Heterogeneity Analysis of Mathematics Learning Achievement, School Life, and Language Ability of Southeastern Asian Female Immigrants' Children

Yi-Horng Lai*

Abstract

Numbers of female immigrants from Southeast Asia came to Taiwan these years, and it mean more and more Southeastern Asian female immigrants' children was born in Taiwan. Immigrants' children were disadvantaged due to language and social interactional conflicts in school. This study focus on 451 new immigrants' children in elementary school. The data would be analysis with growth mixture modeling with three years data. The mathematics learning achievement of Southeastern Asian female immigrants' children could be divided into three groups: high-level mathematics learning achievement group (178 students), middle-level mathematics learning achievement group (16 students), and low-level mathematics learning achievement group (257students). For the high-level one, their teacher-student relationship and language learning achievement were decrease in these three years. For the low-level one, their teacher-student relationship, peer

^{*} Assistant Professor, Department of Healthcare Administration, OIT





relationship, the quality of their teacher-student relationship and peer relationship were decrease, but the quality of language learning achievement was increase in these three years. After all, elementary school teachers should help Southeastern Asian female immigrants' children improve teacher-student relationship. The high-level mathematics learning achievement students need the help of improve the language ability. Middle-level and low-level mathematics learning achievement students need the help of improve the help of improve peer relationship.

Keywords: immigrants' children, mathematics learning achievement, school life



東南亞裔新移民母親之子女數學學習成果、學校

生活與語文能力之群體異質性分析

賴宜弘*

摘要

近年來,台灣與東南亞外籍女性通婚的人數越來越多。相關研究指出新移民 的子女在學習上較在地居民居於劣勢。本研究針對 451 位東南亞裔新移民母親子 女,以潛在混合成長分析對三年的資料進行比較,探討學校生活(師生關係與同 儕關係)與語文學習成果對其數學學習成果的影響。由本研究之結果可知,東南 亞裔新移民母親之子女語文學習成果可以分為三群,分別為高數學學習成就群 (178 人)、中等數學學習成就群(16 人)與低數學學習成就群(257 人)。高數學 學習成就群的學生,師生關係與語文學習成果呈遞減的情形;中等數學學習成就 群的學生,同儕關係呈正向遞增的情形;低數學學習成就群的學生,師生關係與 同儕關係呈遞減的情形,而語文學習成果則呈遞增的情形。對於東南亞裔新移民 母親之子女,不論其數學學習成果如何,國小老師應注重協助東南亞裔新移民母 親之子女改善師生關係,促進高學習成就群學生的語文能力,對中等學習成就群 與低學習成就的學生,還應設法改善其同儕關係。

關鍵字:新移民子女、數學學習成就、學校生活



^{*}亞東技術學院醫務管理系助理教授

I. INTRODUCTION

More and more female immigrants from Southeast Asia came to Taiwan for the recent years, and it mean more and more Southeastern Asian female immigrants' children was born in Taiwan. Immigrants' children are disadvantaged due to language, cultural and social interactional conflicts between home and school (Akar,

2010). Usually, students whose native language is different from the language used for the instruction belong to the minority or immigrant groups that are economically disadvantaged compared to the other students (Mohammadpour, 2013). Immigrant parents who speak a foreign language often have less cultural capital to share with their children, weaker relationships with their children's teachers and less understanding of school norms. Immigrants' children often have weaker understanding of teachers' and classmates' expectations, which can limit their learning opportunities and yield less learning, compared to native children (Chiu & Chow, 2010).

Many studies pointed out that the learning achievement of new immigrants' children were not as well as residents' children, especial in language learning (Mohammadpour, 2013; Akar, 2010; Chiu & Chow, 2010; Ho, 2006; Ministry of Education, 2005). How to help immigrants' Children improve the ability of language was an important topic for government.

Traditional data analysis only focused on the data in one time, and it is difficult to find the effect of factor change (or growth). Methods of growth mixture modeling had emerged as a useful tool for the study of longitudinal change, and it was applied in many research areas (Stulla, Wiklundb, Galec, Capkun-Nigglid, Houghtona, & Jones, 2011). The purpose of this study was to investigate Southeastern Asian female immigrants' children's mathematics learning achievement, teacher-student relationship, peer relationship, and language learning achievement with latent growth mixture modeling for the effect of the change of school life in three years.



A. The Teacher-student Relationship

The teacher-student relationship is the interaction of teachers and students. The interaction of students and teachers is one of the important processes of children's learning. The interaction of students and teachers is not only for learning, but also for the transpose of the values of life and learning attitude. Teachers should maintain aneffective learning and efficient learning environment, and a good teacher-student relationship (Yang, Tsai, & Ho, 2013). Elementary schools, teachers, students, and parents or guardians can improve teacher-student relationships and communications with information system for improve students' learning achievement (Chen, & Cheng, 2013). A close and intimate teacher-studentrelationship is helpful in school learning (Lai & Xue, 2012).

In Chiang's study (2005), most tutors think new immigrants' children are great, and are good in teacher-student relationship. Chen (2004) adopted purposive sampling to select 331 southeastern Asian female immigrants' children from third-grade to six-grade in the academic year of 92, and find Asian female immigrants' children are well in teacher-student relationship. Nurturing quality relationships between and among both teachers and peers may hold promise for enhancing learning (Shen, McCaughtry, Martin, Fahlmann, & Garn, 2012). Teachers' attitude is helpful in the success of the students' performance (Othman & Leng, 2011).

In Chin and Yu's study (2008), the children of Southeast Asian immigrant mothers gained significantly lower scores for academic performance and teacher-student relationship than did the adolescents of native Taiwanese mothers. After interview four southeastern Asian female immigrants' children, Chen (2005) point out that immigrants' children are weak in teacher-student interaction.

B. The Peer Relationship

The socialization of children is not only dependent on the assist of parents, but only also peer group. Children can learn social skills, establishment of self-concept,



and get a sense of security and comfort with the interaction of friends or classmates. In a school, students all come from different family, and their socioeconomic background, habits, and concept are different. In the process of intricate interaction, secondary peer group be formed gradually. If the children adjustment well in the environment, it is helpful in socialization for children. If the children adjustment not well and conflict in the environment, it would become the obstacles on the children's school life.

Nurturing quality relationships between and among both teachers and peers may hold promise for enhancing learning (Shen, McCaughtry, Martin, Fahlmann, & Garn, 2012). Peers' understanding is helpful in the success of the students' performance (Othman & Leng, 2011). Although the computer-assisted learning environment could help students to learn more quickly and conveniently, it is better forstudents to learn with peer relationship (Huang & Liu, 2012).

II. MATERIALS AND METHOD

This study focused on the mathematics learning achievement, the school life and language learning achievement of Southeastern Asian female immigrants' children. The research framework was as Figure 1. The school life included teacher-student relationship, peer relationship, and environmental perception.



Figure 1 Conceptual Framework of This Study



A. Research Data

The research data was obtained from Wu's study (2010) in the Survey Research Data Archive (SRDA) that provided by the Academia Sinica in Taiwan. Wu's study was finished in July 31, 2007, and built the database of "The transected and longitudinal study of the southeast Asian immigrant women's parent-teacher interaction, children's self-efficacy, and school life in Taiwan". The research data in this study was part of this database.

The Wu's research data (2010) was got from three highest degree of urbanization regions that high ration of the number of new immigrant women marriage accounted for the proportion of total marriages in 2003 in Taiwan: New Taipei City, Taoyuan County, and Taichung City, and the three lowest degree of urbanization regions that high ration of the number of new immigrant women marriage accounted for the proportion of total marriages in 2003 in Taiwan: Yunlin County, Pingtung County, and Penghu County. 150 southeastern Asian female immigrants that children study in primary school were sampled in these six regions. The number of residents was the same as the number new immigrants in each region. The data was got one time one year in three years from 2005 to 2007.

There were 1554 records that include 777 new immigrants' records and 777 residents' records in Wu's study (2010). This study focus on 451 Southeastern Asian female immigrants' children data that without missing value in 3-year language learning achievement. The missing value in these 451 records would be estimate by expectation-maximization (EM) with IBM SPSS 20.

The language learning achievement (LLA) in Wu's study (2010) and this study was calculated with Equation 1. It was converted into the relative position of each subject's rank in the class. It could avoid the effect of class sizes on the rank. The mathematics learning achievement and language learning achievement was calculated with Equation 1.

$$LLA = 1 - \frac{\text{Rank}}{\text{Class Size}}$$
 (Equation 1)



B. Research Tools

The school life included teacher-student relationship and pear relationship (Wu, 2010). The questionnaire of school life was being built in Huang's study (2005).

Items for the teacher-student relationship (TR) were as Table 1. There were 4 items for teacher-student relationship. The questionnaire was answered with 5 Likert scale for measuring the relationship of the interaction of teachers and students in campus. Teacher-student relationship was the attitude of interaction of teachers and students. The more scores mean the more positive attitude of teacher-student relationship.

	Table 1 Items for The Teacher-student Relationship (TR)
Item	Questionnaire
TR01	I often get the teacher's praise.
TR02	I will take the initiative to help the teachers.
TR03	I like to talk with teachers.
TR04	When teacher quiz me, I would answer seriously.

Items for the pear relationship (PR) were as Table 2. There were 8 items for pear relationship. The questionnaire was answered with 5 Likert scale for measuring the relationship of the interaction of classmates and classmates in campus. Pear relationship was the attitude of interaction of students and students. The more scores mean the more positive attitude of peer relationship.

Table 2 Items for the Pear Relationship (PR)

Item	Questionnaire
PR01	I am willing to share everything with classmates.
PR02	When I'm in trouble, my classmates would help me.
PR03	I would play with classmates.
PR04	It is funny that play with classmates.
PR05	It makes me happy that live together with classmates.
PR06	The classmates would like let me join in play game.
PR07	I would like to work together with classmates.
PR08	Classmates would like to work together with me.



The scale reliability of the questionnaire, mean, and standard deviation in this study was as Table 3. The Cronbach's α of TR, PR, and EP all above .60, and they were good in internal consistency (Cortina, 1993).

Table 3 Scale Reliability of the Questionnaire in this Study

Scale	Ν	Cronbach's α	Mean	S.D.
The teacher-student relationship (TR)	4	.68	2.47	.81
The pear relationship (PR)	8	.84	3.04	.77

C. Methodology of Data Analysis

The data analysis methodology in this study was combining the latent variable and time-oriented factors. The research data was tested the trend of average change in longitudinal study with growth curve model and average structure analysis. This study would focus on one variable that changed and growth with time (Duncan & Duncan, 1995; Willet, 1988). How the effect of research variables on the starting average and the direction of the trajectory of the target variable would be tested with the covariance analysis of growth curve model that include.

First, the relationship of initial state and the growth (or change) with time of language learning achievement would be tested with the intercept and slope of growth curve model of language learning achievement. Second, the effect of the teacher-student relationship, the pear relationship, and the environmental perception on language learning achievement would be tested with the growth curve model of language learning achievement.

The latent growth model in this study was as Figure 2. The data of language learning achievement were got in 3 years (one year one time) for building the latent variable of intercept and slope (IML and SML) of 3 time points of language learning achievement (MLA1, MLA2, and MLA3), and the trace of language learning achievement in 3 years can be shown with the IML and SML in Figure 2. The change rate and direction of mathematics learning achievement can be tested with IML and SML.



For testing the effect of the teacher-student relationship (TR), the pear relationship (PR), and language learning achievement (LL) on mathematics learning achievement in different time, they all be build the latent variable of initial state (ITR, IPR, and ILL) and the change (STR, SPR, and SLL) based on 3-year data (TR1, TR2, TR3, PR1, PR2, PR3, LL1, LL2, and LL3).

The data would be analysis with Mplus 6.1. The fit situation of theoretical model and research would be shown with goodness of fit statistics, and the result would be shown with completely standardized solution.







III. RESULTS

The data analysis methodology in this study was growth mixture modeling that combining the latent variable and time-oriented factors.

A. The Sample Summarize

The summarization of the research data in this study was as Table 4. There were 451 elementary school students in this study, and it included 171 male elementary school students (37.92%) and 185 female elementary school students (41.02%). About the nationality of the mother, 107 of them were Vietnam (23.73%), 234 of them were Indonesia (51.88%), 26 of them were Thailand (5.76%), 10 of them were Malaysia (2.22%), 29 of them were Philippines (6.43%), 42 of them were Myanmar (9.31), and the others were missing value in the nationality of the mother.

Table 4 Data Summarize					
Variable	Frequency	Percent (%)			
Gender	Male	171	37.92		
	Female	185	41.02		
	Missing	95	21.06		
The nationality of the mother	Vietnam	107	23.73		
	Indonesia	234	51.88		
	Thailand	26	5.76		
	Malaysia	10	2.22		
	Philippines	29	6.43		
	Myanmar	42	9.31		
	Missing	3	.67		
City	New Taipei City	57	12.64		
	Taoyuan County	65	14.41		
	Taichung City	68	15.08		
	Yunlin County	106	23.50		
	Pingtung County	55	12.20		
	Penghu County	100	22.17		
Total		451	100.00		

B. Measurement Model



Table 5 presents factor loading and other metrics for the item measures as well as reliability and validity measures. Hair, Anderson, Tatham, and Black (1998) suggest that in a sample of 150 respondents. The result of relationship of the early (intercept) and the change (slope) was as table 6. The relationship of the beginning language learning achievement and the change of language learning achievement in these three years were not signifies.

	0		
Item	F.L.	S.E.	t-value
IML⇔SML	<.01	<.01	1.07
ITR→IML	08	.04	-1.84
IPR→IML	13*	.05	-2.52
ILL→IML	.65*	.07	9.06
ITR→SML	.02	.05	.48
IPR→SML	.08	.08	.92
ILL→SML	.05	.08	.62
STR→SML	.10	.23	.43
SPR→SML	01	.05	14
SLL→SML	.80*	.18	4.58
ITR⇔STR	02	.02	-1.48
IPR⇔SPR	.01	.01	.52
ILL⇔SLL	<.01	<.01	1.10

Table 5 The Assessing of Measurement Model

*: p-value<.05

The result of the effect of school life on language learning achievement was as Table 7. It could be found that the early peer relationship (IPR) and language learning achievement (ILL) effect on the early the mathematics learning achievement (IML). The growth of language learning achievement (SLL) influence on the growth of mathematics learning achievement (SML).

C. Grouping

The entropy of three, four, and five were as Table 6, and the entropy of three groups were largest than other two. Entropy level of .80 or higher is sufficiently good



class separation. The data summarize of these three groups in three years was as Table 7.

Table 6 The Ent	Table 6 The Entropy of Groups		
N of groups	Entropy		
3	.86		
4	.80		
5	.83		

Table / Data Summarize of Three Groups in Three Years					
		Mean (S.E.)			
Group	N	Year 1	Year 2	Year 3	
1	178	.70 (.21)	.74 (.17)	.65 (.24)	
2	16	.31 (.31)	.40 (.27)	.31 (.26)	
3	257	.42 (.24)	.24 (.18)	.36 (.26)	



Figure 3 The Mathematics Learning Achievement Curve of Three Groups in Three Years

With the figure of the language learning achievement curve of three groups in three years was as Figure 3, it could find that the language learning achievement of Group 1 was higher than other group. Group 2 was last one. So Group 1 was



high-level language learning achievement group, Group 2 was middle-level language learning achievement group, and Group 3 was low-level language learning achievement group. The estimate of the factors of language learning achievement of Group 1, Group 2, and Group3 were as Table 8, Table 9, and Table 10.

(A) Group 1: High-level Mathematics Learning Achievement Group

The estimate of the factors of mathematics learning achievement of Group 1 was as Table 8. The mathematics learning achievement of this group was best in these three groups. The initial value of teacher-student relationship (ITR), peer relationship (IPR), and language learning achievement (ILL) were 2.68, 3.27, and .69. The change (or growth) of teacher-student relationship (STR) and language learning achievement (SLL) were negative, and the quality of teacher-student relationship and the feeling of environmental perception were decrease in this group

Table 8 The Estimate of Group 1				
	Estimate	S.E.	t-value	
ITR	2.68*	.05	49.91	
STR	16*	.03	-5.55	
IPR	3.27*	.04	77.12	
SPR	01	.03	48	
ILL	.69*	.02	34.81	
SLL	04*	.01	-4.49	

Table 8 The Estimate of Group 1

*: p-value<.05

(B) Group 2: Middle-level Mathematics Learning Achievement Group

The estimate of the factors of mathematics learning achievement of Group 2 was as Table 9. The mathematics learning achievement of this group was between Group 1 and Group 3. The initial value of teacher-student relationship (ITR), peer relationship (IPR), and language learning achievement (ILL) were 1.66, 1.66, and .31. The change of peer relationship (SPR) was positive, and it mean the quality of peer relationship was increase in this group.



Table 9 The Estimate of Group 2					
	Estimate S.E. t-valu				
ITR	1.66*	.13	12.39		
STR	.05	.09	.49		
IPR	1.66*	.12	13.95		
SPR	.64*	.10	6.60		
ILL	.31*	.06	5.06		
SLL	.01	.03	.41		
*: p-value<.05					

(C) Group 3: Low-level Mathematics Learning Achievement Group

The estimate of the factors of mathematics learning achievement of Group 3 was as Table 10. The mathematics learning achievement of this group was weak in these three groups. The initial value of teacher-student relationship (ITR), peer relationship (IPR), and language learning achievement (ILL) were 2.33, 2.94, and .33. The change (or growth) of teacher-student relationship (STR) and peer relationship (SPR) were negative, but the change (or growth) of language learning achievement (SLL) were positive. So the quality of peer relationship and peer relationship were decrease, but the language learning achievement were increase in this group.

Table 10 The Estimate of Group 3					
	Estimate S.E. t-val				
ITR	2.33*	.04	58.79		
STR	21*	.02	-8.61		
IPR	2.94*	.03	92.47		
SPR	08*	.02	-4.04		
ILL	.33*	.01	18.83		
SLL	.02*	.01	3.07		

*: p-value<.05

IV. DISCUSSION AND CONCLUSION

The mathematics learning achievement of Southeastern Asian female immigrants' children could be divided into three groups: high-level mathematics learning achievement



group, middle-level mathematics learning achievement group, and low-level mathematics learning achievement group.

For the high-level mathematics learning achievement students, their teacher-student relationship and language learning achievement were decrease in these three years. For the middle-level mathematics learning achievement students, the quality of peer relationship was increase in these three years. For the low-level mathematics learning achievement students, the quality of their teacher-student relationship and peer relationship were decrease, but the quality of language learning achievement was increase in these three years.

After all, it could be find that no matter how the Southeastern Asian female immigrants' children's mathematics learning achievement were, they were poor in improve teacher-student relationship with learning. Elementary school teachers should help Southeastern Asian female immigrants' children improve teacher-student relationship. The high-level mathematics learning achievement students need the help of improve the language ability. Middle-level and low-level mathematics learning achievement students need the help of improve peer relationship.

ACKNOWLEDGEMENTS

This study is based in part on data from the Survey Research Data Archive (SRDA) provided by the Academia Sinica. The interpretation and conclusions contained herein do not represent those of Survey Research Data Archive (SRDA) or Academia Sinica.



REFERENCES

- Akar, H. (2010). Challenges for schools in communities with internal migration flows: evidence from Turkey. International Journal of Educational Development, 30(3), 263-276.
- Chiang, C.C. (2005). New immigrant women parents to participate in their children to school life adaptation: Shuguang Elementary School in Pingtung County. Master's Thesis, Graduate Institute of Educational Administration, National Pingtung University of Education, Taiwan.
- Chin, J.M.C. & Yu, S.C. (2008). School Adjustment Among Children of Immigrant Mothers in Taiwan. Social Behavior and Personality: an international journal, 36(8), 1141-1152.
- Chiu, M.M. & Chow, B.W.Y. (2010). Culture, motivation, and reading achievement: High school students in 41 countries. Learning and Individual Differences, 20(6), 579-592.
- Chen, C.L. (2005). A Case Study of The SCHOOL adjustment of 4 Migrant Brides' Children. Master's Thesis, Department of counseling and psychology, Hua-Shih College of Education, Taiwan.
- Chen, P.J. (2004). A Study of the Relationship between Family Environment and School Life Adjustment for Foreign Brides" Children--Study of Southeast Asia Brides in Taiwan. Master's Thesis, Department of infant and child care, National Taipei University of Nursing and Health Sciences, Taiwan.
- Chen, Y.S. & Cheng, C.H. (2013). Assessing mathematics learning achievement using hybrid rough set classifiers and multiple regression analysis. Applied Soft Computing, 13(2), 1183-1192.
- Cortina, J.M. (1993). What is coefficient alpha? An examination of theory and applications. Journal of Applied Psychology, 78, 98-104.
- Ho, M.Y. (2006). The Research on Academic Achievement of Foreign Spouses' Children--the Analysis of Cultural Capital Perspectives. Doctoral Dissertation, Department of Education, National Kaohsiung Normal University, Taiwan.
- Huang, C.F. & Liu, C.J. (2012). Exploring the Influences of Elementary School Students' Learning Motivation on Web-Based Collaborative Learning. US-China Education Review, 6, 613-618.
- Huang, Y.F. (2005). Parent-teacher interactions for the south Asian female immigrants and the effects on their children's school life. Master's Thesis, Department of psychology and counseling, National Taipei University of Education, Taiwan.



- Lai, E. & Xue, Y. (2012). On the Influence of Online Education on Teacher-Student Relationship. Soft Computing in Information Communication Technology, 2, 49-55.
- Ministry of Education (2005). The Survey of foreign spouses' children in elementary school. The Statistics of Education. Retrieved January 31, 2013 from https://stats.moe.gov.tw/files/analysis/brief.pdf.
- Mohammadpour, E. (2013). A three-level multilevel analysis of Singaporean eighth-graders science achievement. Learning and Individual Differences, In Press, Corrected Proof.
- Othman, N. & Leng, K.B. (2011). The Relationship between Self-Concept, Intrinsic Motivation, Self-Determination and Academic Achievement among Chinese Primary School Students. International Journal of Psychological Studies, 3(1), 90-98.
- Shen, B., McCaughtry, N., Martin, J. J., Fahlmann, M. & Garn, A. (2012). Urban high-school girls sense of relatedness and their engagement in physical education. Journal of Teaching in Physical Education, 31(3), 231-245.
- Stulla, D.E., Wiklundb, I., Galec, R., Capkun-Nigglid, G., Houghtona, K., & Jones, P. (2011). Application of latent growth and growth mixture modeling to identify and characterize differential responders to treatment for COPD. Contemporary Clinical Trials, 32(6), 818-828.
- Wu, Y.Y. (2010). Parental Involvement of Southeastern Asian Female Immigrants and Its Relationship to Their Children's School Life Adjustments (NSC95-2420-H-152-001-KES). Survey Research Data Archive (SRDA). Retrieved January 10, 2013 from https://srda.sinica.edu.tw/search/fsciitem/1126.
- Wu, Y.Y., Tsai, C.C, & Siao, R.F. (2010). Parental Involvement of Southeastern Asian Female Immigrants and Its Relationship to Their Children's School Life Adjustments. Journal of Research in Education Sciences, 55(4), p.157-186.
- Wu, Y.Y., Tsai, C.C, & Siao, R.F. (2011). Southeast Asian Immigrant Mothers' Involvement in their Children's Learning. Educational Review, 37, p.1-35.
- Yang, C.K., Tsai, P.Y., & Ho, T.F. (2013). A Study of Course Assessment on C++ Programming. Advances in Intelligent Systems and Applications, 1, 383-392.

