The Effects of Cram Schooling on the Ethnic Learning Achievement Gap: Evidence from Elementary School Students in Taiwan

Yu-Chia Liu
Department of Hospitality & Tourism, Taiwan Hospitality & Tourism College, Taiwan R.O.C. and Department of Curriculum Design and Human Potential Development, National Dong Hwa University, Taiwan R.O.C.

Chunn-Ying Lin*, Hui-Hua Chen
Department of Early Childhood Education, National Dong Hwa University, Taiwan R.O.C.

He Huang
Department of Clinical Psychology, Chang Gung University, Taiwan R.O.C.

Abstract. For the last three decades, many studies have found an obvious achievement gap between non-minority students and minority students, which was mainly associated with a lower socioeconomic status and a deficiency of family learning resources, such as learning after school, of minority students. In many countries, cram schooling is the most commonly extra learning activity which is believed to have positive effects on learning achievement. However, there are few empirical studies to explore the relationships between cram schooling and the learning achievement gap of different ethnic students. This study used 630 fifth-grade students in Taiwan as samples and carried out a hierarchical regression analysis to discover the effects of cram schooling on the ethnic learning achievement gap of Taiwan's young children. The results showed that cram schooling participation has non-linear effects, first ascending and then descending, on students' learning achievement. In addition, those students who participated in privately tutored classes with higher fees charged demonstrated better learning achievement, but students enrolling in after-school programs in cram schools might not show the same outcomes. Further analysis indicated that minority children had fewer and poorer cram schooling resources than non-minority children. In addition, most minority children have lower socioeconomic status, giving them less opportunity to participate in cram schooling activities and after-class programs in schools, so their learning achievement was significantly lower than non-minority children.

Keywords: cram schooling, ethnic learning achievement gap, elementary school students, hierarchical regression analysis

Introduction

Over the past few years, a number of researchers have concentrated on analyzing the academic achievement of students in different ethnic groups, and discovered that the learning gap between minority students and their counterparts of non-minorities remains constant (Brown-Jeffy 2009; Byun and Park 2012; Rowley and Wright 2011). Some of them suggest that the minorities' learning performance falls off because of the lack of extracurricular and learning activities after school. Among the researches focusing on the relationship between extracurricular activities and the ethnic learning achievement gap, the function of academic cram schooling has aroused sincere consideration. Cram school is believed to have a positive effect on academic achievement, and has become a very visible worldwide phenomenon (Bray 2013; Bray, Zhan, Lykins, Wang and Kwo 2014; Kim and Park 2010; Kuan 2011; Kenayathulla 2013; Zhan, Bray, Wang, Lykins and Kwo 2013).

Cram schools have also existed in East Asian countries for a long time (Bray et al. 2014; Fung 2003; Lee and Shouse 2011), particularly those countries influenced by Confucianism, such as Taiwan, mainland China, South Korea and Japan. Traditional education values may make cram schools more crediable as an fundamental and much needed social organization (Liu 2012). Moreover, cram schooling activities may be influenced by parental socioeconomic status, thus affecting plurality and deprived students to face greater learning achievement gaps when compared to those who attend cram schools (Kim and Park 2010; Lin, Hsieh and Chen 2015; Lee and Shouse 2011).

Aboriginal students are a minority group of the population in Taiwan. The learning weakness of aboriginal students has been proven and is under constant analysis (Kuan 2011; Liu 2012). In the past 20 years, the population composition in Taiwan had changed enormously. This is the result of Taiwanese males marrying females from mainland China and southeast Asia due to their low socioeconomic status or other reasons. Therefore, Taiwan has a considerable number of children of cross-national marriage in all levels of schools. These children are more likely to fall behind their classmates in learning performance, but still little research has considered such possibilities and the effects of cross-national marriages. As a result, the academic field has limited understanding of how the family composition of cross-ethnic or cross-national marriages may affect a child's learning outcome.

Based on the above considerations, this study used 630 fifth-grade Taiwanese students as samples, and carried out a hierarchical regression analysis. The researchers incorporated ethnic cross-national marriages, family background, and participation in academic cram schooling (time spent, expenditures, and patterns) as the mediating variables. These factors were then used to clarify the influential mechanisms of ethnic and cross-national marriages differences on students' academic achievement. Hopefully this investigation will fill in the gaps in current research on the education achievement of different ethnic groups so

that we can better understand both the theoretical and practical implications of ethnic achievement gaps.

Literature Review

Cram schooling is similar to shadow education (Bray et al. 2014; Kuan 2011; Lee and Shouse 2011). This is due to its coexistence with the mainstream schooling and how it mimics the regular school system, i.e. it duplicates the curriculum, the regulations, even the purposes of formal schooling. Cram schooling offers supplementary instruction aiming to assist students to catch up, keep up, or make headway of their peers. Furthermore, it is a fee-paying service for extra learning activities after school or during summer vacation, rather than the unpaid tutoring provided by family members or teachers in after-class programs. Additionally, cram schooling mainly focused on how to enhances students' performance in terms of academic subjects (Liu 2012; Zhan et al. 2013), rather than extra-curricular activities to foster their cultural capital, i.e., music, art, sports, and so on (Shih & Yi 2014). In this study, cram schooling includes languages (Chinese and English), mathematics, science, and other academic subjects that feature in mainstream school examinations. All of these subjects are important branches of learning in the senior high school and university entrance examinations. In this respect, cram schools consist of outside school instruction, provided by profit-oriented organizations (Liu 2012), aiming to help students master academic subjects of school curriculum and improve academic performance in school (Byun and Park 2012; Lin et al. 2015), earn admission to elite schools (Fung 2003) and benefit in their future occupations and the social status (Stevenson and Baker 1992).

Cram schools are also known as Buxiban in Taiwan, Juku in Japan, Hagwon in South Korea, and private tuition or a shadow education system in Western countries (Bray 2013; Byun and Parker 2012; Kim and Park 2010; Kuan 2011). Though cram schools have many different names, they share a common feature in that they serve as a remedial or enrichment strategy. In Taiwan, two major types of cram schools can be categorized: (a) the cram schools that help students do schoolwork and prepare for entrance exams; (b) the institutes that provide training in foreign languages (Liu 2012; Shih and Yi 2014). These two types of cram schools can be regarded as academic cram schools due to the primary focus on students' educational advancement, such as languages, writing, and mathematics, with the primary objectives of improving students' abilities for taking tests, helping them gain higher grades, and enter prestigious high schools and universities. Attending cram schooling can increase academic performance, thereby opening up more opportunities for higher education.

Some empirical studies reveal that cram schooling has a positively significant influence on students' academic achievement (Dang 2007; Kuan 2011; Liu 2012). Rhy and Kang (2013) illustrated that the true effect of private tutoring on academic performance remains, at most, modest. Specially, Chen and Hwang (2011) found a non-linear influence, first increasing and then decreasing, on the hours spent in cram schools. They explained that students' fatigue caused by long cramming hours may decrease the learning efficiency, and that the long

hours spent cramming may decrease the time expended on schoolwork. However, Zhang (2013) doubted the effectiveness of private tutoring. In his study, he found trivial association between private tutoring and students' academic performance. Therefore, the relationship between academic cram schooling and achievement still needs to be investigated thoroughly.

It needs clarification that cram schools in Taiwan are usually private and authorized by the local government. Their objectives are not only to assist students with their learning, but also to earn a profit. These cram schools are consequently fee-based. Moreover, students in Taiwan need to go to different types of cram schools for better scores on tests, leading to a vast household investment in cram schooling. The more famous cram schools produce better student performance, attract more parents and their children, and charge higher tuition fees, causing a heavy economic burden on less wealthy families (Lin et al. 2015). Accordingly, whether children can participate in private cram schools and how many subjects they can take closely relate to the socioeconomic status of the families.

For instance, several studies have found that the higher the parental education level, the more academic subjects their children take at cram schools (Bray et al. 2014; Jung and Lee 2010; Kenayathulla 2013). Moreover, children from high socioeconomic status families are more likely to take part in academic cram schooling activities. Their families are also more likely to spend money on private tutoring (Bray et al. 2014; Jung and Lee 2010; Kim and Park 2010; Kenayathulla 2013; Lin et al. 2015; Shih and Yi 2014; Stevenson and Baker 1992). It may be that if there were more cram schools, the opportunities for students from lower socioeconomic status to attend cram schools and take cram courses would be greater.

There are minority ethnic groups in Taiwan: aborigines and cross-national marriage families with the mothers from mainland China and several southeastern Asia countries. These cross-national marriage families are named "new inhabitants". The population of these minorities is less than ten percent and generally possesses lower socioeconomic status compared to their counterparts. In particular, most of the aborigines inhabit mountains or remote areas, engage in manual labor jobs, earn less income, possess less education, and therefore can provide their children with less educational resources. Similar to Western research results of learning racial/ ethnical gap (Brown-Jeffy 2009; Rowley and Wright 2011; Whitley, Rawana and Brownlee 2014), aboriginal students' learning discrepancies in Taiwan have been verified, including lower educational levels, lower learning achievement, and lower ratio of universities enrollment, etc. (Lin and Hwang 2009).

Accordingly, we assume that aboriginal parents-most from lower socioeconomic status families cannot afford extra academic cram schooling expenditures. Moreover, based on the consideration of profits, few, even none, private cram schools are located in aboriginal areas. Likewise, some Taiwanese males choose to marry females from developing Asian countries, such as Vietnam, Indonesia and so forth. The primary reason for such cross-national marriage families is that

these low socioeconomic status Taiwanese males might marry females with the same socioeconomic status by means of foreign marriage matchmaking. The economic status of these cross-national marriage families might be relatively low, similar to the aboriginal groups. In addition, these mothers from cross-national marriage families cannot get jobs without Taiwanese resident identification until several years after getting married, and they may have difficulties in cultural adaption and oral communication. These difficulties probably cause disadvantages to cross-national marriage children regarding learning performance, including not being able to afford extra academic cram schooling expenditures.

Because of these circumstances, the Ministry of Education in Taiwan promoted a new project beginning in 2008. The project is named the "Night Angel Illumination Program" (Ministry of Education 2009). Its purpose is to help underachieving students to decrease the learning performance gap between minority and non-minority students (Lin & Ou 2010). Two dimensions of this project are "After-School Care Program" and "Hand-in-Hand Program". "After-School Care Program" offers after-school services, aiming to look after elementary school and kindergarten children, help with homework assignments, and guide these students learning. This program provides academic guidance in classrooms after school or during vacations. Generally speaking, children and their families have to pay a fee, but for physically and mentally handicapped students, and students from low-income and aboriginal families, this program is free of charge. Regarding the "Hand-in-Hand Program", the students are from aboriginal families, single-parent, grandparent, new-resident families, or those from low socioeconomic families. Such programs are non-profit in orientation and aim to enhance learning outcomes of disadvantaged students and decrease the learning gap. Additionally, some academic guidance is sponsored by charity groups, religious groups, or foundations established by private enterprises. Financially disadvantaged university and college students or people with teaching experience are hired to provide extra after-school academic guidance. Such programs have low tuition fees, or are even free. The students participating in these programs are primarily minority or underprivileged students. However, there is no existing relevant research to verify the effectiveness of such academic guidance services, compared to private academic cram schools.

Based on the above considerations, the cram schooling activities in Taiwan can be grouped into three categories: (a) private profit-oriented cram schools, regarded as Buxiban; (b) fee-based after-school programs provided by schools; and (c) free after-school programs sponsored by non-profit organizations or schools. According to relative viewpoints and empirical results (Brown-Jeffy 2009; Dang 2007; Kuan 2011; Lin et al. 2015; Liu 2012 ; Rowley and Wright 2011; Whitley et al. 2014), this study assumes that minority groups cannot afford private cram schooling expenditures due to their low socioeconomic status and hence, their children possess lower academic performance. However, with few relevant studies, some questions need to be addressed. First, few studies have been conducted to compare the learning environment and learning performance of cross-marriage children with aboriginal groups and non-minority groups.

Second, the effectiveness of free academic guidance services provided by schools or non-profit organizations, and their effect on the academic achievement of ethnic and cross-marriage children need more investigation.

Method
Participants
The analysis sample for this study includes children between age of 10 and 11 who had valid questionnaire data and their grade achievement assessment at the time of the survey in 2013. In total there were 630 pieces of valid student and parent data. Among the subjects, 49.4% were boys and 50.6% were girls. The average length of education for the fathers and mothers was 12.07 years (SD = 2.23) and 12.07 years (SD = 2.00), respectively, which was the equivalent of a senior high school graduation. The family economic status for the subjects were given 1-3 points according to the level of wealth, and the mean was 2.66 (SD = 0.50).

Measures
Table 1 shows the design and scoring methods for each variable in this study. All variables used in this study are grounded into two types: (1) student individual characteristics, such as ethnicity, gender, and academic achievement, (2) family background and characteristics, including parent educational level, parent occupation, family economic conditions, family structure, sibling size, and children's participation in cram schooling.

Table 1 Variable measurement

Variable	Description	Metric
Ethnicity	The measures were divided into three categories: Non-minorities, aboriginals (minorities), and cross-national marriage (minorities).	Non-minorities = 0 (as reference category)
Parent's educational level	Convert the specified parent's educational level into education years.	Elementary school = 6 years, Junior high school = 9 years, Senior high school = 12 years, Junior college = 14 years, College =16 years, Graduate school = 18 years.
Parents' occupation	What are fathers' and mothers' occupations? The measures include four categories: professional and semi-professional, trading and service, as well as labor-related work and low-tech jobs.	professional and semi-professional = 0 (as reference category)
Family economic status	The economic status of the families when the child studied at the fifth grade.	Item ranged from 1 to 4. 4 = Wealthy families, 1= poor families
Family structure	Family structure is measured with a set of binary indicators reflecting whether the student lived in the two-parent, single-parent or other household.	Single-parent and other household = 0 (as reference category)
Student's gender	What is the student's gender?	1= boy, 0 = girl
Sibling size	How many siblings does the child have?	Item ranged from 1 to 6. 6 = six or more siblings, 1= only one child in family
Academic cram schooling Hours	How many hours do you spend each week participating in cram schooling?	0 = lowest hours; 20 = highest hours
Expenditures (NT$/thousand)	How much do you spend on participating in cram	NT$ 0 = lowest amount; NT$ 20,000 = highest amount

	schooling each week?	
After-school programs in schools	Whether have you taken part in after-school programs in schools this semester?	1= yes 0 = no (as reference category)
After-school tutorial classes (private cram schools)	Whether have you taken part in after-school tutorial classes (private cram schools) this semester?	1= yes 0 = no (as reference category)
After-school programs outside Schools (cost-free)	Whether have you taken part in after-school programs outside schools (cost-free) this semester ?	1= yes 0 = no (as reference category)
Academic achievement	The achievement estimation values the average scores from the first semester (including Chinese, math, social, science, and English) in fifth grade students' survey.	The achievements of each subject were based on different scoring criteria in each class. Therefore, choosing a class as a group, this study standardized students' learning achievements, then made linear transformation in scores with the mean value 85 and the standard deviation 10. The approximate distribution range for the achievements of each subject is as follows: Chinese: lowest score = 10.44 and highest score = 95.55; Math: lowest score = 39.74 and highest score = 92.51; Social: lowest score = 30.89 and highest score = 96.52; Science: lowest score = 25.08 and highest score = 95.01.

Analysis Strategy

A series of hierarchical regression analysis was used with different groups of predictors in the model, first with ethnicity (including non-minorities, aboriginals, and cross-national marriages), then with ethnicity and controls for family background (such as parent educational level, parent occupation, family economic status, family structure, and sibling size) and children's gender, and finally with children's participation in cram schooling measures added. In this

study, we hypothesize that, when parental SES, family background, and children's personal characteristics are included, the remained academic achievement gap between non-minorities and minorities would be reduced when cram schooling is held constant. Namely, the main purpose of this study is to examine the potential mediating pathways through which academic cram schooling mediates the ethnic gap of students' academic achievement in Taiwan. Table 3 shows the effects of the predictor variables on the students' grade achievement. Table 4 and table 5 are the analysis on mediating variables such as cram schooling hours, expenditures and participating types (as dependent variables). Since the dependent variables shown in Tables 3 and Table 4 were continuous variables, the researchers practiced multiple regression analysis. However, we conducted logistic regression analysis in Table 5 due to the dependent variables were binary scale.

Results
Descriptive Analysis
Table 2 displays the results of the descriptive analyses among the minority group students and non-minority group students in the respects of socioeconomic status, personal attributes and family background, participation in cram schooling, and their academic achievement. The results indicated that the parents from minority group families had a lower educational level than their counterparts, especially the cross-national couples (M = 10.82, 9.48; SD = 3.06, 2.97, respectively), which was equivalent to a junior high school level. Secondly, among the non-minority groups, many fathers were engaged in professional or semi-professional work (47.1%), whereas among the aboriginals and cross-national marriage, most fathers were engaged in labor-related work or low-tech jobs, occupying 66.3% and 64.3%, respectively. Among the non-minority group, the percentages of maternal jobs in the professional and semi-professional areas, trading and service sectors, and low-tech sectors were almost the same, over 30% each. However, in aboriginals and cross-national marriage, the mothers were mostly engaged in labor and low-tech jobs (61.1% and 74.1%, respectively).

An analysis of family economic status (based on a Likert 4-point scale) showed that most non-minority families had middle-class income level (M = 3.36, SD = 0.71), while the aboriginals families had a below-average living standard (M = 2.86, SD = 0.83). Also, among the non-minority groups and cross-national marriages, over 10% of the families were single-parent families or were headed by grandparents, whereas 27.3% of the aboriginal people had formed single parent families or families headed by grandparents. In all of the ethnic groups, girls tended to occupy a higher ratio. The average number of siblings was highest in the aboriginals families (M = 3.10, SD = 1.36).

Table 2 Descriptive statistics for family SES, family background, participation in cram schooling, and children's test scores by ethnicity

Ethnicity Variable	Non-minorities				Minorities (aboriginal)				Minorities (cross-national marriages)			
	N	%	Mean	*SD*	N	%	Mean	*SD*	N	%	Mean	*SD*
Parental educational level												
Father	502		13.82	2.78	100		11.23	2.95	28		10.82	3.06
Mother	500		13.50	2.52	100		10.69	2.78	27		9.48	2.97
Father's occupation												
Professional and semi-professional	230	47.1			15	15.8			6	21.4		
Trading and service	107	21.9			17	17.9			4	14.3		
Labor-related work and low-tech jobs	151	30.9			63	66.3			18	64.3		
Mother's occupation												
Professional and semi-professional	159	32.1			12	12.6			2	7.4		
Trading and service	141	28.5			25	26.3			5	18.5		
Labor-related work and low-tech jobs	195	39.4			58	61.1			20	74.1		
Family economic status	504		3.36	0.71	100		2.86	0.83	28		3.14	0.71
Family structure												
Two-parent household	421	84.7			72	72.7			24	88.9		
Single-parent and other household	76	15.3			27	27.3			3	11.1		
Student's gender												
Boy	244	48.9			42	42.0			13	46.4		
Girl	255	51.1			58	58.0			15	53.6		
Sibling size	492		2.08	0.72	96		3.01	1.36	27		2.15	0.72
Cram schooling												
Hours	502		7.75	6.97	100		1.30	3.07	28		5.61	6.80
Expenditures (NT$/ thousand)	501		5.14	4.45	100		0.96	2.77	27		2.96	3.56
After-class programs in schools	499	21.4			99	64.6			28	39.3		
After-class programs outside schools (private cram schools)	499	69.9			99	15.2			28	53.6		
After-class programs outside schools (cost-free)	499	4.0			99	31.3			28	3.6		
Academic achievement (average)	490		85.86	7.47	99		79.88	8.77	28		84.59	7.78

In the aspect of cram schooling, the data showed that students from aboriginal families experienced the lowest number of hours and spent the least amount of money on cram schooling, followed by students from cross-national marriage, while students from non-minority families had the highest number of hours and largest expenditures spent on cram schooling. Furthermore, of the three main types of after-class schooling, nearly 70% of the students from non-minority families chose private cram schools that demand higher tuitions, whereas 64.6% of the aboriginal students chose to take extra hours in tutorial classes organized by schools. Meanwhile, 31.3% of the aboriginal students enrolled in tutorial classes organized by non-profit organizations, which were free of charge. Students from cross-national marriages, like their counterparts from non-minority families, tended to choose private cram schools (53.6%) and tutorial classes organized by schools (39.3%). Lastly, in the aspect of student academic performance, non-minority students scored the highest (M = 85.86, SD = 7.47), closely followed by students from cross-national marriage (M = 84.59, SD = 7.78). The aboriginals students, however, scored lower than their peers (M = 79.88, SD = 8.77).

Multivariate Analysis

This study made ethnic group a predictive variable, as shown in Table 3, Model 1, and found that among the minority groups, aboriginal students scored far lower than non-minority students (B = -5.76, SE = 0.85, $p < .05$), yet there was no discernible difference between cross-national marriage students and their non-minority counterparts. In Model 2, students' personal attributes and family backgrounds were included as control variables. Compared with the results showed in Model 1, the difference between aboriginal students and their non-minority peers became smaller (B = -1.98, SE = 1.57, $p < .05$). It was also discovered that students whose mothers worked as laborers or with low-tech jobs had poorer academic achievement. In Model 2, the explanatory power (R square) reached 0.20. In Model 3, hours of cram schooling and the quadratic term of cram schooling hours were included as mediators to observe the impact of cram schooling hours on academic achievement. The regression coefficient showed that longer hours of cram schooling resulted in better academic performance (B = 0.40, SE = 0.14, $p < .05$). However, the square of the hours spent on after-school cram schooling did not have a remarkable influence on academic achievement. By further taking hours in cram schooling into Model 3 for analysis, the disadvantage of aboriginal students grew smaller (B value dropped from -1.98 to -0.72), and the influence plummeted to 63.63%. This indicated that aboriginal students' poorer performance might come from shorter hours in cram schooling. The explanatory power (*R* square) of Model 3 reached 0.22. Model 3 indicated that the cross-national marriage students, with hours in cram schooling excluded, had better academic achievement than the other two groups. When dealing with factors separately, such as personal attributes, socioeconomic status and hours in cram schooling taken as predict variables, the cross-national marriage students performed better than the non-minority students. This is worth of further discussion and scrutiny in future research. Model 4 and Model 5 displayed similar results.

Table 3 Estimates on the achievement score for 5th grade students

	Model 1 B	SE	Model 2 B	SE	Model 3 B	SE	Model 4 B	SE	Model5 B		SE
Ethnicity											
Non-minorities(reference categories)											
Minorities (aboriginal)	-5.76 **	(0.85)	-1.98 *	(0.93)	-0.72	(0.97)	-.069	(0.96)	-1.02		(1.02)
Minorities(cross-national marriage)	-1.05	(1.51)	2.97	(1.57)	3.32 *	(1.55)	3.47 *	(1.58)	3.59	*	(1.55)
Father educational level			0.53 **	(0.16)	0.50 **	(0.15)	0.46 **	(0.15)	0.47	**	(0.16)
Mother educational level			0.16	(0.16)	0.16	(0.16)	0.10	(0.16)	0.21		(0.16)
Father's occupation											
Professional and semi-professional (reference categories)											
Trading and service			0.15	(0.87)	0.26	(0.86)	0.25	(0.85)	0.14		(0.86)
Labor-related work and low-tech jobs			-1.10	(0.79)	-0.95	(0.79)	-0.95	(0.78)	-0.94		(0.79)
Mother's occupation											
Professional and semi-professional (reference categories)											
Trading and service			-0.74	(0.82)	-0.84	(0.82)	-0.74	(0.81)	-0.40		(0.82)
Labor-related work and low-tech jobs			-1.78 *	(0.77)	-1.50	(0.76)	-1.51 *	(0.76)	-1.71	*	(0.77)
Family economic status			0.49	(0.46)	0.37	(0.46)	0.22	(0.46)	0.29		(0.47)
Family structure											
Two-parent household			2.42 **	(0.86)	2.25 **	(0.86)	2.17 *	(0.86)	2.06	*	(0.86)
Single-parent and other household (reference categories)											
Boy (reference categories: Girl)			-0.48	(0.60)	-0.47	(0.60)	-0.40	(0.59)	-0.41		(0.60)
Sibling size			-0.61	(0.37)	-0.46	(0.36)	-0.38	(0.36)	-0.33		(0.37)
Cram schooling											
Hours					0.40 **	(0.14)					
Hours × Hours					-0.01	(0.01)					
Expenditures							0.71 **	(0.18)			
Expenditures × Expenditures							-0.03 *	(0.11)			
After-school tutorial classes									-2.22	**	(0.76)
After-school programs outside school(private cram schools)									1.23	#	(0.72)
After-school programs outside school(cost-free)									0.74		(1.21)
N	617		582		579		578		575		
R square	0.08		0.20		0.22		0.23		0.22		

# p < .10   * p < .05   ** p < .01

This study included expenditures in cram schooling and the quadratic term of expenditures in Model 4 to explore the relationship between academic achievement and expenditures of cram schooling. The result indicated that higher expenditures of cram schooling resulted in better academic performance (B = 0.71, SE = 0.18, p < .05). In the meantime, the impact made by the quadratic term of expenditures on academic achievement showed an apparent negative value. This further indicated that the positive impact of expenditures on academic achievement showed diminishing marginal utility. In other words, spending too much tuition on cram schooling was negatively correlated with academic achievement. With expenditures as a factor, the disadvantage of aboriginal students became less obvious (the B value of Model 4 dropped from -1.98 to -0.69) by 65.15%. This finding showed that the poorer performance of aboriginal students might be caused by their families' economic condition. The explanatory power (R square) of Model 4 reached 0.23, an increase of 15% over Model 2.

This study further analyzed how different cram schooling types affected student academic performance, as shown in Model 5. The tutorial classes organized by the schools had a negative effect on academic achievement. Although the government invested sufficient funds into the program that allowed students from lower-income families not to pay tuition, the effect was less than satisfactory. On the other hand, students who chose private cram schools often scored higher in their studies. The positive impact on such students reached a remarkable result of nearly .05 (B = 1.23, SE = 0.72, p = .06). Students who participated in tutorial classes set up by non-profit organizations did not show improvement in academic achievement. The explanatory power (R square) of Model 5 reached 0.22, an increase of 10% over that in Model 2.

Mediators
Table 4 showed that the aboriginal students spent less tuition and had fewer hours spent on cram schooling than their non-minority counterparts (B = -4.94, SE = 0.83, B = -2.01, SE = 0.51). Aboriginal families provided apparently fewer resources for learning, which affected their children's academic achievement. Meanwhile, the cross-national marriage couples provided a similar level of resources for their children's after-class education compared with non-minority families. Table 5 showed that the aboriginal students had a higher percentage of choosing after-school tutorial classes (B = 1.44, odds ratio = 4.23, p < .05) or tutorial classes provided by non-profit organizations (B = 2.27, odds ratio = 9.67, p < .05) over private cram schools (B = -2.21, odds ratio = 0.13, p < .05). By compiling the analytical results of Tables 3 to 5, it was concluded that the less satisfactory academic achievement of the aboriginal students was caused by choosing to attend after-school tutorial classes organized by the schools rather than attending private cram schools. However, their choice of free tutorial classes offered by non-profit organizations seemed not to have affected their academic achievement (see Table 3).

Table 4 Estimates on the achievement score for 5th grade students

| | Hours | | Expenditures | |
	B	SE	B	SE
Ethnicity				
Non-minorities (reference categories)				
Minorities (aboriginal)	-4.94 **	(0.83)	-2.01 **	(0.51)
Minorities (cross-national marriage)	-1.48	(1.40)	-0.86	(0.88)
Father educational level	-0.01	(0.14)	0.21 *	(0.08)
Mother educational level	-0.04	(0.14)	0.18 *	(0.09)
Father's occupation				
Professional and semi-professional (reference categories)				
Trading and service	-0.89	(0.76)	-0.33	(0.47)
Labor-related work and low-tech jobs	-1.27	(0.70)	-0.47	(0.43)
Mother's occupation				
Professional and semi-professional (reference categories)				
Trading and service	0.56	(0.73)	0.36	(0.45)
Labor-related work and low-tech jobs	-1.49 *	(0.68)	-0.43	(0.42)
Family economic status	0.50	(0.41)	0.62 *	(0.25)
Family structure				
Two-parent household	-0.03	(0.75)	0.47	(0.46)
Single-parent and other household (reference categories)				
Boy (reference categories: Girl)	-0.18	(0.53)	-0.25	(0.33)
Sibling size	-0.78 *	(0.32)	-0.50 *	(0.20)
N	595		594	
R square	0.16		0.25	

# $p < .10$ * $p < .05$ ** $p < .01$

Table 5 Estimates on the achievement score for 5th grade students

	After-school tutorial classes		After-class programs outside school (private cram schools)		After-class programs outside school (cost-free)	
	B	Odds Ratio	B	Odds Ratio	B	Odds Ratio
Ethnicity						
Non-minorities (Reference categories)						
Minorities (aboriginal)	1.44 **	(4.23)	-2.21 **	(0.13)	2.27 **	(9.67)
Minorities(Cross-natio nal marriage)	0.88	(2.41)	-0.48	(0.62)	0.22	(1.25)
Father educational level	-0.13 *	(0.88)	0.02	(1.02)	-0.13	(0.88)
Mother educational level	0.10 #	(1.11)	0.00	(1.00)	0.15	(1.16)
Father's occupation						
Professional and Semi-professional (Reference categories)						
Trading and service	-0.21	(0.81)	0.07	(1.07)	-0.34	(0.71)
Worker and other	0.29	(1.34)	-0.15	(0.86)	-0.16	(0.85)
Mother's occupation						
Professional and Semi-professional (Reference categories)						
Trading and service	0.53 #	(1.70)	-0.14	(0.87)	0.42	(1.52)
Worker and other	0.18	(1.20)	-0.48 #	(0.62)	0.35	(1.42)
Family finance situation	-0.35 *	(0.70)	0.54 **	(1.71)	-0.48 *	(0.62)
Family structure						
Two-parent household	-0.05	(0.95)	0.18	(1.19)	-0.11	(0.89)
Single-parent and other household (Reference categories)						
Boy (Reference categories: Girl)	0.32	(1.37)	-0.04	(0.96)	0.25	(1.29)
Sibling size	0.32 **	(1.37)	-0.29 *	(0.75)	0.23	(1.25)
N	591		591		591	
Cox & Snell R Square	0.16		0.22		0.11	
Nagelkerke R Square	0.23		0.30		0.27	

# $p < .10$ * $p < .05$ ** $p < .01$

Conclusion and Discussion

Over the years, many researchers have made an effort to explore the relationships between after school learning activities (such as private tutoring, cram schooling and so forth) and students' academic achievement (Bray et al. 2014; Kim and Park 2010; Shih and Yi 2014). Students in East Asia countries have long stressed cram schooling, and they consider it as an effective way to enhance their ability to pass national entry examinations and achieve the schooling successfully (Fung 2003; Kuan 2011; Liu 2012). However, the relationships between diverse cram schooling (including time, expenditures, and types of participation) and students' academic achievement are still not clear and insufficient. Therefore, this topic has a highly referential value for educational policies, instructional affairs, and the education system, where credentials and educational background still have an immense effect on an individual's career in society.

This study discovered that aboriginal students had less satisfactory academic achievement than non-minority students; yet the learning performance of children from cross-national marriage families was similar to that of the non-minority students. This indicated that the main division of achievement only existed between aboriginal students and non-minority students. Secondly, this study discovered that the number of hours spent on cram schooling was positively correlated with academic performance. On the other hand, although expenditures showed diminishing marginal utility, it still had a positive link with academic achievement. This indicated that, for Taiwanese students, cram schooling is a crucial factor in academic achievement, thereby supporting the previous research results (Chen and Hwang 2011; Dang 2007; Kuan 2011; Kim and Park 2010; Liu 2012). Moreover, the results showed that the less satisfactory academic achievement of aboriginal students was due to the scarcity of additional cram schooling provided by their families after school. This result reflected that gaps in learning outcomes between ethnic or racial groups are associated with the abundance of family learning resources and poor educational environment (Brown-Jeffy 2009; Byun and Park 2012; Lin and Hwang 2009; Rowley and Wright 2011).

There has been relatively little research in the link between after-class tutorial classes and academic performance, especially in regards to what type of cram schooling and organizations can achieve better academic performance, what kind of cram schools ethnic groups will choose, and what kind of division exists in student achievement. This study found that tutorial classes organized by schools had a negative impact on students, and that the students attending these classes were mostly from aboriginal groups. This contributed to the lagging behind of aboriginal students. The authorities concerned have been putting great effort and funding into after-school tutorial classes that held in school, as it is felt that they are a great help to minority students in their learning performance. However, this study found that, the government's well-intended policy is not providing the desired effect (possibly due to a poorly-organized teaching plan and poorly trained teaching staff). This poses a concern for how the Taiwan

government allocates educational resources, and it is advised to take immediate action and revise its policies.

Meanwhile, this study found that private cram schools, which generally demand higher tuition fees than schools and non-profit tutorial classes, can be a great help to students' academic achievement. Other than the remote areas, cram schools can be found in almost every city and town in Taiwan. The business of a cram school depends on how its students perform academically. Thus, many parents are eager to pay higher tuition fees as long as their children make improvements in their academic studies (Lin and Hwang 2009; Lin et al. 2015). To attract renowned teachers, cram schools have to be set up in urban areas. Aboriginal students from remote areas find it difficult to commute to these cram schools, and their families face the challenge of higher extra tuition fees. The only choice left to them is to choose after-school tutorial classes, yet such tutorial classes are of little help to diminish the learning gap.

In recent years, a large number of enterprises and non-profit organizations in Taiwan have tried to bridge the gap with less-privileged families by providing considerable funds and manpower to hire college students to teach aboriginal students in remote areas or through online classes. The results of these actions have also proved less satisfactory than expected. As Table 5 shows, aboriginal students have a higher percentage of choosing tutorial programs that are free of charge. Therefore, it is important to enhance the operations of such free tutorial classes so that aboriginal students can have the opportunity to compete with their non-minority peers.

The above findings also showed that children from cross-national marriage families have similar academic performance compared with other non-minority peers, and that the tuition and hours they spend on cram schooling are similar to their counterparts. They may be less likely to attend off-campus cram schools, and they tend to participate in on-campus after-school classes. Many mothers in cross-national marriage families come from mainland China and Southeast Asia, and they often face the problems of obtaining an ID card and finding a job, not to mention language difficulties and culture conflict. The above all pose issues for their children. This study used fifth graders as the research samples, and found that their learning was inhibited considerably.

Although our analytical approach provided new insights regarding the association between cram schooling participation and students' academic achievement gap of ethnic and cross-national marriage, there are several limitations that need to be considered and possibly addressed in the future research. Firstly, multi indicators of cram schooling were selected as a mediator in this study, and it did not examine other mediators that could affect a student's academic achievement or the indirect impact of cram schooling on different academic groups. This study also did not discuss the relationship between student age and academic performance in different educational stages.

Secondly, other questions left to discuss include: What are the effects of cram schooling on student's learning adaptation in the long term? Will it affect a student's career or income (Lin and Hwang 2009)? Does any difference exist about the relative findings between Eastern and Western societies? Additionally, the long hours spent on a cram schooling cause higher pressure and less time for leisure activities. This might lead to a lower sense of happiness or maladjustment at school (Chen & Lu 2009; Csikszentmihalyi and Hunter 2003). Hence it is important to pay attention to the negative effects brought forth by cram schooling.

Lastly, a striking discovery of this study was that, after excluding socioeconomic factors and cram schooling, students from cross-national marriage families often performed better than non-minority students. This study, however, did not investigate a deeper understanding of this phenomenon. The above limitations are all topics that are worth further exploration in future research to create better strategies and educational policies.

Acknowledgement

References

Brown-Jeffy, S. (2009). School effects: Examining the race gap in mathematics achievement. *Journal of Africa- American Study, 13*, 388-405.

Bray, M. (2013). Shadow education: Comparative perspectives on the expansion and implications of private supplementary. *Procedia-Social and Behavioral Sciences, 77*, 412-420.

Bray, M., Zhan, S., Lykins, C., Wang, D., & Kwo, O. (2014). Differentiated demand for private supplementary tutoring: Patterns and implications in Hong Kong secondary education. *Economics of Education Review, 38*, 24-37.

Byun, S. Y., & Park, H. (2012). The academic success of East Asian American youth: the role of shadow education. *Sociology of Education, 85*, 40-60.

Chen, C. W., & Hwang, Y. J. (2011). A re-exploration of stratification and efficacy in cram schooling: An extension of the Wisconsin model. *Bulletin of Educational Research, 57*(1), 101-135 (In Chinese)

Chen, S. Y., & Lu, L. (2009). After-school time use in Taiwan: Effects on educational achievement and well-being. *Adolescence, 44*, 891-909.

Csikszentmihalyi, M., & Hunter, J. (2003). Happiness in everyday life: The uses of experience sampling. *Journal of Happiness Studies, 4*, 185-199.

Dang, H. A. (2007). The determinants and impact of private tutoring classes in Vietnam. *Economics of Education Review, 26*, 683-698.

Fung, A. (2003). Cram schooling in Hong Kong: The privatization of public education. *Asian Anthropology, 2*, 179-195.

Jung, J. H., & Lee, K. H. (2010). The determinants of private tutoring participation and attendant expenditures in Korea. *Asian Pacific Education Review, 11*, 159-168.

Kenayathulla, H. B. (2013). Household expenditures on private tutoring: Emerging evidence from Malaysia. *Asia Pacific Education Review, 14*, 629-644.

Kim, J. H., & Park, D. (2010). The determinants of demand for private tutoring in South Korea. *Asia Pacific Education Review, 11*, 411-421.

Kuan, P. Y. (2011). Effects of cram schooling on mathematics performance: Evidence

from junior high students in Taiwan. *Comparative Education Review, 55*, 342-369.

Lee, S., & Shouse, R. C. (2011). The impact of prestige orientation on shadow education in South Korea. *Sociology of Education, 84*, 212-224.

Lin, C. C., & Ou, I. C.(2010). The implement condition of Night Angel Illumination Program. *School Administrators Research Association, 67*, 122-149. (in Chinese)

Lin, C. Y., Hsieh, Y. H., & Chen, C. H. (2015). Use of latent growth curve modeling for assessing the effects of summer and after-school learning on adolescent students' achievement gap. *Asia Pacific Education Review, 16*, 49-61.

Lin, H. M., & Hwang, Y. J. (2009). The study on relationship among the Aborigines, Hans, cram schooling and academic achievement. The example of the eighth graders in Taitung. *Contemporary Educational Research Quarterly, 17*(3), 41-81 (in Chinese).

Liu, J. (2012). Does cram schooling matter? Who goes to cram schools? Evidence from Taiwan. *International Journal of Educational Development, 32*, 46-52.

Ministry of Education (2009). *Night Angel Illumination Program*. Retrieved August 2, 2014, from http://english.moe.gov.tw/ct.asp?xItem=14748&ctNode=11435&mp=1.

Rhy, D., & Kang, C. (2013). Do private tutoring expenditures raise academic performance? Evidence from middle school students in South Korea. *Asian Economic Journal, 27*, 59-83.

Rowley, R., & Wright, D. W. (2011). No "White" child left behind: The academic achievement gap between black and white students. *The Journal of Negro Education, 80*, 93-107.

Shih, Y. P., & Yi, C. C. (2014). Cultivating the difference: social class, parental values, cultural capital and children's after-school activities in Taiwan. *Journal of Comparative Family Studies, 45*, 55-75.

Stevenson, D. L., & Baker, D. P. (1992). Shadow education and allocation in formal schooling: transition to university in Japan. *American Journal of Sociology, 97*, 1639-1657.

Whitley, J., Rawana, E., & Brownlee, K. (2014). A comparison of aboriginal and non-aboriginal students on the inter-related dimensions of self-concept, strengths and achievement. *Brock Education, 23*(2), 24-46.

Zhang, Y. (2013). Does private tutoring improve students' national college entrance exam performance? A case study from Jinan, China. *Economics of Education Review, 32*, 1-28.