Does 'Habitus' Count in Chinese Australians' Mathematics Achievement?

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Abstract: *Large-scale international comparative studies and cross-ethnic studies have revealed that Chinese students, whether living in China or overseas, consistently outperform their counterparts in mathematics achievement. These studies tended to explain this result from psychological, educational, or cultural perspectives. However, there is scant sociological investigation addressing Chinese students' better mathematics achievement. Drawing on Bourdieu's sociological theory, this study conceptualises Chinese Australians' "Chineseness" by the notion of 'habitus' and considers this "Chineseness" generating but not determinating mechanism that underpins Chinese Australians' mathematics learning. Two hundred and thirty complete responses from Chinese Australian participants were collected by an online questionnaire. Simple regression model statistically significantly well predicted mathematics achievement by "Chineseness" ($F = 141.90$, $R = .62$, $t = 11.91$, $p < .001$). Taking account of "Chineseness" as a sociological mechanism for Chinese Australians' mathematics learning, this study complements psychological and educational impacts on better mathematics achievement of Chinese students revealed by previous studies. This study also challenges the cultural superiority discourse that attributes better mathematics achievement of Chinese students to cultural factors.*
Keywords: habitus, Chineseness, Confucianism, mathematics, Chinese Australians

1. Introduction

Over the past decades, large-scale international comparative studies of mathematics education have measured students' mathematics achievement in different countries. According to a review of Fan and Zhu (2004), the results from those international comparisons consistently indicated that Chinese students were among the top performers. Likewise, cross-ethnic studies of mathematics achievement indicated that students with Chinese ancestry consistently outperformed their white peers (Chen & Stevenson, 1995; Sue & Okazaki, 1990; Zhao & Singh, 2011). In the USA, mathematics scores of Chinese American high school students were generally higher than those of Caucasian American students (Chen & Stevenson, 1995). This finding is consistent with the Australian data. Chinese Australian students were more successful than their white peers in mathematics achievement (Zhao & Singh, 2011). Consequently, there is growing interest within the field of mathematics education to address the achievement gap between Chinese students and their counterparts. By virtue of the conventional testing instruments, open-ended questions, and classroom observations (Cai, 1995; Stevenson & Stigler, 1992), research has identified some factors associated with better mathematics achievement of Chinese students, whether living in or outside China. These factors included examination orientation, achievement orientation, use of repetitive learning, synthesis of memorisation and understanding, parental attitude and support, as well as learning motivation and effort (Chen & Stevenson, 1995; Dahlin & Watkins, 2000; Fan, Wong, Cai, & Li, 2004; Leung, 1998, 1999; Zhao & Singh, 2011). However, existing literature struggles to explain the reasons behind Chinese students' stronger motivation and more efforts, as well as their parents' more positive attitudes and more supports compared to their white counterparts.

Interestingly, some studies have taken account of cultural dimensions to explain better mathematics achievement of Chinese students. These cultural dimensions included Confucian ways of teaching and learning as well as Confucian values towards education (Chen & Stevenson, 1995; Fan, et al., 2004; Leung, 1999, 2001). However, these studies attempted to makes sense of Confucian values towards education in general, yet did not explicitly illuminate Confucian role specifically in teaching and learning mathematics. At the best, these studies partly explained better mathematics

achievement of Chinese students in China, but struggled to explain better mathematics achievement of overseas Chinese students, living in countries where Confucianism is not necessarily rooted in social ideology and valued in the society. At the worst, by attributing better achievements to cultural factors, these studies risked involving cultural superiority or deficits (Sue & Okazaki, 1990).

In short, previous studies have been engaged in examination of better mathematics achievement of Chinese students, living in or outside China, from different perspectives. However, there is a dearth of sociological research addressing better mathematics achievement of Chinese students, overseas Chinese students in particular. Drawing on Bourdieu's notion of 'habitus', this study investigates the underpinning mechanism of Chinese Australians' commitment to mathematics learning. Specifically, this study asks two research questions: (1) Do Chinese Australians outperform their schools peers in mathematics? and (2) Does their habitus of "Chineseness" count in their better mathematics achievement?

2. Theoretical Framework

Bourdieu had used a variety of wordings to explain what he meant by habitus, but the following commonly cited definition is offered:

systems of durable, transposable dispositions, structured structures predisposed to function as structuring structures, that is, as principles of the generation and structuring of practices and representations which can be objectively regulated and regular without in any way being the product of obedience to rules, objectively adapted to their goals without presupposing a conscious aiming at ends or an express mastery of the operations necessary to attain them and, being all this, collectively orchestrated without being the product of the orchestrating action of a conductor. (Bourdieu, 1977, p. 72)

Attributes such as race, ethnicity, gender, and native language, are not of people's own choice, and hereby remain durable and transposable across different time and place in people's lives. Habitus is a tendency to perpetuate such attributes (Bourdieu, 1996), which remains a semiotic and embodied presence and cannot be erased. Therefore, the concept of habitus, as a foundational basis of kinship and culture, offers an opportunity to describe the lasting attributes. One of the ways in which attempts have been made to make sense of cultural attributes associated with ethnic groups has been through the use of Bourdieu's notion of habitus (Connolly, 2011). Drawing insights from this perspective, Connolly (2011) demonstrates how children have already begun to embody and internalise the cultural dispositions and ethnic awareness of their respective ethnic groups. These embodied dispositions of the same ethnic group, such as affiliated cultural, experiential, and historical memories, stay (Luke, 2009; Webb, Schirato, & Danaher, 2002). In this respect, ethnic dimensions are constitutive of habitus (Diamond, Randolph, & Spillane, 2004; Horvat & Antonio, 1999) and habitus can be influenced by these ethnic and racial dimensions (Reay, 2004). While the potential of employing Bourdieu's concept of habitus in ethnic research is evident, only a small body of studies have related 'habitus' to ethnic analysis, Asian ethnic analysis in particular. Given this, the current study conceptualises Chinese Australians' "Chineseness" by virtue of Bourdieu's concept of habitus, interpreting it as a set of durable and transposable tendencies to think and act in such a way that is inculcated by their Chinese heritage, in which they share the same tastes, behaviours, values, and way of life. In short, ethnic attributes makes sense through habitus (Jenkins, 1992) and derives from the cultural history (Rowsell, 2008).

Attributes associated with "Chineseness" result from both intentional and unintentional learning. As Bourdieu suggested, intentional or unintentional learning is made possible by habitus acquired through culture (Bourdieu, 1989) and produced through history (Bourdieu, 1990). As such, Confucianism would constitute such a cultural history or "previous state" (Bourdieu, 2000, p. 161) for "Chineseness", because it is the bedrock, even the definitive core, of Chinese culture (Tan, 2008). Since Confucianism is deeply rooted in the Chinese society and highly valued in the Chinese social field, it has become a mechanism behind Chinese people's thinking, being, and doing. In this respect,

"history turned into nature" (Bourdieu, 1977, p. 78) because what historically needed to be durable and transposable through a process of continuous reproduction is now inscribed through regulations, forms, and norms.

As an embodied disposition, "Chineseness" is both the consciousness and the unconsciousness of the Confucian way of doing and understanding things. As habitus, "Chineseness" embedded with the Confucianism is durable and transposable. It is durable because the core Confucian values have enduring impact on Chinese people today (Lee, 1996) and Confucianism is the dynamic force that determines the direction and form of Chinese life (Tan, 2008). It is also transposable because this Confucian culture can be carried out and enacted by people who reside not just in China but also throughout the world. Therefore, Confucianism underpins the habitual "Chineseness" of oversea Chinese, such as Chinese Australians.

Confucianism developed from the ethics and philosophy of the Chinese philosopher Confucius (551-478 BC), whose principal concept was to maintain harmony and order and thus keep society together without the undue exercise of force (Clayre, 1984). In theory, Confucianism is a complex system of moral, social, political, philosophical, educational, quasi-religious, and ideological thought that has influenced the culture of China and some countries in East Asia and Southeast Asia. In China, Confucianism plays an important role in Chinese civilisation and has a deep impact on Chinese society, Chinese education, and Chinese people. In practice, the dimensions of Confucianism have accumulated over time during the past 2,500 years. As such, the concept of Confucianism is as deep as it is broad. One of the dimensions of Confucianism that is particularly relevant to this study is Liuyi (六艺, Six Skills). Confucianism requires people to grasp Liuyi (六艺, Six Skills), namely Li (礼, Rites), Yue (乐, Music), She (射, Archery), Yu (御, Equestrianism), Shu (书, Calligraphy), and Shu (数, Mathematics). These six skills were first documented in *Zhouli (《周礼》, The Rites of Zhou Dynasty)*: "养国子以道，乃教之六艺：一曰五礼、二曰六乐、三曰五射、四曰五御、五曰六书、六曰九数", which means, "Men who excel in these six skills were considered to have reached the state of perfection." These skills were also documented in 《三字经》 *(Three-Character Classic)* (Wang, 1,223-1,296): "礼乐射，御书数，古六艺", which means, "The traditional six skills are rites, music, archery, equestrianism, calligraphy, and mathematics." The Liuyi (六艺, Six Skills) dimension considers mathematics one of the key skills that people need to have. This legitimate value towards mathematics was rooted in Confucianism and embedded with "Chineseness", durable over time and transposable across space. This legitimate value towards mathematics not only sheds light on the international comparative studies but also makes sense of the cross-ethnic studies in relation to better mathematics achievement of Chinese students in China and students with Chinese ancestry in other countries.

3. The Study

Data included in this study were drawn from the author's PhD project. By snowball sampling, 230 respondents with Chinese ancestry completed the online questionnaire. Because of an overwhelming proportion of Chinese Australians living in urban Australia and also due to the widely spread use and ease of access to the internet in urban areas, all the respondents were from seven capital cities, namely Brisbane, Sydney, Melbourne, Canberra, Perth, Adelaide, and Darwin. Approximately 48% of them are males and 52% of them are females. They ranged in age between 18 and 35. If born outside Australia, they had to move to live in Australia before the age of 13.

To measure habitus of "Chineseness", an instrument of five indicators was developed. The author has justified the reliability and validity of this measurement in previous study (Mu, 2012). To clarify, these measures were reported again as follows. The corrected item-total correlation of all the indicators was well above the cutoff value of .33 (Ho, 2006). The Cronbach's α was .855, higher than the cutoff value of .80 to demonstrate good internal consistency reliability (Kline, 1999). Deleting any of the indicators will decrease the Cronbach's α value. Inter-item correlation matrix demonstrated that all correlations had a statistically significant value within the cutoff range between .3 and .9

(Field, 2009). KMO value of .86, higher than the cutoff value of .50 (Kaiser, 1974), and the statistically significant result from Bartlett's test of sphericity ($\chi^2 = 488.68$, $p < .001$) suggested the basis for EFA. EFA indicated a one-factor solution that accounted for 64.56% of the total variance of the five indicators. CFA demonstrated a good model fit. Four measures of reliability, namely SMC, construct reliability, variance extracted, and coefficient H, as well as two measures of validity, namely construct validity and convergent validity all demonstrated good results. Therefore, this measurement was considered reliable and valid. Taking account of individual and joint measurement error, CFA reported the scale score for the construct "Chineseness", which can be computed as a continuous variable by multiplying individual's raw score on each indicator by the proportionally weighted factor score of each indicator and summing: v1 ×.18 + v2 ×.21 + v3 ×.21 + v4 ×.16 + v5 ×.23.

To measure mathematics achievement, respondents were asked to reply to this item: "My mathematics was much better than that of my classmates. To what extent do you agree with this statement?" To quantify their responses, a 7-point Likert-type scale was used. The scale ranged from 1 (not at all) to 7 (completely). A Likert-type scale is ordinal in nature (Creswell, 2008). However, the errors for treating the Likert-type scale results as interval data are minimal especially when there are more categories or choices in this scale (Binder, 1984; Zumbo & Zimmerman, 1993). Therefore, a 7-point Likert-type scale is widely accepted as a proxy interval level of measurement in line with common practice in educational research (Lehman, 1991; Tabachnick & Fidell, 2007).

To address the two research questions, two null hypotheses were established respectively. H01: Chinese Australians do not statistically significantly outperform their schools peers in mathematics. H02: Habitus of "Chineseness" does not have any statistically significant contribution to Chinese Australians' better mathematics achievement.

To test the first null hypothesis, normal distribution assumption for the measure of mathematics achievement was checked. The critical ratio between the value of skewness and its standard error and that between the value of kurtosis and its standard error were -2.19 (-.35/.16) and -2.63 (-.84/.32), which were lower than the cutoff value of -1.96 (Field, 2009). The normal distribution assumption was violated. The normality assumption was double-checked by Kolmogorov-Smirnov test and Shapiro-Wilk test. Both tests demonstrated statistically significant results, which indicated that the distribution was statistically significantly deviant from normality. The negative value of skewness and the positive value of Kolmogorov-Smirnov and Shapiro-Wilk measures indicated more higher scores in the distribution. As such, more respondents reported that they outperformed their school peers in mathematics. The first null hypothesis can be rejected in favor of the conclusion that Chinese Australians outperform their school peers in mathematics. The test results were shown in Table 1 and Table 2.

Table 1. Descriptive analysis of mathematics achievement

N	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
230	4.55	.12	1.80	3.23	-.35	.16	-.84	.32

Table 2. Test of normality

Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Statistic	df	Sig.	Statistic	df	Sig.
.14	230	.000	.93	230	.000

To test the second null hypothesis, simple regression analysis was conducted. "Chineseness" and mathematics achievement were treated as independent variable and dependent variable respectively. As shown in Table 3, *F* has a statistically significant value of 141.90 ($p < .001$), which indicated that the regression model overall predicted mathematics achievement significantly well by "Chineseness". *R* value of .62 demonstrated a statistically significant positive correlation between mathematics achievement and "Chineseness". R^2 value of .38 demonstrated that 38% of the variance in mathematics achievement can be explained by the variance in "Chineseness". As shown in Table 4, when the value of "Chineseness" increases by 1 unit, mathematics achievement will increase by .79 corresponding. This is a genuine effect given the statistically significant t value ($t = 11.91$, $p < .001$). As such, the second null hypothesis can be rejected in favor of the conclusion that "Chineseness" does count in mathematics achievement.

Table 3. Summary of regression model

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
.62	.38	.38	1.41	.38	141.90	1	228	.000	2.00

Table 4. Coefficients for the regression model

Model	Unstandardised Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.27	.29		4.37	.000		
Chineseness	.79	.07	.62	11.91	.000	1.00	1.00

4. Discussion

"Chineseness" is durable and transposable rather than immutable. However, it can be maintained or developed, and thus transmitted across generations. As Bourdieu (1973) argues that the reproduction of habitus emphasises the importance of the familial environment for learning and accumulation of cultural capital. This Bourdieusian perspective on habitus reproduction can explain the findings from some empirical studies associated with Chinese parents' more positive attitudes and more supports to their children's mathematics learning (Chen & Stevenson, 1995; Dahlin & Watkins, 2000; Zhao & Singh, 2011). This intergenerational influence urges Chinese parents and children to enter the struggle with the aim of reproducing "Chineseness" and if possible augmenting it. As such, mathematics learning is an adventure to reproduce the habitus of "Chineseness" in the next generation and even generations further removed. The habitus of "Chineseness", to borrow a Bourdieusian metaphor, contains the genetic information which both allows and disposes successive generations to reproduce the world they inherit from their previous generation (Bourdieu & Passeron, 1990).

Bourdieu (1977) argues that agents' actions are the product of habitus that the agents may have no conscious mastery because habitus always outruns the conscious intentions. In this respect, "Chineseness" operates at a level that is simultaneously conscious and unconscious. Chinese Australians may be conscious of their stronger perceptions and actions in mathematics learning strategically, but at the same time they may not be aware that their motives, goals, and

aspirations are not spontaneous or natural, but are given to them through their "Chineseness". As such, "Chineseness" is the universalising mediation that causes their mathematics practices, without either explicit reason or signifying intent, to be none the less sensible and reasonable, and to be immediately intelligible and foreseeable, and hence taken for granted. Therefore, Chinese Australians mathematics learning are influenced, consciously or unconsciously, by the values and expectations that they get from their "Chineseness".

"Chineseness" is a set of biological, cultural, and behavioural attributes and propensities. Physical traits, such as looking Chinese, cannot be made over and therefore stay with Chinese Australians all the time. Cultural and behavioural dimensions within "Chineseness" may change constantly in response to new experiences, but the change is "never radical, because it (habitus) works on the basis of the premises established in the previous state" (Bourdieu, 2000, p. 161). Confucianism can be this "previous state" that has enduring impact on Chinese Australians' being, thinking, and doing. The importance of mathematics learning, valued by Confucianism, was embedded with this "Chineseness". This perception becomes the underpinning mechanism that leads to Chinese Australians' more efforts in mathematics learning and therefore better mathematics achievement compared to their counterparts. However, this does not necessarily result in the cultural superiority of Confucianism to white culture or other oriental cultures. Attributing better mathematics achievement of Chinese Australians to or partly to Confucian culture is evidently problematic in that this discourse puts other cultures at a disadvantage. By virtue of Bourdieu's notion of habitus, "Chineseness" is a generating but not determinating mechanism that produces Chinese Australians' more efforts in mathematics learning and ultimately produces their better mathematics achievement. In this practical process, other social, psychological, and educational factors can emerge. With the underpinning mechanism of "Chineseness" argued in this study and other emerging factors investigated in previous studies, the better mathematics performance of Chinese Australians can be explained more explicitly. As such, the findings from this study complement the existing literature.

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