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Research Article

The Impact of Taiwanese College Students' Learning Motivation from Self-Determination Perspective on Learning Outcomes: Moderating Roles of Multi-Traits

Sophia Shi-Huei Ho[1]
University of Taipei

Abstract

The purpose of this study is to explore the associations among learning motivation, engagement and outcomes, and the moderating role of various traits in the relationship between deep approaches to learning and outcomes. Based on data from 2,340 students in multiple universities in Taiwan, this study proposes two alternative models, tested by Structural Equation Modelling (SEM). The findings suggest that deep approaches to learning play a critical role in improving college students' cognitive and non-cognitive gains. The moderating effect in learning outcomes could be attributed to student and faculty traits, suggesting that in order to understand students' learning process, each trait should be considered individually. Implications for theory and practice are also discussed in this paper.

Keywords

Deep approaches to learning • Higher Education • Learning motivation • Structural equation modelling • Student learning outcome

1 **Correspondence to:** Sophia Shi-Huei Ho (PhD), Institute of Educational Administration and Evaluation University of Taipei, Taiwan, No.1, Ai-Guo West Road, Taipei, 10048 Taiwan. Email: shihuei@utaipei.edu.tw

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Higher education plays a key role in national development (Choi & Rhee, 2014). According to statistics from the Ministry of Education (MOE), there were 158 higher education institutions (HEIs) in Taiwan in 2016. This form of mass education provides more educational opportunities for students, but also raises problems like low teaching quality and competitiveness (Marginson, 2011; Shin & Harman, 2009). Recent studies on HEIs have indicated that student learning outcomes (LOs) can be significantly improved through teaching quality improvement, curriculum reform and equipment optimization (Maringe & Sing, 2014; Pike, Kuh, McCormik, Ethington, & Smart, 2011, Pike, Smart, & Ethington, 2012), but students' psychological traits are less explored (Chen, Wang, Wei, Fwu, & Hwang, 2009; Hummel & Randler, 2012). Cole, Field, and Harris (2004) found that learning motivation (LM) is the main predictive indicator of learning efficiency and outcomes. Therefore, this study attempts to explore how to promote students' LM, which has become an urgent issue for HEIs not only in Taiwan but many countries.

Western scholars have attempted to understand learning psychology and behavior (Deci & Ryan, 2000; Wigfield & Eccles, 2000) from the perspective of achievement motivation, although cross-cultural studies have gradually gained more attention. Research has shown that the psychological process and behavior of non-Western samples in pursuing achievement are significantly different from those seen in Western samples (Chang et al., 2011; Chen et al., 2009; Heine et al., 2001). With regard to Taiwanese students, Chen et al. (2009) found that these took factors like social expectations, corresponding obligations, and role identification into account, in addition to autonomous interest and self-identity. Therefore, to improve the performance of Taiwanese college students it is necessary to further verify the perception and status of LM by examining two important factors, academic identity (Nasir, Mclaughin, & Jones, 2009; Winter, 2009) and role identity (White, Thomas, Johnston, & Hyde, 2008), and their correlation with outcome variables.

Studies show that the greatest influence on students' experience and perceptions of the whole learning process are teaching quality and interactions (Pike et al., 2012), which can arouse greater class participation and positive attitudes. Furthermore, the methods and strategies of learning engagement that students adopt are the key to internalize the knowledge they are exposed to. Smart, Feldman, and Ethington (2000) regarded student learning engagement as an important mediator in the relationship between academic development and LOs, with learning engagement referring to the learning behaviors of students and their adaptability to HEIs and course learning (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006).

In student learning engagement, Marton and Säljö (1976) proposed the "deep process," which effectively distinguishes differences in students' reactions to learning

tasks. The deep approach to learning (DAL) shows that students' ability to extract information is the key point to effective learning and obtaining better outcomes. Students applying DAL can process, preserve, integrate and transfer important information more quickly than those applying surface approaches (Ramsden, 2003). Take as a whole, the evidence suggests that the ways students adopt DAL may have different consequences not only for their approaches to learning, but also the quality of their outcomes.

Previous studies discussing the relationship between learning engagement and outcomes often reached different and contradictory results (Campbell & Cabrera, 2014; Pike et al., 2011, 2012; Reason, Cox, Mclntosh, & Terenzini, 2010). It is argued that these inconsistent findings might be caused by contextual variables, such as institutional and student traits, especially in major (Pike et al., 2011). Additionally, faculty traits should be also considered, because the teaching style, personality and attitude of teachers would directly affect students' learning and outcomes.

The current study, examining Taiwanese HEIs' students, will thus help in exploring the factors that influence LOs by proposed a learning motivation theory with a more complete conceptual framework, so as to extend its implications and generalization. The findings of this study can be also used to enhance generic student competencies and improve course design and teaching quality based on LM and DAL, as well as identifying different contextual factors to find the optimal conditions for promoting LOs.

Literature Review

Theoretical Background

This study is based on self-determination theory (SDT) proposed by Deci and Ryan (1985), which emphasizes that individuals have the intrinsic motivation to conduct behaviors in order to address their interests. It also assumes that individuals have three basic requirements: autonomy, competency and social relatedness. Deci and Ryan (2000; 2002) claimed a high level of autonomy and competency will enable individuals to generate intrinsic motivation, and enhance interpersonal interaction through social relatedness. Therefore, SDT, integrating many social contextual factors and individual psychological variables (Guay, Ratelle, & Chanal, 2008) and influencing optimal learning, learning engagement and well-being, has been widely applied in education.

Vallerand, Fortier, and Guay (1997) proposed hierarchical models of intrinsic and extrinsic motivation based on SDT, which showed that the motivation model of individual behaviour mainly follows social context→ psychological intermediary→ motivation pattern→ behavioural results. Self-determination also positively

influences the learning process and learning outcomes (Hummel & Randler, 2012). The purpose of measuring LOs is to make students familiar with their learning status, which can enable teachers to improve teaching quality and learning efficiency (Guay et al., 2008). Pike et al. (2011) maintained that HEIs' educational expenditures and student learning engagement might influence LOs, as represented by two scales: cognitive and non-cognitive gains. Cognitive gains scale means to what extent the college experience contributes to making progress in such areas as general education, writing and speaking effectively, and critical thinking while non-cognitive gains scale is derived from students' responses concerning self-understanding, working with others and civic/community engagement. Referring to Pike et al. (2011), this study adopts cognitive and non-cognitive gains as the indicators to measure LOs.

Learning Motivation

The differences between individuals in learning ability and motivation are often regarded as key predictors for learning and training effectiveness (Cole et al., 2004). LM refers to learners' willingness to participate in a learning program, which will influence the direction and focus of the decision-making process (Noe, Wilk, Mullen, & Wanek 1997). Western research might not be completely extended to an Asian context because of cultural differences. According to the conceptual framework proposed by Chen et al. (2009), the academic achievement of Asian students derives from social expectations and autonomous interests, which are originated from a sense of obligation and autonomy of the individual, respectively (D'ailly, 2003). Further, both social expectations and autonomous interests are the motivations to pursue achievement goals, and there is no trade-off in between. On this basis, Chen et al. (2009) claim that the goals for academic achievement of Asian students can be divided as "vertical goals" and "personal goals." Vertical goals mean the goals that consist of others' expectations and high social value, and their contents and criteria are determined by the society. Personal goals, however, come from one's autonomous interests, and the contents and criteria are decided by an individual. Thus, the aim of this study is to explore the influence of LM, which including "role identity" (vertical goals) and "academic identity" (personal goals) on Asian students' psychology and behaviour in pursuing academic goals (Chen et al., 2009; Nasir et al., 2009; White et al., 2008; Winter, 2009).

Stryker (1987) indicated that individuals would have different self-cognitions because of different social roles and statuses. The self-expression of individuals can not only reflect their role and status in a social structure (White et al., 2008), but is also a set of behavioural tendencies, intentions and social expectations, which generate behavioural patterns (Simon, 1997). Students, as members of a learning group, should identify their roles and shoulder their obligations, and thus the learning process is related to changes in self-identity which include "discover

oneself" or "construct oneself" (Volman & ten Dam, 2007). This requires students to follow instructions and implement tasks, and then teachers will observe the outcomes and demonstrate "beliefs and values" through instruction, affirmation and correction (Reveles & Brown, 2008; Reveles, Cordova, & Kelly, 2004). Furthermore, student outcomes in learning tasks will influence their motivation, engagement and achievement, thus forming up individual role identity (Chavez, 2007). Namely, students' role identity does not exist in their psychological perceptions, but develops from the teaching-learning process, which should not only be in conformity with students' self-expectations, but also the teachers' expectations (Regan, 2012). In this study, learners' cognitive development with regard to self-identity is seen as subject to social relationships, including teacher-student interactions inside and outside the classroom and participation in learning tasks.

According to the SDT perspective, individuals' understanding of their academic interests and competencies (Chen et al., 2009) are part of their self-identity, which is also known as academic identity (Anctil, Ishikawa, & Scott, 2008; Deci & Ryan, 2000). Chen et al. (2009) further explained learners' LM through an achievement goal model. They believed that personal goals consist of a set of highly-recognized common values, from which people select and identify the contents and criteria of achieving their goals from a wide range of specialized fields, including academic and autonomous interests.

Wigfield and Eccles (2000) discussed achievement motivation from the cognitive level. They advocated that the individuals' sense of competence, expectation of success and subjective value of the goal would affect their achievement and choices. However, there are many factors influencing motivation, including positive and negative factors like complexity of the tasks, skill acquisition, anxiety, and lack of effective teaching facilities, which would further influence student LOs (Richardson, Abraham, & Bond, 2012; Tella, 2007). Wentzel (1998) believed that students' interest in academic activities would enhance their possibility of establishing a goal and enable them to input more time and effort to achieve it. Yorke and Knight (2004) also found that autonomous learners would engage in learning activities more actively, influencing their motivation and engagement, as well as expectation of success. If the goal is infeasible or beyond reach, their LM would be reduced as well as further reducing learning engagement. While competency is regarded as the critical factor for greater confidence in learning engagement, the motivation for continuous learning will be strengthened when all challenges are seen as opportunities for learning and engaging in DAL.

In sum, role and academic identities are conducive to stimulating and maintaining students' interest in learning and enabling them to think about the nature and

implications of knowledge thoroughly. Previous studies have shown that students' autonomous interest and competency are the key components for establishing LM, and that academic and role identities, engagement, and academic achievement are related (Abes, Jones, & McEwen, 2007; Boyd, Hunt, Kandell, & Lucas, 2003; Lounsbury, Huffistetler, Leong, & Gibson, 2005). Therefore, this study proposes following hypotheses:

H1: Academic identity and learning engagement ((1a) higher-order learning, (1b) integrative learning, and (1c) reflective learning) have a positive relationship.

H2: Role identity and learning engagement ((2a) higher-order learning, (2b) integrative learning, and (2c) reflective learning) have a positive relationship.

Learning Engagement via Deep Approaches to Learning

Students' learning engagement can be regarded as the quality of their learning experience (Pace, 1984). The physical and psychological efforts that students make depend on the active role they play in the learning process (Choi & Rhee, 2014). Therefore, in the process of inspiring students' learning orientation and engagement, teachers should turn from passive, teacher-oriented teaching methods to active, learner-centered activity design, and commit to bringing students to a deeper understanding, so they can apply real-life examples to different situations (Tagg, 2003), a concept known as DAL.

Campbell and Cabrera (2014) used the National Survey of Student Engagement (NSSE) to measure learning engagement. More than 1400 institutions have applied this to explore their educational practices. DAL is one of the important variables, with well-established internal and construct validity, and Goodness-of-fit Indices (RMSEA, CFI, TLI, etc.) (Laird, Shoup, & Kuh, 2006; Campbell & Cabrera, 2014), and can effectively predict students' GPA. DAL has been applied by scholars and HEIs to develop the diversified learning potential of students (Biggs, Kember, & Leung, 2001; Laird, Shoup, & Kuh, 2006; Laird et al., 2008; Pascarella, Wang, Trolian, & Blaich, 2013; Reason et al., 2010). Students using DAL not only focus on the substantive content of the information, but also the fundamental meaning, contextual connections, and integrated knowledge it represents, thus improving teaching quality in HEIs (Biggs & Tang, 2011; Pascarella et al., 2013; Ramsden, 2003; Tagg, 2003). The development process is composed of the joint efforts of students, faculties and HEIs to foster an in-depth and specific teaching mode (Biggs & Tang, 2011; Campbell & Cabrera, 2014).

Scholars agree that DAL is based on students' commitment to understanding learning materials and information, which is reflected in the different strategies they use in learning

(Ramsden, 2003; Tagg, 2003). The characteristic of DAL is integrating and summarizing previously learned information and transferring this into one's personal knowledge, thus inspecting new phenomena and activities from different perspectives (Ramsden, 2003; Tagg, 2003). As to for variables of DAL, these include higher-order, integrative and reflective learning (Biggs & Tang, 2011; Campbell & Cabrera, 2014; Pascarella et al., 2013). Higher-order learning emphasizes the extent to which students believe that their courses will enable advanced thinking skills, such as analyzing the basic elements of an idea, experience or theory, and integrating them with novel and complex interpretations, as well as proposing their own opinions and solutions to practical problems. Integrative learning refers to students' participation in various fields and the integration of ideas from different channels. Reflective learning is when students can analyze their own opinions, engage in autonomous learning and extend their insights and understandings, and finally apply their new knowledge in practice (Laird et al., 2008; Pascarella et al., 2013). Based on Laird et al. (2008), this study regards higher-order, integrative and reflective learning as the measured variables of DAL.

Scholars have examined whether DAL can effectively enhance LOs (Laird et al., 2008; Reason et al., 2010), with conflicting results. Thus, the application of general principles and knowledge will help students to face unique situations, understand and internalize new information, and thus enhance their knowledge, skills and abilities (Oleson & Hora, 2014). In addition, explicit and systematic course instruction will help students to not only focus on the acquisition of knowledge and facts, but promote their understanding of substantive content and implied significance (Laird et al., 2006), which are conducive to enhancing critical thinking skills and cognitive needs (Pascarella et al., 2013). Therefore, this study proposes the following hypotheses:

H3: Higher-order learning and LOs have a positive relationship.

H4: Integrative learning and LOs have a positive relationship.

H5: Reflective learning and LOs have a positive relationship.

The Influence of Contextual Variables on DAL and LOs

Contextual factors play an important role in students' practice of DAL (Ramsden, 2003; Tagg, 2003). Campbell and Cabrera (2014) found that higher-order, integrative and reflective learning only have a slight influence on GPA, probably because of the different contexts of institutions. Cooperation between institutions (e.g., large, research institutions) and faculties and administrators ensures greater academic rigor, because these institutions would ask the faculties to apply teaching practices and methods that can enhance DAL (Biggs & Tang, 2011). Pascarella et al. (2013) reported similar findings in a Liberal Arts College and Research University, with the

relationships among DAL, critical thinking and cognitive need being moderated by several factors.

As there are many contextual factors affecting DAL and LOs, the author cannot consider them all into this study (Kember & Leung, 2011; Lindblom-Ylänne, Trigwell, Nevgi, & Ashwin, 2006; Vermunt, 2005). However, scholars state that it is necessary to consider the key factors, such as the traits of students, HEIs and faculties, to obtain a more comprehensive understanding of the students' learning process (Choi & Rhee 2014; Laird et al., 2008). Therefore, this study proposes the following hypothesis. In addition, the research framework has been composed according to the research purposes and hypotheses, as shown in Figure 1:

H6: The different traits of students, HEIs and faculties will affect the relationship between DAL and LOs.

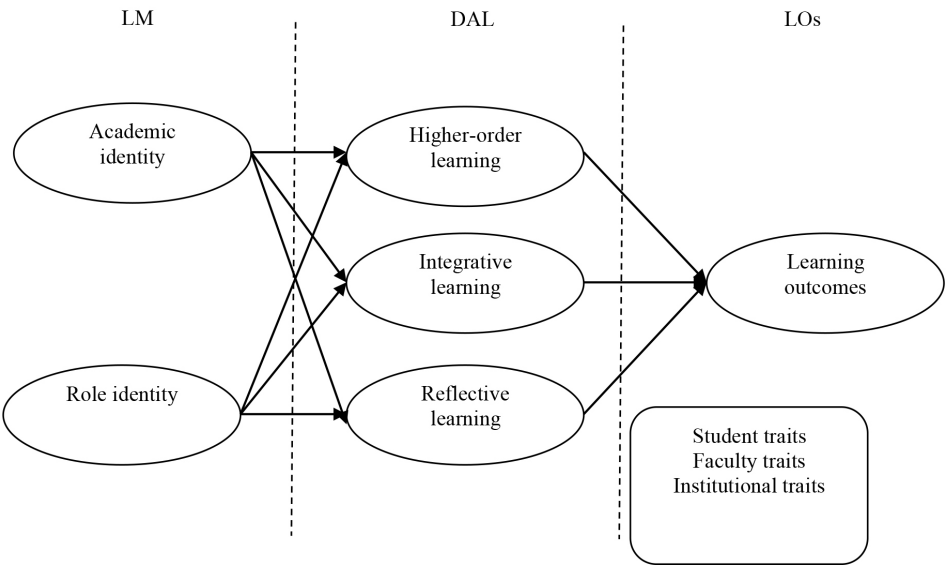

Figure 1. Conceptual framework.

Research Method

Sampling

This study proposed a framework to explore the correlations and development mode of LM, engagement and outcomes. It sampled from all Taiwanese HEIs, including public and private, vocational and general ones. This study also incorporates teaching funding support from MOE of Taiwan as a sampling condition, as HEIs who obtain such funds are recognized as providing quality teaching.

This study selected 16 Taiwanese HEIs and sent 3,000 questionnaires to them. After simple random sampling, a total of 2,354 questionnaires were returned, for an effective response rate of 78.5%. Since freshmen were not familiar with the learning environment, all participants in this study were sophomores, junior and senior students. Excluding 14 invalid questionnaires, the study obtained 2,340 valid ones and 56.6% were from female. 48.7% of them are sophomores, 38.9% juniors and 12.4% seniors. Moreover, most participants (62.0%) spent less than five hours on self-study each week, and 26.3% of them 6-10 hours. In order to generalize the results, this study simplified the influence of disciplines, with 65.8% of the participants being social science majors and 34.2% natural science majors.

Instrument

In the LM construct, academic identity is the degree to which the learners understand and identify their academic interest and ability, which could be used to evaluate their engagement in learning activities through pursuing goals. The academic identity scale adopted in this study was the four items proposed by Nasir et al. (2009) (e.g., "The courses are very suitable for me"). As to role identity, it is the degree to which the students recognize their identity as a learner through participating in learning activities and teacher-student interactions under the influence of social context. This study adopted five items developed by White et al. (2008) (e.g., "Generally speaking, I think it is appropriate for me as a college student to attend study sessions").

DAL is an important construct in learning engagement, and assessed by three scales developed by Campbell and Cabrera (2014), Laird et al. (2006; 2008) and Pascarella et al. (2013), which include higher-order, integrative and reflective learning. Higher-order learning was measured by four items, emphasizing that students should advance their thinking skills. Integrative learning consists of five items, including students' participation in learning activities and their ability to integrate ideas and thoughts from various sources. Reflective learning contains two items, emphasizing that students could apply their new learning to real life after integrating and extending new knowledge.

The construct of LOs is divided into cognitive and non-cognitive gains. This study adopts the scale proposed by Pike et al. (2011). The cognitive gains scale contains nine items and requires students to point out their progress in college learning (e.g., thinking critically and analytically), and the non-cognitive gains scale was measured by seven items concerning self-understanding, working with others, developing ethical standards, and civic/community engagement. All items were measured with a seven-point Likert scale (1 = totally disagree; 7 = totally agree).

Students may also be affected by factors in the learning process that may disrupt learning engagement. Specifically, differences in the relationship between learning

engagement and LOs are caused by variables like student, institutional and faculty traits (Chang, Bai, & Wang, 2014; Choi & Rhee, 2014). Student traits mainly consist of background characteristics (e.g., gender, household income, first-generation status) and learning experience (e.g., years in university, major). Institutional traits refer to structural characteristics, such as location, form (public or private) and mission. And teacher traits mean teaching quality and student-faculty interaction, measured with three items and a seven-point Likert scale (1 = totally disagree; 7 = totally agree).

Analysis and Results

Measurement of Structural Constructs

This study adopted SEM for the analysis. All scales were reliable, with composite reliabilities ranging from .66 to .89, most of which exceeded the benchmark of .70. Table 1 shows the reliability for each scale and factor loadings for each item. Confirmatory factor analysis (CFA) was examined with LISREL 8.54 to verify the convergent and discriminant construct validities of the scales (Anderson & Gerbing, 1988). Hair, Balck, Babin, Anderson, and Tatham (2006) recommended that convergent validity be assessed using three indicators: (1) standardized factor loading higher than .70; (2) Average Variance Extracted (AVE) above .50; and (3) Composite Reliability (CR) above .70. The evaluation standard for discriminant validity is the square root of AVE for one dimension should be greater than the correlation coefficient with any other dimension(s). Table 1 shows that all three criteria were met, except for the slightly lower AVEs of role identity, integrative learning and cognitive gains. The correlation coefficients of the dimensions were all less than the square root of AVEs, suggesting that each had good discriminant validity.

Table 1
Analysis on Reliability and Validity

	1	2	3	4	5	6	7
Role identity	*.648*						
Academic identity	.456**	*.700*					
Higher-order learning	.335**	.347**	*.819*				
Integrative learning	.355**	.465**	.694**	*.671*			
Reflective learning	.295**	.311**	.580**	.604**	*.735*		
Cognitive gains	.387**	.390**	.655**	.657**	.539**	*.633*	
Non-cognitive gains	.320**	.332**	.557**	.544**	.522**	.622**	*.721*
Mean	5.11	5.10	5.06	4.68	5.17	4.85	5.04
SD	.54	.26	.12	.43	.24	.20	.32
α	.664	.793	.889	.801	.766	.863	.836
AVE	.42	.50	.67	.45	.54	.40	.52
CR	.68	.78	.89	.80	.77	.86	.87

Note. ** $p < .001$. Numbers in italic denote the square root of AVE.

SEM Analysis Results

The study verified relationship among constructs via structural equation modelling (SEM). For constructs with a higher-order factor structure (organizational tensions) which are formative in nature, Lee and Cadogan (2013) suggested that research should avoid developing and assessing a model containing a direct link from the antecedent variable to the aggregate endogenous variable. Therefore, the author reduced the number of parameters to be estimated following the partial aggregation method (Little, Cunningham, Shahar, & Widaman, 2002). This procedure involves averaging the responses of sub sets of items measuring a construct. It is formed three indicators for DAL. The measurement model had a good fit with the data, as seen in the statistics for DAL (RMSEA = .063, CFI = .966, NNFI = .952, GFI = .923). Thus, based on these supportive findings and in the interests of parsimony, this study aggregated the sub-constructs of the higher-order, integrative and reflective learning to obtain the higher-order construct of DAL.

This study adopts SEM to test the structural mode of the model and interpret the explained variation of constructs, thus explaining the strength of the cause effect between constructs. Goodness-of-fit tests showed that the original conceptual model failed to properly explain the relationships among all variables (χ^2 = 6475.518; *df* = 482; RMSEA = .073; SRMR = .097; AGFI = .825; CFI = .849). Because the criteria for the RMSEA and SRMR were exceeded and AGFI and CFI were lower, *t*-values for the effect parameters were examined to determine if any non-significant paths could be eliminated. Several non-significant relationships were identified and fixed to zero. After examining the modification indices for the relationships among observed variables, the resulting model provided a better representation of the relationships (χ^2 = 1304.606; *df* = 407; RMSEA = .031; SRMR = .044; AGFI = .954; CFI = .977).

H1a, b, c stated that role identity positively affects high-order, integrative, and reflective learning. Figure 2 shows that role identity (β = .276, p < .001; β = .231, p < .001; β = .248, p < .001) has significantly positive influences on high-order, integrative, and reflective learning, which supports H1a, b, c. Although academic identity (β = -.224, p < .001; β = -.410, p < .001; β = -.240, p < .001) significantly influences high-order, integrative, and reflective learning, these were negative relationship, rejecting H2a, b, c. Moreover, while high-order learning insignificantly affected non-cognitive gains, the other path coefficients on correlations from DAL [high-order (β = .215, p < .001), integrative (β = .589, p < .001; β = .293, p < .001), and reflective learning (β = .136, p < .001; β = .310, p < .001)] to LOs (cognitive and non-cognitive gains) were positive and significant, full supporting H4 and H5, but partially supporting H3. These findings suggest critical DAL, higher-order, integrative, and reflective learning are central factors in explaining LOs in a higher education context.

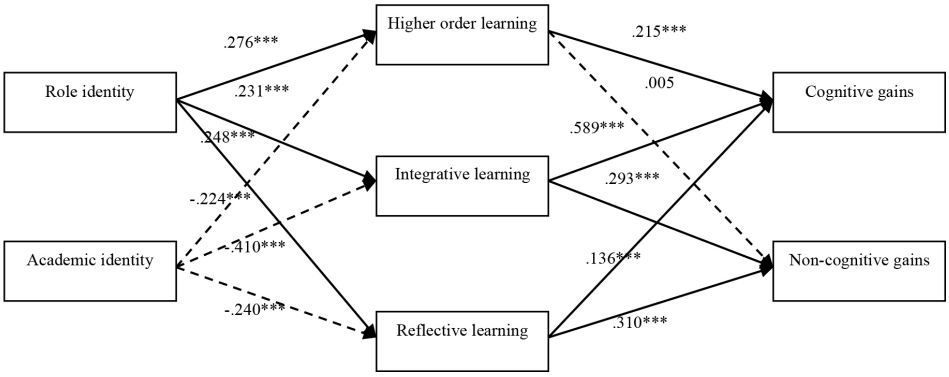

Figure 2. Structural equation modelling with standardized coefficients.

Moderating Effects on the Relationship between DAL and LOs

To examine the moderating effects of student, institutional and faculty traits on the relationship between DAL and LOs, the author mean centered DAL to reduce multicollinearity (Sharma, Durand, & Gur-Arie, 1981) and estimated two graphic depictions of the full SEM models. Student, institutional and faculty traits are entered as moderating variables affecting the main path in the model, with the results shown in Table 2. In the first model the author multiplied DAL with each trait and incorporated it into the interdependent variable for analysis, so as to test the influence of situation variables on the main effect. The result showed that gender (β = .150, p < .001) and faculty traits (β = .047, p < .001) have positive moderating effects on the relationship between DAL and cognitive gains. In the second model, the estimated coefficient of the moderating term between DAL and household income on non-cognitive gains is negative and significant (β = -.272, p < .001), as is the moderating term between DAL and year of university on non-cognitive gains (β = -.156, p < .001), which partially supports H6.

Figure 3 indicates that the effect of DAL on cognitive gains differed by gender and faculty traits (high vs. low teaching quality). The steeper slope for female students suggests that those who are more actively engaged in DAL receive more cognitive gains. Similarly, high teaching quality and teacher-student interaction can enhance LOs and make students obtain more cognitive gains.

Likewise, as shown in Figure 4, the steeper slope of low household income students, compared with that of high household income students, shows the stronger effects the former experience with regard to non-cognitive gains. Another interesting point is the steeper slope of sophomores, compared with that of other years, and these students reported being more engaged in DAL, and thus more non-cognitive gains.

Table 2
Examination of Moderated Effect

Variables	Cognitive gains	Non-cognitive gains
Deep approach to learning	.818(.112)***	.853(.161)***
Student traits		
Gender	.150(.020)***	.076(.028)
Household income	-.091(.023)	-.272(.033)***
First-generation status	-.079(.015)	-.059(.021)
Year of university	.001(.013)	-.156(.020)***
Major	.017(.020)	.055(.029)
Institutional traits		
Location	-.030(.015)	-.070 .022)
Form	-.009(.020)	.057(.030)
Mission	.025(.018)	-.040(.026)
Faculty traits	.047(.008)***	.019(.011)
Chi-square (*df*)	171.287(90)	107.860(54)
RMSEA	.020	.021
SRMR	.030	.025
AGFI	.984	.985
CFI	.999	.999

Note. *** $p < .001$.

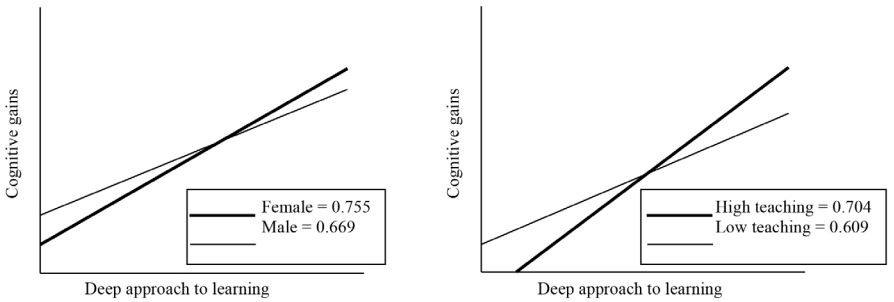

Figure 3. Effect of moderators on relationship between DAL and cognitive gains.

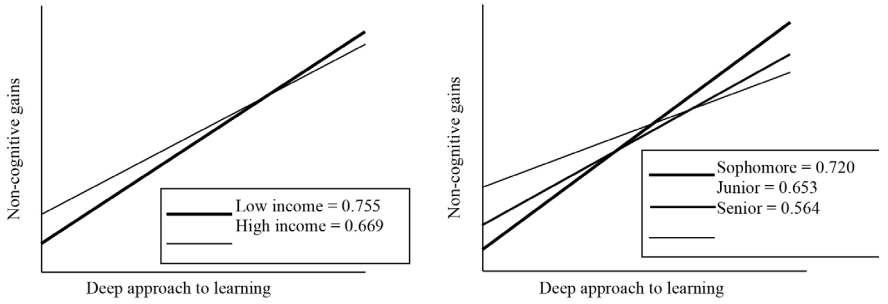

Figure 4. Effect of moderators on relationship between DAL and non-cognitive gains.

Discussion and Conclusions

This study explored the significant developmental forms of LM-engagement-outcome contexts that facilitate LOs at Taiwanese HEIs. Referring to SDT, DAL and the achievement goals proposed by Chen et al. (2009), the results show the correlations among main variables and the influence of each contextual factor on these relationships. Our findings suggest the relationships between role identity and three DAL constructs are positively significant. Therefore, the more the students understand and identify with their role obligations, the more they will be engaged in DAL activities.

For Taiwanese college students, their obligation to social expectations may encourage them to pursue academic achievement. However, our findings revealed that academic identity has negative influences on higher-order, integrative and reflective learning. This does not exactly conform to the motivation theories promoted by Western scholars, but is consistent with Chen et al. (2009). In other words, the LM based on psychological theory must make full consideration of cross-cultural factors (Chang et al., 2011). Although Taiwanese students are likely to have autonomous interest or competency towards academic goals, their autonomy with regard to selecting these goals is still subjected to limitations of various social expectations, in contrast to Western students.

The findings demonstrate that higher-order, integrative and reflective learning are positively related to cognitive and non-cognitive gains, thus supporting the use of DAL. The research results echo the opinions of Biggs and Tang (2011), Campbell and Cabrera (2014), Laird et al. (2008), Maringe and Sing (2014), and Pascarella et al. (2013) that encouraging students to use DAL requires training in approaches to critical engagement with texts and writing critically, and in the application of conceptual ideas in designing concerned issues and empirical investigations.

Higher-order learning had a significant direct effect on cognitive gains but not on non-cognitive gains. This implies that Taiwanese HEIs have insufficiently emphasized general education and the courses they provide are not designed specifically for certain teaching aims, such as enhancing students' social adaptability, ethical values and soft skills. Moreover, the educational funding granted by the government is insufficient to cover the necessary education expenditures, and this indirectly lowers the students' understanding and practice of ethics, values and self-belief. Additionally, non-cognitive gains were derived from students' established social expectations and role obligations in this study, which might further weaken the effect of higher-order learning.

In terms of contextual variables, this study examined whether student, institutional and faculty traits influence the relationships between DAL and LOs. Our findings demonstrate that gender and faculty traits (e.g., teaching quality, interaction with

students, and pedagogical differences) will moderate the relationship between DAL and cognitive gains. This echoes the claims of Chang et al. (2014) that students and faculties are two leading actors in the classroom. However, only student traits have a significant and negative moderating effect on the relationship between DAL and non-cognitive gains, indicating that the effect of DAL will be weakened by students' traits. In terms of household income, low-income students engage more efforts in DAL to improve non-cognitive gains than high-income students. However, the non-cognitive gains obtained by sophomores are higher than those obtained by seniors, probably for the following reasons. For one thing, many students from low-income households have to do part-time jobs to cover their tuition or living expenses. They thus have to develop their own philosophy of life, ethical standards and values in relation to the learning engagement process earlier than more privileged students. In addition, low-income students often lack learning resources, such as computers, supplementary education and learning materials, and so may be slower in acquiring and enhancing professional skills. They are thus more sensitive to non-cognitive gains than other students.

In sum, this study makes three important theoretical contributions to the higher education literature. Firstly, previous LM studies by Western researchers mainly emphasized the importance of intrinsic interest, autonomy and competency to meet academic achievement goals (Deci & Ryan, 2000, 2002). They thus paid few attentions on the positive influence of external social expectations. This study adopted the cross-cultural view suggested by Chen et al. (2009), based on the idea that students from Asian societies have more positive self-regard and identification with social roles than Western students. Moreover, in the face of high role obligations generated by vertical goals, Asian students regard successful academic performance as a responsibility to meet parental expectation. Specifically, even if they have little intrinsic interest or inadequate competence, they will try their best to do well. As a result, some students may get trapped in the under-achiever dilemma, as experiences of failure may transform their learning interest into responsibilities and obligations, which produce maladaptive behaviors in the long run and lower engagement in DAL.

Secondly, this study confirms that the national studies of the NSSE DAL constructs do, in fact, hold for various HEIs. It also supports the recommendation of Campbell and Cabrera (2014) about the need to replicate past research on the impact of DAL on college students. Our replication of multi-institutional studies suggests that three DAL constructs could be useful for formative assessment, enabling HEIs to track progress across time and possibly across institutions. This study also supports the implicit hypothesis made by Mayhew, Seifert, Pascarella, Nelson Laird, and Blaich (2012) that higher-order, integrative and reflective learning are themselves manifestations of a higher order learning factor; namely, DAL. Our measurement of three DAL

constructs differed from that of Campbell and Cabrera's (2014), as it was found the higher-order learning construct was the most reliable indicator of the second order DAL constructs, with fewer measurement errors. HEIs might thus consider the items in this construct to be particularly important for interventions that target students' DAL, with a focus on the degree to which students believe that their courses emphasize advanced thinking skills (Laird et al., 2008; Pascarella et al., 2013).

Thirdly, conforming with the ideas of other scholars, this study holds that the relationship between learning methods and outcome may be subject to many features and properties (Kember & Leung, 2011; Lindblom-Ylänne et al., 2006; Vermunt, 2005). Thus it is suggested that future studies should consider various features more seriously as moderating variables, like student, institutional and faculty traits, when they conceptualize DAL influences on student LOs. This viewpoint is consistent with Pike et al. (2011) which stated that any links between learning engagement and outcomes are likely to be strengthened or attenuated due to differences in student and institutional characteristics. Furthermore, this study added faculty traits to more clearly examine how DAL is consistently related to LOs.

Limitations and Suggestions for Future Research

This study is limited in at least four aspects. Firstly, while studies using motivation theory have achieved remarkable results and make significant contributions in the field of psychology, few of them discuss the relationship between student LM and LOs in the context of HEIs. Although this study established the dimensions of LM based on SDT, including role and academic identities, and the results have great reference value for research on student learning theory, there are still other motivation theories that may explain how to inspire student learning, such as attribution theory, self-efficacy theory, need-hierarchy theory. Future studies can thus follow adopt different models to construct the dimensions that may influence LOs. Secondly, this study required the participants to recall their learning process and performance, because their actual academic records were unobtainable, and the results may thus have some biases. It is thus suggested that future studies can be made based on real student records in order to obtain more accurate results. Thirdly, the participants in this study came from just 16 HEIs, and thus future works can expand sample representativeness by selecting participants from other student groups. Finally, this study failed to discuss a complex causality model, such as one using cross-sectional time series, and so future research could collect multiple channels of information for specific group, to clarify about the interrelationships among variables.

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