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COMMENTARY

Qualitative Comparative Analysis (QCA): An Innovative Approach for Integrating Qualitative and Quantitative Analysis

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> *"Such highly qualitative leadership is demanded especially in the realm of the fostering of right international relations. Here the demand is simply irresistible."*
>
> *–John Raleigh Mott*

EDUCATIONAL research has long used quantitative and qualitative analysis. Quantitative analysis is the process of quantifying things through the use of numbers, which represent quantifiable characteristics of things such as scale, speed, and degree, as well as the spatial arrangement of their constituents (Yang, 1995). Qualitative analysis is the polar opposite, i.e., evaluating things on the basis of their quality rather than their quantity. A thing's quality refers to its normative nature, which distinguishes it from other things (Li, 1997). Simply put, quantitative analysis focuses on the "what" and employs numerical expressions to depict a given reality, whereas qualitative analysis aims to comprehend the "why" and investigates how we describe something.

Qualitative and quantitative analysis, on the other hand, each have their own set of advantages and disadvantages. Qualitative analysis enables us to delve deeply into the subject under investigation. It is frequently criticized for its ambiguity and uncertainty, as well as its susceptibility to analyst subjectivity, because it is based on relatively small sample sizes and specific cases rather than on random selection and extensive sampling (Sun, 2005). In

comparison, quantitative analysis is appropriate for large-scale investigations and frequently produces informative results (Zeng, 2000); it is performed with a high degree of standardization and is less susceptible to analyst bias. On the other hand, quantitative analysis has a limited depth of inquiry and its results are subject to the influence of social factors.

Ragin develops qualitative comparative analysis (QCA) to bridge the divide between qualitative and quantitative analysis. QCA allows for more flexibility in sample selection in response to the uniqueness of each case; it is more focused on the sufficient and necessary conditions for a research result; and it prioritizes investigating the combinatorial factors underlying a social phenomenon.QCA is a collection of three fundamental techniques: fussy set QCA (fsQCA), crisp set QCA (csQCA), and multi-value QCA (mvQCA). By establishing sufficient and necessary relationships between explanatory and outcome variables, researchers can investigate the multifactor combinations influencing a particular case using fsQCA (Ragin & Pennings, 2005).

The Effects of Class Teachers' Leadership and Personal Characteristics on Student Academic Performance: A Qualitative Comparative Analysis of Fuzzy Sets The article Citing H Middle School as a Case Study in this issue examines 24 grade seven classes at Lianyungang H Middle School. It employs fsQCA to examine the effects of differential combinations of factors on student academic performance, including class teacher characteristics and leadership behavior, by creating truth tables and performing necessary computations. The primary objective of this study is to determine the effect of class teachers' leadership behaviors on student academic achievement and to provide useful guidelines for school administrators in selecting appropriate class teachers (Zhao & Zhang, 2022).

We can draw the following conclusions from the study: i) Democratic class teacher leadership is effective in class management and popular with students; ii) Class teacher tenure is detrimental to student academic performance improvement; iii) Class teachers with a high capacity for democratic leadership can make a significant difference in student academic achievement; iv) The effect of class teachers' marital status and gender on student academic results varies depending on their specific combinations with other factors (Zhao & Zhang, 2022).

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ORIGINAL ARTICLE

The Influence of Class Teachers' Leadership Behavior and Personal Characteristics on Student Academic Performance: A Study of Fuzzy Set Qualitative Comparative Analysis Citing H Middle School as a Case Study

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Abstract. *Leadership behavior of classroom teachers has a significant impact on students' academic success. However, little empirical research on this subject has been undertaken in China. By developing truth tables and doing necessary computations, this study examines the influence of differential combinations of parameters connected to class teachers' qualities and leadership behavior on student academic performance. It has been discovered that the democratic leadership behavior displayed by class teachers is the most popular among students and is helpful to student academic achievement; the numerous combinations of linked characteristics have varying effects on student academic performance. The study compensates for a dearth of empirical research on the subject and sheds light on the process by which class teacher leadership influences student academic progress.*

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Keywords*: Leadership Behavior, Academic Performance, Class Teacher, Class Management, Qualitative Comparative Analysis*

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Conflict of Interests*: None.*

Literature Review and Questions

China has been adopting the class teacher system throughout the country since 1949. In China, a class teacher is expected to oversee both the overall management of the class and the teaching of a single subject. Each class teacher applies their own distinctive leadership style to student management. Teacher leadership behavior has long been a source of contention in Western countries, coining the term "Teacher Leadership" in educational literature in the 1950s (Lieberman & Miler, 2004). Lambert and Harris (2003) argue that teacher leadership's objective is to help and encourage students to acquire self-directed learning skills. Wu and Dai (2008) assert that teachers provide an example for pupils and influence them through their excellent moral character and knowledge. After reviewing prior research on teacher leadership, this study defines class teacher leadership as the all-encompassing effect a teacher can exert on students through the integration of personal teaching experience, expertise, teaching skills, and class management competence.

Based on the fundamental variable of "power," Lewin, an American management scientist, divides teacher leadership into three categories: democratic, autocratic, and laissez-faire (Lewin, White, & Lippitt, 1939). Silins and Mulfold find that extensive follow-up research indicates that teacher leadership is directly related to student academic progress (Mulford & Kendall, 2004). According to Wu's research, laissez-faire leadership is detrimental to student academic attainment, but democratic and autocratic leadership are good. However, further analysis reveals that the benefit of autocratic leadership is limited to the current course, whereas democratic leadership contributes to the overall learning of students (Wu & Chen, 1978).

There is a debate regarding whether the personal attributes of teachers have an effect on student academic progress. Huang and Xin (2007) conducted a study to demonstrate that gender, duration of service, educational level, discipline, and qualifications of teachers have no significant effect on student academic performance. Nonetheless, Zhang and her colleagues report that student academic achievement varies by class and that teachers' gender, length of service, commitments, and suitability of their disciplines for their posts all contribute significantly to student academic achievement after conducting a study of the influence of teachers' personal characteristics on student school results using hierarchical linear modeling and extensive survey data on student academic achievement (Zhang, 2012).

Due to the diversity of class management systems in other countries and in Taiwan, the majority of research on this topic focuses on teacher leadership rather than class teacher leadership. While discussions on class teacher leadership are prevalent on the mainland, most of them are theoretical in nature. The scant amount of extant empirical research mostly uses regression analysis to analyze the association between class teacher leadership and student academic achievement, excluding multi-angle examinations of significant elements in various combinations. Given that academic achievement is not only a reflection of students' efforts in learning but also of the effectiveness of class management and teacher leadership behavior (Zhu, 2008), investigations into the influencing mechanisms of various combinations of relevant factors are critical for class management and teaching efficiency improvement. To accomplish this, we use fuzzy

set qualitative comparative analysis (fsQCA) to examine the terminal exam results of 24 grade seven classes at Lianyungang H Middle School and, using truth tables, summarize the influencing mechanisms of various combinations of class teachers' personal characteristics and leadership behavior.

Research Design

Investigation Subjects and Processes

The subjects of the research are class teachers and students from 24 seventh-grade classes at Lianyungang H Middle School. H Middle School, a nine-year private boarding school, has long been ranked first in the district in terms of student academic achievement, despite the fact that its tangible and intangible conditions are not up to par with those at other district schools. Additionally, students at this school come from typical socioeconomic families and are entitled to more time for sports and recreation than their peers at other schools. Thus, the school's academic advantage cannot be explained solely by resource advantages and students' time investment in studying. We make the cautious assumption that the lead originates from the school's distinctive management methods and culture.

In April 2019, we performed two four-day investigations into the school life of students and the routine administration of class teachers at H Middle School. To confirm the validity of our findings, we used two cameras to capture classroom observations and as many instances of teacher-student interaction as feasible. To ascertain the leadership styles of the 24 class teachers, 1,293 questionnaires were sent to all seventh-grade students, and 1,105 effective ones were extracted after screening. Additionally, we interviewed the 24 class teachers to elicit additional demographic characteristics and examples of good classroom management and instruction. The studies enabled us to comprehend the school's distinctive management practices and culture, as well as to gather data for our subsequent examination of the school's academic accomplishment advantage.

We collect the average scores on each class's second semester terminal exams and utilize them as a dependent variable in this study. Each academic year, the institution reorganizes its classes. To maintain equity, the school makes an effort to balance students' average academic levels and the overall strength of the teachers assigned to each class. However, each class may have only one class teacher, and they may differ, providing an ideal control situation and enabling us to conduct important studies of the correlations between class teachers' qualities and student academic attainment using a consistent baseline.

Research Instruments and Methodology

The Teacher Leadership Behavior Questionnaire (hereinafter referred to as the TLBQ) was developed by Professor Wu of Taiwan Normal University for the purpose of assessing seventh graders' perceived and expected classroom teacher leadership behavior. This questionnaire is a customized scale of teacher leadership behavior developed by Wu in consultation with Lewis' theory of leadership behavior (Wu & Chen, 1978). The

scale is a highly reliable and valid instrument that has gained widespread acceptance in academia. This scale has been cited in over 2000 publications as a research instrument.

Professor Wu approved the questionnaire's use in this study and the investigation's findings. Our questionnaire divides class teacher leadership behavior into three categories: democratic, autocratic, and laissez-faire leadership, each of which is comprised of 20 questions. Each question has a score associated with it if the answer is "yes," but not if the answer is "no." The total scores for each category include both perceived and expected class teacher leadership behavior. The category that receives the highest scores is the leadership style that the class teacher is supposed to exhibit.

As mentioned previously, the predominant methodology used in current empirical studies of teacher leadership is correlation analysis based on regression techniques, which makes it difficult to conduct a detailed analysis of the combinatorial factors and influencing mechanisms affecting the effects of teachers' personal characteristics and leadership behavior on student academic performance. The current study attempts to compensate for this shortcoming by utilizing qualitative comparative analysis (QCA), a method of research pioneered by Ragin, a sociologist, in 1980. The purpose of this method is to derive combinations of correlated factors from case studies using truth tables (Du, 2017). In comparison to regression analysis, QCA is more focused on the sufficient and necessary conditions necessary for the achievement of a research result and is less susceptible to the negative effects of autocorrelation and multicollinearity. Additionally, QCA places a premium on examining the combinatorial factors underlying a social phenomenon. As a result, it has been applied in a wide variety of fields in China and other countries, including sociology, political science, and managerial economics. However, QCA is almost entirely absent from educational research in China. As a result, it should garner increased interest from the Chinese educational community.

QCA is composed of three fundamental techniques: fussy set QCA (fsQCA), crisp set QCA (csQCA), and multi-value QCA (mvQCA). Considering the sample size, this study opts for fsQCA as the primary technique. By establishing sufficient and necessary relationships between explanatory and outcome variables, researchers can investigate the multifactor combinations influencing a particular case using fsQCA (Ragin & Pennings, 2005). A specific result is believed to be the result of a number of influencing factors, and the purpose of fsQCA is to define the causal relationship between the relevant influencing factors and the specific result. In fsQCA, a case can be thought of as a collection of conditions and results. By examining the effects of various combinations of conditions on the results, researchers can determine which conditions are sufficient and which are necessary for the outcome variables (Ragin, 2009). fsQCA examines the relationship between explanatory and outcome variables using consistency and coverage indicators. Using consistency indicators, we can determine whether an explanatory variable is a sufficient or necessary condition. Typically, when the consistency of the explanatory variable exceeds 0.8, it can be considered a sufficient condition for the outcome variable. When the explanatory variable's consistency is greater than 0.9, it is considered a necessary condition for the outcome variable. After determining the consistency of the results, the coverage indicator is used to determine the degree of explanation for a combination of causal factors (Gao et al., 2018).

Selection and Treatment of Variables

Academic achievement is influenced by a variety of factors. Based on the analysis of the existing literature and sample, this study selects five condition variables, or independent variables, among which class teachers' leadership behavior is the most important. The four demographic characteristic variables are class teachers' gender, subject, length of service, and marital status. The average of each class's scores is used as the outcome variable, or dependent variable.

We collect data on the independent variables via questionnaires and in-depth interviews. The application of Wu's TLBQ yields data on the leadership behavior of 24 class teachers in grade seven at H middle school (**Table 1**), indicating that all of them practice democratic leadership, albeit at varying levels of proficiency. This is a completely unexpected result that has never been observed in any of our previous studies. In class, we always encountered a certain number of teachers exhibiting autocratic leadership behavior in the schools we investigated previously. Autocratic leadership is even prevalent among class teachers in some schools. According to our interviews, the majority of the 24 class teachers at H Middle School is relatively young and has enjoyed harmonious relationships with their students. As a result, we assume that democratic leadership behavior on the part of class teachers results in fruitful teacher-student relationships. Additionally, prior research indicates that harmonious teacher-student relationships are critical for increasing student academic achievement (Zhou, Gu, & Yao, 2018). Given this, we propose another hypothesis: that class management under democratic leadership contributes to H Middle School's position as the district's top performer in terms of student academic achievement.

The A-E difference refers to the score difference between the actual and expected values for each category of class teacher leadership behavior in **Table 1**. A positive A-E difference indicates that the class teacher's actual leadership behavior exceeds students' expectations in this category, whereas a negative A-E difference indicates that the class teacher's actual leadership behavior falls short of students' expectations. Interestingly, despite the fact that all 24 class teachers receive the highest score for democratic leadership behavior, the majority of classes report a negative A-E difference for this category, indicating that despite democratic leadership behavior's predominance in class management in grade seven, it has fallen short of students' expectations. Students anticipate that their teachers will conduct class management in a more democratic manner.

Variables are coded as shown in **Table 2** for ease of expression in the following discussion.

Empirical Analysis and Discussion

Calibration of Variables

Calibration of variables is a critical step in qualitative comparative analysis, but is not required in regression analysis. Calibration of continuous variables is carried out in fsQCA in order to convert them to membership scores between 0 and 1 (Pan, 2018). Calibration anchors should be chosen with regard to the study's theoretical principles and sample data distribution. Typically, the 10% quantile, 20% quantile, and upper quantile serve as candidates for the first anchor, the mean and median values serve as

Table 1. The results of Class Teacher Leadership Behavior Questionnaire.

Class	Types of Value	Autocratic	Laissez-Faire	Demo-Cratic
1	Actual value	412	149	783
	Expectation value	326	208	821
	A-E difference	86	-59	-38
2	Actual value	289	53	692
	Expectation value	227	90	727
	A-E difference	62	-37	-35
3	Actual value	404	83	768
	Expectation value	240	168	843
	A-E difference	164	-85	-75
4	Actual value	500	87	737
	Expectation value	297	192	860
	A-E difference	203	-105	-123
5	Actual value	310	85	616
	Expectation value	240	185	742
	A-E difference	70	-100	-126
6	Actual value	481	201	865
	Expectation value	405	306	890
	A-E difference	76	-105	-25
7	Actual value	375	115	914
	Expectation value	330	135	904
	A-E difference	45	-20	10
8	Actual value	433	126	972
	Expectation value	342	199	1004
	A-E difference	91	-73	-32
9	Actual value	529	230	799
	Expectation value	429	258	851
	A-E difference	100	-28	-52
10	Actual value	598	90	758
	Expectation value	291	202	986
	A-E difference	307	-112	-228
11	Actual value	640	83	711
	Expectation value	335	191	972
	A-E difference	305	-108	-261
12	Actual value	519	125	905
	Expectation value	348	174	997
	A-E difference	171	-49	-92
13	Actual value	366	92	902
	Expectation value	298	129	934
	A-E difference	68	-37	-32
14	Actual value	436	120	869
	Expectation value	253	171	1027
	A-E difference	183	-51	-158
15	Actual value	335	75	875
	Expectation value	255	147	914
	A-E difference	80	-72	-39

16	Actual value	429	239	857
	Expectation value	361	280	838
	A-E difference	68	-41	19
17	Actual value	444	93	838
	Expectation value	248	165	901
	A-E difference	196	-72	-63
18	Actual value	431	85	984
	Expectation value	355	144	1004
	A-E difference	76	-59	-20
19	Actual value	518	97	916
	Expectation value	340	200	961
	A-E difference	178	-103	-45
20	Actual value	365	103	990
	Expectation value	291	139	984
	A-E difference	74	-36	6
21	Actual value	378	110	903
	Expectation value	306	166	926
	A-E difference	72	-56	-23
22	Actual value	351	137	892
	Expectation value	313	189	919
	A-E difference	38	-52	-27
23	Actual value	519	157	657
	Expectation value	281	225	893
	A-E difference	238	-68	-236
24	Actual value	457	140	657
	Expectation value	349	181	824
	A-E difference	108	-41	21

Table 2. Variable Coding and Descriptions.

Types of Variables	**Variables**	**Variable Codes**	**Meaning And Descriptions**
Condition Variables	Leadership behavior	DEMOCRACY	Level of democracy (low,medium, high)
	Gender	GENDER	male/female
	Subject	SUBJECT	Key subject/non-key subject
	Length of teaching	Length	Length of teaching (short, medium, high)
	Marital status	MARRIAGE	Married/unmarried
Outcome Variable	Average scores of each class	SCORE	Average scores (low, medium, high)

Table 3. Quantile Analysis of Continuous Variables.

		Average Scores	Levels of Democracy	Length of Teaching
N	Valid	24	24	24
	Missing	0	0	0
Mean values		556.83	0.60	2.38
Median values		559.95	0.60	1.00
Percentiles	10	541.15	0.55	1.00
	20	551.20	0.58	1.00
	25	552.20	0.59	1.00
	30	553.90	0.59	1.00
	50	559.95	0.60	1.00
	70	562.30	0.61	2.50
	75	563.08	0.61	3.00
	80	563.50	0.61	4.00
	90	566.35	0.62	6.00

Data source: Output results by software SPSS.

Table 4. Calibration Anchors for All Variables.

		Anchors		
Variable Types	**Variables**	**Full Non-membership**	**Median Point**	**Full Membership**
Condition variables	DEMOCRACY	0.5	0.60	0.62
	GENDER	0.00		1.00
	SUBJECT	0.00		1.00
	LENGTH	1.00	2.38	6.00
	MARRIAGE	0.00		1.00
Outcome variable	SCORE	541.15	556.83	566.35

Data source: Analysis results by software SPSS.

candidates for the second anchor, and the 90% quantile, 80% quantile, and lower quantile serve as candidates for the third anchor (Ragin, 2014). **Table 3** illustrates the quantiles of variables in the current study.

Based on the characteristics of the sample data distribution in this study, we chose the 10% quantile, the mean, and the 90% quantile as the first, second, and third anchors, respectively. The calibration anchors for each variable are illustrated in **Table 4**.

Except for the three dichotomous variables (GENDER, SUBJECT, and MARRIAGE), the other three raw variables (DEMOCRACY, LENGTH, and SCORE) must be calibrated and converted to membership scores in the range of 0 to 1. Democracyfz,

lengthfz, and scorefz are the regenerated codes that represent them. The following are the calibration formulas for the three variables:

(1) democracyfz = calibrate (DEMORACY, 0.549792, 0.595870, 0.619352)
(2) lengthfz = calibrate (LENGTH, 1, 2.38, 6)
(3) scorefz = calibrate (SCORE, 541.150, 556.825, 566.350)

Following calibration, all variables are represented by membership scores ranging from 0 to 1, as illustrated in **Table 5**.

Truth Tables

Ragin suggests that a consistency threshold of 0.75 is the "minimum requirement" for admission, 0.8 is "acceptable," and 0.85 is "very acceptable" (Ragin, 2005). We define the consistency threshold as 0.8 and the frequency threshold as 1, after consulting Ragin's research and examining the distribution characteristics of the sample cases included in this study (Du, 2017). When a case meets the consistency threshold of greater than 0.8, the outcome variable "average score" is coded as 1 (scorefz = 1). Otherwise, it is represented by the value 0 (scorefz = 0). "Scorefz = 1" indicates academic performance improvement; "Scorefz = 0" indicates academic performance decline. The distribution of truth tables for improved and degraded academic performance is shown in **Tables 6** and **7**.

Analytical Results

Empirical analysis using fsQCA generates three types of solutions: complex, intermediate, and parsimonious. In a complex solution, configurations do not undergo simplification, resulting in the greatest number of factor combinations. When a complex solution is incorporated into the path analysis process, the results become extremely intricate. In comparison, the process of simplification inherent in the parsimonious solution tends to include all logical remainders without evaluating their validity, resulting in a simplified solution that is likely to be inconsistent with theories or actualities; another consequence is that it may eliminate numerous indispensable and necessary conditions. Whereas the intermediate solution, based on the researcher's theoretical and practical knowledge, will incorporate the relevant logical remainder into the results. In comparison to complex and parsimonious solutions, the intermediate solution has a significant advantage in that it prevents the elimination of necessary conditions, that is, any superset integral to the result and relevant necessary conditions (Du, 2017). fsQCA 3.0, designed by Ragin et al., was used to process the data in this article. **Tables 8** and **9** illustrate the intermediate solutions to the empirical analysis of improved and degraded student academic achievement.

According to **Table 8**, teachers can positively influence student academic achievement via three distinct pathways, with an overall consistency of 0.89. The first configuration (~lengthfz * MARRIAGE * SUBJECT) indicates that a married class teacher in charge of a key subject (in the context of China's basic education, dominant subjects such as mathematics, Chinese, English, physics, and chemistry are referred to as "key subjects," while others are referred to as "non-key subjects") and with a short

Table 5. Membership Scores of the Set after Variable Calibration.

Classes	Average Scores	Levels of Democracy	Gender	Subjects	Lengths of Teaching	Marital Status
CASEID	scorefz	democracyfz	GENDER	SUBJECT	lengthfz	MARRIAGE
Class1	0.81	0.38	0.00	1.00	0.30	0.00
Class2	0.96	0.47	0.00	1.00	0.05	0.00
Class3	0.87	0.91	0.00	1.00	0.30	1.00
Class4	0.77	0.72	1.00	0.00	0.79	1.00
Class5	0.68	0.69	1.00	1.00	0.79	1.00
Class6	0.89	0.63	0.00	1.00	0.05	0.00
Class7	0.44	0.79	1.00	0.00	0.99	1.00
Class8	0.50	0.89	0.00	1.00	0.05	0.00
Class9	0.88	0.95	0.00	0.00	0.63	0.00
Class10	0.35	0.95	0.00	1.00	0.63	0.00
Class11	0.82	0.96	1.00	1.00	0.05	1.00
Class12	0.98	0.94	0.00	1.00	0.05	0.00
Class13	0.78	0.90	0.00	1.00	0.05	0.00
Class14	0.64	0.79	0.00	1.00	0.05	1.00
Class15	0.13	0.64	0.00	0.00	0.05	0.00
Class16	0.12	0.53	1.00	0.00	0.79	1.00
Class17	0.01	0.73	0.00	1.00	0.05	0.00
Class18	0.37	0.53	1.00	0.00	1.00	1.00
Class19	0.02	0.45	0.00	1.00	0.05	0.00
Class20	0.77	0.27	1.00	1.00	0.05	1.00
Class21	0.95	0.22	0.00	1.00	0.05	1.00
Class22	0.93	0.05	0.00	1.00	0.05	0.00
Class23	0.27	0.04	0.00	0.00	0.05	0.00
Class24	0.25	0.02	1.00	0.00	0.30	0.00

Data source: Results processed by software fsQCA.

Table 6. The Truth Table for Improved Academic Results When Scorefz = 1.

Ideal Cases	Level of Democracy	Length of Teaching	Marital Status	Subject	Gender	Number of Cases with Membership Score > 0.5	Con-sistency
Class 9	1	1	0	0	0	1	1.00
Class 21	0	0	1	1	0	1	1.00
Class 20	0	0	1	1	1	1	1.00
Class 5	1	1	1	1	1	1	0.99
Class 3 & 14	1	0	1	1	0	2	0.91
Class 11	1	0	1	1	1	1	0.91

Data source: Results processed by software fsQCA.

Table 7. The Truth Table for Degraded Academic Results When Scorefz = 0.

Ideal Cases	Level of Democracy	Length of Teaching	Marital Status	Subject	Gender	Number of Cases with Membership Score > 0.5	Consistency
Class 1, 2, 19, & 22	0	0	0	1	0	4	0.78
Class 10	1	0	0	1	0	1	0.74
Class 6, 8, 12,13 & 17	1	0	0	1	0	5	0.71
Class 4, 7, 16, & 18	1	1	1	0	1	4	0.64
Class 15	1	0	0	0	0	1	0.51
Class 24	0	0	0	0	1	1	0.36
Class 23	0	0	0	0	0	1	0.33

Data source: Results processed by software fsQCA.

Table 8. Empirical Analysis of Improved Student Academic Achievement When Scorefz = 1.

Configuration	Raw Coverage	Unique Coverage	Consistency
~lengthfz*MARRIAGE*SUBJECT	0.29	0.20	0.87
democracyfz*lengthfz* ~MARRIAGE*~SUBJECT*~GENDER	0.05	0.05	1.00
democracyfz*MARRIAGE*SUBJECT*GENDER	0.12	0.03	0.92
Solution Coverage: 0.37			
Solution Consistency: 0.89			

Data source: Results processed by software fsQCA.

Table 9. Empirical Analysis of Degraded Student Academic Achievement When Scorefz = 0.

Configuration	Raw Coverage	Unique Coverage	Consistency
~lengthfz*~MARRIAGE*~GENDER	0.48	0.16	0.67
~democracyfz*~lengthfz*~MARRIAGE*~SUBJECT	0.05	0.02	0.34
democracyfz*lengthfz*MARRIAGE*GENDER	0.29	0.00	0.64
democracyfz*lengthfz*MARRIAGE* ~SUBJECT*GENDER	0.12	0.12	0.64
Solution Coverage:0.62			
Solution Consistency: 0.59			

Data source: Results processed by software fsQCA.

tenure is beneficial for improving student academic performance. The second configuration (democracyfz * lengthfz * ~MARRIAGE * ~SUBJECT * ~GENDER) implies that an unmarried female class teacher who has taught a non-core subject for many years and possesses supreme democratic leadership capability can help raise student academic achievement. Configuration three (democracyfz * MARRIAGE * SUBJECT * GENDER) demonstrates that a married male class teacher in charge of a critical subject and possessing a high capacity for democratic leadership has a beneficial effect on student academic attainment.

As per **Table 9**, teachers can have a negative effect on students' academic achievement in four ways, with an overall consistency of 0.59. The first configuration (~lengthfz * ~MARRIAGE * ~GENDER) indicates that an unmarried female class teacher with a short tenure has a detrimental effect on student academic performance. Configuration two (~democracyfz * ~lengthfz * ~MARRIAGE * ~SUBJECT) indicates that an unmarried class teacher with a low capacity for democratic leadership, a short tenure, and responsibility for a non-core subject can have a detrimental effect on student academic achievement. Configuration three (democracyfz * lengthfz * MARRIAGE * GENDER) implies that a married male class teacher with a high capacity for democratic leadership and oversight of a critical subject may be detrimental to student academic achievement. Configuration four (democracyfz * lengthfz * MARRIAGE * ~SUBJECT * GENDER) suggests that a married male class teacher with a strong capacity for democratic leadership and extensive experience teaching a non-core subject may have a negative impact on student academic achievement.

Discussions

The empirical findings in **Tables 8** and **9** indicate that seven distinct combinations of factors are associated with student academic performance. We discover that the variable "democracy level" is included in every combination, regardless of whether it is associated with increased or decreased academic achievement. As a result, we can conclude that the influence of classroom teachers' democratic leadership behavior on student academic performance is contingent upon additional factors. It varies depending on the unique combination of conditions.

In terms of other variables, the marital status and length of service of class teachers have a significant effect on student academic performance. Unmarried class teachers with relatively short tenures exhibit insufficient maturity and consistency in their leadership behavior. As a result, they are unable to communicate with students as effectively as married class teachers with extensive teaching experience. This may have a detrimental effect on students' academic performance. Additionally, different combinations of gender and leadership behavior have varying effects on student academic performance. Related configurations indicate that female class teachers with a high capacity for democratic leadership have a greater positive effect on student academic performance than their male counterparts, which may be explained by gender characteristics such as caution and rigor.

fsQCA is the primary methodology used in this study. It circumvents the sample size constraints inherent in quantitative and qualitative analysis and compensates for the shortcomings of traditional causality analysis. In traditional qualitative research,

findings are derived solely from questionnaires and superficial interviews conducted following observations and are almost certainly influenced by the researchers' subjectivity, making it difficult to conduct in-depth analysis of the issue's inherent mechanisms. On the other hand, in QCA, sample selection is more flexible in response to the uniqueness of the cases, and scientific deduction can also be used to ensure the objectivity and robustness of the conclusions. In comparison to Statistical Product and Service Solutions (SPSS) as a quantitative analysis tool, QCA can enquire more objectively and comprehensively into the complexity of causal relationships, thereby ensuring the validity of investigation results.

Moreover, we would like to point out a weakness in our study, namely the relatively low consistency in our empirical analysis of degraded student academic achievement, which impairs the validity and robustness of our conclusion in this area. We intend to expand our research on this aspect of the subject in the future in order to provide school administrators with additional resources for selecting appropriate class teachers.

Conclusions and Suggestions

Conclusions

The following major conclusions are drawn as a result of sample and data collection: variable selection and calibration; the creation of truth tables; and empirical analysis of the results.

1. Democratic teacher leadership is a successful and popular mode of classroom management. The results of the questionnaire and subsequent analysis indicate that democratic leadership behavior ranks highest, while laissez-faire teacher leadership ranks lowest. The majority of students at H Middle School anticipate their class teachers exercising democratic leadership. In regular class management, teachers here use a democratic leadership style to interact with students and allow students to exercise discretion, which helps develop students' ability to learn independently and self-directedly. Democratic leadership behavior on the part of classroom teachers has been shown to be an effective means of fostering an excellent school and class climate and increasing students' self-motivation to learn.
2. Overall, class instructors with insufficient service time are detrimental to student academic performance. However, when key-subject teachers serve as class teachers concurrently, the element of service time has little effect on student academic performance. According to research on classroom teacher development, classroom teachers often go through stages of adaptation, exploration, creation, and sustained development during their careers (Qi, 2013). When young class teachers are still in the discovery period, their leadership conduct is insufficiently consistent to have a good effect on student academic performance. Additionally, we discover disparities in the focus of work and expectations for students between key-subject instructors and non-key-subject teachers through interviews with class teachers. The former places a higher premium on classroom discipline and academic accomplishment, whereas the latter places a higher premium on students' mental and physical wellness. This may account for why key-subject teachers can have a greater impact on students' academic progress.

3. Except for male teachers with extended tenures, only class teachers with a high level of democracy can contribute positively to student academic performance. Teachers with a high level of democracy are more willing to disrupt the typical teacher-dominated classroom structure and urge pupils to participate more actively in classroom activities. They are frequently excellent listeners and cultivators of optimal teacher-student connections, which are crucial for improving student academic success (Ning, 2016). Additionally, our findings indicate that classes taught by female teachers have higher average test scores than classes taught by male teachers. This could be because female instructors are better at managing the degree of democracy and being more severe with pupils when necessary, whereas male instructors tend to allow themselves too much leeway when exercising democratic leadership. This explains why a high degree of democracy in class management by male teachers with long tenure is detrimental to student academic performance advancement.
4. The effect of marital status and gender on academic achievement varies according to how they interact with other factors. In general, married female teachers can have a greater impact on students' academic performance.

Suggestions

Based on the multifactor combinations identified through empirical analysis and the difficulties expressed during interviews, this paper makes numerous recommendations for maximizing the influence of class teacher leadership behavior in enhancing student academic achievement.

1 It is strongly suggested that experienced teachers be appointed as class teachers. Class teachers with extensive teaching experience are capable of managing democratic leadership effectively in order to optimize class management and so contribute to the improvement of student school results.

2 A mentoring program or a pattern of double-class teachers might be created to assist those new and inexperienced class teachers in swiftly growing. Not only does the mentorship program or double class teacher pattern relieve class teachers of their responsibilities, but it also provides students with appropriate support to improve their academic level.

3 To promote teacher-student interactions, democratic class teacher leadership should be strongly fostered in schools. According to a previous study, democratic and fair-minded teachers are capable of persuading pupils to exert greater effort in their learning and achieve greater success (Pekrun, 2009). Democratic teacher leadership conduct may completely activate students' initiative in learning and aid in their development of self-efficacy and self-esteem, equipping them with the bravery to confront problems in learning and the capacity to achieve continuous academic progress.

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ARTICLE

What is the Most Important Source for Teachers' Knowledge Development? A Meta-Analysis of 27 Empirical Studies on the Sources of Teachers' Knowledge

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Abstract*. Studying the sources of teachers' knowledge and the importance of different sources is of great significance to promote the development of teachers' knowledge. This paper systematically analyzes 27 empirical studies on the sources of teachers' knowledge in China and abroad in the past two decades or so in terms of methods and findings. The results show that the in-service experience of teachers contains more important sources than the preservice education and primary and secondary education. Teacher's experience and reflection, and exchanges with colleagues are the most important sources of teachers' knowledge development. Educational internships and practicums are the most important sources of teachers' knowledge during their preservice education, while other sources have no significant effect. The usefulness of teachers' knowledge sources is affected by variables such as knowledge category, subject, education stage and shows a certain degree of individual differences. The above results confirm the importance of teachers' practice, reflection, collaboration and exchange and indicate the necessity of improving preservice education. In terms of methods, it merits recommendation for future researchers in this area to use single-category-focused and topic-focused knowledge frameworks, more specific knowledge source frameworks, multiple ways of data collection, random selection of research subjects, and inferential statistical analysis. In addition, further studies should also look into the psychological and social-cultural mechanisms of teachers' knowledge development as well as the sources of teachers' knowledge.*

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PROFESSIONAL knowledge is an integral part of teacher competence. Improving the knowledge level of teachers is of great significance to teachers' professional development and the construction of the teaching force. Therefore, teacher knowledge has long been one of the main topics in teacher education. "In general, there exist mainly three major issues in the field of teacher knowledge research: (i) What knowledge do teachers need? (ii) What knowledge do teachers have? (iii) How do teachers develop their knowledge?" (Fan, 2003, p. 6). The research on the sources of teachers' knowledge belongs to the third issue, which began to attract researchers' attention in the 1970s. However, most of the earlier studies dealt with the sources of teachers' knowledge indirectly, and their research approaches were mainly philosophical and there was a lack of systematic and empirical research.

The empirical research on the sources of teachers' knowledge aims to explore the actual sources of teachers' knowledge development and what role various sources play. Thereby, it can provide insights for planning and implementing more effective teacher education and professional development activities. An earlier empirical study on the sources of teachers' knowledge is an investigation by Lianghuo Fan. He focused his research on the sources of teachers' pedagogical knowledge. Through a survey of high school mathematics teachers in the city of Chicago, he found that the most important source of teachers' pedagogical knowledge was their teaching experience and reflection and their daily exchanges with colleagues; in-service training and professional activities were also relatively important sources; in contrast, their experience as students, pre-service training, and reading professional books were the least important sources (Fan, 2003).This conclusion is inconsistent with prior assumptions about the importance of pre-service education, which prompted investigation and reflection on the effectiveness of teacher education and teacher professional development. Since this seminal research, in recent years, researchers have carried out empirical studies on various sources of teachers' knowledge in different disciplines and at different education levels, and the research findings have grown year by year. So, how are these studies designed and implemented? What are the similarities and differences among their conclusions? What is the most important source of teachers' knowledge development? What are less useful sources? What are the implications of these findings for teacher education? The continuous accumulation of studies in this area merits a timely review. This paper systematically analyzes 27 empirical studies on the sources of teachers' knowledge in China and abroad in the past two decades or so and provides an overview in terms of both methods and findings, with the purpose of providing useful information for teachers' knowledge development and teacher education, as well as for future research in this area.

Literature Sources and Overview of 27 Empirical Studies

Literature analyzed in this paper includes studies published either in Chinese or in English, including journal articles, degree theses (dissertations), and monographs. The sources of literature are as follows: journal articles from the Chinese academic journal database in "CNKI" (China National Knowledge Infrastructure); journal articles from the English academic journal database in the "ERIC" (Education Resources Information

Center); degree theses (dissertations) in Chinese from the database in CNKI for doctoral and Master theses, and degree theses (dissertations) in English from the database of "PQDT" (ProQuest Dissertations and Theses); research monographs (books) in Chinese from the "Wenjin" search system of the National Library of China, and those in English from the book search system of the British National Library website.

Due to the large number of journal articles and degree theses (dissertations) and their wide variations in quality, we limited Chinese academic journals to PKU's Core-listed journals and CSSCI-indexed journals, English academic journals to peer reviewed journals, and Chinese and English degree theses (dissertations) to those at the doctoral level. The literature search terms were set to include "teacher" (or "prospective teacher"), "knowledge" (or "PCK", "MPCK", "TPACK") and "source" (or "development") in the titles. The English search terms were the corresponding English translations of the Chinese search terms, and the publication time of the literature was set to on or before March 1, 2020. Through the above search, we obtained a preliminary body of literature, and then consulted the abstract or text to further screen for the literature that meet the following criteria: (i) the research topic(s) involves the role of teachers' knowledge sources; (ii) it collects empirical data through surveys; (iii) based on quantitative statistics and analysis, it ranks or categorizes the importance of various knowledge sources into different levels. According to the above criteria, 31 studies were obtained. Also, one Chinese monograph that meets the above screening criteria was obtained through the citation retrospective method.

The distribution of these 32 pieces of literature in terms of types is as follows: 16 journal articles, four doctoral theses, and nine monographs in Chinese; one journal article, one doctoral thesis, and one monograph in English. It should be noted that these 32 documents are all the empirical studies on the sources of teachers' knowledge obtained according to the above searching methods and screening criteria. In contrast, the amount of English literature is relatively small, which shows that empirical research on teachers' knowledge sources has not attracted enough attention abroad. This imbalance is probably also related to the fact that the first work in this field was published in Chinese in China.

Through analysis and comparison, it is found that the results reported in two doctoral theses and three journal articles are derived from the same research in five monographs among the above 32 documents. Considering that monographs are official publications and their content is more detailed than journal papers, this research preferentially selects the monographs for analysis, thus avoiding the overlap of doctoral theses and journal articles. In addition, if the results of a study are reported in two documents, the document published earlier is included in the analysis, and no repeated statistics will be conducted. Finally, 27 pieces of literature are obtained in this study, and their basic information is shown in **Table 1**.

As shown in **Table 1**, the number of related studies was on the rise in the past two decades or so, indicating continuous attention from the researchers to the investigation of teachers' knowledge sources. From the perspective of the content of teachers' knowledge, some of the 27 studies focused on teachers' overall knowledge, and some focused on a specific field or a branch of teachers' knowledge. As far as the participants in these studies were concerned, there were both in-service teachers and pre-service teachers; the participants' subject backgrounds varied, but in most of the studies they

Table 1. Basic Information of 27 Investigations on the Sources of Teacher knowledge.

Author	Year	Genre	Range of Knowledge	Survey Object		
				Subject	Educational stage	Quantity
Fan, L.	2003	M	Teaching knowledge	Mathematics	High school	69
Zhang, Q., et al.	2005	J	Teaching knowledge	Multidisciplinary	Elementary and Middle	410
Zeng, C., et al.	2006	M	Mathematics teaching knowledge	Mathematics	Elementary and Middle school	191
Liu, L.	2006	D	Teaching knowledge	Geography	Middle and high school	385
Yuan, G.	2006	D	Teaching knowledge	Physical Education	High school	203
Liao, D., et al.	2009	J	Subject teaching knowledge	Multidisciplinary	Elementary and Middle	79
Zhao, D., et al.	2009	J	Professional knowledge	Language	Middle school	113
Hua, Y.	2010	J	Subject teaching knowledge	Multidisciplinary	Elementary school	200
Zhu, X.	2010	M	Teaching knowledge	Language	High school	129
Shao, G.	2011	M	Professional knowledge	Multidisciplinary	High school	234
Li, M., et al.	2011	J	Subject knowledge	Mathematics	Middle school	40
Zhang, Y., et al.	2011	J	Professional knowledge	Information Technology	High school	92
Han, J. et al.	2011	J	Professional knowledge	Mathematics	Middle school	123
Li, M., et al.	2012	J	MPCK	Mathematics	Middle school	41
Ding, R., et al.	2012	J	Professional knowledge	Mathematics	Normal student	241
Zheng, D., et al.	2012	J	Classroom assessment knowledge	Multidisciplinary	Elementary and Middle school	1,735
Han, S.	2013	D	Professional knowledge	English	Pre-employment, middle school	1,963, 177
Han, J., et al.	2014	J	Professional knowledge	Multidisciplinary	Middle school	430
Fan, L.	2014	M	Teaching knowledge	Mathematics	Middle school	73
Xu, P.	2014	M	Chinese teaching knowledge	Language	Pre-employment	109
Liu, J., et al.	2015	J	MPCK	Mathematics	High school	77
Fu, G., et al.	2015	J	Professional knowledge	Multidisciplinary	Pre-employment	1,531
Zhou, F.	2016	M	Teacher individual knowledge	Multidisciplinary	Elementary and Middle school	807
Li, C.	2016	M	Local knowledge	Multidisciplinary	Elementary and Middle school	961
Li, Y.	2017	M	Physics teaching knowledge	Physical	Middle school	54
Liu, L., et al.	2018	M	Professional knowledge	English	Elementary school	131
Wei, B., et al.	2019	J	Teaching knowledge of scientific practice	Science	Middle school	280

Note: J in "genre" means journal paper, D means doctoral dissertation, and M means work. The number of survey subjects is the number of observations in parentheses, the number of interviews is in square brackets, and the number of valid questionnaires is shown in brackets.

were mathematics teachers; the sample size ranged from dozens to more than a thousand. In terms of research methods, most studies adopted questionnaire surveys, though some used a combination of questionnaires, interviews, and classroom observations. The above 27 studies (hereafter referred to as "previous studies") are used as the object of analysis in the present study. Given the importance of research methods to research results, we will first analyze the theoretical framework and specific research methods of the previous studies from the methodological perspective, and then analyze their results.

Analysis of Theoretical Frameworks

Investigating the sources of teachers' knowledge needs to define the scope of teachers' knowledge and categories of sources. The following is an analysis of the theoretical framework of teachers' knowledge and knowledge sources in the previous studies.

Theoretical Frameworks of Teachers' Knowledge

The analysis indicates that there are four modes in which the scope of teachers' knowledge is defined in the previous studies.

Holistic Mode

This mode considers teachers' knowledge as a whole, without further division. This does not mean this mode denies the diversity of teachers' knowledge. The intention of taking teachers' knowledge as a whole is probably to make the investigation operationally feasible. However, treating teachers' knowledge as a whole may obscure the peculiarities of various types of knowledge.

Multi-Category Mode

It divides teachers' knowledge into several categories and then includes each category into the scope of research. For example, Liu (2018) divided teachers' professional knowledge into knowledge of education theory, curriculum knowledge, subject matter knowledge, and pedagogical content knowledge (hereafter referred to as PCK) and then investigated the sources of these four types of knowledge separately; Han (2013) investigated the sources of knowledge of secondary school English teachers in four aspects: theoretical knowledge of pedagogy, knowledge of English subjects, knowledge of teaching environment, and practical knowledge.

Single-Category-Focused Mode

It only focuses on a specific category of teachers' knowledge. This mode covers two situations: (1) The single category of knowledge is studied as a whole. For example, Liao, Zhou and Chen (2009) investigated the sources of PCK of primary and secondary school teachers and did not further divide PCK into sub-categories. (2) Divide single-category knowledge into several sub-categories and investigate the source of each sub-category. For example, Fan (2003) focused on teachers' pedagogical knowledge, and divided the pedagogical knowledge into pedagogical curricular knowledge, PCK, and

pedagogical instructional knowledge, and then investigated the sources of these three types of pedagogical knowledge.

Topic-Focused Mode

This mode is more specific than the single-category-focused mode. It focuses on a topic or a particular content in a specific category (or sub-category) of teachers' knowledge. For example, Li, Wan, and Yang (2011) cited knowledge of Pythagorean Theorem as a case study to investigate the sources of teachers' subject knowledge, while Zheng and Ye (2012) focused on classroom evaluation knowledge of teachers.

The analysis finds that in the previous 27 studies, there is one study in the holistic mode, two studies in the topic-focused mode, 10 in the multi-category mode, and 14 in the single-category-focused mode. In general, multi-category and single-category-focused studies accounted for the vast majority.

Theoretical Frameworks of Teachers' Knowledge Sources

The "source" of teachers' knowledge can be understood in two different ways, that is, "means by which they developed their knowledge, and something (often prior knowledge) teachers acted upon within their minds to develop the knowledge." (Fan, 2003, p. 46). The former is a macro source, and the latter is a micro source. All of the previous studies have adopted the macro-source meaning. The reason is that empirical research from this perspective is more useful and practical for exploring how to improve teachers' knowledge.

The macro knowledge source framework is generally divided into three parts according to the teacher's growth process: first, the teacher's experience as a learner before receiving professional pre-service training; second, the experience during the pre-service training; third, teacher's experience after entering the job. When the above three parts are subdivided, the sub-sources proposed by previous studies differ in complexity and in quantity. Fan (2003) proposed nine sub-sources and further divided four of the sub-sources into nine specific sources. In the end, seven sources were retained for quantitative investigation from all sources, namely: the experience as a learner; pre-service training; in-service training; organized professional activities; informal exchanges with colleagues; reading professional books and journals; teachers' experience and reflection (Fan, 2003).

Most subsequent studies have used the above framework for reference or made some adjustment on it. The largest number of source categories was found in Shao's (2011) study, which had 17 sources in total. Although the classification of knowledge sources in the previous studies shows a trend towards subdivision, none of them attempted to make rigorous and exhaustive classifications, but rather selected sources according to the practical needs of research. Specifically, there are three factors affecting the selection of sources: 1) the research focus, related to the research purpose or problems to be addressed. For example, if the purpose of the study is to examine the effectiveness of pre-service education, it will not include the source related to the in-service period; 2) the practical educational environment. For instance, the 17 sources in

Shao's (2011) study included not only the traditional activities of teacher professional development but also the new activities which have been advocated since the new curriculum reform in China so as to reflect the reality of educational reform and development; 3) the disciplinary backgrounds of the subjects. For example, Zhang, Dong and Jing (2011) added a source of "practice in information technology" to the surveys conducted on the teachers of information technology.

Analysis of Specific Research Methods

Methods of Data Collection

The methods used in the previous studies included questionnaire surveys, interviews, and classroom observations. Questionnaire surveys were used to investigate teachers' perceptions of their knowledge development, especially the contribution of various knowledge sources to their knowledge development. Classroom observations were used to identify what knowledge teachers actually used in classroom teaching so as to confirm what knowledge teachers had and provide clues of questions for interviews. Interviews were aimed to understand how teachers used specific sources to develop their knowledge. In data collection, questionnaires were used to collect quantitative data on a large scale and identify the general patterns of teachers' knowledge development; Class observations and interviews were focused on individual cases and were to collect more specific and in-depth qualitative information. Theoretically, the extensive use of the three methods can help present a complete picture of teachers' knowledge development, but this also would increase difficulties in the implementation at the operational level. As a result, among the previous studies, only five used all the three methods, and most of the other studies used questionnaires as the main or only method.

Selection of Survey Subjects

Among the 27 previous studies, 23 studies were conducted on in-service teachers, with 15 focused on teachers of one particular subject, such as mathematics, Chinese, English, Physics, Sciences, Information Technology, Geography, and Physical Education and the rest eight on a combination of teachers of different subjects. The in-service teachers were mainly from primary and secondary schools, and there were no surveys conducted on pre-school teachers or college teachers. Besides the 23 studies mentioned above, there were three surveys focusing on pre-service teachers, and one study investigated both in-service teachers and pre-service teachers.

In terms of the sample sizes of questionnaire surveys, the largest one in the previous studies was in Han's (2013) study, which involved 2,140 English teachers, including both pre-service and in-service teachers. Another study with a relatively large sample is Zheng and Ye's (2012) investigation, in which 1,735 primary and middle school teachers were surveyed. The number of teachers surveyed in other studies ranged from dozens to hundreds.

The generalizability of the conclusion of a study is affected by its sample size, yet it is also related to the sampling strategy employed. Only 5 of the previous studies clearly stated that a random sampling strategy was used, by which schools were select-

ed in the target city or school district using stratified random sampling, and then the teachers in sample schools are selected using cluster sampling. For example, Fan's (2014) study in Chicago and Singapore showed that the teacher samples in the two places were 77 and 73, respectively. Although it is not a large size, "as stratification may produce a smaller bound on the error of estimation than would be produced by a simple random sample of the same size, coupled with the sample teachers' multiple backgrounds in major demographic variables, the samples in the two studies could well represent the target population" (Zhao & Bokhove, 2019).

Statistical Analysis of the Data

Quantitative statistical analysis was applied to the data collected by the questionnaire surveys in the previous studies. Some studies also conducted a qualitative descriptive analysis of the data collected from interviews and observations so that qualitative and quantitative data were used to complement each other.

The focus of quantitative statistical analysis was on examining the contributions of various sources to the development of teachers' knowledge, based on the data collected by the Likert Scale in questionnaires. There were two main statistical techniques used in analyzing the quantitative data in the previous studies: (i) descriptive analysis, measuring the importance of each source by the frequency or percentage of each level selected in the Likert scale, or by the mean value of each level selected, and (ii) inferential analysis, including logistic regression analysis (hereafter referred to as regression analysis) and the analysis of variance for repeated measures. Regression analysis calculates the Wald value and parameter estimates of each source, ranks sources according to the Wald value, and then further stratifies them according to the significance of coefficient. The importance of different sources to the development of teachers' knowledge is generally classified as "the most important," "secondarily important," and "the least important." The importance of the sources at different levels has statistically significant differences. Repeated measure analysis of variance makes pairwise comparisons of the means of various sources and distinguishes the importance of different sources according to the mean and significance coefficient. In the study of Wei, Chen, and Chen (2019), the source with the intermediate-ranking of the mean was used as the benchmark source, and other sources were compared with the benchmark source. The significance standard adjusted by the Bonferroni method is used to test whether the difference is significant, and finally, various sources are classified as "more important," "important," and "less important", according to their importance. Although descriptive analysis is straightforward, the difference in frequency, percentage, and mean may not be statistically significant. The rankings obtained from inferential analysis are more accurate when the data from a sample are used to make inferences about the population. Of the previous studies, ten adopted the method of inferential analysis.

Re-analysis of the Results of the Included Studies

In addition to reviewing research methods to provide insights for future research, another purpose of the present study is to quantitatively integrate the results of the previous studies to obtain a more comprehensive picture about the importance of various sources of teachers' knowledge. The theoretical frameworks and statistical analyses presented in

the previous studies do not meet the requirements of the quantitative meta-analysis for selecting and calculating effect sizes. Thereby, this study re-analyzes the results of the previous studies with an alternative quantitative analysis method. The specific criteria includes: (i) the statistical analysis of the data is based on the research results in the original literature, rather than the generalized research conclusions; (ii) the data are classified by knowledge categories, that is, if a study reported sources of several categories of knowledge, then the data about the source of each category of knowledge are examined; (iii) if the results obtained from the same group of participants were reported in different publications, then only one is included in the statistics to avoid repetition; and (iv) the statistical methods used in each of the previous studies determine the inclusion of the results about the importance levels of the knowledge source. For the research results obtained by inferential analysis, the sources in the first and third levels of importance (i.e., "the most important" and "the least important") and their ranking of importance are included in the analysis. For the research results obtained by descriptive analysis, the ranking of importance was less straightforward: first, there were more ranking values, and in most cases, there were as many ranking values as there were sources; and second, between two adjacent ranking values there might not be a statistically significant difference. In this case, to distinguish the difference in the importance of each source, this study only includes the top two and bottom two sources in the importance ranking to ensure that the ranking values of the results of the descriptive analysis can be compared with those of the inferential analysis, suitable for combined calculation. For writing convenience, the source(s) in the first level of importance in the results of inferential analysis and the top two sources in the importance ranking in the results of descriptive analysis are collectively referred to as the "most important" sources, and the source(s) in the third level of importance in the results of inferential analysis and the bottom two sources in the importance ranking in the results of descriptive analysis are collectively referred to as the "least important" sources.

According to the above methods, 94 pieces of data are obtained, which to a large degree provide sufficient data to reanalyze the results of the previous studies. Of the 94 pieces of data, 49 are from the inferential analysis results, and 45 from descriptive analysis results. From 94 pieces of data, 214 items are the "most important" sources, and 235 the "least important" sources. The frequencies of various sources that are rated as the most important and least important is shown in **Table 2**.

Commonalities in the Conclusions of the Previous Studies

- In-service experience contains more important sources than pre-service training experience and the experience as a student at primary and secondary schools.

As shown in **Table 2**, according to the summaries of in-service experience, pre-service experience, and the experience as a student at primary and secondary schools, we can see that the cumulative frequencies of the most important sources of the three is 177, 30, and 7, while the cumulative frequencies of the least important sources is 94, 107, and 34. **Figure 1** presents the overall differences in the importance of various sources at different stages in a more visual way. In general, there are more important sources from in-

Table 2. The Number of Times Various Sources Were Rated As the Most Important or Unimportant In Previous Studies.

	"Most Important"			"Unimportant"		
	IA	DA	Grand	IA	DA	Grand
On-the-Job Employment						
Self-experience and reflection	36	41	**77**	0	0	**0**
Communication between colleagues	28	11	**39**	0	0	**0**
Teaching observation activities	14	9	**23**	2	3	**5**
Read professional books	13	8	**21**	14	5	**19**
Internet resources or TV media	4	1	**5**	0	2	**2**
On-the-job training	2	1	**3**	14	9	**23**
Post-employment education	0	0	**0**	25	6	**31**
Organized teaching and research activities	0	5	**5**	4	2	**6**
Technical practice	1	0	**1**	0	0	**0**
Educational Research Project Research	0	3	**3**	0	8	**8**
Subtotal	**98**	**7 9**	**177**	**59**	**35**	**94**
Pre-Employment Education						
Pre-employment training	1	1	**2**	5	17	**22**
Education internship, internship	8	5	**13**	2	7	**9**
Teaching Method Course or Textbook Analysis Course	10	0	**10**	14	0	**14**
Educational Theory Courses	1	1	**2**	20	6	**26**
Subject professional courses	1	1	**2**	3	2	**5**
Microteaching or teaching skills class	0	0	**0**	22	2	**24**
Course study during university	0	1	**1**	0	0	**0**
social activity	0	0	**0**	6	0	**6**
Part-time tutor	0	0	**0**	1	0	**1**
Subtotal	**21**	**9**	**30**	**73**	**34**	**107**
Elementary and Middle School Study						
Experience during Elementary and Middle school	5	2	**7**	13	21	**34**

IA: Inferential analysis; DA: Descriptive analysis.

service experience to promote the development of teachers' knowledge than from the pre-service experience in pre-service training and the experience as a student at primary and secondary education; and more sources from pre-service training experience and the experience as a student at primary and secondary education are considered the least important. It can be seen that teachers believe that their in-service experience has played a more significant role in the development of their knowledge.

- In the in-service experience, teaching experience and reflection, and exchanges with colleagues are regarded as the most important sources, while their further education for higher academic qualifications is regarded as the least important source, and for other sources, there exist differences in the conclusions about their importance levels.

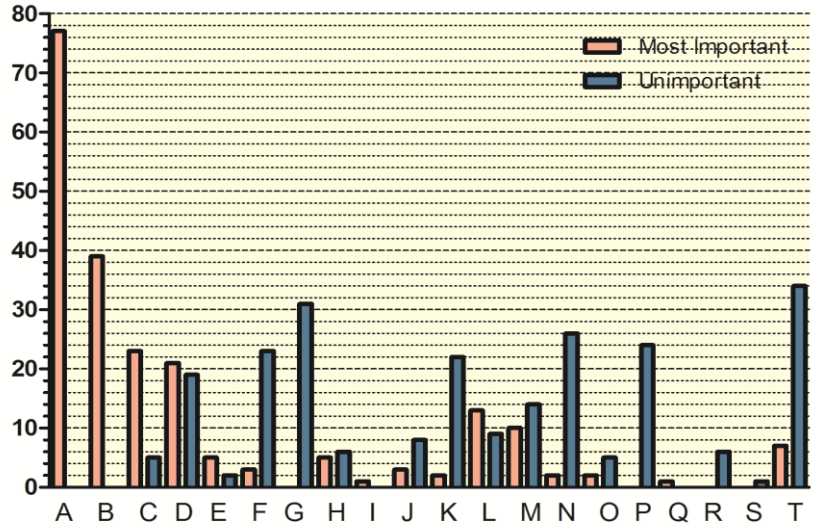

Figure 1. Comparison of the Number of Times Various Sources Were Rated as Most Important or Unimportant.

Note: A-J belong to the source during the employment, A = own experience and reflection, B = communication between colleagues, C = teaching and observation activities, D = reading professional books and periodicals, E = network resources or television media, F = on-the-job training, G = post-employment academic training, H = organized teaching and research activities, I = technical practice, J = research on educational research topics. K ~ S belong to the source of pre-service education period, K= pre-employment training, L=education internship and internship, M = teaching method course or textbook analysis course, N = education theory course, O = discipline professional course, P = micro grid Teaching or teaching skills class, Q = course study during university, R = club activities, S = part-time tutor. T = experience during Elementary and Middle school.

Although there are more important sources in the in service experience, differences also exist in this overall impression. Specifically, the frequency of teachers' experience and reflection and exchanges with colleagues being rated as the most important sources by teachers is as high as 116, while the frequency of their being rated as the least important sources is 0. In contrast, the frequency of the in-service training being rated as the most important source is 0, while the frequency of it being rated as the least important one is 31. The evaluation of the importance of the above three sources is highly consistent across the conclusions of the previous studies.

There exist differences in the conclusions of the previous studies on the role of other sources. Even in evaluating the same source, some studies considered it as the most important, while others considered it the least important. For example, in the previous studies, "organized teaching and research activities" are regarded as the most important source five times but as least important source six times as well. The frequency of classroom observations being considered as the most important source is higher than that as the least important source, while in-service training and engaging in educational research activities are more often regarded as the least important sources.

- The evaluation of the importance of most sources in the pre-service training is rather low, with the only exception that the importance of teaching practicum and internship are more highly recognized.

In some of the previous studies, pre-service training experience is considered as a whole, and it has been rated as the least important source 22 times. In the other studies, pre-service training experience was classified into more specific sources, such as educational theory courses, mathematics subject courses, teaching method courses, and teaching practicum and internship. However, the overall evaluation is relatively low. Only for teaching practicum and internship, the frequency of being rated as the most important source was higher than the other sources, and higher than that of its being rated as the least important source. This suggests that although the overall evaluation about the pre-service training experience is low, the role of teaching practicum and internship cannot be ignored.

- Experience as a student at primary and secondary schools is regarded more as the least important source.

Teacher's learning experience at primary and secondary schools are rated as the most important source 7 times and as the least important source 34 times. In comparison, it is considered to have less effect on teacher's knowledge development.

Divergencies in the Conclusion of the Previous Studies

In addition to the above commonalities, the effects of various sources on teachers' knowledge development also show some differences due to factors such as knowledge types, subjects, educational stages, and individual teachers.

- The importance of the source varies according to the category of knowledge it is related to.

Teachers' knowledge is diverse and has many sources. Sometimes one source can promote multiple types of knowledge, but its effect on each type differs. For example, in Fan's study on high school mathematics teachers in Chicago, reading professional books and journals were considered the secondarily important source of PCK. In contrast, it was considered the least important source of pedagogical curricular knowledge and pedagogical instructional knowledge (Fan, 2003). As another example, in a survey of pre-service primary teachers conducted by Ding, Ma, and Wang (2012), part-time tutoring is considered the least important source of teachers' knowledge of pedagogical theory. However, it is considered the secondarily important source of curriculum knowledge, subject matter knowledge, and PCK. One source promotes the development of multiple types of knowledge, but the effects differ. This shows that the components of experience in some sources are not single, and teachers can select the component of experience that meets their own needs to construct knowledge.

- The importance of the source varies by subjects and educational stages.

In Fan's study in Chicago, reading professional books and journals is not the most important source for developing high school mathematics teachers' PCK (Fan, 2003). However, in Zhao et al.'s (2009) study on secondary school Chinese teachers and Han's (2013) study on secondary school English teachers, reading professional books and journals is the most important source of multiple types of teachers' professional knowledge including PCK. In the survey conducted on English teachers in junior secondary schools by Han et al. (2014), reading professional books and journals is also the most important source of teachers' knowledge of pedagogical theory, English subject matter knowledge, and PCK. Also focusing on the English subject, another investigation conducted on primary English teachers indicates that the effect of reading professional books and journals on the knowledge development is not the most important (Liu, 2018). It can be seen that the importance of a source varies with subjects and educational stages.

- The importance of the source varies among individual teachers.

The conclusions of the commonalities and divergencies discussed above are drawn from the comparisons of the results in multiple studies. It should be noted that the results of quantitative investigations are determined by the majority of individuals in the sample. Therefore, the generality of the conclusion typically overshadows the particularity of a few individuals or individual groups.

For example, in Fan's study in Chicago, if all the 69 teachers surveyed were taken as a whole, then the evaluation of pre-service training would not be high. However, five of these teachers reported that pre-service training contributed a lot to the development of their knowledge of teaching methods and it was very important (Fan, 2003). This difference can also be found among different groups of teachers with different demographic backgrounds. Still taking Fan's study as an example, among the teachers surveyed, the exchanges with colleagues are regarded as the most important source of teachers' PCK; nevertheless, teachers with different lengths of teaching experience had different views on the importance of this source. Specifically, teachers with more years in teaching tend to obtain less PCK in their daily communication with colleagues, compared with teachers with fewer years in teaching (Fan, 2003). Maybe it is because of the disparities in expertise between senior and junior teachers, that is, senior teachers have more experience and would share their experience with their young colleagues instead of learning from their young colleagues. Junior teachers with less experience would more likely to get help from their senior colleagues and thus learn more.

Discussions and Suggestions

Re-understand the Practice, Reflection, Collaboration and Exchanges of Teachers

Teachers' experience and reflection and exchanges with colleagues are considered the most important sources of their knowledge development. This provides not only empirical evidence for the related theories of teacher professional development, but also guidance for the concrete path of teacher professional development in practice.

From Dewey's introduction of the concept of "reflection" to the field of education to Schon's (1983) advocacy of teachers to become "reflective practitioners", and then to Posner's (1989) proposal of " Experience + Reflection = Growth", it becomes the formula of the growth path for teachers. It emphasizes the importance of teachers' practice and reflection. The results obtained from the analysis of the previous studies in this paper support the above viewpoints from the perspective of teachers' knowledge sources. The nature of teachers' "reflection on practice" or "reflection in practice" is the transformation and reorganization of their own experience. It highlights the significance of the individual teacher's internal cognition and the close association between teachers' knowledge development and practice. Moreover, to a certain extent, it explains why teaching practicum and internships are regarded as an important source of knowledge in pre-service training.

Besides, the importance of exchanges with colleagues found in the previous studies confirms the important values of "teacher collaboration," "team learning" and "organizational learning culture". Exchanges with colleagues are experience sharing, aiming to realize the value-added growth and expansion of experience through interpersonal interaction. If experience and reflection represent the characteristics of teachers' knowledge development in the cognitive dimension, exchanges with colleagues reflect the social nature of teachers' knowledge development and teacher learning. Based on this re-understanding of teachers' experience and reflection and exchanges with colleagues, more attention should be paid to the two sources to promote teachers' knowledge development. More specifically, teachers need "to be reflective, accumulative, associative, and attentive" (Fan, 2003, p. 213). Correspondingly, teacher educators and school administrators should also invest more in creating favorable conditions for teachers to maximize the benefits of the two sources.

Re-think the Focus of Teacher Education

The results of the previous studies show that compared with in-service experience, pre-service training experience plays a very limited role. Except for teaching practicum and internships, which are relatively highly evaluated, most of the other sources during pre-service training are considered of low importance. Given that pre-service training has clear goals, covers a wide range of knowledge, and is taken full time, theoretically it should have played an important role in teachers' knowledge development. However, it is not as it should be. On the contrary, it is in-service experience that encompasses more sources of high importance. Does this mean that the focus of teacher education should shift from pre-service training to in-service training? We believe that current research findings are not enough to support a response to this question. Three more specific issues remain to be explored.

First, is the limited role of pre-service training caused by its existing problems? Or is it because pre-service training is inherently less helpful, and any remedy will not make it as effective as in-service experience? The role of pre-service training revealed by the previous studies reflects what has actually been achieved, and yet, it does not necessarily represent what should and could have been achieved.

Second, is the experience from pre-service training replaced or overshadowed by in-service educational experience, or is it integrated into and further developed by

the in-service experience? From the perspective of teacher education integration, pre-service training and in-service teacher education are closely related. The former lays the foundation for the latter, and the latter is somehow like the extension and expansion of the former. If pre-service training is weakened or ignored, the effectiveness of in-service education will also be impaired.

Third, what is the value of pre-service training to the development of teachers' professional competencies? The previous studies revealed the effects of various sources on the development of teachers' knowledge. However, teachers' professional competence is not limited to knowledge but also includes abilities, ideas, and ethics. If the overall professional competencies of teachers are taken into consideration, the role of pre-service training might have to be re-examined.

To sum up, the role and value of pre-service training should be examined holistically. Given that the maximal effects of pre-service training have not yet defined, further investigation and reflection should be emphasized and the problems should be diagnosed in searching for the paths of reform. This idea also applies to in-service training as in-service training also contains some sources that have limited effectiveness.

Implications and Prospective for the Research on the Sources of Teachers' Knowledge

The research on the sources of teachers' knowledge helps to timely understand and accurately evaluate the usefulness of various sources to provide insights for the improvement of teacher education and teacher professional development. Based on the previous studies, future research in this line can be conducted in a more scientific and in-depth manner.

First, the theoretical framework of sources of teachers' knowledge should be improved. Since teachers' knowledge includes different types, and each type of knowledge has specific components within it, the theoretical framework of teachers' knowledge should not adopt the "holistic mode". Instead, "single-category-focused mode" or "topic-focused mode" might be more appropriate. We believe that, given that there are many sources of teachers' knowledge and the nature and usefulness of each source are different, the theoretical framework of teachers' knowledge sources should also be as specific as possible. For example, it is not advisable to use an overgeneralized source, such as "pre-service training", without looking into more specific sources in pre-service training.

Second, appropriate research methods should be adopted in studies of sources of teachers' knowledge. It is recommended, when feasible, to combine questionnaires, classroom observations, and interviews to collect and triangulate the research data, to use random sampling to recruit the research subjects, and to analyze quantitative data by inferential analysis.

Third, by integrating the investigation of the sources of teachers' knowledge with the examination of teacher education courses or teacher professional development activities, a more comprehensive understanding of the usefulness, the content, the contribution process of knowledge sources can be achieved.

Finally, it should be noted that the usefulness or importance of knowledge sources is ultimately a value judgment. It depends on personal needs and perceptions of

the subject (i.e., the teacher) and is affected by the quality of the object (i.e., the source itself) as well. Teachers' knowledge development is a complex internal cognitive process as well as a social practice influenced by external circumstances. The previous studies present the commonalities and divergencies in the effects of various sources of knowledge, but still little is known about the function mechanism of various sources. Therefore, investigation of teachers' knowledge sources is only a part of the research on teachers' knowledge development. The psychological and social-cultural mechanisms of teachers' knowledge development are a topic for further exploration.

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ARTICLE

The Effect of Blended Instruction on Student Performance: A Meta-Analysis of 106 Empirical Studies from China and Abroad

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Abstract*. Blended instruction integrating off-line and on-line teaching has become an important instrument for promoting educational reform and innovation. However, the results of current empirical studies diverge on the effect of blended instruction on student performance, which necessitates further research on the effectiveness of blended instruction and related factors. This study, using an evidence-based meta-analytical approach, conducts a quantitative analysis of 106 experimental and quasi- experimental studies published from January 2000 to September 2021 in China and abroad, and systematically examines the effectiveness of blended instruction. The research finds that: i) The summary effect size (ES) of the included sample is 0.669 (n=142), indicating that blended instruction has above-moderate positive effects on student performance, especially on student learning motivation and academic emotions and attitude; ii) In terms of education levels, experimental periods and class sizes, blended instruction has the most significant positive effect on junior and senior secondary school students, on a teaching period from one to three months, and on a class size of 51 to 100 students; iii) Regarding the proportion and interactive patterns of online teaching, 50% composition of online teaching and synchronous or synchronous + asynchronous interaction exert the most significant positive effects on student learning. iv) Teaching methods including task-driven learning, role-playing, inquiry-based teaching, and case-based teaching have greater positive effects on student performance than other methods. Group study yields a greater effect on promoting student learning compared to individual study. Based on the findings, the present study also makes suggestions for the effective practice of blended instruction.*

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Introduction

BLENDED instruction, a combination of traditional face-to-face and online teaching, has prevailed worldwide since 2020. Through effective instructional design and technological application, it integrates the two teaching modes (Allen & Seaman, 2010; Garrison & Kanuka, 2004; Li & Zhao, 2004) and incorporates the advantages of both modes such as flexible learning time and space, easy access to and sharing of resources, and augmented interaction (Lock, 2006). It is regarded by some researchers as a critical instruction format in overcoming the limitations of traditional teaching and pure online learning (Schlager, Fusco, & Schank, 2002; Feng, Wang, & Wu, 2018). Feng, Sun, and Cao (2019) believe that blended instruction is an innovation in teaching reform; Garrison and Kanuka (2004) suggest that it provides educators with opportunities to re-examine and reconstruct teaching practice.

To evaluate the effectiveness of blended instruction, scholars have undertaken substantial research. The conclusions of their research vary and can be classified into the following three categories: 1) Blended instruction yields significant positive effects on the improvement of student performance; 2) There is no significant difference between blended instruction and traditional teaching; 3) Blended instruction is not as effective as traditional teaching. These conflicting results hinder the universalization of blended instruction.

In the context of the ongoing development of "Internet+" education and new educational requirements in the post-pandemic era, blended instruction tends to become the new normal mode of teaching (Porter et al., 2014). Given that some educational administrators and teachers cannot understand the role of blended instruction clearly with no idea how to reasonably configurate online learning and face-to-face instruction, and contradictory results exist in the current empirical studies of the effects of blended instruction, it is imperative to conduct a systematic study on this topic. A meta-analysis is a systematic quantitative synthesis of results from a series of independent studies under the same research topic (Lipsey & Wilson, 2001), which is effective in alleviating ambiguities and uncertainties in the findings of social sciences and prompting new scientific discoveries (Li & Qu, 2021).

Given this, the present study adopts evidence-based meta-analysis to examine the effect of blended instruction on student learning and its major moderating factors, such as the ratio of online teaching to face-to-face instruction and the sequence of the two components in blended instruction. It aims to answer the following questions: 1) How effective is blended instruction compared to traditional teaching? What effects does it have on the improvement of student performance in various dimensions? 2) How do the ratio of online teaching and sequence of online and offline teaching in the combination impact student learning? 3) What influences do teaching periods, education levels, and class sizes have on blended instruction? 4) What are the differences among various teaching methods and learning styles in blended instruction?

Research Design

Research Methods and Instruments

The present study extracts sample sizes, means, and standard deviations from related literature and integrates results from studies on the same research topic. The effects of blended instruction on student learning performance are measured by standardized mean differences (SMD), denoting effect sizes.

Research Processes

Literature Search

In search for relevant studies, the present study uses keywords including blended learning, blended instruction, hybrid learning, hybrid instruction, mixed mode learning, learning outcomes, learning effect, learning achievement, learning gains, learning performance, and academic achievement, and consult English bibliographic databases such as Web of Science, Google Scholar, ERIC, EBSCO, Science Direct and ProQuest. For literature in Chinese, the search is focused on CNKI's core-listed journals and CSSCI-indexed journals and keywords like blended instruction, blended learning, learning effect, learning outcomes, and experimental intervention. The included studies were published from January of 2000 to September of 2021.

Literature Screening and Inclusion Criteria

In the present study, the following criteria are applied to decide whether to include a study in the analysis: 1) aiming to investigate the relationship between blended instruction and student learning performance; 2) using experimental design, quasi-experimental design or any other form of empirical research in the investigation; 3) including experimental group and control group, with the former being intervened by blended instruction while the latter being spared of any interventions including pre-test and posttest; 4) providing complete data such as the sample size, mean, standard deviation, t-value, p-value or relevant coefficients to calculate the effect values.

Samples in this study are independent. When duplication or overlapping occurs among samples, the more detailed or the larger sample is selected. After screening, there remain 98 articles in English and 8 ones in Chinese. SMD is adopted in calculating effect value. As there is more than one effect size in some studies, finally 142 effect sizes are drawn. The experimental group consists of 7064 students and the control group 6733 students.

Literature Coding

Literature coding in this study covers author information, years of publication, sample sizes, education levels, disciplines, experimental periods, proportions of online teaching, teaching methods, online interactive patterns, and other contents. Education levels range from basic to higher education levels and disciplines here include most of the subjects in place at all education levels. An experimental period can be less than one week, less than one month, less than six months, or more than six months. The proportion of online teaching can be less than 30%, 31% - 49%, 50%, 51% - 70%, or 71% - 80%.

Data Analysis

To comprehensively examine the effect of blended instruction, we follow Cooper's (2009) analytical procedures and conduct data analysis using the software CMA 2.0. Through literature review, it is found that the effect of blended instruction on student performance is also correlated with miscellaneous factors such as subjects (students) of the research and learning content. When the results of the meta-analysis are affected by different qualities of literature, the random-effects model can make them more reasonable and scientific. Therefore, this study chooses the random-effects model as statistical model and confirms the appropriateness of random-effects model by heterogeneity test.

Research Results

The Overall Effect of Blended Instruction on Student Learning Performance

This study uses the standardized mean difference as effect value and the summary effect of 142 effect sizes is 0.669. Cohen (1992) prescribes that an effect size less than 0.2 means a weak effect, an effect size of around 0.5 signifies a moderate effect, and an effect size larger than 0.8 indicates a substantial effect. The results of analysis reveal that blended instruction yields an above-moderate effect on the improvement of student learning outcomes.

To further analyze the differences in the effects of blended instruction on student performance in various dimensions, this study investigates its impact on non-cognitive elements such as learning satisfaction, emotions and attitude, and learning motivation as well as on cognitive elements such as higher order thinking (like critical thinking and innovation mentality), academic achievements, and practical skills. A more concrete demonstration of the effects of blended instruction on student performance can be reflected in the following sequence (from strong to weak): learning motivation (SMD = 0.936) > emotions and attitude (SMD = 0.788) > higher order thinking (SMD = 0.764) > academic achievements (SMD = 0.696) > practical skills (SMD = 0.544) > learning satisfaction (SMD = 0.516). It shows that blended instruction most significantly improves student learning motivation and emotions and attitude; the positive effect of blended instruction on student critical thinking, innovation mentality and academic achievements is above moderate level; it also has moderate positive effects on student satisfaction and practical skills. The between-group effect value $p = 0.240 > 0.05$ is not statistically significant, indicating that there are no significant differences in the effect of blended instruction on student performance in different dimensions.

The Effects of Blended Instruction at Different Education Levels

The effect sizes at all education levels are consistently above 0.5. SMDs at senior secondary, junior secondary, higher education, primary, and adult education levels are

0.867, 0.758, 0.647, 0.566 and 0.565 respectively. The effect sizes at senior secondary and junior secondary levels are both above 0.75, indicating that blended instruction has significant positive effects on student performance at these two levels; the effect sizes at higher education, primary, and adult education levels are all above 0.5, showing the positive effects of blended instruction at these education levels are above moderate. The between-group effect value $p = 0.550 > 0.05$ shows no statistical significance and indicates that there are no significant differences in the impact of blended instruction on student performance at different education levels. Yet, it is worth noting that it has an exceptionally great positive effect at the senior secondary level.

The effects of blended instruction in different class sizes

Blended instruction can replace partial classroom teaching with online instruction and aids in alleviating the problems typical in teaching with large class sizes, such as low effectiveness and insufficient learning room. SMDs of class sizes of 51 - 100 students, 100 + students, 31 - 50 students and 1- 30 students are 0.752, 0.704, 0.663, and 0.562 respectively. The four effect sizes are all above 0.5, indicating that the positive effects of blended instruction in any of the four class sizes are above moderate level. The between-group effect value $p = 0.485 > 0.05$ shows no statistical significance and indicates that there are no significant differences in the effects of blended instruction in different class sizes.

The Effects of Blended Instruction of Different Teaching Periods

In this study, the experimental periods are classified into three groups, namely experimental periods of less than one month, one to three months, and more than three months. The effect sizes of blended instruction of the three periods are all above 0.5, indicating moderate positive effects. Among them, the experimental period of one to three months yields the most significant effect (SMD = 0.845), followed by the periods of less than one month (SMD = 0.705) and more than three months (SMD = 0.530). The between-group effect value $p = 0.017 < 0.05$ shows significant difference in the effects of blended instruction among different experimental periods, which reveals that teaching periods can moderate the effects of blended instruction.

The Effects of Blended Instruction under Different Teaching Methods

To investigate the impact of different teaching methods on the effects of blended instruction, this study codes and analyzes ten teaching methods, namely case-based teaching, task-driven learning, project-based learning, lecturing, role-playing, inquiry-based teaching, learning by discussion, peer instruction, Q & A teaching, and demonstrative teaching. Data analysis results show that the effect sizes of blended instruction under task-driven learning, role-playing, inquiry-based teaching, and case-based teaching are all above 0.8, indicating these four teaching methods have substantial positive effects on student learning performance; the positive effects of project-based learning, peer

instruction, and learning by discussion are above moderate level (SMD > 0.6); lecturing and demonstrative teaching have moderate positive effects on student performance; Q & A teaching (P > 0.05) shows no significant effect on student performance. The between-group effect value p = 0.121> 0.05 indicates that there are no significant differences in the effects of distinct teaching methods on student learning performance in blended instruction.

The Effects of Blended Instruction in Different Learning Organization Forms

This study codes and analyzes data of two learning organization forms, that is, group learning and independent learning. The effect sizes (SMDs) of them are 0.678 and 0.584 respectively, indicating that group learning is more effective than independent learning in blended instruction. The positive effect of group learning on student performance is above moderate level and that of independent learning is moderate. The between-group effect value p = 0.433 > 0.05 shows that distinct learning organization forms engender no significant differences in the effects on student learning performance.

The Effects of Blended Instruction with Different Proportions of Online Teaching

This study classifies the proportions of online teaching into five groups, namely lower than 30%, 30% - 49%, 50%, 51% - 69%, and 70% - 80%. The effect sizes of all five groups are above 0.3, basically indicating blended instruction with whatever proportion of online teaching exerts positive effects on student learning performance. SMDs of proportions of 50%, 30% - 49%, 51% - 69%, lower than 30%, and 70% - 80% are 0.792, 0.525, 0.468, 0.346, and 0.313 respectively. Blended instruction with 50% online teaching yields the most significant positive effect on student learning performance. Blended instruction with 30% - 49% and 51% - 69% online teaching has moderate positive effects on student performance. It is worth noticing that both the lowest proportion (lower than 30%) and the highest one (70% - 80%) produce the least significant effects. The between-group effect value p = 0.000 < 0.05 indicates that blended instruction with distinct proportions of online teaching has remarkably different effects on student performance.

The Effects of Blended Instruction with Different Sequences of Online Teaching and Face-to-Face Teaching

To investigate the effects of blended instruction with different sequences of online teaching and face-to-face teaching on student learning performance, this study summarizes five categories of sequences including “weekly alternation”, “weekly online + face-to-face teaching”, “online teaching followed by face-to-face teaching”, “face-to-face teaching followed by online teaching”, and “face-to-face teaching + online teaching + face-to-face teaching.” “Weekly alternation” is a sequence wherein on-line and

face-to-face teaching occur alternately by the week. In "weekly online + face-to-face teaching", both online and face-to-face teaching happen in every week. "Online teaching followed by face-to-face teaching", "face-to-face teaching followed by online teaching", and "face-to-face teaching + online teaching + face-to-face teaching" are sequences of the two components in the whole experimental period. SMDs for "face-to-face teaching + online teaching + face-to-face teaching", "online teaching followed by face-to-face teaching", "weekly online + face-to-face teaching", "face-to-face teaching followed by online teaching", and "weekly alternation" are 0.757, 0.718, 0.668, 0.649, and 0.363 respectively. With the largest effect size, "face-to-face teaching + online teaching + face-to-face teaching" has the most significant positive effect on student learning performance; the positive effects of "online teaching followed by face-to-face teaching", "weekly online + face-to-face teaching", and "face-to-face teaching followed by online teaching" are above moderate. The between-group effect value $p = 0.908 > 0.05$ indicates there is no significant difference in the effects of blended instructions with different sequences of online and face-to-face teaching.

The Effects of Blended Instruction with Different Teacher-Student Online Interactive Patterns

To investigate the effects of teacher-student online interactions on student learning performance in blended instruction, this study groups them into four patterns, that is, synchronous interaction, asynchronous interaction, synchronous + asynchronous interaction, absence of interaction. SMDs for synchronous + asynchronous interaction, synchronous interaction, asynchronous interaction, and absence of interaction are 1.189, 1.134, 0.521, and 0.130 respectively, which means that synchronous + asynchronous interaction and synchronous interaction have the most significant effects in promoting student learning performance while the positive effect of asynchronous interaction is moderate. The between-group effect value $p = 0.000 < 0.05$ indicates that there is significant difference in the effects of distinct teacher-student online interactive patterns on student learning performance.

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ARTICLE

Can Transfer Payment Reduce the Inequality of Compulsory Education in Poor Areas? An Empirical Study Based on the Data from 18 Counties in 6 Provinces in China

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Abstract*. Transfer payment is of great significance for poverty alleviation and balanced regional development. Based on the first-hand survey data from 18 key counties of 6 provinces in China's national poverty alleviation and development program, this paper uses propensity score matching to calculate the effects of transfer payment funds on the results of compulsory education in impoverished areas and uses Shapley value decomposition to decompose correlated factors. It finds that when the characteristics of students, families and schools controlled, transfer payment funds significantly lower student academic achievements in some subjects and aggravate the inequality of educational results, which may be the result of the reduction of local education funds caused by the "crowding out effect" of transfer payment. Suggestions are made in this paper to standardize the utilization of transfer payment funds, establish a linkage mechanism between the educational results of poor students and transfer payment funds, implement the assisting plan for teachers and students in poor areas, strengthen the "pertinent support for intelligence development", and unite multiple agencies to increase input in education, with the purpose of reducing the inequality of compulsory education in poor areas.*

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AMARTYA Sen (as cited in Xiao & Li, 2021) once gave his insights into the relation between poverty and education that measuring poverty by economic standards is only the minimum threshold while the deprivation of the possibility of individual development constitutes the essence of poverty. Alleviating poverty through education is critical to addressing the issue of poverty in knowledge, skills, mental strength, culture, and information in one's disadvantaged times (Fu, 2021) and fundamental to interception of intergenerational transmission of poverty (Li et al., 2020). Registration of impoverished households is a key component in China's targeted poverty alleviation program, basically funded by transfer payment (Chen et al., 2020). To evaluate the effects of transfer payment on student academic achievements in poor areas in China and define its mechanisms is of great significance to sustaining targeted poverty alleviation, improving the efficiency of poverty alleviation through education, reducing relative poverty, and promoting educational equity.

Literature Review

Transfer payment is a redistribution of incomes by the central government to narrow the gaps among regions of different development levels. It includes general transfer payment and special transfer payment. In previous studies of education-related transfer payment, most researchers focus their investigation on whether it has increased input in education and draw differential conclusions. A common belief is that transfer payment should be able to increase educational expenditure as its primary purpose is to provide public goods and rectify externalities across regions. Also, the central government has attempted to secure the educational input standards by legislation. The increase in transfer payment by the central government should stimulate local governments' willingness to implement the former's policies and to enhance their investment in education (Ma & Hou, 2005). Some of the studies confirm the above opinion by presenting the fact that China's general transfer payment has played the role of "helping hand" by making up for the fiscal deficits at local levels and significantly boosting local educational supply (Gong & Li, 2016), for every 100 million yuan increase in general transfer payment, the provincial financial input in education will rise by 18.4 million yuan (Xiao & Hou, 2018). Other studies find that the existing promotion mechanism for local government officials tend to result in their neglect of investment in education and that transfer payment has little influence on local compulsory education due to the problems inherent in China's transfer payment system (Yang, 2016).

In addition, some investigations of the relationship between financial expenditure and equalized development of educational results indicate that general financial expenditure in education has an "inverted U-shaped" impact on educational results. The increase in financial expenditure in education significantly reduces the negative effects of family economic status on student educational results, and thereby, relieves educational inequity to some extent (Chen & Zhi, 2017). Public educational input accounts for 12.6% of the difference in school educational results. Transfer payment, especially the special transfer payment, can promote the intergenerational mobility of human capital and expanding transfer payment can stimulate equalized development of human capital (Fang, 2020). However, empirical research on the relationship between financial expenditure and educational results is insufficient and some problems remain to be ad-

dressed: i) Few studies have investigated the direct association between transfer payment and student educational outcomes. Most of the previous studies ignore the control of selective biases and the difference in sample characteristics between experimental group and control group, thus unable to reach relatively accurate and unbiased evaluation and research results; ii) Most researchers use the general sampling data from all over the country and pay little attention to the special situations of poor areas in China. Given that China is committed to eliminating "relative poverty" in the future, the present study is to focus its exploration on whether transfer payment aids in alleviating inequality in educational results in undeveloped areas and how to improve the human capital quality of children in impoverished households, with the purpose of providing empirical evidence to educational development in poor areas.

Research Design

Sources of Data

To investigate the academic performance and living conditions of compulsory education students in impoverished areas in China, a project team was established in 2018 to conduct a field survey by random sampling on more than 180 primary and secondary schools in 18 key counties listed in the national poverty alleviation and development program in Hubei, Jiangxi, Guizhou, Sichuan, Yunnan, and Shan'xi Province. A total of 7894 questionnaires were distributed and 7439 valid ones drawn after screening, with an effective rate of 94.23%.

Definition of Variables

This paper defines students with registration cards (to register households which are entitled to transfer payment) as the transfer-payment-entitled group, that is, the treatment group, and students without registration cards as transfer-payment-unentitled group, that is, the control group. To control individual characteristics, factors including student gender, being left-behind or not (when parents leave hometowns for job opportunities as migrant workers), boarding or not, grades, and urban or rural registered residence are incorporated as variables. Factors like parental education levels, vocations, and family economic status are integrated to be home economic, social, and cultural status (hereafter referred to as home ESCS). Home ESCS, together with family structures and family information capital (family's possession of IT devices and access to Internet), is treated as variables related to student family backgrounds. As the survey is conducted in public schools, the present study need only to control two properties regarding school type: rural or urban school. To measure student academic achievements, the survey collects students' scores of the last terminal exams in Chinese, Mathematics, and English. As test scores from different provinces cannot be compared directly, this study manages to standardize the exam papers for each grade in every school and the resulting scores of the three subjects are treated as dependent variables (Chen, Zhang, Chen, & Shi, 2018).

Methodology

Propensity Score Matching

Since the distribution of transfer payment funds is not completely random, there are remarkable differences in individual and family characteristics between the transfer-payment-entitled group and the transfer-payment-unentitled group. A simplified calculation of the effects of transfer payment funds on student educational results is bound to produce biases, and thus, it is necessary to control the selective biases. This paper uses propensity score matching to control individual, family, and school characteristics and then, calculate the effects of transfer payment on compulsory education. To ensure the validity of the results of the model, the study employs different matching methods to verify the results. After computing the propensity value, the nearest neighbor matching is adopted to draw the conclusion, followed by robustness tests by radius matching, kernel matching, and Mahalanobis distance matching.

Shapley Value Decomposition

At the second phase of data analysis, Shapley value decomposition is used to decompose the factors affecting the academic achievements of compulsory education students in poor areas, calculate the contribution of transfer payment to the student academic achievements in different subjects, and put forward specific suggestions for them. In addition, the quadratic terms of family socio-economic status and the interaction terms between transfer payment and home ESCS are included in the model.

Empirical Results

Descriptive Statistics

Descriptive statistics on the full sample, transfer-payment-entitled sample, and transfer-payment-unentitled sample show that there are differences in student characteristics, family characteristics, and student academic achievements between the treatment group and the control group. However, they do not tell whether the differences are of statistical significance. To confirm whether the impact of student overall backgrounds on their access to transfer payment is statistically significant, this study conducts a regression analysis using "access to transfer payment" as dependent variables and student, family, and school characteristics as independent variables. The results indicates that apart from gender, being left behind or not, and school properties, the other variables have significant impact on whether students receive transfer payment or not. Urban students' probability of access to transfer payment is 74.7% lower than that of rural students; Boarding students' probability of access to transfer payment is 73.3% higher than non-boarding students; With the promotion of grade, students' probability of access to transfer payment decreases slightly; The higher the rating of family ESCS, the lower the student's probability of access to transfer payment; The probability of access to transfer payment of students from the normal family structure is significantly lower than that of students from special family structures; Students' probability of access to transfer payment is negatively correlated with the quantity of family information capital; The effect of the gender variable is not significant, indicating that there is no significant relation-

ship between the gender of children and the family economic status; The absence of parents as migrant workers has a negative effect on their left-behind children during their first year away from home, which is later replaced by a positive effect since incomes from their jobs in distant localities can improve the overall economic condition of the family, (Gao et al., 2018). Therefore, the access to transfer payment is correlated with individual and family characteristics, and it is necessary to control variables related to student background information.

Propensity Score Estimates

To effectively reduce the impact of individual, family, and school characteristics on student educational results, this study uses the nearest neighbor matching to match the calculated propensity values and then conducts balance tests on the matching results. The results of t-tests denote that before matching, there exist significant differences between variables (except gender) of treatment group and control group while after matching, sample biases of most variables (except grades and being left behind or not) are reduced by over 90% and the absolute values of standard deviations are all below 20.

After matching the sample of the treatment group with that of the control group, the study finds that the calculated results have changed to various degrees and that the overall effect of transfer payment on student educational results decreases, indicating that without the control of the background information of the sample, the results could be overestimated. Before matching, there is a significant negative correlation between transfer payment and student academic achievements. When individual, family, and school characteristics controlled, "counterfactual estimation" can be conducted, which assumes that differences in student academic achievements result exclusively from the accessibility of transfer payment. The calculation of the average treatment effect (ATE) of the treatment group reveals that after matching, the significance of the impact of transfer payment on student educational results is reduced. Transfer payment significantly lowers mathematics results of students in poor areas by 4.2% while its influences on student Chinese and English results are insignificant.

Robustness Tests

To verify the reliability of the matching results, after analyzing data by the nearest neighbor matching, the study carries out radius matching, Kernel matching, and Mahalanobis distance matching and confirms the results of the nearest neighbor matching. The pre-matching results indicate that transfer payment significantly lowers students' Chinese and Mathematics results yet has no significant impact on English results; The post-matching results show that transfer payment has a significant negative impact on students' mathematics results yet has no significant impact on Chinese and English results.

Shapley Value Decomposition

To make more detailed analysis of the effects of transfer payment on the student educational results in poor areas in China, Shapley value decomposition is applied to decompose the factors influencing students' Chinese, Mathematics, and English performance

based on the results from propensity value matching. The results of SVD indicate that when individual and family characteristics controlled, the access to transfer payment poses significant negative effects on students' mathematics test scores, confirming the results of propensity score estimates. According to SVD results, transfer payment accounts for 11.34% of the disparity in Mathematics results among students and has no impact on Chinese and English results, which denotes that transfer payment does not aid in alleviating the inequity of educational results in poor areas but rather aggravate the inequality. In addition, there is gender difference in student academic achievements in that boys' English and Chinese results are much lower than those of girls, while their mathematics results significantly higher than those of girls; Urban and boarding students' Chinese results are remarkably lower than those of rural and non-boarding students; Home ESCS yields the most significant effect on student academic achievements, accounting for 54.07%, 49.24%, and 47.34% differences in student Chinese, Mathematics, and English results respectively; Students' family structures significantly impact their mathematics and English results in that academic performance of students from normal families are superior to that of students from single-parent families; The school properties make significant differences to students' English and Chinese results as urban students typically perform better in English and Chinese than their rural counterparts; The coefficient of interaction terms between home ESCS and entitlement to transfer payment is significantly negative, indicating that among students of same home socio-economic level, transfer payment poses negative impacts on their academic achievements.

Conclusions

The present study, based on the survey data from 18 counties in 6 provinces in China, concludes different results from some of the previous studies. It finds that compared to students who are not entitled to transfer payment, those entitled to it perform worse in Mathematics and that transfer payment has no significant effects on student English and Chinese results. According to the educational production function, the decrease of educational output is caused by the reduction of educational input. The reasons for the results of this study are summarized as follows:

The increase in transfer payment funds does not necessarily result in the rise of educational input at local levels.

Numerous studies of the relationship between transfer payment and local educational input have revealed the existence of "crowding effect" in educational funding, which means that the increase in transfer payment does not necessarily encourage the local government's investment in education, but rather curtail local educational funds and weaken the local government's commitment in boosting educational supply (Fu & Cui, 2010). The follow-up empirical studies further confirm that transfer payment has a significant negative impact on educational input. Typically, 1% increase in transfer payment leads to 0.03% decreases in investment in education (Yang, 2016). The present study reinforces the point of view of the previous studies by clarifying the negative effects of transfer payment on student academic performance.

The most problematic counties included in the national poverty alleviation and development program have had long-standing financial difficulties.

When the central government allocates them part of the transfer payment funds for poverty alleviation purpose, it is hard for those counties to prioritize education in decision-making of funding. They are inclined to use the funds on more pressing issues and take the economic development and infrastructure construction as top priorities. The continual increase in transfer payment results in shrinkage of educational funding.

Most transfer payment funds allocated to registered households are typically designated as funds for poverty alleviation through start-up business or employment.

Such funds are often "earmarked" to encourage poor households to engage in reproduction. Meanwhile, funds for poverty alleviation through education are usually distributed by means of school operations, such as exemption from tuition and miscellaneous fees at compulsory education level, yearly subsidies of cash, and free lunch, etc. These measures may lead to parental neglect of family input in education. Parents would believe that the state should take charge of their children's education and it is no longer their responsibility to make investment in child education. As a result, the input in child education is reduced, and the inequality of educational results is further aggravated.

Differences in the effects of transfer payment on distinct subjects may be caused by their inherent features.

For instance, transfer payment impacts student mathematics results most significantly because short-term efforts can make a difference to mathematics learning. The insignificant impact of transfer payment on student English and Chinese performance is attributed to the fact that the overall English level of students in poor areas is relatively low and that the learning of Chinese subjects requires long-term accumulation.

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NEWSLETTER

The Relationship between the Home Cognitive Environment and the Development of Infants and Toddlers Aged 0-3 Years

By Zhang, Y., & Hong, X. M.
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THE first few years of a child's life witness the most rapid development in his or her entire life. Promoting the physical and mental health development of infants and toddlers at the age of 0-3 years is receiving widespread attention in China and abroad. Published in Psychological Development and Education recently, this study analyzes the mechanisms of the effects of family cognitive environment, child care experiences, and effortful control on the development of infants and toddlers at the age of 0-3 years, selecting parents of infants and toddlers aged between 0 and 3 as respondents. Effortful control refers to individual-initiated self-regulation of emotional responses and behaviors, and it reflects individual differences in self-control，attention adjustment, and behavioral inhibition and activation.

Findings of the study：

- Infant and toddler effortful control has a mediating effect between the family cognitive environment and infant and toddler development, that is, the family cognitive environment influences infant and toddler development by acting on their effortful control. High-quality family cognitive environments provide rich opportunities for infants and toddlers to exercise effortful control, allowing them to regulate and manage their emotions and behaviors in different tasks, thus contributing to their overall development.
- The first half of the mediating pathway "family cognitive environment-effort control-infant and toddler development" is moderated by whether or not the infant or toddler is enrolled in child care, The effect of family cognitive environment on infant and toddler effortful control is greater when they are enrolled in child care and weaker when they do not have any experience in child care.

Based on the above findings, the authors suggest that parents and educators should create a cognitively stimulating environment for infants and toddlers at home and in nurseries under the premise of ensuring safety and

health, which facilitates high-quality parent-child interactions and provides appropriate play materials, and that effortful control should be exercised in daily life to promote infant and toddler development.

Source: Psychological Development and Education, 2020; 2020(2):178-185.

NEWSLETTER

The Impact of Parents' Marital Quality on Children's Prosocial Behavior

By Wang, S. L., Zhao, B. X., Wu, H., & Zhao, W.
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PUBLISHED in *Psychological Development and Education*, the study attempts to explore the relation between children's prosocial behavior and parents' marital quality, emotional expression, and parenting behavior. The research uses the couples' adaptation scale, parental emotional expression scale, parenting behavior scale and strength scale to investigate 442 parents of school-age children in grades 1-6 from two schools in a city in Guizhou Province. The findings are shown as follows.

- Parents' marriage quality is significantly and positively correlated with children's prosocial behavior. However, the direct relation between parents' marriage quality and children's prosocial behavior is not significant when mediating variables included, which indicates that the relation may not be independent and needs to be moderated by other conditions.
- Parents' positive emotional expression and parental acceptance and company play intermediary roles between parents' marriage quality and the children's prosocial behavior, through three intermediary paths: the independent mediation of parental positive emotional expression, the independent mediation of parental company and acceptance, and the chain mediation of parents' positive emotional expression- parental company and acceptance.
- There are gender differences in the chain mediation of parents' positive emotional expression- parental acceptance and company. The mediation of parents' positive emotional expression works among both boys and girls, with a greater effect for the group of girls, whereas the mediation of parental acceptance and companion only works for the boy group, which may stem from the differences in children's personal factors and parenting behavior.

The study also proposes several suggestions: First, parents should adopt constructive strategies to improve the quality of their marriage and increase intimacy. Second, they are supposed to develop a disposition of positive emotional expression at home and provide emotional behavior para-

digms such as love, reciprocity, and cooperation for family members in order to cultivate children's prosocial motivations and behaviors. Third, they should exert both rigorousness and tolerance in parenting behavior to help children learn rules and regulations, develop empathy, build interpersonal trust, and show more prosocial behavior. Finally, parents should keep pace with the times, learn more scientific gender education knowledge, and improve their personality and gender education skills.

Source: Psychological Development and Education,2022; 2022(3):1-8.

NEWSLETTER

Can Increasing Teaching Rewards Improve Teaching Quality? An Empirical Study of 63 Universities Across the Country

By Li, N., & Tao, Z. Y.
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ALTHOUGH teaching and scientific research are both important tasks for college and university teachers, the phenomenon of emphasizing scientific research over teaching prevails. In the evaluation system, universities tend to give more weight to scientific research. As a result, teachers' scientific research achievements are linked with their appointment, assessment, promotion, and salaries; insufficient attention to teaching leads to low teaching quality. This study explores the effect of teaching incentives on teaching quality improvement by comparing the teaching incentives in different universities. Ordinary least squares are used to estimate the effect of teaching incentives on academic evaluation of teaching performance. The results are as follows.

- The number of teaching rewards itself does not have a significant effect on students' evaluation of teachers' performance.
- When teaching is rewarded more than scientific research, teachers will invest more time and energy in teaching, and the number of teaching awards will increase, which will raise the student evaluation scores. When the weight of teaching in the academic title evaluation increases, teachers will pay more attention to teaching for the purpose of being promoted, which in turn will increase the student evaluation scores.

Given the above results, the study makes several recommendations. Scientific research has been taking a dominant position in teachers' careers in most universities. If we do not change the research-oriented culture, simply increasing teaching incentives will not promote the teaching quality. Only when teaching has a higher position than research can teaching quality be improved. Additionally, the 'quality' of teaching should be emphasized rather than the 'quantity.' Increasing the weight of teaching in the academic title system is an effective way to improve the quality of teaching.

Source: Open Education Research, 2021; 2021(6):53-60.

NEWSLETTER

Individual and Class Factors Influencing Students' Social and Emotional Skills

By Li, M. W., Mao, Y. Q., & Li, Y. F.
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SOCIAL and emotional skills refer to a series of core competencies related to self-adaptation and social development such as emotional regulation, self-control, achievement motivation, and collaboration with others. Cultivation of students' social and emotional skills is critical to the transformation and upgrading of basic education in the new era. Published in Contemporary Education Sciences, the study uses data of 2,020 students from Beijing and Tianjin as an analysis sample to analyze the effects of individual and class factors on students' social and emotional skills by the two-level HLM, in response to the current public concerns with students' comprehensive education and social development. The results of the study are as follows.

- At the individual level, female students, non-boarders and class leaders show higher social and emotional skills. Specifically, gender ($\beta = 0.10$, $p < 0.01$), boarding or not ($\beta = 0.16$, $p < 0.05$), and having been a class leader or not ($\beta = 0.18$, $p < 0.001$) significantly predict students' level of social and emotional skills, while education levels and being the only child or not do not have significant effects.
- At the class level, there are significant inter-class differences in students' social and emotional skills. Specifically, class factors can explain 8.5% of the total variation. In addition, the study finds that teacher-student relationships ($\gamma = 0.11$, $p < 0.05$), peer relationships ($\gamma = 0.53$, $p < 0.001$), and developing opportunities ($\gamma = 0.12$, $p < 0.05$) significantly and positively predict students' social and emotional skills.

Clarifying the effects of individual and class factors on students' social and emotional skills can provide useful references for pertinent education of students' non-cognitive abilities. Based on the analysis results, the researchers suggest that in developing students' social and emotional skills, teachers should understand and respect differences among individuals, tailoring teaching according to students' aptitude; Meanwhile, supportive class

atmosphere and harmonious interpersonal relationships also play an important role in developing students' social and emotional skills; Furthermore, extra curriculum activities in various forms should be provided for students to practice non-cognitive skills.

Source: Contemporary Education Sciences, 2021; 2021(12):80-88.

NEWSLETTER

Is "Hope for Success" Effective?

By Cheng, G., Du, S. H., & Yu, Q.
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"HIGH expectations, strict requirements" has been the typical educational principle for many parents. However, does "ambition" really work? A study published in Journal of *East China Normal University* uses the statistical data of China Education Panel Studies (CEPS) from 2014 to 2015 to explore the influence of parent-child education expectation deviation on adolescent academic performance and its mechanism by applying the least square regression, propensity score matching and Bootstrap mediation effect test. The results are as follows.

- Comprehensive OLS and PSM estimation results of the whole sample show that parent-child education expectation deviation significantly and negatively affects adolescent academic performance.
- The up-biased parent-child education expectation deviation represented by a strong desire for success is not reasonable and has a significant negative impact on academic performance. There is no significant relation between the downward bias of parent-child education expectation deviation and academic performance, but it does not mean that it is reasonable that the perceived parental education expectation should be lower than the children's self-expectation.
- Psychological pressure, academic burden and negative emotions play a partial mediating role in the relationship between upward biased parent-child education expectation deviation and academic achievement. The negative impact of over-expectation on individuals may be related to low learning efficiency and insufficient academic input caused by over-study and psychological pressure, which may lead to more severe psychological problems in the long run.
- The results of gender comparison show that compared with girls, boys' academic performance is more prone to the negative impact of up-biased parent-child education expectation deviation. The mediating mechanism provides a reasonable explanation for this result. The stress level, academic burden, and negative emotions

of boys with high expectation preference are higher than those of girls with high expectation preference.

Based on the research results, this study suggests that in teenager family education, parents should understand the fundamental value of education and make objective evaluation of children's academic ability; Parent-child interaction and communication should be maintained; Parents should help their children to regulate their psychological pressure, academic burden and negative emotions; Parents should pay more attention to boys' educational expectations to help them overcome academic difficulties, build confidence and grow up healthily.

Source: Journal of East China Normal University (Education Science edition), 2022;(01):74-87.

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