

Teaching Approach and Self-Confidence Effect Model Consistency between Taiwan and Singapore Multi-Group HLM

Pei Wen Liao and Tsung Hau Jen

Abstract—This study was conducted to explore the effects of two countries model comparison program in Taiwan and Singapore in TIMSS database. The researchers used Multi-Group Hierarchical Linear Modeling techniques to compare the effects of two different country models and we tested our hypotheses on 4,046 Taiwan students and 4,599 Singapore students in 2007 at two levels: the class level and student (individual) level. Teaching approach is a class level variable. Student level variables are achievement and self-confidence. The results challenge the widely held view that retention has a positive impact on self-confidence. Suggestions for future research are discussed.

Keywords—Teaching approach, self-confidence, achievement, multi-group HLM.

I. INTRODUCTION

In this study, we use a multi-group-level modeling technique to examine the relationship between teaching approach and self-confidence among Taiwan and Singapore. The hypotheses were tested with hierarchical linear modeling (HLM), a model building technique which allows for the analysis of multi-level data. HLM recognizes that individuals nested within groups may be more similar to each other than individuals from different groups [1].

According to the big-fish-little-pond effect (BFLPE) hypothesizes that it is better for academic self-confidence to be a big fish in a little pond (gifted student in regular reference group) than to be a small fish in a big pond (gifted student in gifted reference group). BFLPE means that students in classes where the average achievement is low will have a higher academic self-confidence than equally achieving students in classes where the average achievement is high might prefer to attend a low-ability school instead of a high-ability school [2].

We control the student's self-confidence rule from achievement of individual and classes. Do teaching approach affect student outcome? This is worth discussing. In addition to our theory is based on the 2007 TIMSS database questionnaire information. From the review of the literature, the following major purposes emerge for the current study: First, the teaching approach such as teacher teaching, experimental teaching, and

practice exercises affect individual students' changes in self-confidence. Second, we want to compare with these hypotheses based on differences in which of two countries models from Taiwan and Singapore.

II. BACKGROUND

Studies indicated that teachers need to include the affective objectives into their teaching practices to motivate students' participation in learning activities [3]. Students in the classroom receive classroom learning or teaching approach are the same. Strategic arrangements for teachers to design classroom activities, classroom time will be curriculum designed and delivered in a timely manner or to teach students in an interactive mode, thus achieving student learning. The classroom learning in this research calls the teaching approach, that aims at developing competences are based on collaboration and competition in order to establish hierarchies among students. Teachers as facilitator learning coach as well as a partner who helps the student to understand and explain [4].

Further, the class of learning should be a way of learning to individuals coming together to share learning that mean aggregated learning, classroom learning is shaped by individual learning styles. Science classroom activities are nested in the class, different class has a different learning environment, and the same class students perceived the learning should be consistent. Therefore, the individual's learning style is not necessarily perceived the same as the model constructed by the class. This phase of model construction as well as to individual (level 1) and class (level 2) distinction model must be constructed with multilevel methodology.

III. MATH

The data for the International Study Center analyses came from the Third International Mathematics and Science Study (TIMSS), a continuing annual cross-national research program. Following final approval by the TIMSS, the questionnaires are administered in all participating nations. Each national sample is two-stage stratified cluster sampling.

A. Participants

The affection demographic and teaching approach characteristics of the two samples are shown in Table I. In this table, class-level characteristics reflect the two countries of 153 and 325 classes represented in each student sample, and student-level characteristics demonstrate the results of the

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individual student matches. The results of the matching process presented in Table I show that the two countries were well matched in terms of the characteristics of the class they attended.

B. Measurement

An instrument measuring teaching approach consisted of teacher teaching, experimental teaching and practice exercises are total thirteen items. The items were a 4-point Likert scale (1 = indication never, 4 = very or almost every lesson). Teacher teaching include we read science textbooks and other resource materials, memorize science facts and principles, use scientific formulas and lows to solve problems, explanations about what we are studying. Experimental teaching include we observations and describe what student' see, watch the teacher demonstrate an experiment or investigation, design or plan an experiment or investigation, conduct an experiment or investigation, groups on an experiment or investigation. And practice exercises include we review homework, work problems on our own, and begin homework in class, quiz or test. Self-confidence are total eight items with a 4-point Likert scale (1 = indicating disagree a lot and 4 = agree a lot were felled). Self-confidence includes: usually do will in science, science is more difficult (negative), science is not one of student's strengths (negative), learn things quickly in science. Table II includes inter-correlations for the two countries.

TABLE I
DESCRIPTION OF THE TWO SAMPLES

Class-Level Characteristics	Taiwan(N=153)		Singapore(N=325)	
	Mean	S.D.	Mean	S.D.
Teacher teaching	2.568	0.278	2.999	0.280
Experimental teaching	2.339	0.254	2.612	0.251
Practice exercises	2.333	0.236	2.556	0.208
Achievement(class mean)	559.259	44.396	558.285	94.272
Student-Level Characteristics	Taiwan(N=4046)		Singapore(N=4599)	
	Mean	S.D.	Mean	S.D.
Self-confidence	2.348	0.731	2.680	0.670
Achievement	563.053	89.283	561.471	102.853

Following next step, we carried out a confirmatory factor analysis using LISREL8.80. These indices included the 2 index, the goodness-of-fit index (GFI), the non-normed fit index (NNFI), the comparative fit index (CFI), the goodness of fit index (GFI), the root mean square error of approximation (RMSEA). Chi-square statistic is the most fundamental absolute fit index to measure how well the specified model reproduces the observed data. The multiple indexes like NNFI, GFI and CFI values above 0.90 are usually associated with a model that fits well, and RMSEA considers the error approximation in the population and is a measure of discrepancy per degree of freedom.

The results showed that the model fit the grade comparison well. We show the teaching approach indices following are Chi-square=2433.51, df=62, RMSEA=0.067, NNFI=0.969, GFI=0.959, CFI=0.976. The self-confidence indices following are Chi-square=539.4, df=2, RMSEA=0.025, NNFI=0.925,

GFI=0.923, CFI=0.934. The λ, SE, CR and AVE show in Table III.

TABLE II
CORRELATION MATRIX

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Class Level Achievement in class(1)		0.596***	0.131*	0.019		
Teacher teaching(2)	0.697***	(0.822 /0.801)	0.423***	0.502***		
Experimental teaching(3)	0.159	0.354***	(0.857 /0.843)	0.434***		
Practice exercises(4)	0.563***	0.723***	.360***	(.673 /0.675)		
Students Level Achievement(5)					0.256***	
Self-confidence(6)					0.368***	(0.813 /0.815)

Gray background is the Singapore data.
() shows the reliability analysis

TABLE III
RESULT OF TEACHING APPROACH AND SELF-CONFIDENCE CONFIRMATORY FACTOR ANALYSIS

Variables	λ	SE	CR	AVE
Teaching approach				
Teacher teaching				
Read our science text book	0.64	0.59		
Memorize science facts	0.80	0.36	0.830	0.551
Scientific formula	0.81	0.35		
Give explanations	0.71	0.50		
Experimental teaching				
We make observations	0.68	0.54		
Teacher demonstrate	0.73	0.47		
Plan experiment or invest	0.73	0.46	0.856	0.544
Conduct exp or invest	0.82	0.32		
Work in group exp or inv	0.72	0.49		
Practice exercises teaching				
We review our homework	0.67	0.56		
Work problems on our own	0.64	0.59	0.676	0.346
Begin our homework	0.51	0.74		
We have a quiz or test	0.52	0.73		
Self-confidence				
Usually do well in SCI	0.82	0.33		
SCI is more difficult for me(-)	0.62	0.62	0.824	0.543
Science is not my strengths(-)	0.70	0.50		
Learn things quickly in SCI	0.79	0.38		

IV. RESULTS

Statistical analyses suitable for addressing an objective of the study and the collected data were implemented. A description of these analyses is presented separately for objective.

Objective: To assess the hierarchical model effect on what factors well affect Taiwan and Singapore students of affection are progressing toward attaining model consistency proficiency.

We have the data collection in Taiwan and Singapore afterward we merger and conduct two group HLM total 8645 students and 478 classes each of these countries was dummy coded (Taiwan coding 1, Singapore coding 0). In our models,

since we do have included two countries. Through the EM imputation method fill back missing data and deal with interaction with SPSS the interaction is to deal with the differences nationality, finally weighted using HOUWGT and the use five Plausible values (PV). The final model used in this analysis is described by the set of the following equations. Model building in HLM begins by creating a null or unconditioned model which contains only the dependent variable (i.e. no predictors). In outcome is self-confidence model, the chi-square statistic for both Taiwan ($\chi^2(152) = 430.093, p < .001$) and Singapore ($\chi^2(325) = 769.448, p < .001$) was significant. This indicates that despite standardization, the affection of self-confidence between countries contained sufficient variation to warrant the use of HLM. The set of equations reflecting the final model for the analysis of reading results is given below.

Level-1 Model

$$Y = \beta_0 + \beta_1(\text{achievement}) + \beta_2(\text{nationality} * \text{achievement}) + e_{ij}$$

Level-2 Model

$$B0 = \gamma_{00} + \gamma_{01}(\text{class-achievement}) + \gamma_{02}(\text{nationality} * \text{class-achievement}) + \gamma_{03}(\text{teacher teaching}) + \gamma_{04}(\text{experimental teaching}) + \gamma_{05}(\text{practice exercises}) + \gamma_{06}(\text{nationality} * \text{teacher teaching}) + \gamma_{07}(\text{nationality} * \text{experimental teaching}) + \gamma_{08}(\text{nationality} * \text{practice exercises}) + u_{0j}$$

$$B1 = \gamma_{10}$$

$$B2 = \gamma_{20}$$

This section presents the results of the analyses separately for study objectives. Below, the results of the analyses are presented separately for outcome is self-confidence. Fig. 1 reports this information for each subsample from HLM that predict distributive self-confidence. The BFLP means that the abilities of students are connected with the ability of their peers in school. Self-confidence depends not only on one's academic accomplishments but also the accomplishments of those in the school that a student attends.

However, equally achieving students will have a higher academic self-confidence in classes (or schools) where the average achievement is low and a lower academic self-confidence in classes where the average achievement is high. Thus, there is a negative influence of average class achievement when the effect of individual achievement is partial led out [5]. The result show in Fig. 1, when we control individual achievement, class achievement and teaching approach, the direct effect of experimental teaching ($\gamma_{04} = .097$), practice exercises ($\gamma_{05} = .118$), improved in self-confidence. Further two countries in this model how to differences, from orange figures show there isn't significant difference between Taiwan and Singapore.

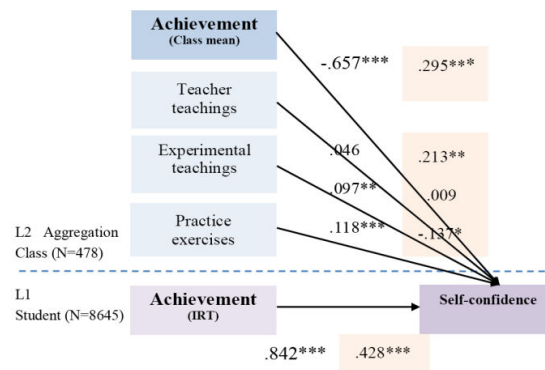


Fig. 1 Research model

V. CONCLUSION

We control the achievement (class and individual) to test the teaching approach are positively relates to self-confidence. In two countries to integrate show the information practice exercises and experimental teachings were strong effect size positively effect to self-confidence.

This research found the same effect with Taiwan and Singapore, that experimental teaching and practice exercises has positive impact on the student's self-confidence.

We found interesting results, the relationship between teacher teaching and self-confidence has strong effect in Taiwan. It is perhaps also worth mentioning that, the relationship between practice exercises and self-confidence has negative strong effect in Taiwan.

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REFERENCES

- [1] L. T. Stickney, and A. M. Konrad, "Gender-role attitudes and earnings: A multinational study of married women and men," *Sex Roles*, vol. 57, pp. 8001-811, 2007.
- [2] T. Jochem, V. Maykel, and H. Petra. "A Further Examination of the Big-Fish-Little-Pond Effect: Perceived Position in Class, Class Size, and Gender Comparisons: a Magazine of Theory and Practice," *Sociology of Education*, vol. 83, no.4, pp. 333-345.
- [3] L. A. Brien, A. Legault, and N. Tremblay. "Affective learning in end-of-life care education: The experience of nurse educators and students," *International Journal of Palliative Nursing*, vol. 14, pp. 610-614, 2008.
- [4] F. M. Singer and H. Moscovici. "Teaching and learning cycles in a constructivist approach to instruction," *Teaching and Teacher Education*, vol. 24, no. 6, 1613-1634, 2008.
- [5] H. W. Marsh, M. Seaton, U. Trautwein, O. Lüdtke, K. T. Hau, A. J. O'Mara, and R. G. Craven, "The Big-Fish Little-Pond-Effect Stands up to Critical Scrutiny: Implications for Theory, Methodology, and Future Research," *Educational Psychology Review*, vol. 20, pp. 319-350, 2008.