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Factors Affecting High School Students' Academic Motivation in Taiwan

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The purpose of this research is to investigate predictive relationships among student characteristics that influence motivation for learning and achievement. A non-Western sample was chosen to test the generalisability of findings outside the Western cultural and social models. The participants were 6,539 students from 14 public high schools distributed across the western half of Taiwan. They were from three grade levels, and were balanced in gender. Correlations, analysis of variance, and multiple regression analyses were conducted. Individual differences predicted classroom perceptions, and perceptions predicted motivation, as did goal structures and group differences. Findings can inform educational policy, as well as teacher professional development and practice.

Introduction

The interaction of teaching and learning results from a complex dynamics of multiple constructs and characteristics. Student outcomes are not the result of simple cause–effect relationships, but of systemic interactions of factors that include the characteristics that teachers and students bring to the instructional context, as well as their institutional and cultural contexts. Thus, students' effort and engagement are the outgrowth of both individual differences and messages received in the context of the learning environment, filtered through their perceptions (Guay, Vallerand, & Blanchard, 2000; Hardré, 2003). While high school teachers may be heavily constrained by institutional policy, they can influence motivational features of the classroom learning environment (Deci & Ryan, 1985; Pintrich & Schunk, 1996).

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Motivation is among the most powerful determinants of students' success or failure in school (Hidi & Harackiewicz, 2000; Ryan & Connell, 1989; Sternberg & Wagner, 1994). Much research on perception and motivation has been done in the United States and Canada, but less so in Asian nations such as Taiwan. Given the cultural influences relevant to motivation, Western findings cannot be generalised for Asian students without confirmation that these constructs, instrumentation, and relationships function similarly in the Asian school and community. For these reasons, the present study applies self-determination theory and achievement goal theory in high schools in Taiwan.

Self-Determination Theory

According to self-determination theory, students' motivation for academic performance varies in both strength (amount) and quality (nature), and both variations predict learning, achievement, and continuation to college (Deci & Ryan, 2002; Reeve, 1996). Self-determined, intrinsic motivation emerges from the learner's own needs and desires rather than from outside pressures (Deci & Ryan, 1987). It is this high-quality, intrinsic, self-determined motivation that most powerfully predicts positive school-related engagement and success (Hardré & Reeve, 2003; Lau & Chan, 2003; Reeve, Bolt, & Cai, 1999; Vallerand, Fortier, & Guay, 1997). However, students are not all intrinsically motivated for all tasks or subjects. Students can increase their motivation towards learning of tasks and content through internalisation, the process of a student adopting increasing choice and value for learning, and ownership of the learning process (Reeve, Deci, & Ryan, 2004; Ryan & Connell, 1989). Internalisation is promoted through the support of three important student characteristics: autonomy, competence, and relatedness (Black & Deci, 2000; Ryan & Deci, 2000). Through internalisation, a student becomes increasingly self-determined (versus other-determined or extrinsically pressured) (Deci, 1995; Reeve *et al.*, 2004). Extensive work on self-determination has been done, primarily in the United States and Canada (for reviews, see Deci & Ryan, 2002; Reeve et al., 2004). Classroom and school environment can either support or reduce students' intrinsic and internalised motivation, through students' perceptions of teachers' and peers' influences and social cues (Deci & Ryan, 2002; Reeve, 1996; Reeve *et al.*, 2004). The positive effects of supporting self-determination have been demonstrated in at least one study in Hong Kong (Kember, Jenkins, & Ng, 2003).

Achievement Goal Theory

Just as self-determination is important to student motivation, so are students' goals. Both sets of characteristics help to explain the reasons why students engage (or fail to engage) in school-related tasks. According to achievement goal theory (Ames, 1992; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002), it is not only the strength but also the nature of students' academic goals that influence their approaches to learning opportunities and their consequent learning and achievement

(Ames, 1992; Ames & Archer, 1988). Achievement goals are divided into at least four types: learning goals, performance-approach goals, performance-avoidance goals (Maehr & Midgley, 1996), and future goals (Mensch, Miller, & Brickman, 2004). Learning goals operate when students engage for the sake of learning and personal interest, while performance goals operate when students engage (or avoid engaging) in order to impress others (or to avoid looking incompetent to others) (Ames, 1992; Greene, Miller, Crowson, Duke, & Akey, 2004). Future goals operate when students engage in learning for the instrumental value of present knowledge in service of future tasks (Brickman & Miller, 2001; Mensch, Miller, & Brickman, 2004). Learning goals are associated with positive motivational and educational outcomes (e.g. effort towards learning, preference for challenge, intrinsic interest in learning, and active engagement) (Elliot & Harackiewicz, 1996; Midgley, Kaplan, & Middleton, 2001). Performance goals are associated with a range of different motivational and educational outcomes (both positive and negative), depending on their interactions with other individual and contextual characteristics (Church, Elliot, & Gable, 2001; Elliot & Church, 1997; Elliott et al., 2000; Harackiewicz et al., 2002). Performance-avoidance goals are associated with negative outcomes (e.g. lack of effort, ego-focused energy, extrinsic motivation, and use of superficial learning strategies) (Elliott et al., 2000; Maehr & Midgley, 1996; Urdan, Midgley, & Anderman, 1998). Future goals have had less attention in research but offer different degrees of benefits for different learner groups (Greene et al., 2004). Extensive work on achievement goals has been conducted, mostly in Western cultural settings (for reviews, see Harackiewicz et al., 2002; Sansone & Harackiewicz, 2000). In a longitudinal study in Hong Kong, more Chinese students were consistently found to have performance goals (over learning goals), a pattern linked to their Asian sociocultural values and learning context (Salili & Lai, 2003).

Both self-determination and goal orientation are motivational responses to messages from the learning environment as the student perceives and interprets them. Both directly affect the depth of processing, test performance, and persistence at tasks (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). Students' perception of teacher practice influences the quality of their academic motivation, effort, and self-perception of competence (Hidi & Harackiewicz, 2000), their achievement goals (Greene et al., 2004), and their internalisation of reasons for engaging in school (Reeve, Jang, Hardré, & Omura, 2003). Teachers' instructional decisions can promote or reduce students' motivation for learning and achievement, in terms of both teachers' design of the classroom learning environment and in their styles of interpersonal interaction with individual students (Hardré, 2001). High school students' perceptions of their classroom environments strongly predict self-determined motivation and competence perceptions, and these in turn predict school performance and intentions to persist in education (Hardré & Reeve, 2003). Some recent research on these constructs in East Asian nations has focused either on self-determination (e.g. Watkins, 2004), or on achievement goals (e.g. Lau & Chan, 2003; Salili & Lai, 2003), but none has included both in a single study.

Cognitive Preferences and Self-Perceptions

Students' cognitive preferences and self-perceptions influence their reception of and responses to teachers' and peers' messages regarding self-determination and goals (Reeve, 1996). One important preference is the need for cognition, which refers to a student's inclination for deep and thoughtful engagement and ill-structured problems (versus simple questions with "right" or easy answers) (Evans, Kirby, & Fabrigar, 2003; Forsterlee & Ho, 1999). Another important motivational self-perception is the student's perceived ability in the discipline (Reeve, 1996). Perceived ability refers to the student's self-evaluation of capacity to learn and do well in educational endeavours, and it can influence both motivational and achievement outcomes (Greene et al., 2004; Stevenson, Chen, & Lee, 1993; Wood & Bandura, 1989). Both of these individual characteristics may influence the way students interpret and respond to classroom environments and goal structures, and thus they are important factors to include with regard to motivation.

East–West Cultural Differences

A body of comparison research suggests East–West cultural differences. Among high school students in the UK and China, motivational orientations and self-perceptions including goal structures, attributions, and self-esteem predicted motivation similarly across cultures, but UK students tended to focus on ability, while Chinese students tended to emphasise strategic effort (Rogers, 1998). In a study comparing Chinese and Western students in Hong Kong, Chinese students were found to have lower school-related perceptions of competence, lower task orientation, and more anxiety about academics (Hong, 2001). Other studies indicate differential attributions for failure and success between American and Chinese students in Taiwan (Chiu, 1986) and among Chinese, Japanese, and US elementary and secondary students (Stevenson et al., 1993). One study that included self-determination indicated that culturally defined values (specifically individual versus collectivist values) may influence the process of internalisation as defined in self-determination theory (Moneta, 2004). These studies underscore the need for more research that tests self-determination theory and achievement goal theory in East Asian nations. Building on this previous research, the present study investigates relationships among Taiwanese students' individual difference characteristics, their achievement goals, their perceptions of classroom environment characteristics, and their motivation.

Taiwan's High School System

In the Taiwanese high school system, there are three grade levels, referred to as Levels 1, 2, and 3 (analogous to Grades 10–12 in the U.S. system). In addition, there are three different types of high schools: traditional, vocational, and comprehensive. The traditional high school is academically oriented and college preparatory. The vocational high school focuses on the teaching of technical and professional skills to

prepare students to enter the workforce. The comprehensive high school is a newer secondary institution (started in 1996), with the goal of easing the transition from junior to senior high school for students, and it combines the missions of both traditional and vocational high schools (Ministry of Education, Taiwan, personal communication, July 14, 2005). Traditional and vocational high schools include only the senior high levels (Year 1–3), while the comprehensive high school combines both junior high and senior high school levels in the same institution. In Year 2 in both the traditional and comprehensive high schools, students choose a major and work with more selective content and teaching staff until graduation. These distinctions are important because the nature and mission of the high school influence its administrative policy, curriculum, and teaching practice, which in turn influence students' perceptions and consequent motivations (Hardré, in review b).

Methods

Participants

Participants were 6,539 students from 14 high schools in Taiwan. There were 3,233 (49%) male and 3,306 (51%) female students. The grade-level distribution was as follows: Year 1: 2,474 (38%); Year 2: 2,297 (35%); and Year 3: 1,658 (25%) (2% did not report grade level). They represent a range of socioeconomic groups and are homogeneous in nationality. Research sites were geographically distributed over the western half of the nation and included seven traditional, three vocational, and four comprehensive high schools.

Procedures

Principals gave permission and helped facilitate the data collection. Paper-based questionnaires were administered to all participants during prearranged on-site visits to each school. These were held in the students' regular classrooms, using a standard protocol. Confidentiality was maintained for all data.

Measures

All measures were originally developed in English, and have been used successfully with high school students in the U.S. studies (e.g. Greene et al., 2004; Hardré, in review a; Hardré, Crowson, DeBacker, & White, 2005; Hardré & Reeve, 2003; Hardré & Sullivan, in review). For this project, native Chinese speakers translated the instruments, and then multiple bilingual scholars independently evaluated all instruments for literal and conceptual accuracy, and revisions were made according to their recommendations. Instruments were administered in Chinese, and participants indicated a good understanding of the translations, both grammatically and conceptually. The questionnaire sets required about 30 minutes to complete (all using Likert-type numerical scales).

Need for cognition. The Need for Cognition scale was used to assess individual preference for deep thinking and ill-structured problems (versus simple questions with right answers) (18 items on a 5-point scale from Forsterlee & Ho, 1999). Sample items include: "I would prefer complex to simple problems" and "I only think as hard as I have to" (Cronbach's alpha = .84).

Classroom climate. The In My Classroom (IMC) scale was used to assess students' perceptions of their classroom climate, including teacher-related and peer-related environmental factors (14 items on a 7-point scale from Academic Self-Regulation Questionnaire, Ryan & Connell, 1989). A sample item from the teacher-related environmental factors subscale is: "In this class mistakes are considered a normal part of learning/In this class mistakes are considered a sign that students can't learn", and from the peer-related environmental factors subscale: "In this class students care about each other/In this class students don't care about each other". Recently noted reliabilities for this scale were between alpha = .80 to .88 (e.g. Grable, Overbay, & Osborne, 2005; Hardré, Crowson, Xie, & Ly, in press; Hardré et al., 2005). Similar to Hardré and Sullivan (in review), the original IMC scales revealed low reliability, so items that demonstrated negative or very low inter-item correlations were omitted, and the reliability analysis repeated. The resulting measure is well represented as two subscales. The first is a 13-item teacher support subscale ($\alpha = .77$) and the second, an 11-item peer support subscale ($\alpha = .67$).

Interpersonal style. The Interpersonal Style Questionnaire (ISQ) assessed students' perceptions of interpersonal autonomy support from their teachers (8 items on a 7-point scale: from 1 = *not at all true*, to 7 = *extremely true*) (adapted from AFS Scales, Reeve & Sickenius, 1994). Sample items include: "My teacher provides me with choices and options" and "My teacher conveys confidence in my ability to become what I want to become" (Cronbach's alpha = .89).

Achievement goals and perceived ability. The Approaches to Learning scale was used to assess four types of student achievement goals: learning, performance approach, performance avoidance, and future goals/perceived instrumentality. An additional subscale addresses students' perceived ability in the course. Sample items include: learning goals subscale ("I do my work in this class because I want to understand the ideas"), performance-approach goals subscale ("I do my work in this class because I can show other people that I am smart"), performance-avoidance goals subscale ("I don't do my work in this class so I can avoid looking stupid to others"), future goals subscale ("I do my work in this class because knowing the material will be useful in my future"), and perceived ability subscale ("I can do the work in this class"). The 30 items utilise a 5-point scale from: 1 = *strongly disagree*, to 5 = *strongly agree*. The subscale reliabilities were as follows: learning goals ($\alpha = .85$), performance-approach goals ($\alpha = .74$), performance-avoidance goals ($\alpha = .65$), future goals ($\alpha = .85$) and perceived ability ($\alpha = .78$).

School engagement and effort. The School Engagement and Effort Scale assessed students' self-reported engagement in class (6 items from Vallerand et al., 1997). Items are arranged as continua, on a 7-point scale, with parallel, positively, and negatively phrased items anchoring the end points. A sample item would be: "I put forth a lot of effort in class"/"I don't put forth much effort in class" (Cronbach's alpha = .77).

Results

School, school type, grade level, and gender differences on the subscales were investigated using the one-way multivariate analysis of variance (MANOVA) technique. MANOVA was conducted to determine the effect of group differences on the dependent variables (individual differences, classroom perceptions, goal orientation, and motivation). Table 1 shows the results of the analyses of variance in terms of single group differences and the combined effects. Significant differences were found for the three types of differences on dependent measures, both in the univariate comparisons and for the intercept of all three factors.

Wilks's Lambda was chosen as an appropriately conservative test, and it demonstrated significance: Wilks's $\Lambda = .98$, $F(40, 21475) = 3.60$, $p < .000$, $\eta^2 = .006$, observed power = 1.00. Analysis of variance (ANOVA) was conducted on each dependent variable as follow-up tests to the MANOVA. The following dependent measures were found significant for the intercept of all three group differences: learning goals, $F(4, 5672) = 4.49$, $\eta^2 = .003$, observed power = .84; future goals, $F(4, 5672) = 4.26$, $\eta^2 = .003$, observed power = .81; teacher interpersonal style, $F(4, 5672) = 14.32$, $\eta^2 = .01$, observed power = .10; teacher support environment, $F(4, 5672) = 8.19$, $\eta^2 = .006$, observed power = .99; peer support environment, $F(4, 5672) = 9.71$, $\eta^2 = .007$, observed power = .99; and engagement and effort, $F(4, 5672) = 4.51$, $\eta^2 = .003$, observed power = .84.

Correlation Analyses

Table 2 presents correlations of the primary study variables. Significant correlations range from .08 to .65 (all were significant at $p < .01$).

Regression Analysis

The relationships among the study variables were investigated using simultaneous multiple regression analysis. Figure 1 shows the hypothesised relationships between the constructs. While different directional relationships may be proposed among these factors, this study's predictions were based on the literature reviewed previously. The first relationship of interest was whether students' individual characteristics (need for cognition and perceived ability) would significantly predict their perceptions of classroom environment characteristics and their classroom goal structures. The

Table 1. Mean and standard deviation scores for group difference factors

Outcome Variable	School Type	Mean	Std Deviation	Grade Level	Mean	Std Deviation	Gender	Mean	Std Deviation	Grand Mean	Std Error of Mean
Student engagement and effort	**Trad.**	**4.40**	1.054	3	4.42	1.033	Male	4.19	1.120	**4.34**	.075
	Vocat.	4.29	1.034	2	4.34	1.069	**Female**	**4.56**	.971		
	Comp.	4.38	1.096	1	4.35	1.099					
Performance-avoidance goals	**Trad.**	**2.54**	.600	3	2.522	.585	Male	2.52	.619	2.42	.043
	Vocat.	2.52	.585	2	2.521	.607	Female	2.49	.574		
	Comp.	2.43	.595	1	2.472	.597					
Perceived ability	**Trad.**	**3.07**	.633	3	3.04	.614	Male	3.03	.651	2.97	.046
	Vocat.	2.97	.624	**2**	**3.08**	.647	Female	3.03	.639		
	Comp.	2.99	.670	1	2.98	.677					
Future goals	Trad.	3.52	.825	3	3.58	.884	Male	3.53	.843	**3.52**	.060
	Vocat.	**3.67**	.801	2	3.58	.826	**Female**	**3.63**	.815		
	Comp.	3.58	.851	1	3.57	.804					
Interpersonal style	Trad.	4.59	1.167	3	4.51	1.160	Male	4.62	1.200	**4.61**	.083
	Vocat.	4.61	1.159	**2**	**4.70**	1.144	Female	4.66	1.142		
	Comp.	**4.72**	1.178	1	4.68	1.214					
Need for cognition	Trad.	3.30	.498	**3**	**3.38**	.500	**Male**	**3.36**	.504	3.38	.036
	Vocat.	3.33	.501	2	3.34	.493	Female	3.32	.490		
	Comp.	**3.39**	.491	1	3.31	.500					
Teacher support	Trad.	4.71	.777	3	4.75	.768	Male	4.68	.773	**4.84**	.054
	Vocat.	4.79	.743	2	4.80	.785	**Female**	**4.94**	.760		
	Comp.	**4.95**	.775	**1**	**4.86**	.775					
Peer support	Trad.	4.12	.679	3	4.13	1.016	Male	4.08	.693	**4.17**	.049
	Vocat.	4.13	.665	2	3.98	1.042	**Female**	**4.24**	.672		
	Comp.	**4.24**	.702	1	3.94	1.106					
Learning goals	Trad.	3.48	.726	3	3.44	.732	Male	3.42	.770	**3.46**	.053
	Vocat.	3.53	.712	2	3.49	.726	**Female**	**3.56**	.691		

	Comp.	**3.48**	.767	**1**	**3.52**	.751					
Performance-approach goals	Trad.	2.82	.731	3	2.79	.736	Male	2.81	.769	2.78	.054
	Vocat.	2.80	.737	2	2.84	.746	Female	2.82	.730		
	Comp.	2.80	.781	1	2.81	.771					

Note. Numbers in **bold type** are statistically significant differences (at $p < .01$).

Table 2. Zero-order correlations relevant to individual student differences, classroom environment perceptions, and motivation

	Student motivation	Learning goals	Performance-approach goals	Performance-avoidance goals	Perceived ability	Future goals	Interpersonal style	Need for cognition	Teacher support	Peer support
Student motivation	—									
Learning goals	.582(**)	—								
Performance-approach goals	.288(**)	.347(**)	—							
Performance-avoidance goals	.003	.086(**)	.499(**)	—						
Perceived ability	.432(**)	.400(**)	.255(**)	−.039(**)	—					
Future goals	.406(**)	.634(**)	.304(**)	.101(**)	.219(**)	—				
Interpersonal style	.376(**)	.352(**)	.117(**)	.004	.211(**)	.269(**)	—			
Need for cognition	.301(**)	.365(**)	.064(**)	−.151(**)	.279(**)	.234(**)	.197(**)	—		
Teacher support	.351(**)	.337(**)	−.008	−.131(**)	.167(**)	.254(**)	.550(**)	.202(**)	—	
Peer support	.410(**)	.377(**)	.075(**)	−.075(**)	.334(**)	.243(**)	.476(**)	.250(**)	.650(**)	—

**Correlation is significant at the 0.01 level (2-tailed).

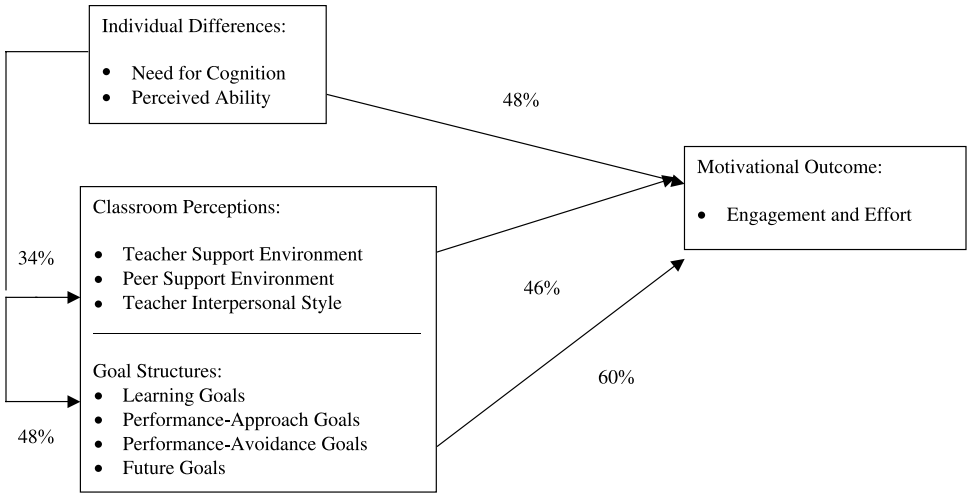

Figure 1. Relational model of the study with regression results

predictive relationship was supported as follows: the individual characteristics in perceived ability were found to significantly predict: teacher support, $R^2 = .06$, adjusted $R^2 = .06$, $F(2, 6494) = 185.85$, $p < .001$; peer support, $R^2 = .14$, adjusted $R^2 = .14$, $F(2, 6535) = 519.73$, $p < .001$; interpersonal style, $R^2 = .07$, adjusted $R^2 = .07$, $F(2, 6506) = 231.57$, $p < .001$; learning goals, $R^2 = .23$, adjusted $R^2 = .23$, $F(2, 6488) = 977.00$, $p < .001$; performance-approach goals, $R^2 = .07$, adjusted $R^2 = .07$, $F(2, 6552) = 228.52$, $p < .001$; performance-avoidance goals, $R^2 = .02$, adjusted $R^2 = .02$, $F(2, 6470) = 75.11$, $p < .001$; and future goals, $R^2 = .08$, adjusted $R^2 = .08$, $F(2, 6515) = 293.263$, $p < .001$. Individual difference characteristics explained 48% of variance in goal structures and a moderate amount of variance in classroom perceptions (34%). Students' individual characteristics predicted significantly and in the hypothesised direction, the students' perceptions of the classroom environment and their goal orientations.

The second relationship of interest was whether students' environmental perceptions and goal orientations would significantly influence their motivation. A simultaneous multiple regression analysis was conducted. The results show that students' environmental perceptions were strong predictors for students' motivation, $R^2 = .21$, adjusted $R^2 = .21$, $F(3, 6485) = 582.83$, $p < .001$. Classroom perceptions explained 46% of variance in students' motivation. An additional regression was performed to examine the relationship between students' goal structures and their motivation. Students' goal structures predicted their motivation, $R^2 = .36$, adjusted $R^2 = .36$, $F(4, 6350) = 893.22$, $p < .001$, and explained 60% of observed variance in students' motivation. Thus, students' environmental perceptions and goal structures strongly predicted their engagement and efforts.

The third relationship of interest was whether students' individual characteristics (need for cognition, perceived ability) would significantly predict their motivation. Again, a simultaneous multiple regression analysis was conducted. It supported

the hypothesised role of individual characteristics in influencing students' motivation, $R^2 = .23$, adjusted $R^2 = .23$, $F(2, 6559) = 947.79$, $p < .001$. Individual characteristics explained 48% of variance in their motivation. Thus, students' individual characteristics predicted their academic motivation. Table 3 presents standardised regression coefficients for each of the variables and their interactions.

Conclusions

This study set out to test the relationships between individual differences, perceptions of classroom environments (based on self-determination theory), and goal structures (based on achievement goal theory), and how these collectively and differentially predict high school students' motivation in the Asian context of Taiwan. Relationships between supportive climate and goals to motivation have been widely demonstrated, but primarily in Western nations. Little research has been done on the relationships between autonomy-supportive climate and goals, and still less in East Asian cultural contexts. Given the potential influences of culture, context, and policy on the classroom and school environment and on students' educational experiences, this research is essential. Beyond testing the environmental and interpersonal support constructs of the self-determination theory and the three familiar types of goal structures from the achievement goal theory in an understudied population, the present study included in the range of goal structures a fourth goal type: future goals, on which less research has been done.

Thus, the present study makes four distinct contributions to the literature. First, it combines self-determination theory and achievement goal theory in a single study, both of which are recognised as influential motivational factors, but which have rarely been studied in tandem. Second, it includes future goals in its consideration of goal structures. Third, it takes into consideration the need for cognition, which can potentially shed additional light on the investigation of these other influential motivational factors. Fourth, and most importantly, it tests these relationships using a sample of high school students in Taiwan, from all three grades and all three public school types.

First, individual differences did predict perceptions. Need for cognition is the desire to think and know, not simply but deeply, and a student with a high need for cognition sees teacher support differently from a student who wants simple questions and easy or "right" answers. Perceived ability seems to affect what students think they are capable of, so it makes sense that it influences whether they put in effort in school. The student who feels more able views teachers and peers as being more supportive, while one who feels less able sees them as less supportive. This difference may be related to behaviours like interacting and question asking (in-class inquiry), since teachers report that students who are more motivated and who feel more capable ask more questions in class (Hardré, in review b).

Second, perceptions of classroom climate did predict students' motivation. Students who focused on learning goals were in general more motivated, while those trying to avoid looking less capable had lower motivation. These findings are

Table 3. Standardised regression coefficients (βs) from regression of individual difference and achievement goal orientation variables predicting motivational variables

	Outcome variables (R^2)						
Predictor variables	Learning goals ($R^2 = .23$)	Performance-approach goals ($R^2 = .07$)	Performance-avoidance goals ($R^2 = .02$)	Future goals ($R^2 = .08$)	Teacher support ($R^2 = .06$)	Peer support ($R^2 = .14$)	Interpersonal style ($R^2 = .07$)
Need for cognition	.28***	−.01	−.15***	.17***	.17***	.17***	.15***
Perceived ability	.33***	.29***	.00	.19***	.12***	.29***	.17***

	Outcome variables (R^2)
Predictor variables	Student motivation ($R^2 = .21$)
Teacher support	.07***
Peer support	.27***
ISQ	.21***

***Significant at the 0.001 level.

consistent with Western studies using achievement goal theory. Students who regard peers as being supportive, and those who regard teachers' one-to-one interpersonal style as being supportive of their choices and learning, were more engaged and worked harder. These findings are also consistent with the Western studies in self-determination. Teacher support in the classroom was less important than peer support and the teacher's interpersonal style, so these students' perceptions of teachers are focused on how the teacher interacts with them as individuals, rather than on their more general classroom behaviours.

Third, students' individual differences also directly predicted students' motivation. Students with preference for deep thought and complex questions and those who feel more capable are more motivated and put forth more effort in school. These findings connect to learning goals in that a desire to know and understand (not just to be "right" or to "get it done") fuels a greater investment in learning tasks and in deep processing of content.

The predictors used in this study account for a large portion of the variance in students' motivation to engage and put in effort in high schools in Taiwan. The combination of individual differences and classroom environment perceptions can help to explain school-related motivation of high school students in Taiwan. For example, an assumption often made about adolescents is that peers, rather than adults, have the most significant influence on the choices they make. While high school students are very peer conscious, teachers rather than peers can have the greatest effect on high school students' school-related motivation (Hardré & Sullivan, in review). Similarly, in the present study, teachers were much more influential than peers on the motivation of these high school students in Taiwan. This finding should encourage teachers as their efforts to motivate can make a difference, despite peer influence during the high school years.

Factors that varied by interactions of all three group differences included two goal types, three types of environmental perceptions, and students' engagement and effort. In addition, some factors varied by one or more group differences, suggesting possible interactions among these variables. These findings indicate both important instructional implications and interesting directions for possible future research.

Gender differences favour females who have higher overall motivation and more positive and adaptive goal profiles than male students. Further, females reported higher perceptions of environmental support and choice. Male students in this sample reported a higher preference for deep thinking and complex problems.

As for grade-level differences, older students (Level 3) favoured perceptions of a supportive climate, and middle students (Level 2) favoured positive interpersonal-style perceptions. These findings may be related to the increasing specialisation and interpersonal connection that occurs after students declare a major in Level 2 and proceed with more intensive study with a particular subset of teachers into Level 3. Younger students (Level 1) favoured learning goal orientations (decreasing as they progress through the levels), which may in part be explained by the increased pressure and emphasis on performance assessments, including high-stakes tests in higher grades. In this sample, the need for cognition was higher among older students,

indicating that as they mature, students more readily embrace complex questions and deeper thinking about what they are learning. Perceived ability was highest in the middle group, which may be explained by the timing of students' major selection in Year 2. Clearly there are differences by grade level exhibited in both self-perceptions and environment perceptions. It is not clear whether these differences are developmental or experiential.

Among the three types of schools, overall perceived ability and student motivation were strongest in the traditional high school, but so were performance-avoidance goals. This finding suggests that these students believe they can succeed, and they try hard but they also experience a higher level of performance anxiety about their school work than students in either vocational or comprehensive high schools. Students in the comprehensive high school held the strongest interpersonal autonomy-support perceptions of their teachers and also reported feeling the most strongly supported by their peers. These findings may in part be explained by the relative stability of keeping students in the same school during both their middle school and high school years, so that they are more familiar and comfortable with their teachers, peers, and the overall school climate than students in either of the 3-year high schools.

Students in the vocational high schools had the strongest future goals, reporting the closest perceived connections between school work and their eventual careers. Given the relationship between relevance and transfer, this finding may be explained by the emphasis of vocational education on direct transfer and linkages to post-educational applications and careers (see Bransford, Brown, & Cocking, 1999; Bransford & Schwartz, 1999; Druckman & Bjork, 1994).

Across the whole sample, the present study's findings support the hypothesised relationships among these constructs that have previously been demonstrated in mostly Western studies. However, some findings presented contrasts, such as the strong positive correlation between performance-approach and performance-avoidance goals. This correlation indicates that in Taiwan's education system, high school students tend to embrace both types of performance goals together. That is, they seek to appear capable to others and to avoid appearing incapable by utilising strategies such as avoiding work to hide areas of weakness. This pattern, along with the different psychometric performance of the goal instruments, indicates some important sociocultural issues surrounding goal orientations. Within the specialised context of the Asian school, this study demonstrated some differences which indicate directions for future research.

Limitations

The present study involved a single data collection event, the quality of which is unavoidably dependent on conditions of the context at the given time. Thus, these findings assert general characteristics of the participating group at each school based on one point in time. While this is not an optimal design, it was the result of administrative constraints. This limitation is balanced by the overall large sample size and the inclusion of 14 schools improves the researchers' confidence that these

findings are indeed characteristic of the learner group and can be generalised across the large number of sites and individuals. Another limitation is that data were collected only via a single type of instrument, the self-report questionnaire, and thus they are subject to the limitations of the data-collection instrument. However, these were well-tested, psychometrically sound instruments. Therefore, the researchers are reasonably confident about using them. Further, their internal reliabilities for this participating group and context were demonstrably in the acceptable range, providing additional support for their use in this study. Nevertheless, the findings of the present study must be seen as being limited by these measurement constraints.

Instructional Implications

Based on these findings, teachers who want to enhance students' motivation might see benefits from focusing on learning goals and self-determination. Instead of focusing on performance goals (tests, grades), they could provide a supportive classroom environment by paying more attention to their interpersonal communication with students, offering choices and supporting and encouraging students to pursue their interests whenever possible. The findings on interpersonal style indicate that most students place a lot of importance on their individual interactions with teachers. At the same time, teachers should also be attentive to the peer elements of the environment. An important part of the peer support environment is the difference between competition and cooperation. Teachers can enhance peer support by reducing competition between students, and by valuing and emphasising collaboration and cooperation within the peer group.

Perceived ability is an important individual factor that significantly predicts perceptions of self and environment, as well as motivation. Ways of supporting students' positive ability perceptions include consistent feedback on developing competence and skills in the field. Teachers can use assessment to build and inform competence instead of using them to discriminate and focus on lack of skills. Students can be encouraged when they make progress if teachers set a standard of acknowledging development towards a goal (rather than emphasising distance from the goal).

Research and Policy Implications

Directions for future research in Asian cultural contexts generally and in Taiwan specifically are many, and this study suggests several that will continue to illuminate the understanding of the motivational dynamics in Taiwan's education system. First, further study should target causes of group differences, such as whether grade-level differences are developmental or experiential, and how gender-related perceptual differences may be explained. Second, more detailed study of teachers and classroom learning environments is recommended, including the strategies teachers use to motivate students, and the ordering and causal relationships of classroom characteristics and student perceptions. Third, future research should extend the

study of classroom-level environments to whole-school motivational models and contexts, including supportive environments and goal structures and orientations. Fourth, given the key role of parents and family in Asian culture, additional research may explore the role of parental support in the educational experience of high school students. All of these further investigations will contribute to the development of a more robust model of motivation for Taiwan's education system. Such a model will further inform educational reform and policy decisions.

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