study has proved that academic achievement goals were significantly related to learning strategies which was accordant with past studies (Greene & Miller, 1996; Meece, et al, 1988; Middleton & Midgley, 1997; Nolen, 1988). The result supported past studies' findings (Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997) that performance-avoidance goal holders adopt relatively fewer self-regulated learning strategies.

On the other side, strong positive correlation between learning goal and all learning strategies except rehearsal were found. The rank of use of strategies from the highest to the lowest is metacognitive self-regulation, critical thinking, elaboration, organization accordingly. This is reasonable as learning goal holders mostly adopt skills requiring deep cognition especially metacognitive self-regulation but not such skills involving surface cognition as rehearsal (Greene & Miller, 1996; Meece, et al, 1988; Middleton & Midgley, 1997; Nolen, 1988). Students with learning goal are willing to spend more time and effort in studying as they are motivated to gain more knowledge (Leondari & Gialamas, 2002). Therefore, with more time investment, they will adopt all types of learning strategies except rehearsal. We found that learning goal holders also use such surface strategies as elaboration but less significantly compared with other deep strategies. In addition, all learning strategies (rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation) were predicted by performance-approach goal. The rank of use of strategies from the highest to the lowest is elaboration, critical thinking, rehearsal, organization, metacognitive self-regulation accordingly. This does not fully match the present study's hypothesis. Previous findings showed that performance goal holders tend to use surface cognition strategies and prefer easy tasks (Ames, 1992; Dweck & Leggett, 1988). But in the present study, they use both surface cognition and deep cognition.

The present findings of the pathway from learning goal and performance-approach goal to learning strategies respectively may be explained from several aspects. First, college students of performance-approach goal have a strong sense of ego (Dweck, 1986; Dweck & Leggett, 1988; Nicholls, Patashnick & Nolen, 1985). They have high sense of social comparison (Darnon, C., Dompnier, B., Gillieron, O., & Butera, F., 2010) and need for normative competence than other students (Elliot, 1999; Elliot & Church, 1997; Elliot, & Harackiewicz, 1996) in the current competitive learning environment emphasizing others' evaluations (Anderman & Young, 1994). Thus, they engage in any possible learning strategies including surface strategies and deep strategies in order to outperform than others in academic areas. Second, according to Pintrich (2000), performance-approach goal also have adaptive outcomes as learning goal when combining the two goals in multiple pathways under the revised goal theory perspective. Study from Pintrich (2000)

supported results of the present study that performance-approach goal is somehow related to adaptive outcomes in terms of deep learning strategies, given performance-approach goal is considered together with learning goal. Both learning goal and performance-approach goal had positive effect on academic behaviors (Elliot & Harackiewicz, 1996; Leondari & Glalamas, 2002).

To elaborate more, in the present study, Hong Kong college students do not orient to only one fixed academic achievement goal, but they may have both learning goal and performance-approach goal simultaneously but with different levels. Previous studies have mentioned about this (Covington & Mueller, 2001; Elliot & Church, 1997; Ho & Hau, 2008; Midgley et al., 1998). The simultaneous use of learning goal and performance-approach goal by Hong Kong college students can be attributed to the Chinese cultural value of interdependence: working hard corresponding to learning goal, and getting fruitful results to bring honor of studying to family corresponding to performance goals (Chan, 2008). Moreover, the college students may have different goals and learning strategies on different subjects (VanderStoep et al., 1996; Wolters & Pintrich, 1998), given that type of information and lecture's requirements of each subject are different. Thus, students may shift their academic achievement goal orientations between learning goal and performance-approach goal, or combine both of them, and in turns, all learning strategies (rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation) or both deep cognition strategies and surface cognition strategies will be adopted.

Considering social motivation and learning strategies, significant relationship between social achievement goals and learning strategies was found. This is consistent with Ryan and Shim (2006, 2008)'s findings that academic behaviors of students are influenced by their goal setting in social domain. Indeed, it is important for adolescents to develop social relationship in college's activities (Allen, 1986; Ford, 1982). Generally, there are more and more group assignments, cooperative learning, and peer evaluation for Hong Kong university students, and thus, most of them focus not only on studying but also on social competence in order to achieve higher in academic domain. It is believed that types of learning strategies that college students adopt are predicted by corresponding social achievement goal they hold.

Specifically, social development goal is most significantly related critical thinking, followed by elaboration, organization, metacognitive self-regulation accordingly. Indeed, Chinese culture of collectivism can be applied to holders of social development goal. Since Chinese emphasize 'guanxi' among groups, they may have thought that everything including academic achievement can be benefited from establishing good quality social relationship (Chou, 2002). For social development-oriented college students, they focus on developing 'guanxi' and improving prosocial skills and relationship with peers (Mouratidis & Sideridis, 2009; Ryan & Shim, 2006, 2008) in order to facilitate harmony and cooperation among group members in academic domain. It can foster the

effectiveness among group members to complete good group assignments (Chou, Cheng, Huang, & Cheng, 2006). Therefore, they adopt nearly all types of possible learning strategies in order to achieve adaptive social adjustment in academic field.

Moreover, social demonstration-approach goal is significantly related to rehearsal, and then followed by organization. Students who adopt social demonstration-approach goal have a need to gain social status and positive evaluation from peers (Ryan & Shim, 2006, 2008). Self-regulated learning strategies are a possible route to gain outperforming academic achievement than other students (Yip, 2007; Yip & Chung, 2002) and in turns boast social prestige. Thus, it is believed that there is association between social demonstration-approach goal and learning strategies. Also, social demonstration-approach goal oriented to neutral is unrelated to both adaptive and maladaptive adjustment (Ryan & Shim, 2006, 2008). It implies that students with such goals engage in learning strategies but only use surface cognition strategies (rehearsal and organization). On the other hand, there was no significant correlation between social demonstration-avoid goal and learning strategies. College students who hold social demonstration-avoid goal tend to engage in maladjustment and anxious solitary behavior (Ryan & Shim, 2006, 2008). They may not know how to make use of learning strategies effectively, and so, they do not adopt any types of learning strategies (positive adjustment).

Both academic and social motivation is significantly associated to academic achievement (Wentzel & Wigfield, 1998). From the present findings, both academic and social achievement goals had strong effect on learning strategies with similar patterns of pathways were discovered. Academic achievement goals played a more significant role than social achievement goals on learning strategies. It revealed that academic achievement goals is about cognition more while social achievement goals is about social interaction more with less relationship to cognition.

Particularly, an indirect effect was found between implicit belief of intelligence and learning strategies, meaning that academic achievement goals mediate the relationship between implicit belief of intelligence and learning strategies of Hong Kong university students. Through the mediator of academic achievement goals, implicit belief of intelligence of college students is related to their learning strategies. In other words, how they perceive intelligence influence on how their academic behaviors indirectly, and academic achievement goals plays a major role in the process.

The present study revealed that academic achievement goals are important mediator to implicit belief of intelligence and learning strategies, while social achievement goals are another important factor related to learning strategies. The findings provided implications to Hong Kong university students that they can develop better learning strategies through relating their implicit belief of intelligence to academic achievement goal orientations, and emphasizing the importance of relating

their social achievement goals to learning strategies correspondingly so as to foster academic learning. Moreover, educators and teachers should focus on both social domain and academic area of students in order to develop better learning environment and suitable curriculum to fit the needs of different students. It is noted that colleges and teachers should consider beliefs of students when designing programs (Wentzel & Wigfield, 1998).

Conclusion

In sum, this study contributed by revealing academic achievement goals as mediator of implicit belief of intelligence in predicting university students' learning strategies. Social achievement goals are a significant predicting factor to learning strategies, but they are only related to implicit belief of intelligence with marginal significance. Generally, major findings of the present study are consistent with previous studies, which showed the possibility of applying western theories and measurement instruments of achievement goals on Hong Kong Chinese university student. The present study extended research on association of social achievement goals with implicit belief of intelligence and learning strategies. Also, it provided implications to university students, educators, and teachers by emphasizing not only academic achievement goals but also social-related goals for striving achievement in academic field.

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