# 教學成效對長榮大學翻譯系系友職涯發展之影響——線性結構方程模型（SEM）之應用與分析

熊彬杉

## 摘　要

本論文主要目的以教學成效為中介變項，分析其對長榮大學翻譯系專業人才培育及職涯發展造成之影響 , 欲探討教學成效對於核心能力、課程設計與社會回饋之間的關係 . 因此，本研究針對長榮大學翻譯系所有系友—第 87 級至 100 級，尚可聯繫上的系友們—進行系友就業（Employment）與升學（Academic Advancement）的近況調查問卷調查（1998-2011）。

經由 “ 結構方程模型 ”（SEM），及與其他相關技術與統計方法，假設檢驗與 “ 驗證性因素分析 ”（CFA），它們可以產生參數估計和模型配適度指標，具多種用途，包含縱向研究數據，及群組比較。再配合 AMOS 統計方法（Amos Statistic System），對問卷結果進行有效分析，進而總結長榮大學翻譯系整體教學表現對系友的職涯與升學發展有何影響。

最後，希冀透過本論文利用 SEM、CFA 來對教學品質現況做分析，了解課程設計與教學成效，能提升學生畢業後在職場之競爭力。大學應該培養學生具備該上述的核心能力，因為這些因素是間接影響日後的就業機會與薪資。

**關鍵詞：線性結構方程模型，Amos 統計法，教學成效，課程設計，個人核心能力**

熊彬彬，長榮大學翻譯系副教授

# The Effects of the Teaching Effectiveness on the Careers of Alumni of the Department of Translation and Interpretation Studies (DTIS), CJCU-An Analysis of Structural Equation Modeling (SEM)

Angela Hsiung

## Abstract

The purpose of this research is to analyze the teaching effectiveness as the moderator for the careers of alumni of the DTIS, this paper will investigate the influence of teaching effectiveness on core competency, course design and repaying to the society.

It is designed for more analysis on the survey of the Employment and Academic Advancement of Alumni from the DTIS (1998-2011) with the statistical technique well-known as "Structural Equation Modeling," along with other related techniques. Through the hypothesis testing, such as "confirmatory factor analysis", it can produce parameter estimates and goodness-of-fit indices, which could be useful for many purposes, examining longitudinal data, and comparing groups excellently. Using the Amos statistical package for SEM, the overall teaching performance of DTIS is analyzed, and possibilities for improvement are explored.

It is hoped that this brief study by using SEM and CFA to analyze the teaching quality and course design can to improve students' competitiveness at workplace. In other word, students should equip with these core competence after graduating because these factors would affect graduates' job-seeking opportunities and salary indirectly.

**Keywords: Structural Equation Modeling (SEM), Amos Statistic System, Teaching Effectiveness, Course design, Core Competency**

Angela Hsiung, Associate Professor, Department of Translation and Interpretation Studies, Chang Jung Christian University

## 1. Introduction

In the field of social and behavioral science research, statistical analysis of quantitative data processing is one of the main focuses of the complete research. In accordance with the research questions, choosing appropriate statistical methods, certifying the research thoroughly, correct analysis, data processing, and rendering data results are important directions of author's concern.

In recent years, among the Translation Studies field, the translation industry is gradually being taken seriously, due to the needs of the evaluation of university; the graduates career developments become also important. In the past decade, DTIS offered translation courses or related classes for students. Translation and interpretation has become a popular course option. Translation and interpretation combines language skills with modern technological and practical training. There are many differences of curriculum design between translation and interpretation departments and traditional applied foreign language departments.

This article will apply with the traditional descriptive statistics (such as SPSS statistical methods) and SEM (Structural Model Equations) statistics system to generate different evaluation of the teaching effectiveness and to obtain some new results compared to other languages department. Two questionnaires were designed, one for investigating further academic advancement and current situation, the other for obtaining feedback on curriculum design, self-awareness, repayment to society and other factors. Structural Equation Modeling (SEM) and Amos were used in the paper to analyze the results and findings.

The Department of Translation and Interpretation Studies (DTIS) of Chang Jung Christian University (CJCU), established in 1998, was the first department in Taiwan aiming to cultivate professional translators and interpreters, and, over more than a decade, has had many graduates. Their further academic advancement and employability is of importance to the school, and is of interest to the translation profession in general.

In addition, researchers also would like to assess the effectiveness of teaching for future employment, since, although Sung-Fa Chiu, Jing-Ing Wang and Wu-Der Tsay (2007) state that curriculum design is one of the major factors in job seeking, there are no published papers investigating this influence for translation graduates.

## 2. Literature Review

### 2.1 Structural Equation Modeling (SEM)

In recent years, Linear structure model (Structural Equation Modeling, SEM) has been

gradually popular and connected to such as social science, behavioral and education research, even in biology, economics, marketing and medical research areas. (Raykov, Marcoulides, 2006). Structural equation model was combined with the path analysis skills by factor analysis which had developed from the concept of LISREL software by Karl Joreskog (1970) who had made the structural equation modeling principle discussion and introduced rapidly this technology expertise to become an essential social and behavioral science research equipment. (Steenkamp, 2000). SEM was also known as covariance structure analysis, covariance structure modeling or the Analysis of moment structure.

Structural Equation Modeling (SEM) is a numerical analysis method for the simultaneous maximization of several variable functions. The analysis method was developed by Jöreskog and Sörbom as the LISREL(Liserel Structural Relation ) package in 1993. (Cheng S.C. & Cheng B.L., 2001). It deals with constructs (or dimensions) in the social science and behavioral sciences fields that are based on abstract concepts that cannot be measured directly. Jöreskog and Sörbom (1993) note that researchers must define the meaning and scope of each construct before exploring the relationships between them.

This paper refers to Thompson (2004) Exploratory Factor Analysis (EFA) of the primary requirements of the criteria: Samplings in the study which rise up to 300 to fit the population, because the EFA is a large sample analysis, author's study reaches the standard. In this study, 300 specimens, all the commonalities are averagely more than 0.5 standards. In the explanation of the two constructs of our SEM are fairly average, which can be seen that there is no occurrence of common method variance CMV in this questionnaire, that is Single source bias, CMV causes deviations (Avolio, Yammarino, and Bas 1991). Please refer to the attached confirmatory factor analysis table (Confirmatory Factor Analysis, CFA)

As with other statistical techniques, the symbol set associated with the original syntax of LISREL is the most widely used in advanced works about SEM, it features a profusion of subscripted lowercase Greek letters (e.g., 23), for individual model parameters, Instead, this study will uses a minimum number of alphabetic characters to represent various aspects of SEM such as observed versus latent variables.

As the LISREL model includes latent independent, latent dependent variables, the observable indicators of latent independent and the observable indicators of latent dependent variables. Researchers should provide theory-based evidence when exploring the casual relation between constructs by LISREL because it is, basically, a verifiable approach. As a result, researchers should provide initial relevant modeling like the following[1] figure1.

Some kinds of statistical results in SEM are interpreted exactly as regression coefficients

1 榮泰生（2007）AMOS 與研究方法。臺北：五南出版，頁 11

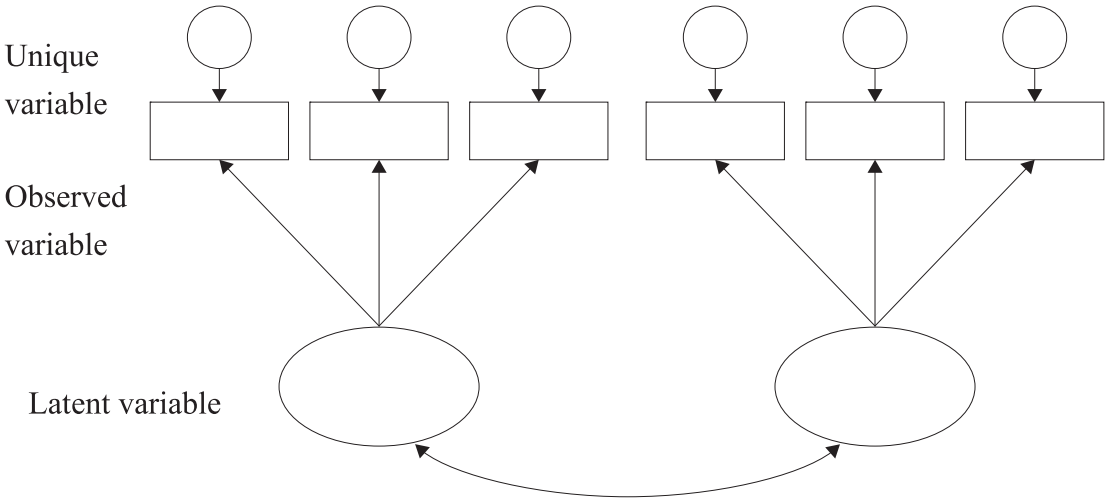


Figure 1. SEM Model

in multiple regression (MR). Values of these coefficients are corrected for the presence of correlated predictors in SEM just as they are in MR.[2]

The SEM has been applied to a range of topics, by, Jöreskog and Sörbom (1993) and others. Daire Hooper, Joseph Coughlan & Michael R.Mullen (2008) also said Structural Equation Modeling (SEM) has become one of the techniques of choice for researchers across disciplines and increasingly is a must for researchers in the social sciences. However, Substantive use of structural equation modeling has been growing in psychology and the social sciences. One reason for this is that these confirmatory methods (e.g., Bentler, 1983;Browne, 1984; Jöreskog, 1978)provide researchers with a comprehensive means for assessing and modifying theoretical models.

In a survey of university students by Fang-Tai Tseng, Jin-Li Hu and Young-Yu Chen (2011), learning of languages and concepts, skill learning, cultivation of thinking and creativity and cultivation of attitude and vision have an impact on self-efficacy, as analyzed by SEM; further, self-efficacy had direct impact on future job-seeking and salary. In other word, students should be equipped with these core competencies after graduating because these factors would affect graduates' job-seeking opportunities and salary.

Ying-Chi Yang (2011) also conducted a survey of students' core competence, showing that students are aware of the importance of personal core competence for their future, but most of them lack of these abilities. Thus, researchers consider personal core competency is an important construct for alumni success. The application of SEM in the studies of personal core competency: it has increased in the past few years. It is known that the knowledge-based

2 Rex B. Kline(2011), *Principles and Practice of Structural Equation Modeling,* The Guilford Press, New York,pp5-6

economy plays an important role in this century. People have varied means of access to higher education, leading more people to receive bachelor degrees or higher. One purpose of higher education is to cultivate students with personal core competency to get better jobs or compete with other applicants in their future career. However, graduate unemployment has increased with the number of graduates, and there is therefore doubt that completing higher education guarantees the acquisition of core competence.

Chao-Chi Yeh (2011) state that teaching is one of the important elements. After analyzing by SEM, he concluded that quality courses play an important role in promoting better teaching quality and efficiency*;* His study also showed there was a positive relation between teaching quality and quality courses. Accordingly, school should offer courses matching future career needs so as to help students improve their employability. Course design is also a major construct. If a school offers appropriate courses for students, their learning-effectiveness and ability will improve and vice versa. A course will have a direct effect on students' ability. Ying-Chi Yang (2011)note that students' ability and course design have a significant positive relationship.

Chao-Chi Yeh (2011) stated that there is a positive relation between repayment to society and teaching results. Additionally, Fang-Tai Tseng, Jin-Li Hu and Young-Yu Chen (2011) mention that employability and remuneration also have positive influence on the behavior of making contribution to school. Repayment to society is an influential concept. Repaying the society isn't a one-way behavior. The more contribution you make, the more social resources you receive, implying that the people who are able to make a contribution to society usually have greatest achievement in their life. People who have great achievement in the society are contributing to accumulated working experience, and teaching results. Angela Hsiung &Yi-Ru Zhan (2007) note that competency-based education initiatives increase relevance to society, and by extension, to the global economy. Additionally, students perceptions of role models influence significant others in their lives.

In this article, which uses the SEM analysis through the fit index, provides the control to fit different size about the hypothetical model and collection of data. In these indicators, there are Absolute fit indexes, Increasemental fit classes indexes, Parsimony adjusted indexes and Alternative fit indexes. The commonly usage of evaluation indicators: the model covariance matrix (Σ) and similar sample covariance matrix(S), which meet specific criteria, known as Goodness of fit Index, GFI, which ranges between 0 to 1, Kline (2011). In addition, in the study, it also adds the X2 test, the chi-square value is a kind of Badness of fit, when the chi-square value is larger, the model and sample data statistically significant fit types are worse. Carmines and Mclrer (1981) recommended the freedom of the chi-square (X2 / df) should be 2:1 or 3:1, and Ullman (2001) thought the value should be within 2, but Schumacker and

Lomax (2004) believed that it was within 5. In short, the chi-square degrees of freedom is smaller, model in this article will be the ideal fit.

Kline (1998) also stated that the variable with missing data must co-vary at least moderately with the other variables. The technique allows for the iterative refinement of a model, with the inclusion of additional factors, perhaps suggested by initial analyses, to obtain a better fit with the observations. [3]Chiu (2006) notes that the hypothesis can be satisfied by the model and variables are quantitative constructs, unique variables are moderate and independent as well.

These are some of the reasons for, the growth of SEM since 1993 with more 300 technical articles using SEM published than all others combined in each year. Although many researchers have applied SEM to their studies in western countries, there are still few researches in Taiwan. However, studies with SEM application have increased gradually in recent years, including those on issues of personal core competence and course design.

## 2.2 Amos (Analysis of Moment Structures)

Before understanding the application of Amos, researchers should know Confirmatory Factor Analysis (CFA). CFA is a powerful statistical tool for examining the nature of and relations among latent constructs. Brown (2006) mentioned CFA is often the analytic tool of choice for developing and refining measurement instruments and is a useful application for investigating issues. There are many types of special CFA models. The Hierarchical CFA models represent hypotheses about relations between constructs in CFA models through the specification of higher order factors and lower-order factors. Amos is widely applied in various research areas, such as, physiology, medicine, social sciences and marketing.

The results of a CFA include estimates of factor variances and covariances, loadings of the indicators on their respective factors, and the amount of measurement error for each indicator. If the researcher's model is reasonably correct, then one should see the following pattern of results: (1) all indicators specified to measure a common factor have relatively high standardized factor loadings on that factor (e.g., > .70); and (2) estimated correlations between the factors are not excessively high (e.g., < .90 in absolute value). The first result indicates convergent validity; the second, discriminant validity.

Amos is the software which processes SEM developed by James L. Arbuckle of SmallWaters to implement the Analysis of Covariance Structure. Amos is a tool which can analyze multiple variables simultaneously. Establishing models by drawing is the feature of the software. It is easy to operate, and demonstrate. Additionally, researchers can easily check

3 邱皓政（2006），社會與行為科學的量化研究與統計分析，臺北：五南出版，頁 13-22。

the data for fit with the established model.

Additionally, Bandalos (2002) also said CFA model may nevertheless fit the data reasonably well. Thus, CFA is a useful application for investigating issues. There are many types of special CFA models. The Hierarchical CFA models represent hypotheses about relations between constructs in CFA models through the specification of higher order factors and lower-order factors.

### 2.3 Theories about Translation & Interpretation Studies

In the first part of basic personal information, this article uses SPSS (Statistical Package for the Social Science) operations, including research design and scale analysis, project analysis, factor analysis, and the theory and application of statistical methods and including research questions and statistical methods, related and descriptive statistics, T-value test and one-way ANOVA analysis. Through the statistical analysis, do the project analysis of Friends of the Department who fills the forms, calculate the decisiveness values (Critical ratio: CR) that the so-called F Value. Through observation, if the items' CR reaches the level of significance ($\alpha < 0.05$ or $\alpha < 0.01$), it means that the items can identify the extent of reaction of the different subjects, and inform that whether an item should be deleted.

As mentioned the Table 1, statistical analysis was not only applied in marketing, medical researches and other social sciences, but applied in translation and interpretation studies even most of them use descriptive analysis.

In the translation and interpretation field, statistical analysis has been used for several years. The following table 1summarises the application of statistical analysis to interpretation and relevant teaching. Most researches use SPSS to analyze data; To the best of our knowledge, SEM has not been used in this field.

## 3. Method

In this paper, the research question, predictive variables include gender, age, and non-continuous variables of engaging in translation work. The non-continuous variables first replaced by a dummy variable, change the data into a 0 or 1. It will use the gender of the Alumni of the Department as a predictor variable, and take the multiple regression analysis. In addition, because some items are dichotomous categorical variables, the author deals it with the different analysis or logistic regression analysis. In this article, there are many continuous variables, and hence the author will use the two-way ANOVA.

In the two-way ANOVA, independent variables were called factors (A factor, B factor). The two are completely independent, so in the context of system design (SPSS), were also

Table 1. The Application of Statistical Analysis in Translation and Interpretation studies

| Subject | Content | Authors/Sources |
|---|---|---|
| College Students' Attitudes toward short story reading | The study is to explore students' perceptions of the effects of short story. it took the pre-test and post-test of reading fluency and comprehension, and filled out a questionnaire. | Hsin-Yu Liang & I-Chen Chen (International Conference on English Teaching and Learning STUT, 2012) |
| Teaching College Interpretation in Taiwan | The study took departments of Applied English and Foreign Language with interpretation course as object. Interviews and questionnaires were used as the research method of this study. Results were conducted through descriptive statistics. | Clarence M. Davis & Posen Liao (The Twelve Conference for the Teaching of Translation and Interpretation, 2007.) |
| A cognitive linguistics approach to quality control of business translation | The paper aims to investigate in depth the cognitive activity of Chinese-English translation. With a thirty-minute retrospective interview with students, then author analyze the result. | Junghsiu Liu (The Twelve Conference for the Teaching of Translation and Interpretation, 2007.) |
| The Blended Learning Interpretation Course: A Teaching Solution Incorporating MIT OpenCourse Ware | Participants were graduate students from the Regular M.A. Degree Program and the M.A. Degree Program for On-the-Job students, Department of Translation and Interpretation Studies, CJCU in the study. Questionnaire was used as researching method and the results were conducted though descriptive analysis by T-test. | Lynn Tsai (The Twelve Conference for the Teaching of Translation and Interpretation, 2007.) |
| A Corpus Study of Student English Textual Competence in Translation from Chinese into English | The study took native English interpreters and native Chinese translators as researching objects. Database was established by SPSS system with ten characteristics to analyze and examine the variables and the results were conducted through descriptive Statistics. | Da Hui Dong& Yu-Su Lan(The Twelve Conference for the Teaching of Translation and Interpretation, 2007.) |

called the "two-factor between-subjects design" or "completely randomized factorial design". However, this article is not using multiple analysis of variance: MANOVA, only focus on common factor analysis of social science in SEM to display the pattern of variable factor analysis. Because factors can simplify the data, based on the correlation between variables, the author will find out the potential structure of the relationship between the variables. This simple structure relationship is called components or factors. Therefore, taking into consideration the variables' communality and factor loadings, it is very important to calculate the correlation matrix or covariance matrix between the variables. And the estimating load

factors through factors extraction methods such as principal components analysis, the most likelihood method, is more often used (SPSS Inc., 1998) .

The SEM equations used in this article, which established the First Order confirmatory analysis, which refers to (Kline, 2011): (1) The model containing constructs, (2) Assuming the constructs of the measure, the SEM is multiple indicators measurements, the general recommendation is three observed variables (Bollen, 1989). This article is suitable recommendations, and through the adequate convergent validity to provide an assessment. (3) Setting the Association between the constructs and the temporal precedence, the correct effect priority to exclude other isolation (4) Complexity of the model (5) The state of the parameters, at least three conditions must be consistent above these items (Mulaik, 2009; Pearl, 2000; Cook & Campbell, 1979).

In general, in this paper the model identification (Identification = f) is divided into three types: message provided by SEM covariance matrix (Covariances) the amount (df = DF, degree of freedom), and the number of estimated parameters (P), the DF-P has three categories: (1) over-identified, DF-P > 0. the SEM model is keeping in the rest of DF (2) just-identified, DF-P = 0, the chi-square value equals 0, all fit index is 0 or 1, and that is not suitable for the SEM model, which violates the evidence to the contrary nature of SEM, (3) under-identified, DF-P < 0, the model in this article are not taken. In the traditional model estimation (MacCllumet Al., 1996) there are two ways, that is, likelihood ration X2 and also H0: $\Sigma = \Sigma$ (Y).This article adds “Maximum Likelihood Estimation, MLE”, and observed (sample) covariance assumptions and model are the same to calculate maximum probability. Olsson et Al. (2000)

The SEM parameter setting via Raycov & Marcoulide (2006) ,their principle regards all exogenous variance covariance as model parameters. All potential factors (observed) variables loading are estimated parameters of the model, and the t-rule: that is the freely estimated parameters, $t \leqq DP = (P)(P + 1) \div 2$

## 3.1 SPSS Test for Homogeneity

For returning the valid questionnaires, the author divided them into different groups by different sources, namely, the paper questionnaires and the Internet questionnaires. According to the data characteristics, such as sex, marriage, education level, the average monthly income, which uses the SPSS execution chi-square analysis to test whether the recovered samples have consistent features to facilitate the data merge analysis. This homogeneity of questionnaire test adopts gender, marital status, age, education level, and the average monthly income for the chi-square test because the data characters are categorical variables, the questionnaire uses the SPSS 17 to precede the $\chi^2$ test. Due to the variable types of occupation, or other variable

types, which are not all suitable for the homogeneity test. There are 300 samples totally.

This survey was conducted from October 31, 2011 to December 16, 2011 when an anonymous questionnaire was used to collect data from alumni. Structural Equation Modeling and Amos18.0 were used to analyze the data, and a Second Order Confirmatory Factor Analysis Model was made to detect differences among factors. The purpose of this paper was, to investigate the effects of core competency and course design on advancement and employment of CJCU alumni, and the further influence on their willingness to repay the society.

## 3.2 Structural Equation Modeling (SEM)

After the first-order CFA , the authentication of second-order CFA, Joreskog Sorborn (1992) and Doll, Xia. Torkzaden (1994) gave the recommendations, this second-order model hopes to find out the latent moderator factors (Chin, 1998), whether there is a generalizations of factors exist that can explain all covariation between first-order factors and second-order validation, and this is the standardized factor loading must be greater than 0.7 (This article presents 0.9), can be called the model fit.

Thomopson (2004) notes that before Structural Equation Modeling, a measurement model should be analyzed first. This method could identify the relevant dimensions and factors and explain the relations among dimensions. It could also help to identify the factors that will affect dimensions and the relations among dimensions, and was used for this paper. The Second Order Confirmatory Factor Analysis Model (Structural Regression Model) is combined with Confirmatory Factor Analysis.

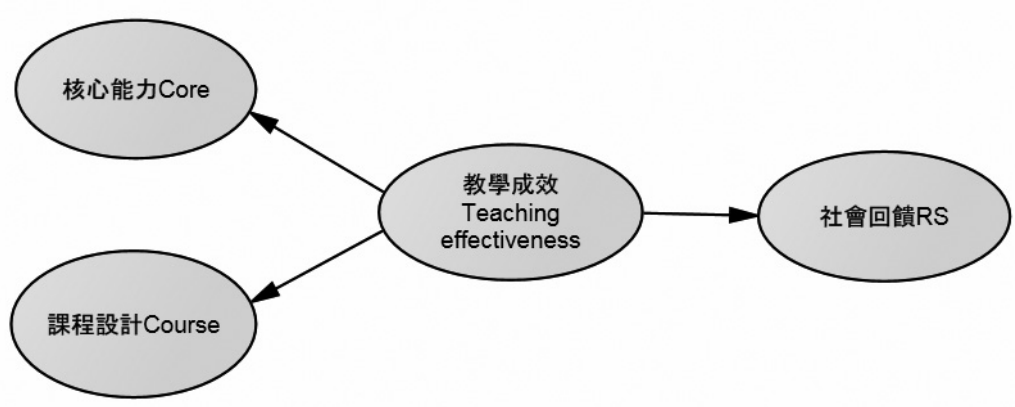


Figure 2. (Flow chart 2) Second Order Confirmatory Factor Analysis Model (Structural Equation Modeling)

## 3.3 Measurement model assessment (second-order)

The analysis is based on two important constructs validity in the measurement model test mode: Convergent validity and discriminant validity. This study is based on Hair (1998)'s three suggestion indicators to evaluate measurement mode. The indicators are as follows: factor loadings (Factor Loadings): This indicator is to assess if each load is statistically significant and it is greater than 0.7. Composite reliability of latent variables (composite reliability): CR showed, latent variables CR Value is measurement of the composition of variable reliability, which means the internal consistency of the construct indicators, the higher the reliability, the indicator function is higher, the consistency of reliability between 0.6 and 0.7 is acceptable, it shows the research model internal consistency which is good. The measurement error is 1-the square of the normalized load indicators. General requirements for the reliability of the dimensions is (but at least more than 0.6), preferably over 0.7.

Variability extraction of latent variables (Average variance extracted): AVE value calculated the latent variables of each measurement variation explanatory power of the variables of the latent variables. If AVE values is higher, which indicates potential variables possess higher reliability and convergent validity, it is recommended that its standard value must be greater than 0.5.

## 3.4 Hypothesis

The hypothesis of the paper was second order: Assessment of the structural model

When the model fit is under acceptable level, that is seeking the ability to explain, the methods of assessment as diverse related squared multiple correlations, SMC as an indicator, the value is bigger, to each evaluation and assessment of the overall structure of the program.

A dissertation about teaching effectiveness "The Evaluation of the University Teaching Excellence Project-An Analysis in the Perspectives between Teachers and Students" by Yeh Chao-Chi (2011) used SEM and CFA to analyze teaching quality, including course design and teaching effectiveness, in order to improve students' competitiveness at workplace. Based on the above study, hypothesis 1 and hypothesis 2 are constructed as follows: This study will investigate the effects of teaching effectiveness on core competency, course design and repaying the society. However, little literature has been published on teaching effectiveness. One of the studies used hierarchical linear model analysis to explore the impact of teaching behaviors and learning motivation on learning effectiveness.[4]

Hypothesis 1: Through the CFA, teaching effectiveness as the moderator reaches the basic standard fitness which is significantly related to course design and core competency.

4 吳銘達，鄭宇珊（2010）。〈教師教學行為、學生學習動機對學習成效之影響：階層線性模式分析〉，《中等教育》，2010 年，第 61 卷第 3 期，頁 32-51。

Hypothesis 2: Through the CFA, Repaying the society is significantly related to "teaching effectiveness".

## 3.5 Operational Definitions of Dimensions

### 3.5.1 Questionnaire pre-test

The study questionnaire modified design by the traditional references and school questionnaires, because the test results did not show out the particularly significant differences in the questions, with the analysis of items is not much , all questions in the questionnaire are keeping into the survey.

In addition to the first part of basic personal information, The questionnaire consisted of three parts (dimensions): (1) core competency (2) course design (3) repay the society. The operational definitions, 14 questions and relevant literature sources are shown in the Table 2. All of the three dimensions, core competency, course design and repay the society, used a Five Point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree). The research of this paper is to critically evaluate previous empirical applications of SEM in core competency, course design and repaying the society and to provide suggestion to future users on how to employ the methodology. (Hans Baumgartner and Christian Homburg, 1996).[5]

After using CFA to verify the questions about being recognized by employers (Customer Satisfaction), Question CCP10 was deleted because of the high homogeneity of question CCP9 and CCP10 in the core competency part,. However, other variables were all qualified after being verified under the factor of teaching effectiveness.

## 3.6 Sample Size Calculation

SEM is an analysis technique of large size sample. The ratios of observed variables and sample should be around 1:10~1:15 and the numbers of samples should be from 200 to 400 (Hair et al. 1998).

The number of samples should not be too small because the covariance matrix is very sensitive according to the number of samples. Usually the requirement of the observation variables of SEM model, which is between 10 and 15. The number of samples should be between 200 and 400, which are more appropriate.

MacCallum, et al. (1996) explained for this phenomenon that under the fixed circumstances of the test force and effect ($\varepsilon 0 = 0.05$ and $\varepsilon a = 0.08$), the larger number of samples of degree of freedom will be reduced. However, assessment of the number of

5 Baumgartner, Hans., Homburg, Christian. (1996). "Applications of structural equation modeling in marketing and consumer research. A review," *International Journal of Research in Marketing*. p.140.

Table 2. Literature sources of the questions

| Dimensions | Questions (Indicator) | Source |
|---|---|---|
| Core competency | CCP2 The diploma of the DTIS gives me a wide range of job opportunities.<br>CCP3 The training courses of the DTIS made me possess active learning ability.<br>CCP4 The training courses of the DTIS made me possess good concentration, reaction and memory.<br>CCP7 Learning of the DTIS made me possess professional knowledge and skills.<br>CCP8 My foreign language proficiency has improved during the time in school.<br>CCP9 At my current job, I think that my job performance was recognized by my supervisor or employer.<br>CCP10 As my current job ability, I think that I can accomplish my job tasks. | Claes Fornell(1983)[6] |
| Course design | CDS2 I am satisfied with the faculty members provided by the DTIS.<br>CDS3 I think that the course materials arranged by the DTIS meet the job requirements.<br>CDS4 I think that the course designed by the DTIS helped me acquire interdisciplinary skills.<br>CDS5 I think that the course designed by the DTIS made me feel fulfilled in my current job.<br>CDS6 I think that the professional image and reputation of the DTIS are increasingly recognized by society. | Richard P. Bagozzi (1983)[7]<br>Questionnaire of Teaching and Learning Assessment from CJCU Office of Academic affairs Teaching and Learning Center |
| Repay the society | RS1 I'd like to offer the internship opportunities for junior brothers/sisters in the school.<br>RS2 I'd like to share my job experience with my junior brothers/sisters in the school.<br>RS3 I'd like to offer scholarships for my junior brothers/sisters in the school. | Hans Baumgartner and Christian Homburg (1996) |

samples is Rmsea, which can be similar to the chi-square distribution under the large samples, therefore, even if the calculated number of samples is few, the actual assessed samples still cannot be under the basic requirements for SEM analysis. Hence, this study randomly picks at

6 Fornell, Claes. (1983) "Issues in the Application of Covariance Structure Analysis: A Comment," *Journal of Consumer Research*. Vol. 9, p.444.

7 Bagozzi, Richard P. (1983). "Issues in the Application of Covariance Structure Analysis: A Further Comment," *Journal of Consumer Research*. Vol. 9, p.450.

least more 300 samples for analysis.

According to Hair, et al. (2009), there should be at least three variables in every dimension. If the sample was too small, the variables would be invalid. This was called "Heywood Case". Since the sample size in this study is300, the variables are valid. This paper adopted the method provided by MacCallum, Browne, and Sugawara (1996), using RMSEA to calculate the samples. The calculation method was to set the RMSEA of H0 as 0.05 and the power as 0.8. There were 300 samples in this study, which met the requirement of the numbers of samples.

## 3.7 Participants and Sampling

In the effective survey sample, The participants of this paper were alumni of CJCU, Department of Translation & Interpretation Studies. The sample was from the internet questionnaire and paper questionnaire. The website of the questionnaire (http://www.my3q.com/go.php?url = dtis2011/59189) was sent to all of the alumni by e-mail, and the paper questionnaires were given to alumni or sent to alumni who could not be able to use internet. The survey started from October 31, 2011 to December 16, 2011. A total of 300 questionnaires were collected.

To prevent incorrect deduction, the data has been tested for homogeneity, by Chi-square test, analyzed in Amos 18.0. In addition to the above questions, personal information, advancement and employment of alumni was also surveyed. These were categorical variables, so the result would be described in the following terms. There were 10 questions on personal information and 19 questions on advancement and employment. In this survey of anonymous samples, alumni perception of core competency, course design and repaying the society was investigated. The samples came from paper questionnaires and internet questionnaires:

### 3.7.1 The analysis of personal information

Most participants who filled out this questionnaire graduated in 2011(38 people). Participants who graduated in 2003 and 2004 were the second and the third largest groups in questionnaire response. In the academic program part, 163 participants entered the 4-year bachelors program, and the remaining participants were two-year bachelors program (49), two-year evening bachelors program (67), Day-time master program (9) and Evening master program (12), respectively. 66 participants studied Translation/Interpretation, 93 participants studied Interpretation, 137 participants studied Translation, 32 participants studied Commerce, 25 participants studied News, and 23 participants studied Science &Technology. Females accounted for 76% of the participants Most participants were 20-39 years old. 59 participants were aged 20-24, 76 participants aged 25-29, 108 participants aged 30-34, 40 participants

aged 35-39, 9 participants aged40-44, 6 participants aged 45-49 and 2 participants aged above 60. The graduation years of the participants were from 1998 to 2011.

90 participants' spouses were Taiwanese, 3 participants' spouses were European or American, 1 participant's spouse was a Australian and one Chinese. Spouses' occupations were: Education/Government/Organization (26), Traditional industry/Manufacture (15), Information technology (14), Service (9), Business (7), Trades (5), and Agriculture/forestry/fishery (0). 73% of participants were single, 26.67% were married, and only 55 participants had children.

### 3.7.2 The analysis of advancement and employment

Of the approximately 30% of alumni who earned a Master's degree, 33% of them studied translation or languages. About 73% participants got Bachelor's degrees, 27% participants received a Master's degree, and 1% of participants earned a Doctor's degree. In the current status part, 24 participants were students, 5 participants were students with part-time jobs, 24 participants were unemployed, 49 participants were taking on-the-job training, 2 participants were serving in the military, leaving 196 participants in full time employment.

More than 30% of our alumni's reach average salary, and alumni with above average salary also accounts for over 30%. Monthly salary: 30,000-40,000 (64 participants), 20,000-30,000 (48 participants), 40,000-50,000 (29 participants), 50,000-60,000 (17 participants), 60,000-100,000 (17 participants), below 20,000 (116participants), over 100,000 (3 participants), over 500,000 (1participants).

The alumni participants worked as professional translators or interpreters and had part-time jobs in translation and interpretation accounted for more than 30%. Among the translators was 44.3 %；interpreters 30.7, and both of them are 25%. (Table 4).

The numbers of participants whose work related to languages were second highest among all of the groups. Participants who were language teachers also accounted for about 80%. In addition, participants who would need to use English translation ability accounted for 67%. All of above data showed that alumni would still constantly use translation and language ability.

The question of working places was multiple selection question, but it was obvious that most alumni had worked in Southern Taiwan (121) and Northern Taiwan (106). The remaining participants had worked in Central Taiwan (43), Eastern Taiwan (5), Off-Islands (1), Mainland China (19), Northern America (15), Asian countries (13), Europe (11), Australia (5), Southern America (2), and Africa (1).

The following table 3 is the first part: the part of the descriptive statistics scale of personal data questionnaire containing a number, mean, standard deviation, minimum,

Table 3. Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Gender | 300 | .000 | 1.000 | .24000 | .427797 |
| License | 300 | .000 | 1.000 | .26000 | .439367 |
| Marital Status | 300 | .000 | 2.000 | .27333 | .453845 |
| Monthly salary | 300 | 1.000 | 8.000 | 2.82000 | 1.331733 |
| Further advancement: Master's program | 300 | .000 | 4.000 | .62667 | 1.283008 |
| How many years do you work in your company? | 300 | .000 | 6.000 | 1.39000 | 1.620696 |
| Valid N (list wise) | 300 | | | | |

Table 4. Frequency Table: Group

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | translation & interpretation | 75 | 25.0 | 25.0 | 25.0 |
| | interpretation | 92 | 30.7 | 30.7 | 55.7 |
| | translation | 133 | 44.3 | 44.3 | 100.0 |
| | Total | 300 | 100.0 | 100.0 | |

maximum. Table 4 is the Frequency Table about the translation groups.

## 4. Measurement and Analysis of Structural Equation Modeling

### 4.1 Confirmatory Factor Analysis (CFA)

The measurement model of this study is second order factor with three dimensions: Core Competency (CCP), Course Design (CDS) and Repayment to Society (RS). CFA is the basis of the measurement model in full structural equation modeling (SEM) and can be established using SEM software.[8] The CFA measurement model of this study will be accurately analyzed according to the modification of second order factor from Kline (2005). When conducting SEM, researchers often first evaluate the measurement model with established Goodness of Fit Index (GFI) before assessing the structural model. The values of this study meet the standard of Hair et al. (1998) and Fornell and Larcker (1981) :1. the factor loading is greater than 0.5；2. composite reliability is greater than 0.6；3. the average variance extracted is

8 Albright, J. Jeremy.,& Park, Hun Myoung.(2009). "Confirmatory Factor Analysis using Amos, LISREL, Mplus, SAS/STAT CALIS." *The University Information Technology Services(UITS)*, pp 2-86.

greater than 0.5；4. the square of multiple correlation coefficient is greater than 0.5. Only RS has three variables, however, Fornell indicated that the measurement model can be established with three variables.

The standard of Goodness of Fit Index value in this paper is based on that proposed by Schreiber (2008), McDonald and Ho (2002), Boomsma (2000), Jackson Gillaspy and Purc-Stephenson (2009), Schreiber, Nora, Stage, Barlow and King (2006): $\chi^2$、the ratio of $\chi^2$ and the degree of freedom、GFI、AGFI、Root Mean Square Error of Approximation (RMSEA). Byrne (2010) noted that when conducting SEM, an adequate GFI is essential for examining the theoretical model. If the value of Goodness of Fit Index is significant, it means that the measurement model is closer to the sample model.

## 4.2 Assessment of the whole pattern for the common evaluation indicators

### 4.2.1 Chi-square test ($\chi^2$ test)

The chi-square test is a badness of fit indicator. When the chi-square value is higher, it meant the estimated model and sample data become worse on the statistical significance of the fit. The chi-square value is common noun which is used the most, the smaller chi-square value is, which meant the fitting model is  better, but during the calculation, the sample size is extremely sensitive for the chi-square value, a larger sample is easy to produce a larger chi-square value. The chi-square test produces the chi-square degrees of freedom to compensate for lack of reliability.

### 4.2.2 Chi-square degrees of freedom ratio ($\chi^2$/df)

The main purpose of the chi-square degrees of freedom is to reduce the impact of the number of samples, the chi-square degrees of freedom gets smaller, which means model fit gets higher; Carmines and McIver (1981) recommended the chi-square degrees of freedom ratio should be 2:1 or 3:1, Ullman (2001) thought the ratio should be within 2, which is called well-model fit, Kline (2005) suggested that it's acceptable that the ratio is within 3, Schumacker and Lomax (2004) thought liberally that it's good that the ratio is in 5. The chi-square degrees of freedom is much smaller, that meant the model possessed the ideal fit, preferably it is in 3 but not under 1.

### 4.2.3 Fit index (Goodness of Fit Index, GFI)

GFI = 1 - (default model chi-square value / independent model chi-square value), GFI ranges between 0 and 1, but sometimes it will produce the meaningless negative value, the larger the number of samples get, the greater the GFI are. Although the concept of GFI is similar to R-square of the regression analysis, it cannot be interpreted as the percentage of the

model explanation. GFI showed the proportion between the hypothesized model covariance and the explained sample covariance, that is to test the degree how close between the model covariance matrix and the sample covariance matrix. GFI value is closer to 1, which indicated that the model fit is higher; in contrary, it showed model fit is lower. Typically GFI > 0.9.

### 4.2.4 Root Mean Square Error of Approximation(RMSEA)

The Root Mean Square Error of Approximation (RMSEA) is scaled as a badness-of-fit index where a value of zero indicates the best fit. It is also a parsimony-adjusted index that does *not* approximate a central chi-square distribution. Instead, the RMSEA theoretically follows a noncentral chi-square distribution where the noncentrality parameter allows for discrepancies between model-implied and sample covariances up to the level of the expected value. The model degrees of freedom and one less than the sample size are represented in the denominator of Equation 8.1. This means that the value of the RMSEA decreases as there are more degrees of freedom (greater parsimony) or a larger sample size, keeping all else constant. However, the RMSEA does not necessarily favor models with more degrees of freedom. This is because the effect of the correction for parsimony diminishes as the sample size becomes increasingly large (Mulaik, 2009). See Mulaik (pp. 342-345)

RMSEA is also a kind of lack appropriate indicators, the larger the value is, which means the hypothetical model and information are more unworthy. If RMSEA is less than or equal to 0.5, which indicated a good model fit (Schumacker and Lomax, 2004). If it ranges between 0.5 to 0.8, then the model is a good fit. Hu and Bentler (1999) suggested

RMSEA is to be less than or equal to 0.06, known as a good model fit. RMSEA recently gets welcomed; part of the reasons is that it does not need to compare with the independent model. In addition, RMSEA distribution is non-concentrated chi-square distribution. Thus, need not to create a confidence interval by using bootstrap. All statistic software reports the confidence interval of RMSEA. The RMSEA is less affected by the number of samples, but in a small sample RMSEA will be overvalued (Fan, Thompson, and Wang 1999). It's also used to estimate the statistical power of SEM important indicator (MacCallum Browne, and Sugawara, 1996). It can be said, hence, it is the most important statistical indicator for SEM.

Moreover, Kline (2005) asserts that if the factor loading is less than 0.45, it means that the questionnaire is not well-designed and that should be removed. All three dimensions of this measurement model have significant values of convergent validity, that is, the results meet the standard. In other words, if the factor loading is good, i.e. larger than 0.7, but the goodness of fit index is not significant, this means that the residual, and hence the variables are not independent, and they should be removed. When testifying the research hypothesis, we found that two dimensions CCP and CDS have unexpectedly high covariant values, which means

that both are highly correlated with a common factor which affects them directly. It can be inferred from the result that our assumption that the common factor is teaching effectiveness is right.

Especially in the cases of social and behavioral sciences, initial analysis by CFA is more accurate than simply conducting SEM alone. Thus, in order to provide more effective and accurate results, there is a need to use CFA, in this study. As noted by Brown (2006), "In many studies, problems with SEM models are due to measurement model issues that can be identified with the application of CFA."

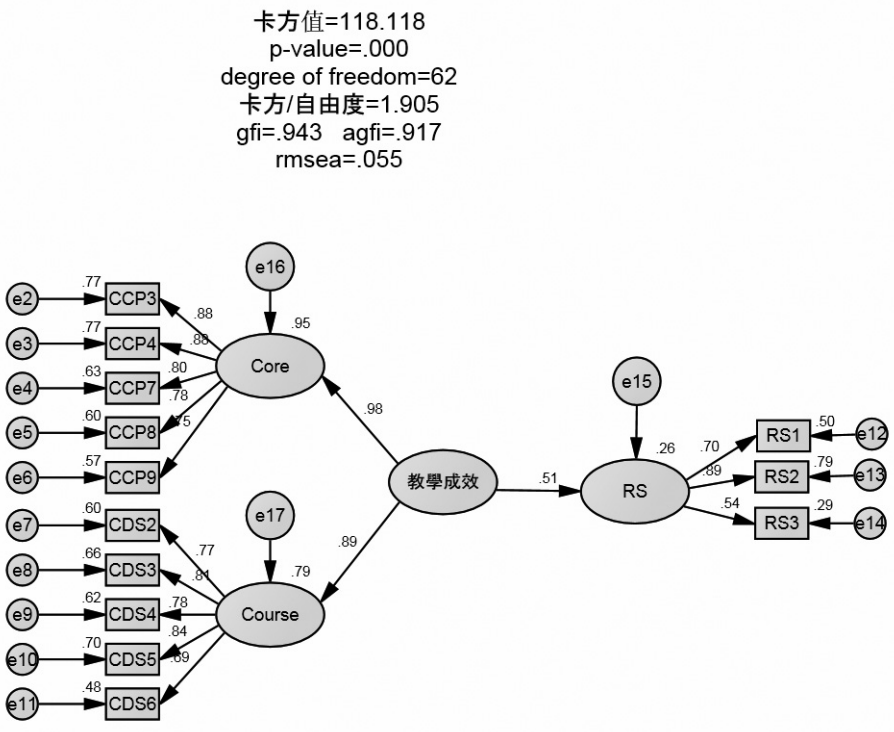


Figure 3. The statistical analysis of SEM (Two Factor Model)

## 4.3 Analysis of Results

Confirmatory factor analysis (CFA) is one part of SEM Analysis, Kenny (2006) considered the social and behavioral sciences have learned much more from CFA than SEM, because CFA can provide information on the model specification, evaluation and a confidence level of result. A measurement model needs to meet several conditions, called convergent validity (Hair et al, 2009,Fornell and Larcker, 1981): 1). Factor loadings is greater than 0.7; 2). Composite reliability is greater than 0.7; 3) Average variance extracted is more than 0.5; 4). The square of the multiple correlation coefficient is greater than 0.5. This paper final

CFA analysis will present in table with factor loadings which the proper fit indicators should include the standardized and non-standardized loadings, the standard errors, the significance, the composed reliability, the amount of variance extracted, and the Root Mean Square Error of Approximation (RMSEA).

In our study, The composite reliability is closer to 1, which means that with the direct effect of teaching efficacy, our alumni gave generally positive responses to core competency. With good values, the result is possessed with validity and reliability. The SEM to analysis of the multiple regression and its founding is demonstrated on the Table 5 which shows the values of non-standardized factor loading and standard deviation. Factor loading of convergent validity is 0.975 which is larger than scholar's standard 0.5, therefore, this result has reliability.

The GFI value of X2 is 118.118, the degree of freedom is 62 and X2/DF is 1.905 which is around 1 to 3. AGFI is 0.917, larger than 0.8, and RESEA is 0.055. The above values all fit the GFI standard as you can see from Table 5. The results indicate that the teaching efficacy is the key factor which directly affects the satisfaction of alumni with core competency and course design. We collected 300 samples. The number of samples is far beyond the parametric regression of the degree of freedom. P value is 0, which means the number of samples is unquestionably valid. In addition, considering the factors in Table 5, the value of the Core dimension achieves the minimum required, at a X2 of 32.016 with 9 degrees of freedom.

Table 5. Confirmatory Factor Analysis (CFA) Compiled chart: Results of Two Factor Model by using CFA (Latent Dimension Reliability、Convergent Validity、Composite Reliability)

| CFA Compiled chart | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimated values of parameters | | | | Convergent Validity | | | | Model fit indicator | | | | | |
| Dimension | Indic | UNSC | (S.E.) | C.R. (t-Value) | P | SC | SMC | C.R. | AVE | x2 | DF | x2/DF | GFI | AGFI | RMSEA |
| Core | T E | 1 | | | | 0.975 | 0.951 | 0.849 | 0.666 | 118.1 | 62 | 1.905 | 0.94 | 0.917 | 0.055 |
| Course | T E | 0.768 | 0.083 | 9.269 | *** | 0.888 | 0.789 | | | | | | | | |
| RS | T E | 0.442 | 0.069 | 6.386 | *** | 0.509 | 0.259 | | | | | | | | |

Considering the factors in Table 6, Core dimension indicator questions CCP3, CCP4 and CCP8 are especially designed for DTIS alumni,. Their values of standardized loading factor are slightly lower than other values. CCP2「The DTIS diploma gives me a wide range of job opportunities.」meet the required CFA factor standard, but its GFI is not significant in the SEM second factor model, suggesting this item is not independent. It means the diploma

Table 6. Confirmatory Factor Analysis (CFA) Compiled chart: Results of Two Factor Model by using CFA (Latent Dimension Reliability、Convergent Validity、Composite Reliability)

| CFA Compiled chart | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimated values of parameters | | | | Convergent Validity | | Model fit indicator | | | | | | | |
| Dimension | Indic | UNSC | (S.E.) | C.R. (t-Value) | P | SC | SMC | C.R. | AVE | x2 | DF | x2/DF | GFI | AGFI | RMSEA |
| core | CCP2 | 1 | | | | 0.687 | 0.472 | 0.913 | 0.637 | 32.02 | 9 | 3.557 | 0.97 | 0.918 | 0.092 |
| core | CCP3 | 1.233 | 0.09 | 13.719 | *** | 0.874 | 0.764 | | | | | | | | |
| core | CCP4 | 1.278 | 0.093 | 13.711 | *** | 0.873 | 0.762 | | | | | | | | |
| core | CCP7 | 1.119 | 0.089 | 12.599 | *** | 0.793 | 0.629 | | | | | | | | |
| core | CCP8 | 1.077 | 0.086 | 12.46 | *** | 0.783 | 0.613 | | | | | | | | |
| core | CCP9 | 1.063 | 0.088 | 12.127 | *** | 0.761 | 0.579 | | | | | | | | |

of DTIS whether it provides a wide range of job opportunities depends on individuals of the alumni, therefore, under the influence of other indicators, since its validity and reliability are lower than other indicators, it should be removed from the model (Kline, 2005).

In other words, the question CCP3「The training courses of the DTIS made me possess active learning ability」got the highest value of convergent validity 0.847, which suggests that due to the professional course training, the perception of the alumni is that their learning ability, and hence their core competency, has been enhanced. Question CCP4「The training courses of the DTIS made me possess good concentration, reaction and memory.」is 0.873 which is close to CCP3's. As a result, the above two questions (CCP3, CCP4) are the most obvious indicators for the teaching effectiveness. The RMSEA reaches to 0.092 is a good fitness which is larger than the required value of 0.055.

Fornell and Larker (1981) suggest that the value of the Core dimension should be larger than 0.6. so these questions have high degree of reliability. The AVE value also exceeds Fornell and Larker's standard criterion of 0.5. Since the values of CCP9 and CCP10 are almost the same, one of them should be removed.The convergent validity of CCP7「Learning in the DTIS made me possess professional knowledge and skills.」is 0.793, which reflects the positive response of our alumni.. The composite reliability of Core dimension reaches to 0.913 which is closer to 1 than that of the SEM model, that is, our alumni think that the effective teaching have helped them to enhance their core competency and to be confident.

In the Course dimension Table 7, its indicator also meets the validity criteria. The value of composite reliability is 0.902 which is close to 1, second only to that of core competency. AVE is 0.606, which also meets the standard. The GFI (0.98) and AGFI (0.935) of this

Table 7. Confirmatory Factor Analysis (CFA) Compiled chart: Results of Two Factor Model by using CFA (Latent Dimension Reliability、Convergent Validity、Composite Reliability)

| CFA Compiled chart | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimated values of parameters | | | | Convergent Validity | | Model fit indicator | | | | | | | |
| Dimension | Indic | UNSC | (S.E.) | C.R. (t-Value) | P | SC | SMC | C.R. | AVE | x2 | DF | x2/DF | GFI | AGFI | RMSEA |
| course | CDS2 | 1 | | | | 0.754 | 0.569 | 0.902 | 0.606 | 16.32 | 5 | 3.264 | 0.98 | 0.935 | 0.087 |
| course | CDS3 | 1.143 | 0.08 | 14.243 | *** | 0.826 | 0.682 | | | | | | | | |
| course | CDS4 | 1.228 | 0.091 | 13.53 | *** | 0.786 | 0.618 | | | | | | | | |
| course | CDS5 | 1.247 | 0.087 | 14.384 | *** | 0.834 | 0.696 | | | | | | | | |
| course | CDS6 | 1.082 | 0.09 | 11.977 | *** | 0.702 | 0.493 | | | | | | | | |

dimension also meet the standard criteria, and its RMSEA (0.087) is larger than the required value of 0.055.

Considering individual questions, the standardized factor loading of CDS5「I think that the course designed by the DTIS made me feel fulfilled in my current job」is the highest 0.834, suggesting the course training can help our alumni do a good job and gain confidence. The second highest value (0.826) is CDS3「I think that the course materials arranged by the DTIS meet the job requirements.」, which means that the teaching is perceived as effective in helping our alumni meet the employers' demands.

According to the SEM practices proposed by Bollen (1989), Considering the indicators of the Repay Society dimension, CFA measurement model questions should have at least three questions, so we are required to provide three questions in this part. The composite reliability is 0.763 which meets Hair et al's. (1998), larger than 0,7 criterion. Its AVE is 0.526, larger than the 0.5 criterion of Fornell and Loacker (1981). Since 2003, DTIS has held "Welcome back to DTIS, CJCU" activities each year, where the job experience of our alumni is shared with current students. These have received a positive response from current students and visiting alumni. sessions, the highest value (0.864) is RS2「I'd like to share my job experience with my junior brothers/sisters in the school.」, which reflects that our alumni are highly willing to share job experience with junior brothers/sisters in school.

Table 8. Confirmatory Factor Analysis (CFA) Compiled chart: Results of Two Factor Model by using CFA (Latent Dimension Reliability、Convergent Validity、Composite Reliability)

| CFA Compiled chart | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimated values of parameters | | | | Convergent Validity | | | | Model fit indicator | | | | | |
| Dimension | Indic | UNSC | (S.E.) | C.R. (t-Value) | P | SC | SMC | C.R. | AVE | x2 | DF | x2/DF | GFI | AGFI | RMSEA |
| Repay | RS1 | 1 | | | | 0.720 | 0.518 | 0.763 | 0.526 | 0 | - | - | - | - | - |
| Repay | RS2 | 1.21 | 0.141 | 8.581 | *** | 0.864 | 0.746 | | | | | | | | |
| Repay | RS3 | 0.664 | 0.079 | 8.447 | *** | 0.559 | 0.312 | | | | | | | | |

## 5. Discussion and Conclusion

In the table of SPSS and SEM analysis, a Probability of value, a P value, is represented to the statistics significance which is mainly helping determining. Therefore, in the SPSS and SEM factors table of this article, the P value is provided as important indicators to identify whether to reject the null hypothesis (two groups equal covariance (non-average)). The basic independent sample One-Way, ANOVA, also known as the F-statistic method, all with the basic assumption (Kirk, 1995).

The questionnaire of this article is assigned to Normality, and with randomized features and independence and variance homogeneity. For data analysis, if ANOVA F value of the whole ordeal was not significant, this paper will also use afterwards comparative analysis, Scheffe Law: control the overall alpha value at 0.05. The Scheffe method is to test every average linear combination to provide the protection of level. The larger of F value means smaller inside variance (error variance). The greater the variance between the group means larger difference between groups, the more easy to reach statistical significant effect.

### 5.1 Hypothesis and Research Results

The questionnaire, SEM measurement model and the analysis of CFA and GFI, support the teaching effectiveness of DTIS and our hypotheses. All values of this paper are statistically significant, suggesting that this research possesses validity and reliability. The results of analysis show that among three dimensions, the teaching effectiveness as the moderator affects the Core dimension the most with the standardized factor loading 0.975. The next in effectiveness is the Course dimension and then the RS dimension.

According to the survey of the Employment and Academic Advancement of Alumni from the DTIS (1998-2011), these research questions were especially designed for DTIS alumni,

so these initial results should provide a relevant reference frame for any future related studies. Some problems were inevitably encountered with the questionnaire design. For example, some questions are not clear enough and were misunderstood by participants. However, we believe some questions are innovative and well-designed, such as questions in Course Design, Core Competency and Repayment to Society, and wish to establish the basic direction for the future.

As shown in Table 9, about 20% of our alumni are willing to provide scholarships and financial aids for minority students, up to 35% are willing to provide internship and company visiting opportunities and almost 40% are willing to go back to school to share their job experiences. Collecting not only 300 anonymous but also 150 named questionnaires, the founding results shows that the perception on repayment to society is fairly positive. From this point, our alumni are highly willing to repay to the school and further to the society, consistent with (Schferand Mayer, 2005) who find that the education from school will influence students and society.

Table 9. The result of Repay the Society

| Items / N/P | Scholarships | Financial aids for minority students | Internship | Company Visiting | Experience Sharing |
|---|---|---|---|---|---|
| Number | 5 | 27 | 25 | 27 | 56 |
| Percentage | 3% | 18% | 17% | 18% | 39% |

Note: 150 named questionnaires from a survey of the employment and academic advancement of alumni from CJCU department of translation & interpretation studies (1998-2011)

Table 10 present the 150 named questionnaires statistics of occupational categories. Most of the alumni are engaged in education, for example: cram school teacher, university professor, vocational high school teacher, high school teacher, junior high school teacher, mentor, elementary school teacher; overseas sales assistant, trade company secretary.

Finally, special thanks are owed to our alumni for high proportion of questionnaire replies, which made this paper more objective and effective. From these results of SEM and Amos analysis, we have a better understanding about the status quo of DTIS alumni and also their positive attitude to repayment to society. Good teaching effectiveness in DTIS is reflected in the high satisfaction of our alumni with course design, which enhances their core competency, as well as their repayment to society.

Table 10. Occupational Categories

| | |
|---|---|
| Commercial Finance | Financial and consultant, chairman of CPC (China Petrochemical Corporation), director, brand manager, tellers, public relations, market analyst, planning manager, Insurance Brokers |
| Electronic Science & Technology | Chief engineer, Application Engineer, head of U.S. operations, sales engineers, process engineers, overseas department manager, 3D Lighting & Compositing Artist |
| Translation & Entertainment Mass media | Translators, interpreter, translation company PR, International Compilation & Translation Center,<br>the entertainment broker, program planning and international television reporter, the late director of program |
| others | Civil service, foreign language tour guides, sightseeing interpreters, architects, Lieutenant Colonel principals (Army) |

Note: Ibid 150 named questionnaires.

## 5.2 Academic Contribution

The Analysis of Moment Structure (Amos) package is a useful tool for analyzing SEM. This tool has a wide application within areas of marketing research, educational research and psychology. The present paper uses Amos analysis to reveal the latent relationship among variables. In the past three decades, structural equation modeling (SEM) has been used extensively in behavior or social sciences. Many researchers use SEM to build models in order to investigate measurement issues and examine structural relationships among sets of variables.

The descriptive analysis of advancement and employment reveals the status quo of our alumni: the numbers of participants whose work related to languages were second highest among all of the groups, participants who were language teaching teachers also accounted for about 80% and participants who would need to use English translation ability accounted for 67%.Participants who worked as professional translators or interpreters and who had part-time jobs of translation and interpretation accounted for more than 30%. Moreover, it can be inferred from the above analysis that the teaching in DTIS is effective. Concerning salaries, more than 60% of our alumni's reach the average salary. It can also be demonstrated that our alumni have positive attitude toward social repayment.

This paper is a novel application of SEM to study the experience and perception of DTIS alumni, by an analysis questionnaire response using the Amos statistical package. Through an analysis of 150 named and 300 anonymous questionnaires, we explore the effect of overall teaching effectiveness as the moderator on their job-seeking, academic advancement and their repayment to society. New questions specially developed for this study CDS5 "I think that the course designed by the DTIS made me feel fulfilled on current job.", CCP3 "The training

courses of the DTIS made me possess active learning ability." and CCP4 "The training courses of the DTIS made me possess good concentration, reaction and memory.", as well as CCP8 "My foreign language proficiency has improved during the time in school." have significant values of GFI by using CFA statistical analysis, suggesting these questions can be useful examples for future related research. Conversely, problematic questions in this research can also be effective references for pitfalls to avoid in the future. For instance, questions CCP10 and CCP9 are too similar to have good values of GFI, and were eliminated from the analysis. Iterative adjustment is a feature of the research instrument development process.

In sum, the author hopes in this article, the use of statistical methods could present complete and methodical research and the results would guide the translation industry researchers to enter a new field of quantitative data process. It is hoped that this brief study may contribute to a better understanding of alumni status and satisfaction, as well as to provide effective guidance for future research especially in questionnaire design and statistical analysis. In particular, this study would also provide a practical way for the needs of the university evaluation on a forward-looking interest.

## Reference

Albright, J. Jeremy., & Park, Hun Myoung.(2009). "Confirmatory Factor Analysis using Amos, LISREL, Mplus, SAS/STAT CALIS." *The University Information Technology Services(UITS)*, 2-86.

Anders G., Michael D. J. and Inger R. (2005). The Effects of Customer Satisfaction, Relationship Commitment Dimensions and Triggers on Customer Retention, Journal of Marketing. 69(4), CRM Special Section, 210-218.

Anderson, E.W., Fornell, C. and Lehmann, D.R. (1994). Customer satisfaction, market share, and profitability: findings from Sweden, Journal of Marketing. 58(4), 53-66.

Anderson, J. C. and Gerbing, D. (1984), 'The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis', Psychometrika 49, 155-173.

Anderson,C.James.,&Gerbing,W.David.(1982). "Some Methods for Respecifying Measurement Models to Obtain Unidimensional Construct Measurement." *Journal of Marketing Resarch*,XIX,453-460.

Anderson,C.James.,&Gerbing,W.David.(1988). "Structural Equation Modeling in Practce: A Review and Recommended Two-Step Approach." *Psychological Bulletin*,103(3),411-423.

Barrett, P. (2007). Structural equation modelling: Adjudging model fit, Personality and Individual Differences. 42, 815-824.

Baumgartner and C., Homburg (1996). Aplications of Structural Equation Modeling in Marketing and Consumer Research: a review, International Journal of Research in Marketing. 13 (2), 139-161.

Bei, L. T. and Y. C. Chiao (2001). An Integrated Model for the Effects of Perceived Product, Perceived Service Quality, and Perceived Price Fairness on Consumer Satisfaction and Loyalty, Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior. 14, 125-140.

Boomsma, A. (2000). Reporting analyses of covariance structures. Structural Equation Modeling, 7, 461-483.

Bowen, and Chen, S. L. (2001). The relationship between customer loyalty and customer satisfaction, International Journal of Contemporary Hospitality Management. 13(4/5), 213-217.

Bowen, J. T., Shoemaker, S. (2003). Loyalty: a strategic commitment, Cornell Hotel and Restaurant Administration Quarterly. 44(5/6), 31-46.

Breckler, S. J. 1990.Application of Covariance Structure Modeling in Psychology: Cause for Concern? Psychological Bulletin ,107(2), 260-372.

Brown, T. A. (2006). Confirmatoryfactoranalysisforapplied research. NewYork: Guilford.

Byrne, B. B. (2010). Structural equation modeling using AMOS. Basic concepts, applications, and programming (2nd Ed). New York: Routledge.

Carter,Lynn Rufus.(2006). "Solutions for Missing Data in Structural Equation Modeling." *Research & Practice in Assessment*,1(1),1-5.

Chang, C. H. and Tu, C. Y. (2005). Exploring store image, customer satisfaction and customer loyalty relationship: evidence from Taiwanese hypermarket industry, Journal of American Academy of Business. 7,197-202.

Chatura Ranaweera, and Prabhu, Jaideep (2003). On the Relative Importance of Customer Satisfaction and Trust as Determinants of Customer Retention and Positive Word of Mouth, Journal of Targeting, measurement and Analysis of Marketing. 12, 82-90.

Chin,W. Wynne.(1998). "Commentary: Issues and Opinion on Structural Equation Modeling." *MIS Quarterly*, 22(1), vii-xvi.

Climaco, C. (1992). "Getting to know schools using performance indicators: Criteria, indicators and processes." *Educational Review*, 44, 295-297.

Diamantopoulos, A., and Siguaw, J. A. (2000). Introducing LISREL: A guide for the uninitiated. Thousand Oaks, CA: SAGE.

Doll, J. William., Xia, Weidong.,&Torkzadeh, Gholamreza.(2010). "A Confirmatory Factor Analysis of the End-User Computing Satisfaction Instrument." *MIS Quarterly*, 18(4),453-461.

Fornell, C.,& Larcker, D. F. (1981).“Evaluating structural equation models with unobservable variables and measurement error.”*Journal of Marketing Research*, 18 , 39-50.

Fomell, Claes.(1981). “Evaluating Structural Equation Models with Unobservable Variables and Measurement Error.” *Journal of Marketing Research*,18(1),39-50.

Fornell, Claes.(1983). “Issues in the Application of Covariance Structure Analysis: A Comment.” *The Journal of Consumer Research*,9,443-448.

Frederick, N. (2000). Loyalty: Customer Relationship Management in the New Era of Internet Marketing. McGraw-Hill, London.

Fullerton, Gordon (2005). The Impact of Brand Commitment on Loyalty to Retail Service Brands, Canadian Journal ofAdministrative Sciences. 22(2), 97-110.

Ganesh, J., Mark, J., Arnold, and Kristy, R. E. (2000). Understanding the customer base of service providers: An examination of the differences between switchers and stayers, Journal of Marketing. 64, 65-87.

Hair, J. F., Tatham, R. L., Anderson, R. E., & Black, W. (1998). *Multivariate Data Analysis with Readings*, New Jersey: Prentice Hall.

Hellier, Phil K., Gus M. Geursen, Rodney A. Carr and John A. Rickard (2003). Customer repurchase intention: A general structural equation model, European Journal of Marketing. 37(11/12), 1762-1800.

Heskett, James L., Jones, Thomas O., Loveman, Gary W., Sasser W. Earl Jr., and Schlesinger, Leonard A. (1994). Putting the service-profit chain to work. In: Christopher H. Lovelock ed. Service Marketing. 3th ed., U.S.A:Prentice Hall inc.

Hershberger,L.Scott.(2003). “The Growth of Structural Equation Modeling: 1994-2001.” *Structural Equation Modeling*,10(1),35-46.

Hsiung,Kellina.,&Zhan,Yi-Ru.(2007).“Vocational Choice, Employability and Academic Advancement of Alumni from CJCU, Department of Translation & Interpretation Studies-A Survey from Perspective on Theory of Planned Behavior.” *The Twelve Conference for Teaching of Translation and Interpretation,* 第 *12* 屆口筆譯教學研討會 ,50-59.

Hooper, Daire., Coughlan, Joseph.,&Mullen, R. Michael.(2008). “Structural Equation Modeling: Guidelines for Determining Model Fit.” *Electronic Journal of Business Research Methods*,(6)1,53-60.

Host, V. and Knie-Andersen, M. (2004). Modeling customer satisfaction in mortgage credit companies, The International Journal of Bank Marketing. 22(1), 26-42.

Humphreys, P. (2003). Mathematical modeling in the social sciences. In S. P. Turner and P. A. Roth (Eds.). The Blackwell guide to the philosophy of the social sciences 166-184. Malden, MA: Blackwell Publishing.

Jackson, D.L., Gillaspy, J.A., &Purc-Stephenson, R. (2009).“Reporting practices in

confirmatory factor analysis: An overview and some recommendations."*Psychological methods* ,14(1), 6-23.

Joreskog, G. Karl.(1999). *How Large Can a Standardized Coefficient be?* 1-3.

Jöreskog, K. G., and Sörbom, D. (1993). *LISREL8: Structural equation modeling with SIMPLIS command language*. Chicago: Scientific Software International Inc.

Kenny, A. David.(2010). *Measuring Model Fit.*

Kline,R.B. (2005). Principles and practice of structural equation modeling (2nd ed.). New York: Guilford.

Kline,R.B. (2011). Principles and practice of structural equation modeling (3nded.). New York: Guilford.

Kolenikov, S. & Bollen, K. A. (2007), A specification test for negative error variances: Is a Heywood Case a Symptom of Misspecification? http://web.missouri.edu/~kolenikovs/papers/heywood-4.pdf (2011.02.27)

Li, Fuzhong., & Acock,C.Alan.(1976). "Latent Curve Analysis: A manual for Research Data Analysts." *National Institute of Drug Abuse*,2-40.

MacCallum, R. C., and Austin, J. T. (2000). Applications of structural equation modeling in psychological research, Annual Review of Psychology. 51, 201-236.

MacCallum, R. C., and Hong, S. (1997). Power analysis in covariance structure modeling using GFI and AGFI, Multivariate Behavioral Research. 32, 193-210.

MacCallum, R.C., Browne, M.W., and Sugawara, H.M. (1996). Power analysis and determination of sample size for covariance structure modeling, Psychological Methods. 1(2), 130-149.

McDonald, R.P., and Ho, M. H. R. (2002). Principles and practice in reporting structural equation analyses, Psychological Methods. 7, 64-82.

McFarland, D.B. and Sweeney, P.D. (1992). Distributive and procedural justice as predictors of satisfaction with personal and organizational outcomes, Academy of Management Journal. 35(3): 626-637.

Millsap, R. E. (2007). Structural equation modeling made difficult, Personality and Individual Differences. 42, 875-881.

Patel,Charmi.,Budhwar,Pawan.,&Varma,Arup.(2011). "Overall justice,work group identification and work outcomes: Test of moderated mediation process." *Journal of World Business*,1-10.

Raykov, T., and Marcoulides, G. A. (2006). A first course in structural equation modeling 2nd ed. Lawrence Erlbaum.

Schreiber, J. B. (2008). Core reporting practices in structural equation modeling. Research in Social and Administrative Pharmacy, 4, 83-97.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., and King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: Areview, The Journal of Educational Research. 99, 323-337.

Schumacker, Randall E. and Richard G. Lomax (2004). A beginner's guide to structural equation modeling, 2th ed., Mahwah, NJ: Lawrence Erlbaum Associates.

Schwarz, A., Schwarz, C., and Rizzuto, T. (2008). Examining the "Urban Legend" of 135 Common Method Bias: Nine Common Errors and Their Impact. In Proceedings of the Proceedings of the 41st Annual Hawaii International Conference on System Sciences, 441.

Steensma, H.K., Tihanyi, L., Lyles, M.A., and Dhanaraj, C. (2005). The evolving value of foreign partnerships in transitioning economies, Academy of Management Journal. 48 (2), 213-235.

Thompson, B. (2004). Exploratory and confirmatory factor analysis: Understanding concepts and applications. Washington, DC: American Psychological Association.

Widaman, K. F., and Thompson, J. S. (2003). On specifying the null model for incremental fit indices in structural equation modeling, Psychological Methods. 8, 16-37.

Wu Ming-Ta, Cheng Yu-shen. (2010). "A Study of National Science Council Highscope Program Teaching Behaviors, Learning Motivation Impact On Learning Effectiveness: Hierarchical Linear Model Analysis." *Zhong Deng Jiao Yu*, 61(3),32-51.

Zins, C., (2001). Defining human services, Journal of Sociology and Social Welfare. 28 (1), 3-21.

王保進（1994）。「我國高等教育表現指標現況之實證分析」。教育與心理研究，17，61。

王保進（1995）。「評估我國高等教育的表現指標之可行模式之研究」。行政院國家科學委員會專題研究計畫（編號；NCS 83-01030H-123004）。

田振榮（2001）。「以職場為導向學生能力標準架構與能力分析模式」。技術及職業教育雙月刊，63，216-220。

陳正昌、程炳林（2001）。『SPSS、SAS、BMDP 統計軟體在多變量統計上的應用』。臺北 : 五南。

榮泰生（2007）。『AMOS 與研究方法』。台中市 : 五南。

邱皓政（2006）。『社會與行為科學的量化研究與統計分析』。臺北市 : 五南。

邱松發、王靜瑛、蔡武德（2007）。「職涯輔導與就業力及網站運用之研究」。高雄應用科技大學，1-11。

吳銘達、鄭宇珊（2010）。「教師教學行為、學生學習動機對學習成效之影響：階層線性模式分析」。中等教育，61(3)，32-51。

胡凱傑、魏文浩（2011）。「從關係行銷與社會線索觀點探討中小企業顧客對銀行忠誠

度之影響因素」。第 14 屆科技整合管理研討會，31-45。
曾芳代、胡均立、陳韻宇（2011）。「人力資本或是信心資產？自我效能對大學畢業生的學習經驗與就業力之中介效果」。長庚人文社會學報，4(2)，335-356。
張文良（2010）。「PISA 中學校背景、學校經營因素與學生學科成就表現關係之研究—以臺韓為例」。高雄師範大學教育學系博士論文，高雄市。
葉兆祺（2011）。「獎勵大學教學卓越計畫成效評估—師生觀點之分析」。國立暨南大學教育政策與行政學系博士論文，南投縣。
楊穎琪（2011）。「我國大學生核心能力指標現況調查與建構之研究」。中元大學教育研究所碩士論文，桃園縣。

# Appendix

Table 1. Personal Information Questionnaire

| | Questions | Source |
|---|---|---|
| Personal Information | PI1 Gender<br>PI2 Age<br>PI3 Graduation year<br>PI4 Academic program<br>PI5 Group<br>PI6 License<br>PI7 Marital Status<br>PI8 Children<br>PI9 Spouse<br>PI10 Spouse's occupation | Telephone Survey of CJCU Alumni by CJCU (1996~2005) |

Table 2: Advancement and Employment Questionnaire

| | Questions | Source |
|---|---|---|
| Advancement and Employment | AE1 Degree<br>AE2 Current Status<br>AE3 Monthly salary<br>AE4 Further advancement: Master's program<br>AE5 Major of Master Degree<br>AE6 Would you like to attend a doctoral program?<br>AE7 Further advancement: Doctoral program<br>AE8 Major of Doctoral Degree<br>AE9 After graduated from DTIS of CJCU, does your work related to translation or interpretation?<br>AE10 After graduated from DTIS of CJCU, which field does your work related?<br>AE11 After graduated from DTIS of CJCU, do you have a part-time job related to translation?<br>AE12 Are you a language teaching teacher?<br>AE13 How many years do you work as a free-lancer, SOHO or tutor?<br>AE14 Which one is your current job position/rank?<br>AE15 How many years do you work in your company?<br>AE16 How many languages do you use in workplace? (Multiple selection question)<br>AE17 How many languages do you translate in workplace? (Multiple selection question)<br>AE18How many jobs do you change since graduation?<br>AE19 Where have you worked?(Multiple selection question) | Telephone Survey of CJCU Alumni by CJCU (1996~2005) (1996~2005) |