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The Impact of the Time and Subject of Shadow Education on Academic Achievement: Evidence from Chinese Junior High School Students

Kaisheng Wang 1, Danyi Wang 2*

1 Center for Studies of Education and Psychology of Ethnic Minorities in Southwest China, Southwest University

2 Institute of Curriculum and Instruction, East China Normal University, Shanghai, China.

***Corresponding Author**

Address: NO.3663 Zhongshan North Road, Putuo District, Shanghai P.R.China.

Abstract

The purpose of this study was to investigate the effects of shadow education time and subjects on Chinese junior high school students' academic achievements, applying data from China Education Panel Survey (CEPS2013-2014). It was found that (a) shadow education can improve the academic achievement of junior high school students, but this improvement is affected by the length, period, and subjects of tuition; (b) participating in shadow education from Monday to Friday will significantly reduce students' academic achievement; participating in shadow education on weekends or holidays will significantly improve student performance, and students' academic performance and participation time have experienced an "up and then down" "inverted U-shape"; (c) students participating in extracurricular tutoring in English and math subjects can significantly improve the academic achievement of the subject, and participating in English tutoring on weekends and participating in math tutoring on holidays has the most significant impact on the scientific achievement.

Key Words: Shadow education; Academic achievement; Shadowing education hours; Shadow education periods; shadowing education subjects.

INTRODUCTION

Affected by globalization, rankings of various economic and social development indicators and international student achievement evaluations, international competition in education has become increasingly fierce, and the shadow education system has also continued to expand (Bary, 2006; Stevenson & Baker, 1992), becoming mainstream education supplement and imitate (Hu, Fan & Ding, 2015). As a wide-ranging global educational activity (Bray, 2014; Lee, Park, & Lee, 2009; Mori & Baker, 2010), shadow education refers to a series of educational activities that take place outside the school to improve academic achievement and advancement opportunities (Stevenson & Baker, 1992), which most typical characteristics are private, supplementary and academic (Bray & Bunly, 1999). The scale and content of tutoring also change with mainstream education.

Previous studies have shown that shadow education is generally regarded as an essential additional education to improve students' academic achievement (Baker, Akiba, LeTendre & Wiseman, 2001; Berberoğlu & Tansel, 2014; Choi, Calero & Escardibul, 2012; Cole, 2017; Kuan, 2011; Ryu & Kang, 2013; Thongphat, 2012; Wright, Lee & Feng, 2018), so about 70% of young people in Korea and Japan have participated in shadow education (Korea National Statistical Office, 2015; Ministry of Education, Culture, Sports, Science and Technology, 2015); surveys in China also show that about 50% of young people have participated in shadow education (Yuan, 2017); the scale of shadow education in Europe, North America, and other regions is also expanding (Loyalka & Zakharov, 2014; Nath, 2008; Tansel & Bircan, 2005). Studies have also shown that shadow education accounted for most of the time, not only young people and become an essential part of household expenditure have far-reaching economic and social impacts (Bray, 2014).

The evidence shows that it is necessary to conduct in-depth research on shadow education. Moreover, out of concern about the learning effect, researchers pay special attention to the relationship between shadow education and academic achievement in shadow education research. This study's research objective is to examine the link between shadow education and academic achievement.

LITERATURE REVIEW AND HYPOTHESIS

The relationship between shadow education and academic achievement

Academic achievement refers to the staged achievements such as test scores or academic achievements obtained by young people after participating in academic competitions. Part of the study believes that the shadow between education and academic achievement is positively correlated (Baker, Akiba, Le Tendre & Wiseman, 2001; Lee, Kim & Yoon, 2004; Zeng & Zhou, 2012). Shadow education helps young people learn and consolidate knowledge through early teaching, over-level teaching and strengthening exam-taking, thereby enhancing their academic achievements. Lee, Kim, and Yoon (2004) surveyed Korean students in 15 junior high schools

and 15 high schools and found a significant positive correlation between shadow education and academic achievement (r Korean = .806, r English = .831, r Mathematics = .784). Besides, the survey of Zeng and Zhou (2012) found that there is also a positive correlation between shadow education and academic achievement of Chinese students (r = .042).

However, some researchers do not agree with the research conclusion of the positive correlation between shadow education and academic achievement, pointing out that its positive effects are at most moderate (Kang, 2009; Kuan, 2011), and there is even a negative correlation, that is, the more shadow education, the worse the academic achievement (Cheo & Quah, 2015; Tang & Fu, 2007). Cheo and Quah (2015) found that there is a negative correlation between Singaporean middle school students' participation in shadow education and academic achievement (r = -.303); Tang and Fu (2007) surveyed 2868 fourth-grade and 3637 seventh-grade students in China, which also found that there is also a negative correlation between shadow education and academic achievement (r fourth grade = -.156, r seventh grade = -.208). Shadow education, which is characterized by advancement, indoctrination, and repetitive exercises, has no positive effect on cultivating students' thinking ability, which cannot improve students' academic achievement, and even has a negative effect (Zhang & Huang, 2014).

Based on prior studies, the direction of the effects of shadow education on academic achievements remains unclear. Therefore, we can only propose that shadow education will positively influence students' academic achievements for a moment. Our first hypothesis is as follows:

H1: Shadow education is positively correlated with students' academic achievements.

The relationship between time in shadow education and academic achievement

In recent years, shadow education has attracted widespread attention from researchers in pedagogy and sociology. However, the difference in researchers' perspectives has led to a different measurement range of shadow education. At present, under Bray's influence, the academic circles have unified attitudes towards the three characteristics of shadow education: "private, supplementary, and academic," but they have different understandings of shadow education. For example, Tang and Fu (2007) are based on the statistics of 1, 2, 3, 4, and 5 times a week or more. However, according to time, it is divided into short-term and long-term categories. Short-term time includes 1 to 2 hours, 3 to 4 hours and 5 hours or more per week (Choi, Calero & Escardibul, 2012) or 5 hours or less per week, 6 to 10 hours per week, 11 to 15 hours per week, 16 to 20 hours per week, 21 to 25 hours per week, and 26 to 30 hours per week (Tse, 2014), etc. are calculated every week. The long-term time includes nine consecutive months (Mischo & Haag, 2002), the past three years (Buchmann, 2002) and the past five years (Lee, Kim & Yoon, 2004), and other calculation units in months or years.

In terms of the length of time involved in shadow education and its specific impact on students' academic achievement, Liu (2012) based on the data of seventh-grade students in Taiwan, China,

and found that shadow education has a significant positive impact on students' analytical ability and mathematics performance, but the longer the participation, the smaller the positive effect. Hao (2016) used Chinese school curriculum and teaching survey data to study and found that the correlation between tutoring time and students' mathematics academic achievement is negative. Wang & Hao (2014) found that the time spent on extracurricular tutoring in Beijing's fifth-grade students was associated with different levels of academic achievement and other performance: students who took 2 to 3 hours and more than 3 hours of tutoring a week had significantly higher scores than those who did not take extracurricular tutoring; there is no significant difference between the results of students who take 1 to 2 hours of tutoring a week and those who do not participate intuition; the results of students who take 0 to 1 hour of tutoring a week are significantly lower than those of students who do not participate intuition.

Existing studies have mainly focused on the length of participation in shadow education, but the variable of when to participate in shadow education has not been involved. Therefore, this article includes when to participate in shadow education into the consideration of affecting students' academic achievement, and temporarily believes that the period of participation in shadow education is different, and the impact on students' academic achievement is also different. Therefore, our second research hypothesis is as follows:

H2: The length and period that students participate in shadow education significantly impact their academic achievements.

The relationship between shadow education and academic achievement subjects

The differences in the measurement of academic achievement mainly lie in the types of academic achievement, the subjects of academic achievement measurement, and whether academic achievement matches the subjects of shadow education.

From the perspective of academic achievement, it is mainly divided into three categories: national entrance examination scores, scores in large-scale tests, and subject scores in more formal examinations. For example, Aysit and Fatma (2005) use the 2002 college entrance examination results to sign academic achievement. The scores in the large-scale test include the total scores of English, mathematics, and science in the GCSE exam (Ireson & Rushforth, 2005), the 2004 College Aptitude Test (CSAT) in Korean, mathematics, and English (Kang, 2007), and the 2006PISA Achievements (Choi, Calero & Escardíbul, 2011; Ünala, Özkana, Miltonb, Priceb & Curvac, 2010) and other subjects in more formal examinations are based on the results of a particular exam to represent academic achievement (Lee, Kim & Yoon, 2004; Suryadarma & Sumarto, 2006).

From the perspective of academic achievement measurement subjects, some past studies have found that shadow education in liberal arts courses such as Chinese, Korean, and English is more related to academic achievement than shadow education in science courses such as mathematics and nature (Lee, Kim & Yoon, 2004; Tang & Fu, 2007). However, some studies prove that

shadow education participating in math and English courses are more related to academic achievement than shadow education participating in language courses (Zhang, 2001).

Whether academic achievement matches with shadow education subjects, only a small number of studies measured academic achievement matches with shadow education subjects (Aysit & Fatma, 2005; Lee, Kim & Yoon, 2004; Ireson & Rushforth, 2005). Most studies do not explain this, and there are even studies that directly show that the measured academic achievement does not match the subject of shadow education (Mischo & Haag, 2002).

Given this, this research will explore the relationship between participating in shadow education in different subjects and academic achievement in that subject and form a third research hypothesis:

H3: Participating in shadow education in different subjects has a significant impact on the related subjects' academic achievement.

Based on the above, based on the foundation and deficiencies of previous research, this article studies the impact of shadow education on students' academic achievement based on the time of participation in shadow education and the perspective of subjects, which uses the 2013-2014 China Education Panel Survey (CEPS) database for empirical testing, providing China's experience and exploring possible mechanisms. The contribution and innovation of this article are: first, this article studies the relationship between student shadow education participation and academic achievement from a micro perspective, which will add the existing research on shadow education and student academic achievement; secondly, this article analyzes the mechanism of the effect of shadow education participation time on students' academic achievement, especially the variable time selection, which provides a new perspective for studying the influence of shadow education time on students' academic achievement; third, while studying the impact of shadow education on student performance, this article also focuses on subject issues, and discusses the impact of shadow education on students' academic achievement from shadow education in different subjects, in order to provide a policy basis for future education reforms.

RESEARCH METHOD

Data

This article uses the "China Education Panel Survey" (CEPS) conducted by the National Survey Research Center at Renmin University of China (NSRC) in 2013 and 2014. The survey involved 112 schools nationwide, 438 classes, and about 20,000 students, parents, teachers, and school leaders. The survey started with two cohorts of the first grade of junior high school (grade 7) and the third grade (grade 9) of junior high school. The population's average education level and the proportion of the floating population were used as stratified variables. Twenty-eight county-level

units (counties, districts, and cities) were randomly selected from the whole country as survey points. This paper selects the student baseline and eliminates relevant invalid samples to obtain 13,993 valid junior high school samples.

Variables

Shadow education time

One of this article's core explanatory variables is the length of time students participate in shadow education, including whether to participate in tutoring classes and the length of time they participate in tutoring in one week. The duration of one-week participation in tutoring is a specific quantitative time. Also, explanatory variables include the period during which students participate in shadow education, including whether to participate in tutoring classes from Monday to Friday, whether to participate in tutoring classes on weekends, and whether to participate in tutoring classes during holidays. The value of students participating in the tutoring class is 1, and the value of not participating in tutoring classes is 0. In selecting the period for participating in shadow education, to control the mutual influence between participating in shadow education from Monday to Friday and participating in weekends, the sample of students who participated in shadow education at the same time from Monday to Friday and weekends was deleted.

Shadow education subjects

Another core explanatory variable in this article is how students participate in shadow education, including whether to participate in Chinese tuition, whether to participate in Mathematics tuition, whether to participate in English tuition, etc. If the student participates, it is one, and if not, it is 0.

Student academic achievement

The dependent variable used in this article is the student's academic achievement, explicitly using the student's initial 2013 mid-term exam results (language, mathematics, English). The survey data itself has been standardized, so the revised standardized scores (mean value 70, standard deviation 10) of the students in the 2013 midterm exam were used as the dependent variable.

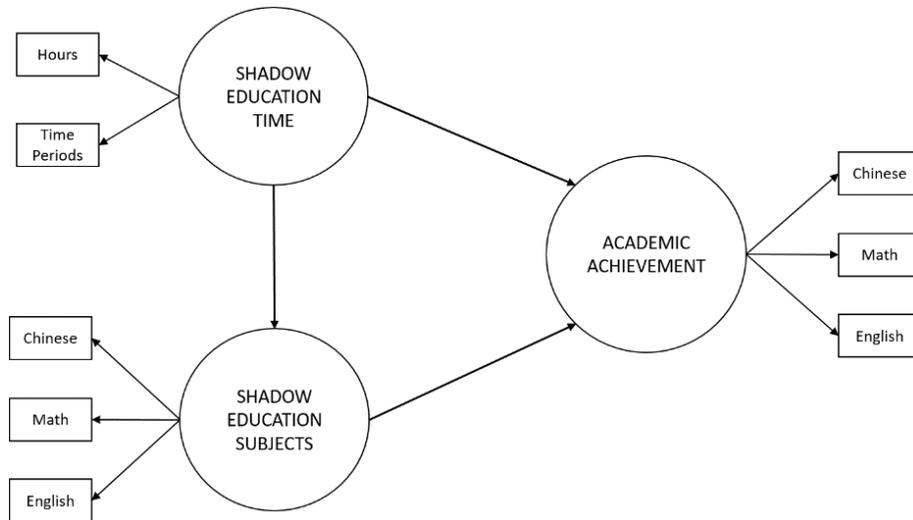


Fig.1 Research model in this study

Analysis method

This study's data used ordinary least squares (OLS) regression to explore the influence of the time and subjects involved in shadow education on students' academic achievement. The results of the survey were processed by Stata (version 14.0) software.

DATA ANALYSIS AND RESULTS

Descriptive statistics of variables

The definitions and descriptive statistics of explanatory variables and their dependent variables in this article are shown in Table 1.

Table 1 Variable descriptive statistics table (N=13993)

Variable	Me \bar{x}	SD
Standardized total score	211.1	24.15
Standardized Chinese scores	70.5	9.55
Standardized Mathematics scores	70.4	9.72
Standardized English scores	70.5	9.65
Whether to participate in shadow education	0.5	0.50
The length of time to participate in shadow education each week	1.2	2.61
Whether to participate in shadow education from Monday to Friday	0.0	0.12
Whether to participate in shadow education on weekends	0.1	0.39
Whether to participate in shadow education during holidays	0.3	0.47
Participate in shadow education in Chinese	0.1	0.31
Participate in shadow education in Mathematics	0.2	0.39
Participate in shadow education in English	0.2	0.42

Table 1 Variable descriptive statistics table (N=13993)

Analysis of academic achievement

The average standardized achievement of students participating in shadow education is 211.94, and the standardized Chinese, Mathematics, and English achievements are 70.56, 70.48, and 70.58, respectively. Besides, the number of people participating in extracurricular tutoring accounted for 54.23% of the total, of which the number of participants in English tuition accounted for the largest proportion, accounting for 22.99% of the total, followed by Mathematics at 19.71%, and the lowest proportion was Chinese at 11%. In terms of the relationship between participation in shadow education and students' academic achievement, participation in extracurricular tutoring is positively correlated with students' academic achievement, and it is significant at the 1% level. Students who participate in shadow education have higher academic achievements than students who do not participate in shadow education out of 2.83 points.

Analysis of shadow education time

According to the length of time involved in shadow education, the length of extracurricular tutoring is negatively correlated with the student's academic achievement ($r=-.33$), and it is significant at the 1% level of significance, which means that the longer the tuition time after class, the better the results. Instead, it drops.

According to the period of participating in shadow education, students participating in shadow education from Monday to Friday reduced their academic performance by 6.77 points, which is significant at a significant level of 1%; students participating in shadow education on weekends improved their academic performance by 3.70 points, which was significant at the 1% level; students participating in shadow education on weekends improved their academic performance by 4.48 points, which was significant at the 1% level. Meaning that students participating in shadow education from Monday to Friday will reduce their academic achievement, and participating in shadow education on weekends or holidays will increase academic achievement. The participation period of shadow education has a "time choice" effect on students' academic achievement changes.

Analysis of shadow education subjects

Students to participate in Chinese, Mathematics, and English subjects were influential in their academic achievement. However, shadow education of different subjects shows different directions and significance. Among them, students can significantly improve their performance in English by participating in extracurricular tutoring in English ($r=.1.58$), which is significant at the 1% significance level; students can significantly improve their performance in Mathematics by participating in extracurricular tutoring in Mathematics ($r=.1.9$), which is significant at the 5%

significance level. On the contrary, students participating in Chinese shadow education will reduce Chinese performance ($r=-.07$), but the significance of this result is low.

Analysis of shadow education time and subjects

From the perspective of the length of participation in shadow education, the length of participation in extracurricular tutoring is negatively correlated with students' Chinese ($r=-.09$), mathematics ($r=-.14$) and English academic achievement ($r=-.10$), which at the significance levels of 5%, 1%, and 5%, respectively.

From the perspective of the period of participation in shadow education, participation in shadow education on weekends has the most significant improvement in academic achievement in English subjects ($r=0.68$), followed by mathematics ($r=.58$) and Chinese ($r=0.32$). Participating in shadow education during the holidays has the most significant improvement in academic achievement in mathematics subjects ($r=0.77$), followed by English ($r=.55$) and Chinese ($r=0.49$). This is consistent with the effect of participation in shadow education on students' academic achievement.

DISCUSSION AND CONCLUSION

This article uses data from the China Education Panel Survey (CEPS2013-2014) and uses ordinary least squares (OLS) regression to analyze the impact of the time and subjects involved in shadow education on students' academic achievement. The main research conclusions are as follows:

First, more than half of junior high school students in China have participated in shadow education. Overall, participating in shadow education can improve students' academic achievement to a certain extent, but there is not much difference between the scores of students participating in shadow education and those not participating in shadow education. Second, from the perspective of the length of time involved in shadow education, appropriate extracurricular tutoring can promote students' academic achievement, but the performance beyond the threshold will decrease. From the perspective of participation in shadow education, participating in shadow education on weekends and holidays can improve students' academic achievements; but participating in shadow education from Monday to Friday will reduce students' academic achievements. Third, Chinese junior high school students participating in extracurricular English tutoring can significantly improve their English scores, and participating in Mathematics tutoring can also promote Mathematics scores. This improvement effect is significant and cheerful, but increasing Chinese tutoring participation is beneficial to students' Chinese performance negatively. Fourth, in combination with time and subjects, participating in English subjects on weekends has the most significant improvement in students' English academic achievement. In

contrast, participation in math subjects during holidays has the most significant improvement in students' academic achievement in mathematics.

The empirical data from the China Education Panel Survey (CEPS) shows that participating in shadow education for junior high school students can improve their academic achievements. However, it is still more dependent on the length of time they participate in shadow education, when they participate in shadow education, and what subjects they participate in shadow education. Based on this, the government and schools need to give more care to disadvantaged groups of students who cannot afford shadow education on their own, such as migrant students and students with low-income family economic conditions. According to the students' academic situation and family conditions, increase the supply of free shadow education opportunities to achieve the effect of improving academic performance and narrowing the performance gap, and achieving the equalization of educational results to a certain extent. In addition, junior high school students should focus on the learning tasks assigned by the school teacher from Monday to Friday. For students who are able to participate in shadow education, they can choose to participate in shadow education on weekends or holidays, and the participation time should be controlled within a reasonable range. This not only improves academic performance, but does not increase the academic burden of students too much. Finally, based on the characteristics of English and Mathematics subjects, extracurricular tutoring can provide short-term, large-scale and specialized training for students' problem-solving ideas and examination questions, and participating in shadow education can effectively improve students' math performance. This is more obvious in English subjects than in mathematics, and weekends can be used to improve students' academic achievement in a short time. Mathematics subjects are suitable for intensive training for a relatively long time, such as a holiday. In contrast, the Chinese require the long-term accumulation of cultural knowledge, so Chinese extracurricular tutoring does not effectively play a role in cultivating good students and making up for the poor. Therefore, when parents and students participate in shadow education, they should have appropriate subject awareness and choose the corresponding tuition subjects at the appropriate time.

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