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Relation among Traditional Teaching, Interactive Teaching, Learning Satisfaction, and Learning Effectiveness: Comparison of a Case Study in Cross-Strait

Pao-Ching Lin[1*], Dan Wang[2], Jian-Cheng Wang[3]
[1,2 &3] *Chizhou University, China*
Corresponding Author: Pao-Ching Lin

ABSTRACT: *This study aims to validate and understand the influence of traditional (one-way) teaching and interactive teaching on learning effectiveness in Cross-Strait, by referring to learning satisfaction as the double mediating variable. The target population is the teachers (lecturers and above) and students in the Department of Marketing in a Cross-Strait universities respectively. A Linear Structural Equation Modeling (SEM) is constructed to verify the goodness-of-fit of the overall model, the structural model, and the measurement model. According to the research results, the research findings show the differences between the two groups. The research findings can serve as a reference to education policy makers in Cross-Strait, and provide food for thought to teachers in teaching innovation and methods.*

KEY WORD*: Traditional Teaching, Interactive Teaching, Learning Satisfaction, Learning effectiveness, Cross-Strait*

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I. INTRODUCTION

1.1 Research Motivation

In face of change in the global economy and the society of the 21st century, all the governments in the world hope to enhance the quality of its people and the competitiveness of the nation with education reforms. To this end, Cross-Strait has been implementing bold reforms in education. Indeed, there are many differences in Cross-Strait due to different guidance in education and separation over a long period of time (Chen, 2012).

Tradition teacher is rendered with teachers lecturing from the podium and students sitting on their seats listening passively. The teachers control the process and the classes are dull. Some students are distracted due to boredom. As a result, students are not absorbing much, and the academic performances deteriorate. They gradually give up on learning and even space out or doze off in class. Low-achieving students who are unable to learn effectively fail to keep up with the teaching. They simply throw in the towel because they feel learning is difficult. Manabu Sato in his book published in 2012, "Learning Revolution: The Innovation Starting from Classrooms" mentions that traditional teaching often ignores the students who have learning difficulties or are slow in learning. It also neglects the interest of students. Students feel bored in the classroom and gradually lose momentum of learning. At last but not the least, it deprives students of opportunities in active learning (Kang, 2014). As the education in the 21st century advocates diversity in culture and respect for individual differences and opinions of each student, the teaching environment should be created jointly by both teachers and students. Teachers should encourage students to express their opinions in class. In face of difficult problems, teachers should provide timely guidance and engage in discussion and dialogue with students to identify the best solutions. This will impress students and leave a mark on them (Huang, 2013).

The ongoing change of the education system is gradually empowering both teachers and students in the teaching/learning process. Answers are found via discussion and communication with students, to enhance the effectiveness of teaching and the motivation of learning.

In addition to innate and intellectual factors, many non-intellectual issues also affect learning effectiveness. Given the current focus on personalized teaching, teachers must understand the individual differences of students to modify teaching accordingly. Among the non-intellectual factors, cognitive style is an extremely important factor highly relevant to education. The traditional metrics about intelligence often fail to capture the complete picture of variances in the cognitive processing of students. This is the reason why cognitive style is treated as an indicator of individual differences (Chang, 2003).

Teaching is an interactive process between teachers and students. It can be subjects-oriented or students-oriented. The former emphasizes the teaching of academic disciplines; whilst the latter focuses on the domain knowledge relevant to the employability of students (Van Driel, Bulte, & Verloop, 2007).

1.2 Research Objectives

The education policies are different between Cross-Strait. In Mainland China, the regulators should have the foresight in the formation of policies and guidelines, to empower teachers to mentor students in a professional and capable way. There have been frequent interactions in education and cultural between Cross-Strait over recent years. However, the difference in the underlying concepts has led to differences in educational outcomes.

Therefore, this study aims to validate and understand the influence of Traditional (one way) teaching and Interactive teaching on Learning Effectiveness by referring to learning satisfaction as the double mediation. The target population is the teachers (lecturers and above) and students in the Department of Marketing in a university in Cross-Strait respectively. The main research objectives are as follows:

(I) To validate and understand about Group 1 (teachers and students of the Department of Marketing of a Formosa University) regarding the following:
- (1) Whether Traditional Teaching has significant and positive influence on Learning Satisfaction ($H_{1\text{-}a}$)
- (2) Whether Interactive Teaching has significant and positive influence on Learning Satisfaction ($H_{1\text{-}b}$)
- (3) Whether Traditional Teaching has significant and positive influence on Learning Effectiveness ($H_{1\text{-}c}$)
- (4) Whether Learning Satisfaction has significant and positive influence on Learning Effectiveness ($H_{1\text{-}d}$)
- (5) Whether Interactive Teaching has significant and positive influence on Learning Effectiveness ($H_{1\text{-}e}$)

(II) To validate and understand about Group 2 (teachers and students of the Department of Marketing of a Mainland China University) regarding the following:
- (1) Whether Traditional Teaching has significant and positive influence on Learning Satisfaction ($H_{2\text{-}a}$)
- (2) Whether Interactive Teaching has significant and positive influence on Learning Satisfaction ($H_{2\text{-}b}$)
- (3) Whether Traditional Teaching has significant and positive influence on Learning Effectiveness ($H_{2\text{-}c}$)
- (4) Whether Learning Satisfaction has significant and positive influence on Learning Effectiveness ($H_{2\text{-}d}$)
- (5) Whether Interactive Teaching has significant and positive influence on Learning Effectiveness ($H_{2\text{-}e}$)

II. LITERATURE REVIEW

2.1 Traditional Teaching

The conceptual definition of Traditional Teaching in this study is defined as "the teaching method centered on teachers, with curricula progressing as planned. It is the status-quo teaching activities whereby textbook knowledge is taught, students listen carefully in the classroom, finish homework and review that has been taught." The definition is synthesized by referring to the following literature.

Huang (1997) indicated that Traditional teaching is centered on teachers and intended to familiarize students with what is taught. The frequently seen teaching techniques include didactic instruction; discussion instruction; practice instruction; and expressive instruction.

Lin & Nien (2000) argued that Traditional education is general education, with no need to factor into individual differences of learners. Teaching comes first, followed by learning. Curricula are usually determined by teachers and students are less able to learn independently. Due to a lack of comprehensive and appropriate teaching materials and media, traditional teaching is often delivered with didactic instruction in the classroom. It is the most conventional, representative, and widely accepted teaching method. This method is done with teachers giving systematic and organized verbal instruction on a topic (Tsai, 2009).

Wang (2013) thought that Traditional teaching is didactic instruction, with the teachers lecturing and the students listening. It is the teaching activity with a blackboard as the basic media.

2.2 Interactive Teaching

The conceptual definition of Interactive Teaching in this study is defined as "the learning process centered on students as individuals by enabling interactions with teaching materials. It is an interactive activity of teaching and learning that aims to foster active learning with a systematic teaching design to help teachers guide students through essential concepts". The definition is synthesized by referring to the following literature.

Sun (1999) posited that Interactive teaching aims to establish interactions between teaching materials and learners. The contents in teaching materials must work in sync with the learning environment. For example, there should be questions to interest and encourage students for discussion, to foster positive interactions between students and teaching materials. In this regard, video is a better media to assist learning. It can transmit in one way the contents of teaching materials, as well as enable two-way communication by incorporating discussion features.

Chen (2011) believed that Interactive teaching is the exchange process between teachers and students, between students and students, and between students and teaching materials. It is the learning process centered on students with an emphasis on individuality. Teachers can systematically guide students through key concepts and get students involved in the learning process with interactive activities. Active discussions in the classroom help students to explain and present their solutions. This method fosters the self-construction of deeper understanding and reflection.

2.3 Learning Satisfaction

The conceptual definition of Learning Satisfaction in this study is defined as "the level of satisfaction derived by learners from the learning process. The level of satisfaction is different due to subjective feelings by individuals. This includes positive attitudes and personal willingness, needs addressed. It also depends on the expectations from learners about learning, and the gap between requirements and curricula delivered."

Learning Satisfaction is one of the major items used for measuring learning results. In addition to students' individual issues, teachers, curriculum, and learning environment are possible factors that can affect students' learning satisfaction. Summarizing the perspectives of the following scholars, the conceptual definition concerning "learning satisfaction" in this paper is "students' feelings of pleasantry or attitudes on learning activities." Explanations on the dimensions of the "Latent Variables" (Forsey, Low & Glance, 2013) of learning satisfaction and their operational definitions are described as follows: The discussion of Learning Satisfaction in this paper is divided into the following three "Explicit Variables", i.e. (1) Learning Attitude: It is a relatively stable psychological tendency that a student shows towards learning and learning status. It may be determined by observation of, or described as, the attention paid, emotions displayed, and mental status that the student shows while learning; (2) Learning Motivation: It refers to the driving force that propels a person to learn. Learning motivation is directly related to how active, how happy, and how successful a student is while learning; and (3) Interest in Learning: It refers to a positive emotional tendency that a student has towards the learning target, and where the student understands and is actively seeking contact with it. It is the force that drives students to actively learn. The above-mentioned conceptual definition and dimensions of learning satisfaction are derived from the following literature reviews:

Tsai & Li (2015) suggested that satisfaction is a psychological feeling. It can be interpreted as satisfaction of needs or realization of expectations. It is gradually formed internally and psychologically via the learning process and hence not directly observable. It can only be determined with external and behavior expressions such as words, texts, and facial expressions.

Tsai, Wei, Wu & Tseng (2017) in their study divided Learning satisfaction into five elements, i.e. teaching by teachers; curricula & contents; environment & facilities; peer relations; and learning effectiveness.

Chang (2018) contended that learning satisfaction is the degree to which the knowledge, capabilities or achievements acquired through education meet the expectations or needs of learners.

Wang (2019) suggested that learning satisfaction is the level of satisfaction to learners from the learning activities. The level of satisfaction is different because it is subjective feelings of individuals. This includes positive attitudes and personal willingness, needs addressed. It also depends on the expectations from learners about learning, and the gap between requirements and curricula delivered.

2.4 Learning Effectiveness

The conceptual definition of "learning effectiveness" in this paper can be defined as "that which can be measured by indicators of three explicit variables, namely: students' grades after learning in school, demonstrated professional skills, and proficiency results from various external exams." Its manipulation definition is briefly described by referring to the concept of Lin (2015) as follows: (1) School grades: refers to, during the process of learning in school, the test scores obtained after learning; (2) The number of professional certificates: refers to the number of professional certificates obtained from various professional proficiency exams after the process of learning in school or other venues of capability training; and (3) External examinations: refers to the process of participating in various external professional proficiency tests after the process of learning in school or other venues of professional training. The above-mentioned conceptual definition and dimensions of learning effectiveness are derived from following the literature reviews:

According to Piccoli, Ahmad & Lves (2001), Learning Effectiveness is the change in the learner's cognition, affection, and skills at the end of teaching.

Kirkpatrick& Kirkpatrick (2006) proposed a four-level model (i.e. reaction, learning, behavior, and results) to evaluate Learning Effectiveness. Reaction is the thoughts and feelings of students after training programs. Learning is the professional knowledge and technical capability acquired by students after studying of the curriculum. Behavior is the student's change in cognition, behavior, and attitude post learning. Results refer to whether the student can correctly and effectively apply the skills acquired from the curriculum (Li, 2017).

Lee (2010) indicated that Learning Effectiveness is the results shown in assessment tests for research subjects after learning. In general, the higher the score, the better the Learning Effectiveness. The lower the score, the worse the learning effectiveness.

Lin (2015) defined Learning Effectiveness as: "it is an indicator for measuring learning outcomes, and is one of the most important criteria used for assessing teaching quality. It refers to a student's learning results, as measured on Cognitive, Affective, and Psychomotor Domains with defined test tools, after the learner has spent a prescribed time studying in a certain field. The methods used for assessing learning effectiveness should include factors: accuracy, completion time, expected difficulty, complexity, and proper values for the answer, thus offering a more fair and reasonable assessment method. Teachers may use various learning performance records for the evaluation, such as oral exams, writing exams, hands-on operation, reports, homework, worksheets, quizzes, and regular assessment tests. All of these are broad definitions of learning effectiveness. If defined from a narrower perspective, it may refer to academic performance on each subject, or on the average performance of a combination of subjects."

Huang (2018) deemed that Learning Effectiveness as the learning outcome achieved during or after the participation of learning activities. As far as teaching venues are concerned, learning effectiveness is the learning achievement shown in the tests on students via a diversity of assessment methods. It consists of three elements, i.e. cognition, skills, and affections, as stated in teaching goals and manifested through students' involvements in learning activities.

2.5 Pair-wise Dimensions & Relations

2.5.1 Traditional Teaching and Learning Satisfaction

This study has not been able to identify literature on Traditional Learning and Learning Satisfaction to date. To ensure the robustness of the hypotheses development, this study conducts a questionnaire survey and develops the following hypotheses:

Group 1:

$H_{1\text{-}a}$: Traditional Teaching has significant and positive influence on Learning Satisfaction.

Group 2:

$H_{2\text{-}a}$: Traditional Teaching has significant and positive influence on Learning Satisfaction.

2.5.2 Interactive Teaching and Learning Satisfaction

The literature review by this study on Interactive Teaching and Learning Satisfaction is as follows.

Lin (2012) indicated that the integration of interactive and digital mind-maps into the learning of social sciences enhances the learning motivation of students.

Lo (2015) found that Interactive teaching lifts the learning interest of senior high school students in human rights education. Students appreciate the importance of human rights from the curriculum and acknowledge the high relevance of human rights conventions to themselves.

Liu (2016) indicated that most students hold a positive view and attitude towards the use of interactive teaching platforms to remedial teaching in mathematics. They exhibit a high level of interest in and satisfaction with such platforms.

Chen (2019) posited that task-technology fit and teachers' capability both have significant and positive influence on learning satisfaction. This suggests the openness of students to new technologies. In addition to teaching contents, the technique in combination with interactive systems is equally important.

Based on the above, this study develops the following hypotheses:

Group 1

$H_{1\text{-}b}$: Interactive Teaching has significant and positive influence on Learning Satisfaction.

Group 2

$H_{2\text{-}b}$: Interactive Teaching has significant and positive influence on Learning Satisfaction.

2.5.3 Traditional Teaching and Learning Effectiveness

The literature review by this study on Traditional Teaching and Learning Effectiveness is as follows.

Chang (2005) contended that the combination of traditional teaching and multimedia teaching enables better school grade results than traditional teaching alone. Meanwhile, the three teaching methods yield significantly different levels of learning satisfaction

This study has not been able to identify intensive literature on traditional teaching and learning effectiveness to date. To achieve the robustness of the hypothesis development, this study conducts a questionnaire survey and develops the following hypotheses:

Group 1

$H_{1\text{-}c}$: Traditional Teaching has significant and positive influence on Learning Effectiveness.

Group 2

$H_{2\text{-}c}$: Traditional Teaching has significant and positive influence on Learning Effectiveness.

2.5.4 Learning Satisfaction and Learning Effectiveness

The literature review by this study on Learning Satisfaction and Learning Effectiveness is as follows.

Wang (2000) indicated a significant correlation between Learning satisfaction and Learning performance.

Chang (2012) pointed out a positive correlation between Learning satisfaction and Learning effectiveness of students with physical education in senior high and vocational schools in New Taipei City.

Kuo (2018) indicated that Learning Satisfaction and Learning Effectiveness are positively and significantly correlated.

Based on the above, this study develops the following hypotheses:

Group 1

$H_{1\text{-}d}$: Learning Satisfaction has significant and positive influence on Learning Effectiveness.

Group 2

$H_{2\text{-}d}$: Learning Satisfaction has significant and positive influence on Learning Effectiveness.

2.5.5 Interactive Teaching and Learning Effectiveness

The literature review by this study on Interactive Teaching and Learning Effectiveness is as follows.

Liao (2007) indicated that the use of Interactive teaching systems, in general, improves learning effectiveness significantly. However, the benefits are less noticeable with low-achieving students in mathematics. They need extra support after classes just to keep up.

Lin (2012) suggested that the integration of interactive and digital mind-maps into the learning of social sciences boosts the learning achievements of students.

Liu (2016) noted that the use of interactive teaching platforms is effective in the remedial teaching of mathematics.

Chen (2019) argued that task-technology fit exhibits positive and significant influence on learning effectiveness, but teachers' capability's influence is not statistically significant. This suggests that technology plays a bigger role than teachers in the interactive teaching environment.

Based on the above, this study develops the following hypotheses:

Group 1

$H_{1\text{-}e}$: Interactive Teaching has significant and positive influence on Learning Effectiveness.

Group 2

$H_{2\text{-}e}$: Interactive Teaching has significant and positive influence on Learning Effectiveness.

2.6 Based on the above research purpose, and literature review, this paper constructs a conceptual research framework, as shown in Figures 1 and 2:

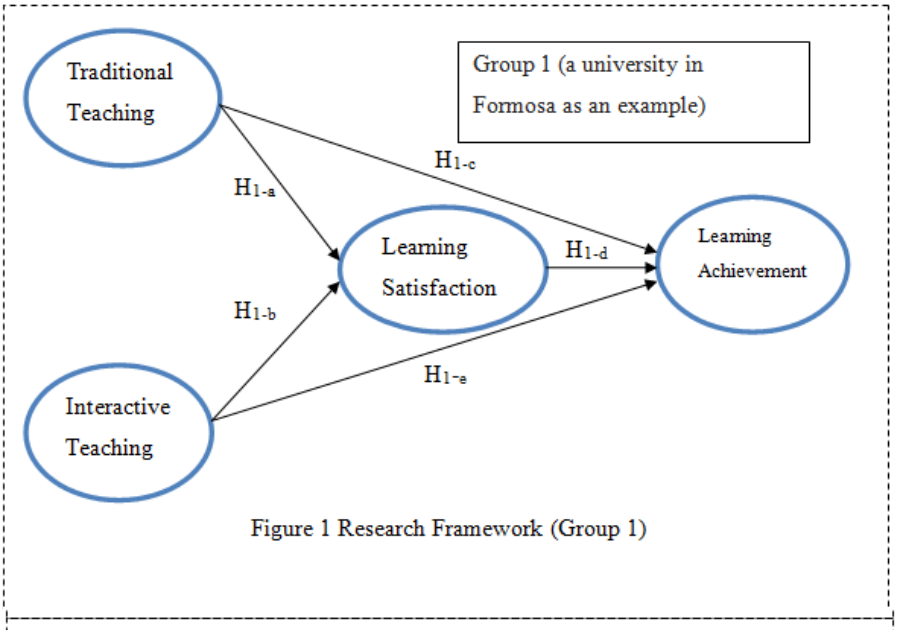

Figure 1 Research Framework (Group 1)

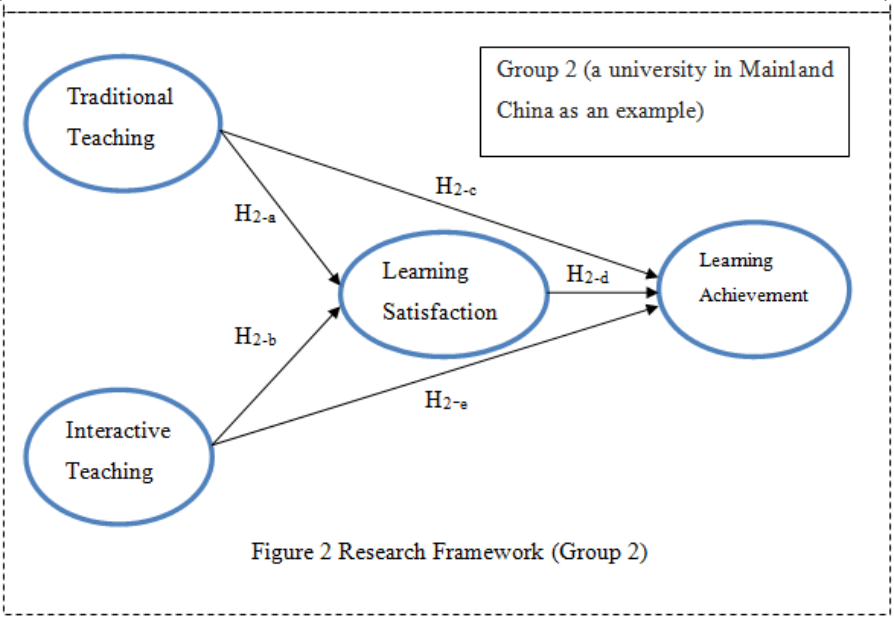

Figure 2 Research Framework (Group 2)

III. RESEARCH METHOD

3.1 Sampling Method

This study conducted a survey with Purposive sampling on the population, i.e. teachers (lecturers and above) and students of Department of Marketing in a Cross-Strait Universities respectively (Group 1 and Group 2). A total of 25 expert questionnaires were released to Group 1 and Group 2, respectively, as the pilot-test. The questionnaire was then modified according to the feedback from experts and scholars. In the post-test, a total of 300 questionnaires were released to Group 1 and Group 2 respectively. The number of effective samples was 243 for Group 1, 262 for Group 2, at a recovery ratio of 81.0% and 87.3% respectively.

3.2 Questionnaire Design

The questionnaire designed by this study for Group 1 and Group 2 measures all the observable constructs. The questionnaire is divided into different sections for measurement. On a 7-point Likert Scale, the answers were measured with 7 denoting Strongly Agree and 1 denoting Strongly Disagree. A higher score represents a greater level of agreement, and vice versa.

The construct of Traditional teaching is based on Wang (2013) and modified by this study. There are 4 questions in total.

The construct of Interactive teaching is based on Chen (2011) and modified by this study. There are 4 questions in total.

The questionnaire design relating to Learning satisfaction in this study incorporates the Learning satisfaction scale proposed by Forsey et al (2013) with added improvements. This dimension includes three variables: learning attitudes, learning motivations, and learning interests, where the first two variables are applied to three questions, while the last variable is applied to 3 questions, resulting in a total of 9 questions.

The questionnaire design relating to Learning Effectiveness in this study integrates the studies proposed by Lin (2015) and others with added improvements. This unobservable variable item includes three variables: school grades, the number of professional certificates, and external examinations, while the design follows the method of Itemization Survey, with each variable comprising three questions, resulting in a total of 9 questions.

3.4 The Data Obtained from Questionnaire and Measurement Model

This study adopted SEM in a Confirmatory Factor Analysis (CFA) of the research framework 1 and framework 2, and based the questionnaire design on three latent variables (i.e., Flipped learning, Learning satisfaction and Learning effectiveness), each of which was divided into observable/explicit sub-variables containing several questions, as shown in the Table1 below. After processing the collected data, the authors created a primary file that preceded the design of questionnaire, using Itemization Survey method for the construction of this paper's measurement system. Although Itemization Survey method is applied to the design of the questionnaire, Dual Measurement was adopted to ensure the computer software efficiently handled and/or measured all data (Chen, 2010). Table 1 shows the number of questions under each implicit or explicit variable, as well as the referential sources.

Table 1 No. of Questions Covering Latent Variables and Observable Variables

Latent variable	Observable variable	No. of questions	Reference
Traditional teaching	Lecturing	4	Wang, (2013)
Interactive teaching	Interaction between teachers and students	2	Chen (2011)
	Interaction between students and teaching materials	2	
Learning satisfaction	Learning attitude	3	Forsey et al (2013)
	Learning motivation	3	
	Learning interest	3	
Learning effectiveness	School grades	3	Lin (2015)
	No. of professional licenses	3	
	External exams	3	

IV. RESULTS AND ANALYSIS

4.1 Linear structure model analysis

Confirmatory Factor Analysis (CFA) is a technique in contrast with Exploratory Factor Analysis (EFA). This study conducts a survey via purposive sampling on the population, i.e. teachers (lecturers and above) and students of Department of Marketing in a Cross-Strait Universities respectively. Linear Structural Equation Modeling (SEM) is used to validate the goodness-of-fit for the whole model, i.e. structural model and measurement model.

This study includes a CFA, an analytical method contrary to the Exploratory Factor Analysis (EFA), on the four unobservable/latent variables of Traditional teaching, Interactive teaching, Learning satisfaction and Learning effectiveness. SEM is made up of Structural and Measurement models to efficiently tackle the cause-effect relations among implicit/latent variables. The three parts of model-testing in this study are: (1) goodness-of-fit of the measurement model; (2) goodness-of-fit of the structural model; and (3) the overall model's conformity with goodness-of-fit indicators. In other words, goodness-of-fit indictors were applied to a test of the overall goodness-of-fit effect of SEM (Diamantopoulos & Siguaw, 2000).

4.2 Analyzing goodness-of-fit of the Measurement Model

To a large extent, factor loading is intended to measure the intensity of linear correlation between each latent/implicit variable and a manifest/explicit one. The closer the factor loading is to 1, the better an observable variable is in measuring latent variables. Since this paper's reliability is supported by the fact that factor loadings for all observable variables range between 0.7 and 0.8, all observable/explicit variables in the measurement model appropriately gauged the latent/implicit ones. The Average Variance Extracted (AVE), on the other hand, gauges an unobservable/implicit variable's explanatory power of variance with regard to an observable one, with the AVE value growing in proportion to the reliability and convergent validity of that particular implicit/latent variable. As a rule, AVE must be larger than 0.5 for an observable variable's

explainable variance to exceed the measurement error (Fornell & Larcker, 1981). As Tables 2 and 3 show that all AVEs in this study exceed 0.5, the explicit variables have excellent reliability and convergent validity.

Table 2 Judgment Indicators for the Measurement Model 1

Implicit Variables	Explicit Variables	Factor loading	Variance Extracted, VE
Traditional Teaching (X_{1-1})	X_{1-1a}	.752	.621
	X_{1-1b}	.763	.642
Interactive Teaching (X_{1-2})	X_{1-2a}	.723	.634
	X_{1-2b}	.734	.643
Learning Satisfaction (ME_1)	ME_{1-1}	.743	.621
	ME_{1-2}	.744	.614
Learning Effectiveness (Y_1)	Y_{1-1}	.751	.642
	Y_{1-2}	.772	.663

Table 3 Judgment Indicators for the Measurement Model 2

Implicit Variables	Explicit Variables	Factor loading	Variance Extracted, VE
Traditional Teaching (X_{2-1})	X_{2-1a}	.742	.634
	X_{2-1b}	.753	.650
Interactive Teaching (X_{2-2})	X_{2-2a}	.732	.631
	X_{2-2b}	.734	.644
Learning Satisfaction (ME_2)	ME_{2-1}	.733	.632
	ME_{2-2}	.742	.645
Learning Effectiveness (Y_2)	Y_{2-1}	.751	.651
	Y_{2-2}	.774	.673

4.3 Analyzing Goodness-of-Fit of Structure Model

4.3.1 Path analysis results of structure model

After the group model of this study has passed the goodness-of-fit test, the parameter Estimates, Standard Errors (S.E.) and Critical Ratio (C.R.) among latent variables were calculated (as shown in Tables 4 and 5).

Table 4 Path Analysis Results of the Structural Model (Group 1)

Path Coefficients between Implicit Variables			Estimate	S.E.	C.R.	P	Label
Traditional Teaching (X_{1-1})	→	Learning Satisfaction (ME_1)	.123	.162	.759		H_{1-a}
Interactive Teaching (X_{1-2})	→	Learning Satisfaction (ME_1)	.531	.131	4.053	***	H_{1-b}
Traditional Teaching (X_{1-1})	→	Learning Effectiveness (Y_1)	.202	.213	.948		H_{1-c}
Learning Satisfaction (ME_1)	→	Learning Effectiveness (Y_1)	.161	.174	.925		H_{1-d}
Interactive Teaching (X_{1-2})	→	Learning Effectiveness (Y_1)	.312	.341	.915		H_{1-e}

Note: * indicates P<0.05; ** indicates P<0.01; *** indicates P<0.001

Table 5 Path Analysis Results of the Structural Model (Group 2)

Path Coefficients between Implicit Variables			Estimate	S.E.	C.R.	P	Label
Traditional Teaching (X_{2-1})	→	Learning Satisfaction (ME_2)	.501	.154	3.253	***	H_{2-a}
Interactive Teaching (X_{2-2})	→	Learning Satisfaction (ME_2)	.563	.134	4.201	***	H_{2-b}
Traditional Teaching (X_{2-1})	→	Learning Effectiveness (Y_2)	.502	.133	3.774	***	H_{2-c}
Learning Satisfaction (ME_2)	→	Learning Effectiveness (Y_2)	.321	.334	.961		H_{2-d}
Interactive Teaching (X_{2-2})	→	Learning Effectiveness (Y_2)	.623	.172	3.622	***	H_{2-e}

Note: * indicates P<0.05; ** indicates P<0.01; *** indicates P<0.001

4.3.2 Coefficient of Determination

The explaining level of each implicit independent variable to each implicit dependent variable is the R^2 value (Squared Multiple Correlation, SMC). Therefore, the R^2 value shown in Tables 6 and 7 indicates that the implicit independent variable has adequate explaining ability on the implicit dependent variable, respectively.

Table 6 Path Coefficient of Determination (Group 1)

Coefficients of Determination	R^2
Traditional Teaching → Learning Satisfaction	.713
Interactive Teaching → Learning Satisfaction	.713
Traditional Teaching → Learning Effectiveness	.733
Learning Satisfaction → Learning Effectiveness	.733
Interactive Teaching → Learning Effectiveness	.733

Table 7 Path Coefficient of Determination (Group 2)

Coefficients of Determination	R^2
Traditional Teaching → Learning Satisfaction	.731
Interactive Teaching → Learning Satisfaction	.731
Traditional Teaching → Learning Effectiveness	.726
Learning Satisfaction → Learning Effectiveness	.726
Interactive Teaching → Learning Effectiveness	.726

4.4 Indices of Goodness-of-Fit of the Overall Model

The purpose of adopting SEM in the modeling phase of this paper is to explore how unobservable variables are interconnected within the structural model, to determine if the measurement model has measurement reliability, and also to measure this paper's overall goodness-of-fit effect using such indices as χ^2, d.f., GFI, AGFI, NFI, CFI, RMR and RMSEA. In most cases, it is required that χ^2/d.f. <5, 1>GFI>0.9, 1>NFI>0.9, 1>CFI>0.9, RMR<0.05 and RMSEA<0.05 (Bagozzi & Yi, 1988). The goodness-of-fit of the overall model proved satisfactory in Group 1 and Group 2 of this paper because χ^2/d.f. <5 and GFI, AGFI and NFI all exceed 0.90, with the RMR smaller than 0.05 (see Tables 8&9).

Table 8: The Goodness-of-Fit Evaluation Table of the Overall Group Model **(Group 1)**

Determination index	χ^2	DF	GFI	NFI	AGFI	CFI	RMR	RMSEA
Fit value	243	179	.901	.913	.861	.932	.002	.035

Table 9: The Goodness-of-Fit Evaluation Table of the Overall Group Model **(Group 2)_**

Determination index	χ^2	DF	GFI	NFI	AGFI	CFI	RMR	RMSEA
Fit value	243	179	.902	.914	.862	.933	.003	.034

4.5 Standardized results of SEM analysis

The computerized standardized results of the overall framework are shown in Figures 3 and 4.

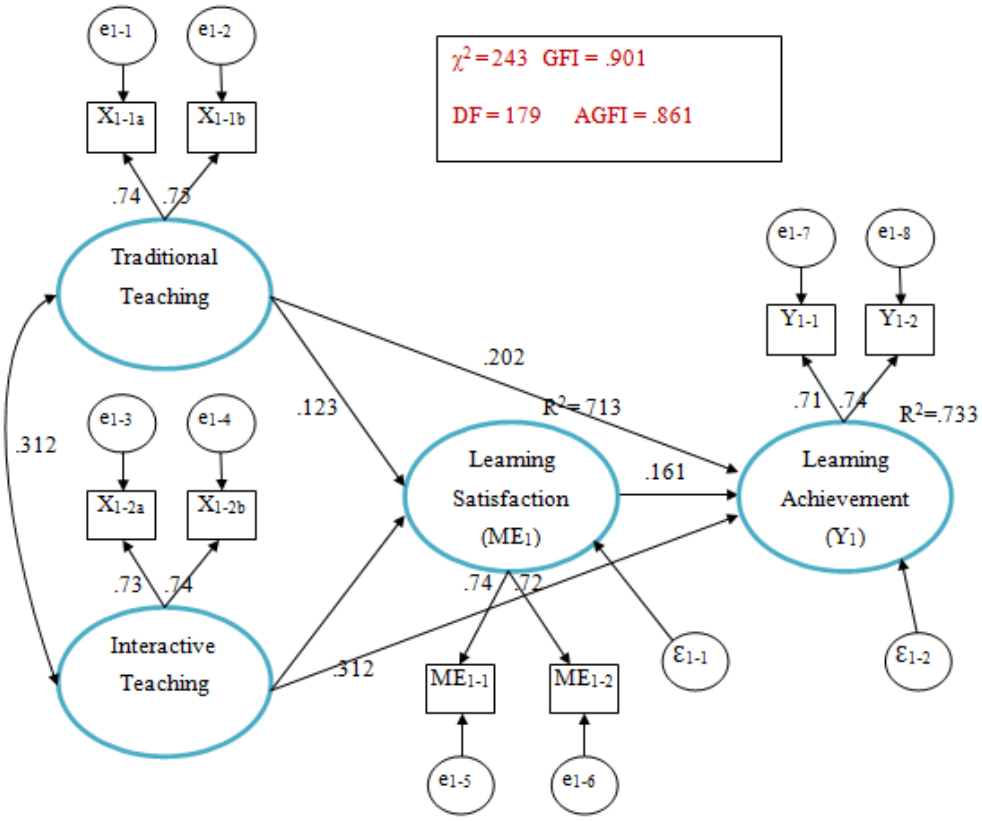

Figure 3 Standardized results of SEM analysis (Group 1)

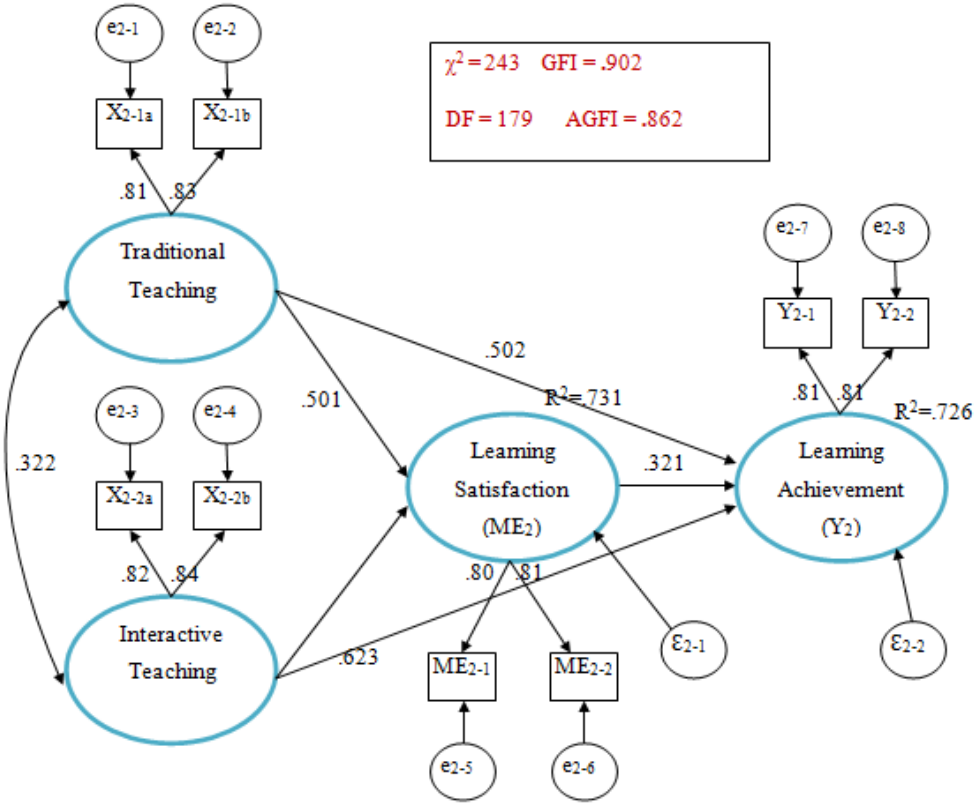

Figure 4 Standardized results of SEM analysis (Group 2)

4.6 Path Effect Analysis & Tests of Inner Model

The Bayesian Estimation is adopted for an analytical test, with specific focus on the path coefficients between implicit (unobservable) variables of the inner model, to analyze and verify the group inner model's path effect, using students' learning satisfaction (ME) as the double mediating variable. Based on the results of Group 1 as Table 10:

(1) The path coefficient from traditional teaching ($X_{1\text{-}1}$) to learning satisfaction (ME_1) is $H_{1\text{-}a}$=.123, at a 95% confidence interval of (-.039, .285). The influence is positive, but not significant.

(2) The path coefficient from interactive teaching ($X_{1\text{-}2}$) to learning satisfaction (ME_1) is $H_{1\text{-}b}$ =.531, at a 95% confidence interval of (.400, .662). The influence is positive and significant.

(3) The path coefficient from traditional teaching ($X_{1\text{-}1}$) to learning effectiveness (Y_1) is $H_{1\text{-}c}$ =.202, at a 95% confidence interval of (-.011, .415). The influence is positive, but not significant.

(4) The path coefficient from learning satisfaction (ME_1) to learning effectiveness (Y_1) is $H_{1\text{-}d}$ =.161, at a 95% confidence interval of (-.013, .335). The influence is positive, but not significant.

(5) The path coefficient from interactive teaching ($X_{1\text{-}1}$) to learning effectiveness (Y_1) is $H_{1\text{-}e}$ =.312, at a 95% confidence interval of (-.029, .653). The influence is positive, but not significant.

Table 10 Bayesian Estimation (Group 1)

Regression weights	Mean	S.D.	95% Lower bound	95% Upper bound	Name
Traditional Teaching($X_{1\text{-}1}$)→Learning Satisfaction (ME_1)	.123	.162	-.039	.285	$H_{1\text{-}a}$
Interactive Teaching($X_{1\text{-}2}$)→Learning Satisfaction (ME_1)	.531	.131	.400	.662	$H_{1\text{-}b}$
Traditional Teaching($X_{1\text{-}1}$)→Learning Effectiveness(Y_1)	.202	.213	-.011	.415	$H_{1\text{-}c}$
Learning Satisfaction(ME_1)→Learning Effectiveness(Y_1)	.161	.174	-.013	.335	$H_{1\text{-}d}$
Interactive Teaching($X_{1\text{-}2}$)→Learning Effectiveness(Y_1)	.312	.341	-.029	.653	$H_{1\text{-}e}$

Based on the results of Group 2 as shown in Table 11:

(6) The path coefficient from traditional teaching ($X_{2\text{-}1}$) to learning satisfaction (ME_2) is $H_{2\text{-}a}$=.501, at a

95% confidence interval of (.347, .655). The influence is positive and significant.

(7) The path coefficient from interactive teaching ($X_{2\text{-}2}$) to learning satisfaction (ME_2) is $H_{2\text{-}b}$ =.563, at a 95% confidence interval of (.429, .697). The influence is positive and significant.

(8) The path coefficient from traditional teaching ($X_{2\text{-}1}$) to learning effectiveness (Y_2) is $H_{2\text{-}c}$ =.502, at a 95% confidence interval of (.369, .635). The influence is positive and significant.

(9) The path coefficient from learning satisfaction (ME_2) to learning effectiveness (Y_2) is $H_{2\text{-}d}$ =.321, at a 95% confidence interval of (-.013, .655). The influence is positive, but not significant.

(10) The path coefficient from interactive teaching ($X_{2\text{-}1}$) to learning effectiveness (Y_2) is $H_{2\text{-}e}$ =.623, at a 95% confidence interval of (.451, .795). The influence is positive and significant.

Table 11 Bayesian Estimation (Group 2)

Regression weights	Mean	S.D.	95% Lower bound	95% Upper bound	Name
Traditional Teaching($X_{2\text{-}1}$) → Learning Satisfaction (ME_2)	.501	.154	.347	.655	$H_{2\text{-}a}$
Interactive Teaching($X_{2\text{-}2}$) → Learning Satisfaction (ME_2)	.563	.134	.429	.697	$H_{2\text{-}b}$
Traditional Teaching($X_{2\text{-}1}$) → Learning Effectiveness(Y_2)	.502	.133	.369	.635	$H_{2\text{-}c}$
Learning Satisfaction (ME_2) → Learning Effectiveness(Y_2)	.321	.334	-.013	.655	$H_{2\text{-}d}$
Interactive Teaching($X_{2\text{-}2}$) → Learning Effectiveness(Y_2)	.623	.172	.451	.795	$H_{2\text{-}e}$

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The following conclusions are obtained from summarizing the above mentioned results and analysis:

(1) In terms of validating Linear Structural equation modeling (SEM), the structures of the Measurement Model, Structure Model, and overall group model of the SEM in this study have goodness-of-fit, showing good fitting effects.

(2) From the practical verification perspective:

(A) The research findings on Group 1 (teachers and students in a Formosa University) are validated as follows:

(1) Traditional Teaching has positive but insignificant influence on Learning Effectiveness. This suggests that students find it acceptable to sit and listen passively to lectures, i.e. the traditional teaching in the classroom. That said, students are likely to get bored sitting there.

(2) Interactive Teaching has positive and significant influence on Learning Satisfaction. This shows that students are pleased with interactive and innovative teaching. In other words, teachers initiate dialogues with students by asking questions and students can internalize the acquired knowledge into their thought process. The two processes are complementary and supporting the improvement in Learning effectiveness.

(3) Traditional Teaching has positive but insignificant influence on Learning Effectiveness. In other words, students cannot achieve the full learning effectiveness under traditional teaching. Nonetheless, it has certain learning effects.

(4) Learning Satisfaction has positive but insignificant influence on Learning Effectiveness. Stated differently, learning satisfaction with teaching methods does not necessarily lead to learning effectiveness.

(5) Interactive Teaching has positive but insignificant influence on Learning Effectiveness. Whilst interactive teaching boosts learning effectiveness, foundation knowledge remains a prerequisite for certain fundamental subjects to achieve good learning outcomes. For example, if students are not familiar with basic statistics, they will be hard pressed to achieve good learning effectiveness in subjects such as "marketing research".

(B) Based on the above analysis, the research findings on Group 2 (in a Mainland China University) are validated as follows:

(1) Traditional Teaching has positive and insignificant influence on Learning Satisfaction. This shows that students are pleased with Traditional teaching, possibly due to high awareness and competitiveness and hence stronger Learning motivation among students in Mainland China.

(2) Interactive Teaching has positive and significant influence on Learning Satisfaction. In other words, students are happy with interactive and innovative teaching. Teachers initiate dialogues with students by raising questions and students can internalize the acquired knowledge into their thought process. The two processes are complementary and help to improve Learning Effectiveness. This phenomenon is similar with Group 1 (students in Formosa).

(3) Traditional Teaching has positive and significant influence on Learning Effectiveness. This shows that students can fully accomplish Learning effectiveness under traditional teaching, possibly because of high awareness and competitiveness and hence stronger learning motivation among students in Mainland China.
(4) Learning Satisfaction has positive but insignificant influence on Learning Effectiveness. It implies that Learning satisfaction with teaching methods does not necessarily translate into Learning effectiveness. This result is similar as the result with Group 1 (students in Formosa).
(5) Interactive Teaching has positive and significant influence on Learning Effectiveness. This suggests that interactive teaching betters the learning effectiveness, evidenced by a larger coefficient than that with traditional teaching. Hence, Interactive teaching is a positive and innovative teaching method.

5.2 Suggestions

In sum, schools in Cross-Strait are focused on traditional teaching and centered on learners. This means teachers lecturing in the classroom and instruction provided in a single direction. Given the change in the learning environment, it is a worthwhile question to explore whether teachers can still engage with students and whether students can stay attentive to classroom lectures and achieve good learning results. This study posits that Interactive Teaching is an innovative teaching technique. It enables students to find pleasure in learning, enhances learning satisfaction and encourages active learning. This allows teachers to do what they are best at, to help students find the drive for growth and learning. Teachers can engage students in dialogues by asking questions, and students can internalize the acquired knowledge into their thinking. These two processes work together to improve learning effectiveness and performance. This teaching method can serve as a reference for education authorities in Cross-Strait in the formation of education policies. It can also provide food for thought to teachers in driving teaching innovations.

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