The Effects of Informal Faculty-Student Interaction and Use of Information Technology on Non-Traditional Students' Persistence Intentions and Educational Outcomes

Morgan M. Shepherd
University of Colorado at Colorado Springs

Tsong Shin Sheu
Nan Kai University of Technology

Most previous research has not found social integration to have an impact on non-traditional (NT) students' education outcomes. The purpose of this study was to see the effects of information technology (IT) and informal faculty-student interaction on education outcome for NT students, and to see if IT will enhance the impact of informal faculty-student interaction on academic integration. The results indicate that informal faculty-student interaction has a positive effect on academic integration and persistence intention and that the use of information technology has a positive effect on academic integration and psychological outcomes.

INTRODUCTION

Previous research has shown a positive relationship between student-faculty interaction and academic achievement, educational aspiration, intellectual growth and academic satisfaction among traditional students (Kim & Sax 2009; Newswander & Borrego 2009; Pascarella & Terenzini 1976). Some researchers have found the interaction to also help with student persistence intentions, or retention while others focused on the impact to academic and non-academic experiences along with persistence intentions (Cotton & Wilson 2006; Gardner 2007; Pascarella & Terenzini 1976; Severiens & Schmidt 2009; Tinto 1975). In their study, Read et al. (2003) found that constraints on the availability of instructors to interact with students outside the classroom setting creates a distancing effect in the students' minds. These interactions generally consist of formal interactions in the classroom setting and informal interactions outside of class. However, studies by Endo and Harpel (1982) showed that informal student-faculty interaction impacts students more than formal interaction does. For this paper, student-faculty informal interaction is defined as students' active involvement in informal interaction, and faculty-student interaction is defined as faculties' active involvement in informal interaction. Kobrak's (1992) study showed that black students benefitted more from informal faculty-student interaction than they did from formal interaction in terms of their persistence intentions.

The issues with NT students have become more of a concern for universities today because of the short supply of traditional students and because of the increase in the numbers of NT students. The NT students are coming back for career changes, promotion requirements or just for personal enrichment and their numbers are increasing (Brinkworth et al. 2009; Jamelske 2009; Spellman 2007).

The results from Thompson's (2001) study of NT community college students concurred with prior studies that showed informal student-faculty interaction has the greatest overall effect on science- and mathematics-based academic achievement. However, the link between informal student-faculty interaction and NT student retention needs to be further clarified. Although previous research has shown that informal student-faculty interaction does have a positive impact on student retention, that relationship was not validated in Thompson's study. It has been suggested that this may be attributed to the fact that there are additional time constraints on NT students due to their work and possibly due to family obligations. This was also found to be true in studies done by Cotton and Wilson (2006) and Metzner and Bean (1987) where neither membership in campus organizations, faculty contact nor identifying with friends who were also enrolled had an effect on student dropout rates or persistence intentions. Christie et al. wrote that these social and institutional factors "…are crucial to a deeper understanding of the nature of non-completion." (2004, page 621). However, this raises the question of how we can increase the impact of faculty-student interaction on NT students. The first part of this current study is to see if more active faculty involvement in the faculty-student interaction will significantly increase the impact on education outcome.

In addition, Metzner and Bean's (1987) study of attrition for NT students examined environmental variables such as finances and the support and encouragement of significant others. These variables were found to directly influence the NT students' psychological outcomes and their persistence intentions. Laird and Kuh (2005) and Paul and Mukhopadhyay (2001) examined the use of information technology (IT) to see the impacts on collaborative learning and student-faculty interaction among traditional students. They found that IT does have a strong impact on both active and collaborative learning and student-faculty interaction. It is thought that the use of IT can mitigate the time constraints faced by NT students by facilitating their learning and communication. IT here refers to email, the WWW and collaborative technologies. Thus the second part of this current study is to see what effect the use of IT has on the academic outcomes, the psychological outcomes and the persistence intentions of NT students.

BACKGROUND AND HYPOTHESES

Definition of a Non-traditional (NT) Student

Unfortunately, there are various definitions for the term "NT student" among researchers today. Bean and Metzner (1985 p.489) state "A nontraditional student is older than 24, or does not live in a campus residence (e.g., is a commuter), or is a part-time student, or some combination of these three factors; is not greatly influenced by the social environment of the institution; and is chiefly concerned with the institution's academic offerings (especially courses, certification, and degrees)." Horn (in Spellman 2007) defined NT students as those having any of the following characteristics: (a) those who delayed enrollment into college, (b) part-time students enrolled in less than 12 credits a semester, (c) financially independent students, (d) those who work full-time, defined as more than 35 hours per week, (e) those with dependents other than a spouse, including children or other relatives, (f) single parents, or those responsible for more than 50% of their child's upbringing, and (g) those who did not receive a standard high school diploma. Horn suggests that students falling into one category are minimally non-traditional, students with two or three characteristics are moderately non-traditional, and those possessing four or more of the non-traditional characteristics are considered to be highly non-traditional.

The U.S. National Postsecondary Student Aid Study used seven traits to define NT students: first generation status (those whose parents' highest level of education attainment is a high school diploma or less), delayed entry (students < 24 years of age who delayed entering a post secondary institution for one or more years following high school graduation), part-time attendance (those enrolled in less than full-time or 12 credits), having off-campus employment, having financial independence, having dependents/single parenthood (students having at least one child or parent dependent), and the absence of a high school diploma (U.S. Dept. of Education 1999). This National Center for Educational Statistics (NCES)-sponsored study used these traits to compute a Risk Factor Index (RFI) for non-traditionality. Based on the absence or presence of these factors, a score was created and students were categorized as:

traditional (0 risk factors), minimally non-traditional (1 risk factor), moderately non-traditional (2-3 risk factors), and highly non-traditional (4 or more risk factors). The NCES study found that increased non-traditionality was associated with lower student persistence and attainment.

The Attrition Model of NT Students

Bean and Metzner (1985) first proposed a conceptual model for NT undergraduate student attrition; and they subsequently tested the model (Metzner & Bean, 1987). In the model, they examined the relationships between background and defining variables, academic variables, academic outcome, environmental variables, social integration variables (peer-group interactions and faculty interactions), psychological outcomes (including education utility, role satisfaction of being a student, and goal commitment), intent to leave, and dropout rates. Their findings indicate that the chief difference between the attrition process of traditional and NT students was that NT students were more affected by the external environment than by the social integration variables that typically affect traditional student attrition. The results showed that NT students' dropout and persistence intentions were unrelated to social factors. However, the environmental variables were not found to directly affect dropout rates but were found to indirectly affect dropout rates with psychological outcomes and intent to leave as mediators.

Metzner and Bean's empirical results revealed that academic variables and academic outcome did not directly affect intent to leave; and that academic variables affect intent to leave with psychological outcomes as a mediator. Their study suggests that academic integration (academic performance and intellectual development) affects NT student persistence intentions with psychological outcomes as a mediator. That is, better academic performance and intellectual development will tend to increase NT students' sense of education utility, increase their satisfaction with being a student, and increase their desire to complete a university degree. Subsequently, these positive psychological outcomes will eventually enhance NT students' persistence intentions. This relationship is reproduced in the research model of this study as the dashed arrow lines shown in Fig. 1.

Informal Faculty-Student Interaction

The faculty are one of the most obvious and important resources universities have to offer students. In addition to formal classroom interaction, students may engage faculty in informal interaction outside of the classroom. Some examples of this include seeking help with a specific problem, seeking help with a specific course or seeking help or advice with a specific need (Cotton & Wilson, 2006). The existing research suggests that student-faculty informal interactions are important to a student's college experience. Pascarella et al. (1978) found that informal student-faculty interaction has a significant influence on students' academic performance as measured by SAT scores and cumulative GPA. The literature also reveals that the frequency and quality of student-faculty informal interactions significantly predict freshman academic outcomes such as college satisfaction and attrition and that informal interactions were related to gains in intellectual development as well as student persistence (Endo & Harpel 1982; Pascarella & Terenzini, 1976; Pascarella & Terenzini 1980a). In addition, "those students who have developed interpersonal relationships with faculty members tend to reveal higher degrees of academic skills development. They were also more satisfied with their institutional experience (Thompson 2001 p.35-36). "

However, unlike traditional students, NT students are constrained by work demands and family responsibilities. These constraints impact the type and effectiveness of their informal interactions with faculty. In addition, the faculty involvement and the role faculty play in student retention is more limited than it could be (Tinto 2006). In order to promote the benefits students gain from informal faculty-student interaction, the faculty should be encouraged to develop better relationships with students, especially NT students. One position is that a more active faculty role in the informal faculty-student interactions with NT students should improve NT students' academic integration (including academic performance and intellectual development), psychological outcomes (including utility, role satisfaction, and goal commitment), and persistence intention (Thompson 2001). Thus, this study proposes the following hypotheses:

H1: Informal faculty-student interaction will positively affect NT students' academic integration
H2: Informal faculty-student interaction will positively affect NT students' psychological outcomes
H3: Informal faculty-student interaction will positively affect NT students' persistence intention

Information Technology

The educational benefits of utilizing information technology (IT), including keeping in touch via email, keeping up to date on assignments, fostering more frequent faculty-student contact and encouraging collaboration among students, have been well documented in the literature (Laird & Kuh 2005; Paul & Mukhopadhyay 2001). The use of IT has been shown to help students achieve several important educational outcomes. Laird and Kuh (2005) reported that the incorporation of IT into a course resulted in greater learning and Kuh and Hu (2001) found that use of IT positively affected student gains in general education, personal development, and intellectual development. Laird and Kuh's (2005) study revealed that students enrolled in the 'best wired campus' reported having more frequent contact with faculty and participating more in active learning activities. Thus, this study proposes the following hypothesis:

H4: NT students' use of IT will positively affect their academic integration

Previous researchers have examined the moderating effect of IT on promoting organization / service performance. Deweet and Jones (2001) discussed how the relationship between organizational characteristics and outcomes may be moderated by IT. Búrca et al. (2006) examined the moderating effect of IT sophistication on service practice and performance; and Ravichandran et al. (2009) explored the moderating effect of IT spending on diversification and firm performance. However, it remains to be seen if these results can be duplicated in the academic environment. That is, how well can the service provided by a university to NT students be improved through the use of IT?

The improved interaction due to IT is expected to enhance the academic integration of NT students. IT can be used to mitigate the time constraints that NT students have due to work and family responsibilities. However, this may only be true if the NT students are apt to use the technology. If there is a learning curve involved, the NT student may not ever get to the point where they are effectively using the IT. This results in the following hypothesis:

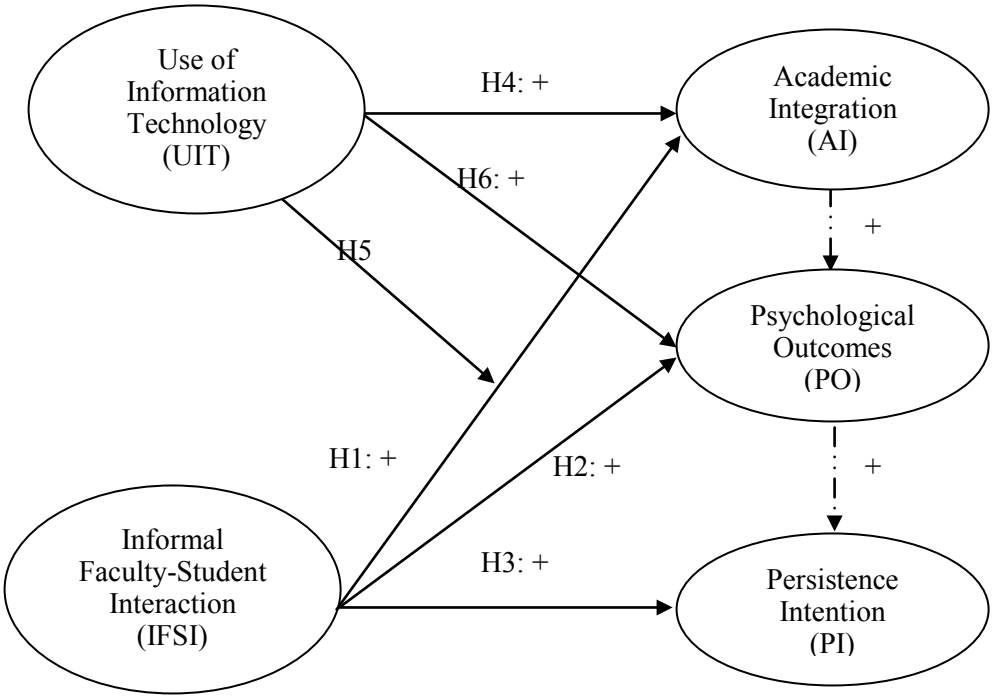
H5: The effect of informal faculty-student interaction on NT students' academic integration will be more positive for NT students who are apt to use IT than for NT students who are not apt to use IT

Finally, this study tries to verify whether use of IT as an external environmental construct also affects psychological outcomes just like the relationship between the environmental variable and psychological outcomes in Metzner and Bean's (1987) attrition model. That is, this study hopes to examine whether the use of IT will stimulate NT students' sense of education utility, role satisfaction of being a student, and goal commitment. This leads to the final hypothesis:

H6: NT students' use of IT will positively affect their psychological outcomes

The proposed theoretical relationships among constructs are summarized in the research model presented in Fig. 1.

FIGURE 1
THE RESEARCH MODEL



METHODOLOGY

Instrument

Three types of informal interaction measurements were developed; please refer to the appendix for a description of the measurement items. They were "Informal Student-Faculty Interaction," "Perception of Informal Faculty-Student Interaction," and "Informal Faculty-Student Interaction". All three measurements were adopted and modified from the dimension of Informal Student-Faculty Interaction of Friedlander et al.'s Community College Student Experiences Questionnaire (Thompson 2001). The "Informal Student-Faculty Interaction" and "Perception of Informal Faculty-Student Interaction" measurements were used for comparison purposes. The "Informal Faculty-Student Interaction" was used for the research model construction and testing.

Informal Student-Faculty Interaction (ISFI) – NT students were asked to indicate the extent to which they had contact with faculty on a 4-point Likert-scale ranging from 1 = "never" to 4 = "very often."

Perception of Informal Faculty-Student Interaction (PIFSI) – NT students were asked to indicate their perceptions on the extent to which faculty had contact with them on a 4-point Likert-scale ranging from 1 = "never" to 4 = "very often."

Informal Faculty-Student Interaction (IFSI) – NT students were asked to rate the helpfulness of their faculty contacts on a 5-point Likert-scale ranging from 1 = "not very helpful" to 5 = "very helpful."

Academic Integration (AI) – Academic integration comprises two dimensions: the cognitive component consisting of the student's academic achievement and the non-cognitive component

reflecting the academic and intellectual development of the student (Cabrera et al. 1992). Students were asked to rank their academic achievement on a 5-point Likert-scale ranging from 1 = "bottom 20%" to 5 = "top 20%." Seven other items were borrowed from Pascarella and Terenzini (1980b) to measure the academic and intellectual development on a 5-point Likert-scale ranging from 1 = "strongly disagree" to 5 = "strongly agree."

Psychological Outcomes (PO) – There were two items for the measurement of education utility, role satisfaction of being a student, and goal commitment respectively. Each used a 5-point Likert-scale ranging from 1 = "strongly disagree" to 5 = "strongly agree." These six items were adopted and modified from Metzner (1983), and Matzner and Bean (1987).

Persistence Intention (PI) – Four items were modified from Metzner (1983) to measure persistence intention on a 5-point Likert-scale ranging from 1 = "strongly disagree" to 5 = "strongly agree."

Use of IT Technology (UIT) – Seven items were modified from Laird and Kuh (2005) to measure classroom engagement with IT (the first three items), using campus IT for academics (the second three items), and academic use of the WWW (the last item) on a 4-point Likert-scale ranging from 1 = "never" to 4 = "very often."

Non-traditionality – A 7-item questionnaire was devised based on the traits identified in the literature and their definitions. For example, one question was "I am employed full-time." and the choices were yes or no. The respondents were asked to indicate if they met each specific trait and the non-traditionality of each was determined by their answers.

Sample

A pretest of the questionnaires was conducted to check the Cronbach α value of latent constructs, with 150 questionnaires distributed to students in classes of a university located in central Taiwan. One hundred thirty-six questionnaires were valid. From the results, measurement items 28, 33 and 56 were deleted, resulting in all α values falling in the acceptable range 0.72 ~ 0.96 (Hair et al. 2006). After validating the instrument, another 288 questionnaires were distributed to students in classes at the same university. This resulted in 279 valid responses. These were combined with the 136 valid responses from the pretest surveys to produce a total of 415 valid responses. Among the valid responses, 12 responses were found to be from traditional students and were further deleted. Hence, this study had 403 valid responses from NT students. The breakdown of the responses was: 27 were minimally non-traditional, 115 were moderately non-traditional, and 261 were highly non-traditional. The demographics show that 80 students were from a junior college, 303 were undergraduate students in a four year university, 17 were graduate students, and 3 students did not respond on their demographics.

Analysis

This study used a confirmatory factor analysis via Lisrel 8.7 to assess the measurement model and structural model. The analytical results revealed that some observable items had low factor loadings which caused the AVEs (average variance extracted) of UIT, PO and PI to be lower than the acceptable cutoff value of 0.5 (Fornell & Larcker 1981). Five additional items were deleted (items 32, 53, 54, 65 and 66) to bring the AVEs up to acceptable levels.

TABLE 1
CONVERGENT VALIDITY STATISTICS AND DESCRIPTIVE STATISTICS

Constructs	Items	λ	δ or ε	SMC	CR	AVE	α
IFSI	11	0.79	0.37	0.63	0.93	0.61	0.93
	12	0.80	0.37	0.63			
	13	0.74	0.45	0.55			
	14	0.82	0.33	0.67			
	15	0.81	0.34	0.66			
	16	0.80	0.36	0.64			
	17	0.80	0.36	0.64			
	18	0.70	0.52	0.48			
AI	21	0.77	0.40	0.60	0.90	0.58	0.90
	22	0.72	0.48	0.52			
	23	0.82	0.32	0.68			
	24	0.83	0.31	0.69			
	25	0.78	0.39	0.61			
	26	0.67	0.55	0.45			
	27	0.71	0.50	0.50			
PI	31	0.67	0.50	0.45	0.71	0.55	0.70
	34	0.81	0.55	0.65			
PO	51	0.88	0.22	0.78	0.78	0.56	0.77
	52	0.84	0.30	0.70			
	55	0.48	0.77	0.23			
UIT	61	0.72	0.49	0.51	0.83	0.50	0.81
	62	0.82	0.33	0.67			
	63	0.84	0.30	0.70			
	64	0.47	0.78	0.22			
	67	0.62	0.62	0.38			

Measurement Model Validation

Table 1 shows that the final Cronbach α value of the constructs falls in the range 0.70 ~ 0.93, which is above the cutoff value of 0.7 (Hair et al., 2006). Table 1 also shows the convergent validity statistics for the purified measurement model, including the standardized factor loadings (λ), error variances (δ or ε), square multiple correlations (SMC), composite reliability (CR) and AVE. All λs were significant at the 0.01 level (t >2.575) and reached the cutoff value of 0.5 (Anderson & Gerbing, 1988) or 0.45 (Bentler & Wu, 1993; Joreskog & Sorbom, 1989); the SMCs were greater than the cutoff value of 0.5 (Bollen, 1989) or 0.2 (Bentler & Wu, 1993; Joreskog & Sorbom, 1989); the CRs were greater than the cutoff value of 0.6 and the AVEs all exceeded the cutoff value of 0.5 (Fornell & Larcker, 1981). In conclusion, all the provided statistics assured the convergent validity of the measurement model.

Discriminant validity was assessed by calculating the AVE for all pairs of constructs and comparing this value to the squared correlation between the two constructs of interest. Discriminant validity is satisfied when the squared correlation between any pair of constructs is less than the respective AVE of each of the constructs in the pair (Fornell & Larcker, 1981). Taking Table 2 into account, all AVEs were greater than the squared correlation between the two constructs of interest.

TABLE 2
DISCRIMINANT VALIDITY STATISTICS*

	AI	PI	PO	IFSI	UIT
AI	0.58				
PI	0.36	0.55			
PO	0.55	0.55	0.56		
IFSI	0.29	0.32	0.22	0.61	
UIT	0.22	0.15	0.20	0.16	0.50

*The figures in the diagonal are AVEs of constructs and the ones in the off-diagonal are squared correlations.

The analysis also subjected the purified measurement items to a CFA. Although the resulted chi-square value was significant ($\chi 2$ (265) = 847.51, p = 0), the key indexes were satisfactory, including NNFI = 0.97 (> 0.9), CFI = 0.97 (> 0.9), RMR = 0.037 (< 0.05), and RMSEA = 0.074 (< 0.08, fair fit). On the basis of Cronbach α values, convergent and discriminant validity tests, and CFA results, the analysis shows that the measurement model satisfied all of the psychometric property requirements and the measurement model suggested a good fit to the data.

Structure Model Validation

The structural relationship among constructs also suggested a good fit to the data. Although the resulting chi-square value was significant ($\chi^2_{(267)}$ = 874.31, p = 0), the key indexes were satisfactory, including NNFI = 0.96 (> 0.9), CFI = 0.97 (> 0.9), RMR = 0.039 (< 0.05), and RMSEA = 0.075 (< 0.08, fair fit). Fig. 2 showed the path coefficients between constructs. Although the path coefficient between IFSI and PO (Hypothesis 2) was insignificant, all other path coefficients were significant. Further, three endogenous constructs were highly explained by other constructs; 37% of AI variability (R^2 = 0.37) was explained by IFSI and UIT, 56% of PO variability (R^2 = 0.56) was explained by AI, IFSI and UIT, and 62% of PI variability (R^2 = 0.62) was explained by IFSI and PO.

RESULTS

The Descriptive Statistics

The upper part of Table 3 shows the grand means and standard deviations of the latent constructs. The grand construct mean (μ) was calculated by averaging the construct means of the responses and each construct mean was calculated by averaging the measurement item scores. The grand standard deviation of construct was calculated from the data set of construct means of responses. The grand means (μs) were then subjected to statistical hypotheses, and the results are presented in the lower part of Table 3.

TABLE 3
THE DESCRIPTIVE STATISTICS OF CONSTRUCTS

	IFSI (5-point)	AI (5-point)	PI (5-point)	PO (5-point)	UIT (4-point)	PIFSI (4-point)	ISFI (4-point)
Mean (μ)	3.60	3.67	3.84	3.67	2.94	2.32	2.27
Standard deviation	0.69	0.63	0.77	0.72	0.54	0.73	0.69
Hypothesis	H_0: $\mu \leq 3$ H_1: $\mu > 3$				H_0: $\mu \geq 3$ H_1: $\mu < 3$		
z	17.46*	21.35*	21.90*	18.68*	-2.2**	-21.24*	-18.70*
p	* $p < 0.01$, ** $p < 0.05$						

For those constructs measured with a 5-point Likert-scale such as IFSI, AI, PI and PO, this study tested the null hypotheses $\mu \leq 3$ (3 represents the "neutral" response). The analytical results rejected the null hypotheses. Thus the results indicate that NT students agree that informal faculty-student interaction is helpful, that their academic integration in campus is improved, that they have more positive psychological outcomes, and that they have more positive persistence intentions. Additionally, for those constructs measured with a 4-point Likert-scale such as UIT, ISFI, and PIFSI, this study tested the null hypotheses $\mu \geq 3$ (3 represents the "often" response). Again, the analytical results rejected the null hypotheses. Thus the results indicate that NT students did not often use IT; did not often contact faculty, and they did not perceive that faculty often had informal contact with them.

The Direct Effect Tests

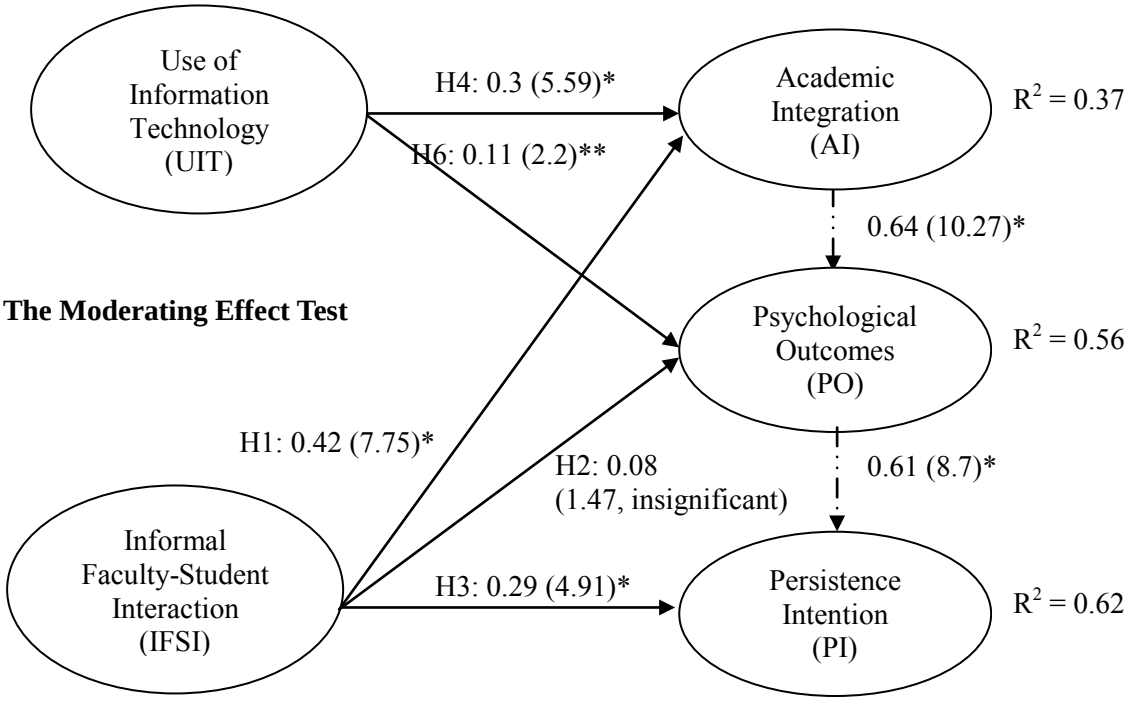
Fig. 2 depicts the hypotheses testing results. First, the empirical results re-verified the relationship proposed in the attrition model for NT students (Metzner & Bean, 1987) that AI affects NT student's PI with PO as a mediator (the relationships indicated with the dashed arrow lines in the research model). Secondly, except hypothesis 2, all the other hypotheses were supported.

The results indicate that active faculty informal interaction will promote NT students' PI directly and indirectly with AI and PO as mediators. The support of hypotheses 1 and 3 refutes the traditional paradigm that social integration is not influential in NT students' educational outcomes and is similar to the previous literature which indicates that there is a positive relationship between informal student-faculty interaction and educational outcomes for traditional students (Cotton & Wilson, 2006; Kim & Sax, 2009). However, PO was not directly induced by IFSI (H2 was not supported) as expected. This could be because NT students do not attend the university mainly for socialization (Metzner & Bean, 1987). The acceptance of hypotheses 4 and 6 supports the positive effect of IT use on AI and PO.

The moderating effect predicted in H5 was tested by multigroup analysis in structural equation modeling. The full sample was divided into two groups using a median split of the UIT scale, which is a common procedure in the literature (de Matos et al., 2009; Evanschitzky & Wunderlich, 2006). These two groups include those NT students less apt at using IT (low UIT, $n = 182$) and those more predisposed to use IT (high UIT, $n = 221$). The results showed a significantly positive effect of IFSI on AI for both groups (the standardized coefficients equal 0.32 ($t = 4.48$) for high UIT, and 0.69 ($t = 4.80$) for low UIT). The chi-square difference test for restricted (the equality constraint of the IFSI → AI path coefficient for both groups) and unrestricted models produced significant results ($\Delta\chi^2 = 5.75$, $\Delta df = 1$, $p < 0.025$). This shows that the relationship between IFST and AI was significantly different between the two groups. Thus, the moderating effect of UIT was supported although it was in the opposite direction. The moderating direction was contrary to the hypothesized direction because the IFSI → AI path coefficient for the low UIT group was greater than the coefficient for the high UIT group. In summary, H5 was

partially supported. The unexpected moderating direction suggests a practical implication, which will be discussed later in the section.

FIGURE 2
THE ANALYTICAL RESULTS



* $p < 0.01$; ** $p < 0.05$; Value in parenthesis is the *t*-value

The Effects of the Constructs on Persistence Intention (PI)

Constructs IFSI, UIT, AI and PO had their respective direct and/or indirect effects on PI; and the direct and indirect effects were then summed up to be the total effect. Table 4 shows the effects. The analytical results revealed that PO had the largest total effect on PI with the IFSI having the second largest effect, AI the third largest effect and UIT the least effect on PI.

TABLE 4
THE EFFECTS OF CONSTRUCTS ON PERSISTENCE INTENTION

	PI			
	direct effect	indirect effect		total effect
IFSI	0.29	IFSI→AI→PO→PI	0.16	0.45
UIT	-	UIT→AI→PO→PI	0.12	0.19
		UIT→PO→PI	0.07	
AI	-	AI→PO→PI	0.39	0.39
PO	0.61	-	-	0.61

DISCUSSION

Theoretical Implications

Social Integration is Influential in Affecting NT Students' Campus Experiences

The empirical results of this study refute the traditional paradigm of the attrition model of NT students (Metzner and Bean 1987) that social integration is not influential in affecting NT students' educational outcomes. NT students were thought to be too constrained by their family and work responsibilities to develop social relationships, especially with faculty. However, the empirical results from this study show that NT students believed that the active informal interaction from faculty was helpful, and that this informal faculty-student interaction had a positive influence on NT students' educational outcomes, such as AI, PO and PI.

The results suggest that NT students can receive the same benefits from faculty-student interaction as traditional students if faculty are willing to devote more time to the informal interaction outside of the classroom. This confirms the purpose of the first part of the study.

Part of the Structural Relationship of the Attrition Model of NT Students is Validated

The results supported some of the relationships proposed by the Metzner and Bean attrition model for NT students (1987). AI was found to influence PI through PO. The results also supported the effect of UIT, as an environmental variable, on NT students' educational outcomes. Similar to other environmental variables examined by Cabrera et al. (1992), such as finance and the support of significant others, UIT was found to have a positive effect on NT students' AI, PO and PI as well. Thus the second purpose of this study, exploring the environmental effect of UIT is confirmed.

Practical Implications

Informal Faculty-student Interaction and Use of Information Technology Predict a Large Proportion of NT Students' Persistence Intention

Two exogenous latent constructs, IFSI and UIT, make up sixty-two percent of the NT student PI explanation. This shows the importance of having active faculty involvement in the informal faculty-student interactions and the use of information technology in keeping NT students on campus. IFSI has the larger total effect on PI than does UIT (0.45 vs. 0.19). This further highlights the significant role that active faculty involvement has on the informal faculty-student interactions. Social integration does play an influential role in NT students' PI.

Informal Faculty-student Interaction is Influential in Affecting NT Students' Educational Outcomes; However, Neither Faculty Nor NT Students Are Active Enough in Promoting the Informal Interaction Relationship With Each Other

As the previous literature indicated (Cotton & Wilson, 2006; Thompson, 2001), NT students and faculty may not have put enough effort into the informal faculty-student interactions for NT students to gain anything from it. This research indicates that faculty must adjust their mindset and become more actively involved in the informal interaction with NT students, especially in today's competitive education environment where universities seek to retain students. Further, universities need to ensure that there is an adequate IT system to facilitate the informal interaction between faculty and NT students. This study also showed that NT students get more out of the interactions when they use the IT systems.

Use of Information Technology is Influential in Affecting NT Students' Persistence Intention; However, More Can Be Done to Promote the Use of Information Technology

As expected from the previous literature the benefits of IT were confirmed in the context of NT students' education (Kuh & Hu, 2001; Laird & Kuh, 2005; Paul & Mukhopadhyay, 2001). The use of IT enhanced NT students' academic integration, their psychological outcomes and increased their persistence intention. Not all NT students used IT enough, and therefore efforts are needed to induce NT students to

increase their use of IT. Such efforts may include the construction of a complete IT system and environment, the training in the use of the IT, and providing some type of motivation for using IT.

Informal Faculty-student Interaction Had More Influence on Academic Integration for NT Students with Low UIT Than for Those with High UIT.

Contrary to the position of H5, the effect of IFSI on AI was found to be greater for NT students less apt to use IT than for NT students who were more apt to use IT. The thought is that the time constraints that NT students face from work and family life would limit their informal interactions with faculty and may affect their AI. Those students who were more apt to use IT did see an improvement to their AI. Here, IT is a channel to achieve AI, which mitigates the positive contribution of IFSI on AI. However, those students who were less predisposed to use IT saw the majority of their AI improvement coming from IFSI. For these students IFSI had the dominant effect on their AI. In summary, the additional active informal interaction from faculty will have more of an effect on AI for NT students with low UIT.

Limitations and Future Research

This study has a number of limitations. First, cross-sectional surveys have limitations in attributing and substantiating affirmative causality. Future studies should collect longitudinal data to assess causal relationships. Second, since the data was collected from NT students from Taiwan, generalization of the findings due to cultural influences will be limited. Future studies can investigate the potential differences for other cultures. Lastly, this study confirmed the structural relationship proposed in the attrition model of NT students that AI influences PI with PO as a mediator. However, it is believed that the AI will also directly influence NT students' PI. A supplement test was conducted to see the direct effect of AI on PI if PO was removed from the research model, and the result supported the speculation. More research is needed to confirm this.

REFERENCES

Anderson, J. & Gerbing, S. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin* 103, 411-423.

Bean, J. P. & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research*, *55*, 485-540.

Bentler, P. M. & Wu, E. J. C. (1993). *EQS/Windows user guide.* BMDP Statistical Software, Los Angles.

Bollen, K. A. (1989). *Structural equations with latent variables*, New York: John Wiley.

Brinkworth, R., McCann, B., Matthews, C. & Nordstrom, K. (2009). First year expectations and experiences: Student and teacher perspectives. *Higher Education*, 58, 157-173.

Búrca, Seá de, Fynes, B. & Brannick, T. (2006). The moderating effects of information technology sophistication on service practice and performance. *International Journal of Operations & Production Management*, 26, 1240-1254.

Cabrera. A. F., Nora, A. & Castañeda, M. B. (1992). The role of finances in the persistence process: A structural model. *Research in Higher Education*, 33, 571-593.

Christie, H., Monoe, M. & Fisher, T. (2004). Leaving university early: Exploring the differences between continuing and non-continuing students. Studies in Higher Education, 29, (5), 617-636.

Cotten, S. R. & Wilson, B. (2006). Student-faculty interactions: Dynamics and determinants. *Higher Education*, 51, 487-519.

de Matos, C. A., Rossi, C. A. V., Veiga, R. T. & Vieira, V.A. (2009). Consumer reaction to service failure and recovery: The moderating role of attitude toward complaining. *Journal of Services Marketing*, 23, 462-475.

Deweet, T. & Jones, G. R. (2001). The role of information technology in the organization: A review, model, and assessment. *Journal of Management*, 27, 313-346.

Endo, J. & Harpel, R. (1982). The effect of student-faculty interaction on students' educational outcomes. *Research in Higher Education*, 16, 115-136.

Evanschitzky, H. & Wunderlich, M. (2006). An examination of moderator effects in the four-stage loyalty model. *Journal of Service Research*, 8, 330-345.
Fornell, C. & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement errors. *Journal of Marketing Research*, 18, 39-50.
Gardner, S. (2007). "I heard it through the grapevine": Doctoral student socialization in chemistry and history. *Higher Education*, 54, 723-740.
Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. & Tatham, R. L. (2006). *Multivariate data analysis* 6th ed., Prentice-Hall, Englewood Cliffs.
Jamelske, E. (2009). Measuring the impact of a university first-year experience program on student GPA and retention. *Higher Education*, 57, 373-391.
Joreskog, K. G. & Sorbom, D. (1989). *LISREL 7: A guide to the program and application* SPSS, Inc., Chicago.
Kim, Y. K. & Sax, L. J. (2009). Student-faculty interaction in research universities: Differences by student gender, race, social class, and first-generation status. *Research in Higher Education*, 50, 437-459.
Kobrak, P. (1992). Black student retention in predominantly white regional universities: The politics of faculty involvement. *Journal of Negro Education*, 61, 509-530.
Kuh, G. D. & Hu, S. (2001). The relationships between computer and information technology use, student learning, and other college experiences. *Journal of College Student Development*, 42, 217-232.
Laird, T. S.. & Kuh, G. D. (2005). Student experiences with information technology and their relationship to other aspects of student engagement. *Research in Higher Education*, 46, 211-233.
Metzner, B. S. (1983). An application and evaluation of a model of student attrition using freshmen at a public urban commuter university. *Dissertation Abstracts International*, *44: 2378A*. (UMI No.83-288080).
Metzner, B. S. & Bean, J. P. (1987). The estimation of a conceptual model of nontraditional undergraduate student attrition. *Research in Higher Education*, 27, 15-38.
Newswander, L. & Borrego, M. (2009). Engagement in two interdisciplinary graduate programs. *Higher Education*, 58, 551-562.
Pascarella, E. T. & Terenzini, P. T. (1976). Informal interaction with faculty and freshman ratings of academic and non-academic experience of college. *Journal of Educational Research*, 70, 35-41.
Pascarella, E. T. & Terenzini, P. T. (1980a). Student-faculty and student-peer relationships as mediators of the structural effects of undergraduate residence arrangement. *Journal of Educational Research*, 73, 344-353.
Pascarella, E. T. & Terenzini, P. T. (1980b). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. *Journal of Higher Educational*, 51, 60-75.
Pascarella, E. T., Terenzini, P. T. & Hibel, J. (1978). Student-faculty interactional settings and their relationship to predicted academic performance. *Journal of Higher Education*, 49, 450-463.
Paul, P. & Mukhopadhyay, K. (2001). Using information technology for active learning in international business education. *Marketing Education Review*, 11, 81-89.
Ravichandran, T., Liu, Y., Han, S. & Hansan, I. (2009). Diversification and firm performance: Exploring the moderating effects of information technology spending. *Journal of Management Information Systems*, 25, 205-240.
Read, B., Archer, L. & Leathwood, C., (2003). Challenging cultures? Student conceptions of 'belonging' and 'isolation' at a post-1992 University. *Studies in Higher Education*, 28, (3), 261-277.
Severiens, S. E. & Schmidt, H. G. (2009). Academic and social integration and study progress in problem based learning. *Higher Education*, 58, 59-69.
Spellman, N. (2007). Enrollment and retention barriers adult students encounter. *The Community College Enterprise*, Spring, pp. 63-79.
Thompson, M. D. (2001). Informal student-faculty interaction: Its relationship to educational gains in science and mathematics among community college students. *Community College Review*, 29, 35-57.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 45, 89-125.

Tinto, V. (2006). Research and practice of student retention: What next? *Journal of College Student Retention, 8,* 1-19.

U.S. Department of Education. (1998). *First-generation students: Undergraduates whose parents never enrolled in postsecondary education,* National Center for Education Statistics, Statistical Analysis Report NCES 98-082, Washington, DC.

APPENDIX

THE MEASUREMENT INSTRUMENT

Construct	Pre-test α	Note
1. Informal Faculty-Student Interaction (IFSI) 11. Discussed information about grades, make-up work, assignments, etc. 12. Talked briefly after class about course content. 13. Made an appointment in faculty office. 14. Discussed ideas for a term paper or other class project. 15. Discussed career plans and/or educational plans, interests, and ambitions. 16. Discussed comments an instructor made on a test or paper student wrote. 17. Talked informally about current events, campus activities, or other common interests. 18. Discussed school performance, difficulties, or student's personal problems.	0.95	
2. Academic Integration (AI) 21. I am satisfied with the extent of my intellectual development since enrolling in this university. 22. My academic experience has had a positive influence on my intellectual growth and interest in ideas. 23. I am satisfied with my academic experience at this university. 24. Many of my courses have been intellectually stimulating. 25. My interest in ideas and intellectual matters has increased since coming to this university. 26. I am more likely to attend a cultural event now than I was before coming to this college. 27. I have performed academically as well as I anticipated I would. 28. My academic achievement is in the range of	0.92 if item 28 was deleted	
3. Persistence Intention (PI) 31. I expect to return this university next semester. 32. I expect to graduate from this university. 33. I seldom discussed leaving this university with people outside the college.	0.72 if item 33 was deleted	item 32 was further deleted to enhance AVE

34. I expect to re-enroll this university someday in the future in need of training program and/or education.		
4. Perception of Informal Faculty-Student Interaction 41. ~ 48. Repeat 11. ~ 18.	0.96	
5. Psychological Outcomes (PO) 51. The education here will be useful for gaining future employment I really like. 52. The education here will be useful for gaining a well paying job. 53. I find real enjoyment in being a student. 54. I consider being a student rather pleasant. 55. It is important for me to attend university. 56. It is important for me to complete a university degree.	0.82 if item 56 was deleted	Items 53 and 54 were further deleted to enhance AVE
6. Use of IT Technology (UIT) 61. Worked in teams using information technology. 62. Communicated with classmates online to complete academic work. 63. Used computer and information technology when making class presentations. 64. Used library website to obtain resources for academic work. 65. Expressed ideas to a professor via e-mail that you did not feel comfortable saying in class. 66. Used e-mail to ask an instructor to clarify an assignment. 67. Used the WWW to obtain resources for academic work.	0.88	Items 65 and 66 were further deleted to enhance AVE
7. Informal Student-Faculty Interaction 71. ~ 78. Repeat 11. ~ 18.	0.94	
8. Non-traditionality 81. Delayed entering at a post secondary education. 82. A part-time student enrolled in less than 12 credits a semester. 83. Full-time employment (more than 35 hours per week). 84. Dependent / single parenthood. 85. Financial independence. 86. A commuter. 87. Chiefly concerned with academic offerings and not greatly influenced by the social environment of the institution.		