A Study on the Development of Advanced Faculty in Leisure and Sport for Higher Education between 2006 and 2011

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ABSTRACT

This study employed latent growth curve modeling to verify the growth on the number of full-time faculty in the department relevant to leisure and sports in higher educational institutions in Taiwan. The scope of this study covers the departments relevant to leisure and sport. The number of the full-time faculty in the department relevant to leisure and sport was treated as observed variable for the analysis of its growth. The results found that a goodness fit between the number of students recruited in the latent growth curve model and observed data and that the growth of the number of the faculty in the department relevant to leisure and sport was significantly different along with time and the increase of the number of classes in the department relevant to the leisure and sport. And, the number of the faculty in the department relevant to leisure and sport in between 2006 and 2011 was significantly impacted by the higher educational systems, traditional or vocational universities, both of the number in the beginning point and growth rate were significantly different. It revealed that the factor of traditional and vocational educational system did influence the number of full-time faculty.

Keywords: *latent growth curve model, department relevant to leisure and sport, number of full-time faculty*

INTRODUCTION

Higher education is facing problems and new challenges worldwide. Martin Trow (1973) suggested that the global expansion of higher education has been a trend and higher education would be transited from the type of elite to that of mass and to universal. According to the statistics made by the Ministry of Education (Wu, 2011), there were seven colleges in Taiwan in 1950. The figure rose from 92 in 2010 academic year to 163 at the present, which clearly showed the trend of expansion in higher education. While the prevalence of higher education provided students with more opportunity to pursue higher education, it also created issues such as maintaining the quality of education and competiveness for higher educational institutions. Wu (2007) concluded that the consequences of the expansion of higher education are that the number of college increased but quality of education was downgraded, that college diploma was devalued and bobbled, that the number of graduate students was increased, and that college could not recruit sufficient number of students. Knowing that education is a phase in a society, the development of education is closely relating to the change of society. For instance, lessened birth rate greatly impacted the development of higher education. According to the annual statistics report published

by the Ministry of Interior, averaged annual birth rate was 1.03 persons in 2009, which was record low in the history. The number of one-year-old children in 1997, year they were expected to enrolled for elementary, junior high, senior high or junior college, two-year college, and four-year college education was listed in Table 1. From Table 1, it is clearly seen that the number of one-year children was sharply decreased from 326,002 in 1997 to 166,866 in 2010, which could be a crisis for the development of higher education in Taiwan by 2016.

Table 1: Number of One-year-old Children and Enrollment in all Level of Education from 1997 to 2010.

Year	Number of One-year-old Children	Year for Elementary Education	Year for Jr. High	Year for Sr. High / Jr. College	Year to 2-Year College	Year to Four-Year College
1997	326,002	2003	2009	2012	2017	2015
1998	271,450	2004	2010	2013	2018	2016
1999	283,661	2005	2011	2014	2019	2017
2000	305,312	2006	2012	2015	2020	2018
2001	260,354	2007	2013	2016	2021	2019
2002	247,530	2008	2014	2017	2022	2020
2003	227,070	2009	2015	2018	2023	2021
2004	216,419	2010	2016	2019	2024	2022
2005	205,854	2011	2017	2020	2025	2023
2006	204,459	2012	2018	2021	2026	2024
2007	204,414	2013	2019	2022	2027	2025
2008	198,733	2014	2020	2023	2028	2026
2009	191,310	2015	2021	2024	2029	2027
2010	166,886	2016	2022	2025	2030	2028

Resource: Wu (2011).

While higher education and leisure service industry were prosperously developed in Taiwan, departments relevant to leisure and sport were founded one after another in colleges in Taiwan. The first department in sport management was founded in the Aletheia University as the Department of Sport Management in 1995. The year the department relevant to leisure and sport established in other colleges and the city the college located were listed in Table 2.

Table 2: Department Relevant to Leisure and Sport in Taiwan

Department Relevant to Leisure and Sport	College/University	Location
Dept. of Exercise and Health Science	National Taipei University of Nursing and Health Science	Taipei
Dept. of Athletic Performance	National Taiwan University	Taipei
Dept. of Sport Health & Leisure	TPE Chengshih University of Science And Technology	Taipei
Dept. of Sport Health & Leisure	Ching Kuo Institute of Management and Health	Keelung
Dept. of Aquatic Sport and Recreation	TPE College of Maritime Technology	Taipei
Dept. of Athletic Training and Health	National Taiwan Sport University	Taoyuan
Dept. of Exercise and Health Promotion	Chinese Culture University	Taipei
Dept. of Leisure Sports & Health Management	St. John's University	Xinbei City
Dept. of Sport Management	Aletheia University	Xinbei City
Dept. of Sports Information Communication	Aletheia University	Xinbei City
Dept. of Recreational Sport Management	University of Taipei	Taipei
Dept. of Leisure and Sport Management	National Taipei University	Xinbei City
Dept. of Sport Management	Minghsin University of Science And Technology	Hsinchu
Dept. of Recreational Sports Management	Yu Da University of Science and Technology	Miaoli

Dept. of Recreation Sports and Health Promotion	Asia-Pacific Institute of Creativity	Miaoli
Dept. of Sports and Leisure	Hungkuang University	Taichung
Dept. of Kinesiology Health Leisure Studies	Cheinkuo Technology University	Changhua
Dept. of Exercise and Health Promotion	Chung Chou University of Science and Technology	Changhua
Dept. of Recreational Sport	National Taiwan University of Physical Education and Sport	Taichung
Dept. of Exercise Health Science	National Taiwan University of Physical Education and Sport	Taichung
Dept. of Sports Information & and Communication	National Taiwan University of Physical Education and Sport	Jiayi
Dept. of Sport Management	National Taiwan University of Physical Education and Sport	Jiayi
Dept. of Leisure and Recreation Management	DaYeh University	Changhua
Dept. of Recreational Sport & Health Promotion	National Pingtung University of Science And Technology	Pingtung
Dept. of Sports Management	Chia Nan University of Pharmacy & Science	Tainan
Dept. of Recreation & Sport Management	Shu-Te University	Kaohsiung
Dept. of Sport, Health & Leisure	Cheng Shiu University	Kaohsiung
Dept. of Recreation Sports Management	Kao Yuan University	Kaohsiung
College of Leisure and Hospitality Recreation Sports Management	TaJen University	Pingtung
Dept. of Leisure and Sports Management	Far East University	Tainan
Dept. of Sport, Health and Leisure	Chung Hwa University of Medical Technology	Tainan
College of Tourism and Hospitality Dept of Sport, Health and Leisure	WuFeng University	Jiayi
Dept. of Recreation Sports and Health Promotion	MeiHo University	Pingtung
Dept. of Sports, Health and Leisure	Yung Ta Institute of Technology And Commerce	Pingtung
Dept. of Sports, Health and Leisure	Tatung Institute of Commerce and Technology	Jiayi
Dept. of Kinesiology, Health and Leisure Studies	National University of Kaohsiung	Kaohsiung
Dept. of Sports, Health & Leisure	Aletheia University, Tainan Campus	Tainan
Dept. of Sports Medicine	Kaohsiung Medical University	Kaohsiung
Dept. of Athletic Sports	Chang Jung Christian University	Tainan
Dept. of Athletic Sports	National Chung Cheng University	Jiayi
Dept. of Recreational Sports Management	Dahan Institute of Technology	Hualien
Dept. of Somatics and Sports Leisure Industry	National Taitung University	Taitung
Dept. of Sports and Leisure	National Quemoy University	Kinmen
Dept. of Marine Sports and Recreation	National Penghu University of Science and Technology	Penghu

Resource: Lee (2012)

As shown in Table 2, the title of the departments included Sports and Health Care, Sport Management, Leisure, Sport, & Recreation, Sports Medicine, and Sports Information and Communication. The colleges that have established departments relevant to leisure and sport were located in almost all cities including outlying islands around Taiwan. The number of full-time faculty hired in the department relevant to leisure and sport was increased drastically. The intent of this research was to study the variation on the number of full-time faculty in the department relevant to leisure and sport with latent growth model (LGM). The LGM was developed from confirmatory factor analysis, which could be employed to repeatedly measure variables at different time slot for analysis. The LGM mainly was applied in longitudinal studies. There were two variables included in the LGM, which were used to describe all observed value at initial stage and the growth of these observed values during the time span of study. With the latent variable analysis, one could see if there was a significant different at the first time slot and if the characteristics would be changed along with time.

The study was trying to see if the growth, as well as the dynamic process, of the number of full-time faculty in the department relevant to leisure and sport through the analyses at different time slot (Chan, 1998; Curran & Bauer, 2011; Curran & Hussong, 2003; Ferrer & McArdle, 2010; Hung, 2010;

Pitariu & Ployhart, 2010; Ployhart & Vandenberg, 2010; Preacher, 2010). And, to further understand the growing trajectory, individual growing trajectory, predicted variables, as well as the influence, individual growing trajectory of the number of full-time faculty in the department relevant to leisure and sport (Kaplan, 2009; Preacher, 2010; Wu, West, & Taylor, 2009).

Scope of the Study

The study was focused on the department relevant to leisure and sport in universities and technology universities in Taiwan. The number of full-time faculty in each of these institutions was observed variable. And, the growth of the number of full-time faculty in the department relevant to leisure and sport was analyzed.

RESEARCH METHOD

The AMOS version 20.0 was employed to study the growth of the number of full-time faculty in the department relevant to leisure and sport, which was explained as follows:

1. Latent growth curve model was employed to describe the growth locus of the number of full-time faculty in relevant departs to leisure and sport. The latent growth linear model was employed to test the latent growth of the number of full-time faculty in the relevant department in leisure and sport between 2006 and 2011. Figure 1 shows the latent growth curve model for the growth of the number of full-time faculty in the department relevant to leisure and sports. There were three observed indexes that represent the number of full-time faculty in the department relevant to leisure and sport calculated separately. The three observed indexes were affected by two latent variables which were the starting point of the study (ICEPT, ηI) and the rate of growth (SLOPE, ηS) respectively. The two latent variables were assumed to be correlated (ψSI). All the residuals were assumed to be equal and the intercept of all observed variables were assumed to be zero (Ho, 2009). The factor leading coefficients (λ) of the growth rate to observed variables were assumed to be 0,1, 2, 3, 4, and 5 respectively as the growth of the number of the full-time faculty was assumed to be linear in this study. The starting point was the intercept of simple regression and therefore all coefficients were assumed to be 1 (Ho, 2009; Bollen & Curran, 2006；Duncan, Duncan & Strycker, 2006).

2. With the employment of conditional growth model, the number of full-time faculty in the department relevant to leisure and sport in university and technology universities in between 2006 to 2011 were significantly changed. The two latent variables ICEPT and SLOPE shown in figure 1 became forecasted (pre-tested) variables and residual variables, Z1 and Z2, were added and the two added variables were assumed to covariate. Two more forecasted (pre-tested) were added as level 2 variables (see Figure 2). Where or not the starting points for studying the growth of the number of full-time faculty in traditional universities and technology universities were different is subject to be answered in the new model shown in Figure 2? And, if the rate of growth would be affected?

The maximum likelihood was hired for all models in this study for estimation. The overall model fitness was examined by χ^2、TLI、IFI、CFI and SRMR (Ho, 2009).

Research Hypothesis

Latent growth model (LGM) was employed to study the number change of full-time faculty member in the department relevant to leisure and sport revealed a positive trend. Research hypotheses are as follows:

1. The number of faculty member in the department relevant to leisure and sport revealed a significant growth in between 2006 and 2011.

2. The traditional and vocational higher education systems have significant impact on the number of faculty member in the department relevant to leisure and sport in between 2006 and 2011.

RESULTS

The test for skew was in between 1.72 to 2.39 and Kurtosis was in between 3.21 and 9.98 in this study. This reveals that the data in this study was in normal distribution (see Table 3).

Table 3: Normal Hypotheses Identification

Variable	min	max	skew	c.r.	kurtosis	c.r.
2010-2011	0.00	89.00	1.45	8.38	3.69	10.68
2008-2009	0.00	90.00	1.97	11.40	5.69	16.46
2006-2997	0.00	72.00	2.38	13.77	8.96	25.92

Data Analysis

The AMOS version 20.0 was employed to conduct latent growth model to verify research hypotheses in this study. Other than χ^2, the assessment also adopted added indexes including TLI (> .90), IFI (> .90), and CFI (> .90) (Ho, 2009; Hsu, 2012; Bagozzi & Yi, 1988). In this study, TLI (NNFI) was .85; IFI was .96, CFI was .96 and SRMR was .00, which revealed the goodness of fit in this study (See Table 4).

Table 4: Model Fit Index

Fitness Index	Criteria	Model in this study	Model Fit Identification
χ^2	The Smaller The Better	16.56	Pass
TLI(NNFI)	>0.90	0.85	Pass
IFI	>0.90	0.96	Pass
CFI	>0.90	0.96	Pass
SRMR	<0.05	0.00	Pass

Interpretation of Model Parameters

The intercept revealed that average number of faculty member in the department relevant to leisure and sport in higher education institutions was 8.36. The slop showed the growth of the number of faculty member in the department relevant to leisure and sport in higher education institutions was 3.79 (See Table 5).
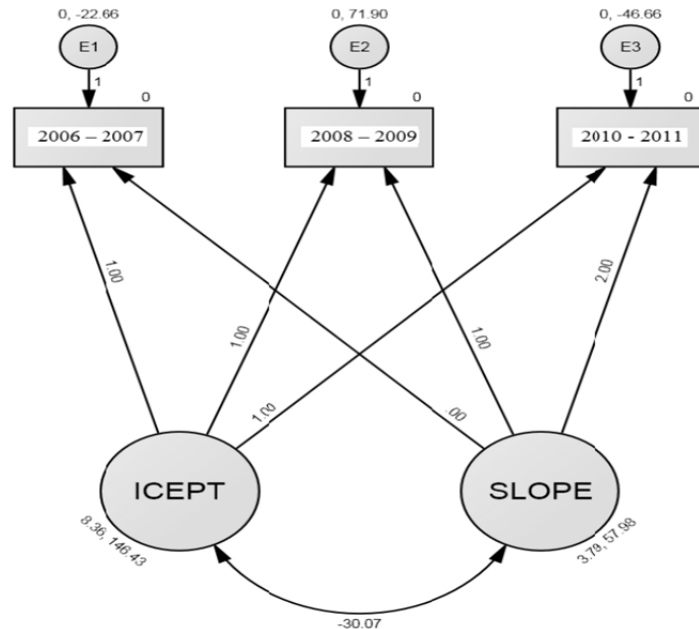
**Figure 1: Latent Growth Model for the Number of Faculty in Department
Relevant to Leisure and Sport in College between 2006 to 2011**

Table 5：Estimate Model Parameters

		Estimate
Intercept	Number of Average College Full-time Faculty Member in Department relevant to Leisure and Sport in 2006	8.36 Persons
Slop	Average Growth of College Full-time Faculty Member in Department relevant to Leisure and Sport in 2006 and 2011	3.79 Persons

Average Growth of College Full-time Faculty Member in Department relevant to Leisure and Sport between 2006 and 2011

Table 6 shows the average number and average growth of college full-time faculty in department relevant to leisure and sport in between 2006 to 2011 respectively. The average number of full-time faculty in between 2006 to 2011 began with 8.36 persons and the average growth curve was 3.79 persons and t value for the two parameters were 10.29 and 8.23 respectively. This revealed a significant difference at $p<.05$. In other words, beginning with the average number of full-time faculty of 8.36 persons in 2006, the average growth since 2006 was 3.79 every year till the year of 2011. The number of average faculty members in 2006 was significant different from the average growth in between 2006 to 2011. Hence, the hypothesis that the number of faculty member in the department relevant to leisure and sport revealed a significant growth in between 2006 and 2011 is true. The estimate of residual variance -22.66, 71.90, and -46.66 were seen random variance in level 1. The researcher further analyzed the influence of variables from different group to beginning number and growth rate.

Table 6: The Parameters in Latent Growth Model for the Average Growth of College Full-time Faculty Member in Department Relevant to Leisure and Sport between 2006 and 2011

	Estimate	Std. Error	C.R.	P
Average Number				
Intercept	8.36	0.81	10.29	***
Slop	3.79	0.47	8.13	***
Variance				
Intercept	146.43	19.07	7.68	***
Slop	57.98	7.64	7.59	***
E1	-22.66	12.21	-1.86	0.06
E2	71.90	9.36	7.68	***
E3	-46.66	16.14	-2.89	0.00
Covariance and Correlation				
Beginning Number and Growth Covariance	-30.07	7.65	-3.93	***
Covariance and Correlation	-0.33			

The Impact of Traditional and Vocational Higher Education Systems on the Number of Faculty in the Department Relevant to Leisure and Sport between 2006 and 2011

To learn the impact or influence of traditional and vocational higher education on the initial point and growth, the study treated different educational system in the original latent growth curve model as Level 2 predictors and that the initial point and growth in the previous model became predictor. Therefore, the two residuals e4 and e5 were added according to the theoretical hypothesis along with the line represents the covariance of the e4 and e5. The different variables in the model were bisect variables which were composed of 0 and 1, where 0 represents for traditional educational system (N=121) and 1 for vocational educational system (N=80).
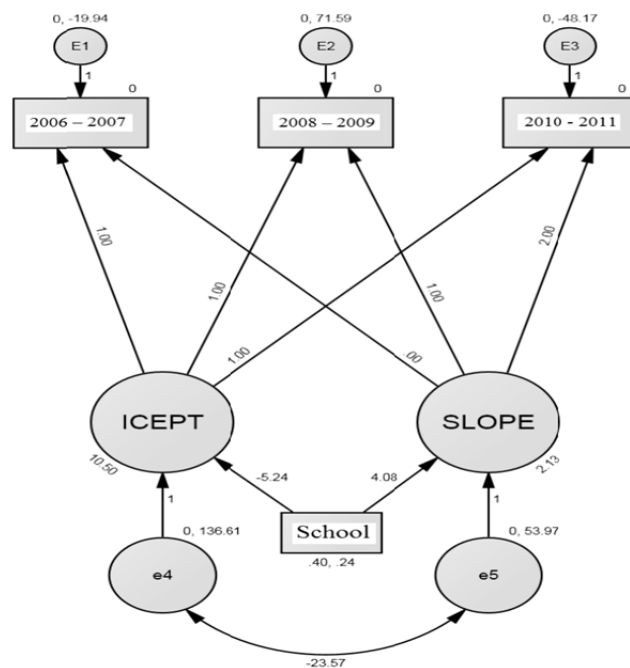

Figure 2: Two-Level Latent Growth Model for the Number of Full-time Faculty in the Department Relevant to Leisure and Sport in between 2006 to 2011

The results of the parameters in the latent growth model for the number of full-time faculty in the department relevant to leisure and sport were listed in Table 7. In which, it is cleared seen that the path coefficient of the initial point (intercept) is -5.24, the path coefficient of growth rate (slop) is 4.08, and the t value of the two parameters are -3.38 and 4.69 respectively, which were significant different at (*p<.05). Therefore, the hypothesis that traditional and vocational higher education systems have significant impact on the number of faculty member in the department relevant to leisure and sport in between 2006 and 2011 was true. The number of full-time faculty in the department relevant to leisure and sport in traditional education system was 5.24 more than that of vocational education system. However, the growth rate of full-time faculty in the department relevant to leisure and sport in traditional education system was 5.24 less than that of vocational education system.

Table 7: The Results of Parameters in the LGM for the Number of Full-Time Faculty in Department Relevant to Leisure and Sport in Traditional and vocational Education System

	Estimate	Std. Error	C.R.	P
Predictor (Different educational system)				
Intercept	-5.24	1.55	-3.38	***
Slop	4.08	0.87	4.69	***
e4	136.61	18.11	7.54	***
e5	53.97	7.50	7.20	***
e4 e5 Covariance	-23.57	7.09	-3.32	***
e4 e5Correlation	-0.27			

CONCLUSION

The sport and leisure industry has been transited along with the development of the society and the needs of the people in Taiwan (Wang, Hong and Chang, 2007). Knowing the tremendous benefits in health and economy for a community, the government has set policy to advocate leisure and sport. On the other hand, private health clubs and fitness center were established one after another. To compensate the shortage of human power in the field of leisure and sport, higher education institutions began to offer academic programs at both undergraduate and graduate levels cultivate quality professionals in this field since 1990 (Yang, 2007). This has created tremendous needs of full-time faculty for departments relevant to leisure and sport. The purpose of this study was to analyze the growth of full-time faculty in the field of leisure and sport with latent growth model.

With the analysis of latent growth model, the study found that the growth of the number of full-time faculty along with the increase of students enrolled in the field of leisure and sport was significant. This has complied with the expending trend in higher education worldwide (Wu, 2007) and the evolution of the society and needs of the people in Taiwan (Wang, Hong and Chang, 2007).

The influence of traditional and vocational education system in higher education on the growth of full-time faculty in the department of leisure and sport in between 2006 to 2011 was significant. The number of full-time faculty in traditional education system was 5.24 persons more than vocational education system in 2006. As time went by, the growth of the full-time faculty in traditional educational system was lower than that of vocational system, 4.08 persons less, in 2011. The phenomenon was quite consistent with the industrial evolution of technology intensified in Taiwan. Yang (2007) concluded that the proportion of traditional high school students to that of vocational high school was decreased from 7:3 to 5:5 and further down to 3:7. In addition, vocational higher education also injected tremendous skillful

manpower with high quality and less pay into the job market in leisure and sport. This explained why the number of full-time faculty in vocational education system was 4.08 persons more than in traditional educational system from 2006 to 2011.

RECOMMENDATION

Despite the fact that the number of full-time faculty has significantly growth along with the increase of student enrolled in the departments relevant to leisure and sport, high education indeed faced severe challenges that included conceptualized revolution on education and competition between institutions (Wu, 2007). In the situation that less students but more competition, higher education institutions have to bring up the quality of education for the departments relevant to leisure and sport. That includes maintaining faculty-student ration that meets the criteria set by the Ministry of Education and setting up the assessment standard for faculty to enhance research and service. The ultimate goal would be to provide quality faculty to cultivate quality professionals in the field of leisure and sport.

Latent variables were employed for analysis in this study, which is a creative method for data analysis. It is more capable of calculating individual change versus to using observed variables. The author recommended this analytical tool to those who are interested in conducting the research in the future.

The higher education institutions employed in this study was not categorized in state/public or private. It would be interesting to see if the public/state or private ownership of the higher education institutions would be a factor influencing the growth of full-time faculty along with the increase of students enrolled in future study.

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