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EDITORIAL

Blossoming Branches Symbol the Real Spring: Chinese Sample of School Management

Alan C. K. Cheung

THE development of education is influenced by the economy, politics, and culture. Due to the differences in politics, economy, and culture of various countries, various countries' education also shows different characteristics. China's education is affected by specific economics, politics, and culture and has its unique operating model and mechanism. As far as school management is concerned, the management system of Chinese schools more reflects Chinese characteristics.

Two original papers in this issue of the journal focus on school management, one discusses the issue of physical education teachers serving as head teachers (Bai et al., 2021), and the other discusses the impact of local political elites and decision-making collectives on China's educational expenditures (Cai & Zhang, 2021).

Bai's study object, "Head Teacher (it is referred to as Ban Zhu Ren in Chinese)," is a character with distinctive Chinese characteristics. A teacher who serves as a head teacher has to teach one or more classes and manage a specific class. From this perspective, the head teacher often has a more significant influence on students than other teachers. So, who is the head teacher has become a particular concern for parents (Shi, 2021). This research is different from most of the same kind of empirical research. It used more standardized experimental research, supplemented by qualitative research, and obtained interesting and robust conclusions. This was a helpful attempt by the head teacher to do scientific management research.

Cai's study explores a more sensitive topic. People often think that political elites such as mayors and municipal party committee secretaries have greater discretion in China's local education governance. Previous studies

indicated that this is one of the characteristics of Chinese authoritarian local governance that is different from Western democratic systems (Blanchard, 2011; Qian & Weingast, 1996). The study shows that in the field of local education expenditure, which is closely related to the welfare of the people, China's local governments seem to rely more on the leadership collective rather than the "rule by the voice of one man alone" of the political elite to make decisions. This is an exciting discovery. This means that, at least in the process of local education governance in China, various localities are indeed making decisions by the principle of "democratic centralism." This also shows that it is not appropriate to understand the logic of local education governance in China and simply apply Western mainstream theories. Therefore, we need to construct a more explanatory theory to describe the facts more accurately.

We published these two papers with "Chinese characteristics" at the same time. The intention was to present the uniqueness of China's problems from both the micro and macro levels. For researchers who do not understand Chinese education's essence, it may not be easy to understand these two topics. However, considering the vast volume and incredible development speed of China's education, we believe that such efforts are necessary to provide Chinese samples to the world or promote the common progress of education between China and the world through such academic expressions. This shall be the so-called "international value" of these studies.

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COMMENTARY

Discussion on the Role of "Head Teacher" in China's Basic Education

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"I have been impressed with the urgency of doing. Knowing is not enough; we must apply. Being willing is not enough; we must do." –Leonardo da Vinci

FROM the perspective of the development of education, the initial reason for the emergence of schools is to enable students to master specific knowledge and skills required by society. In this process, it is inevitable to undertake the task of cultivating students' ideology and morality. Before the 18th century, due to the relatively low level of social development and education, the two functions of "teaching" and "educating" were often intertwined in the education process.

After the British bourgeois industrial revolution in the 18th century, education began to pursue the ability to train the talents needed for large-scale machine production on a large scale and with high efficiency. All capitalist countries have established modern school education systems one after another. Scientific knowledge is developing daily, and subject teaching is gradually taking shape (Silver, 2013). The refinement and scientific requirement of modern school teaching content intensified the division and contradiction between teaching and educating people. Teaching and management have increasingly evolved into two independent and professional activities. By the end of the 19th century, influenced by the Herbart School's ideas and others,

people "divided the school's internal educational activities into four functional aspects: teaching, training, conservation and management" (Herbat, 1806). At this time, there are two functional systems in ordinary schools: one was the "work system" divided by disciplines, that is, the teaching system; the other was the student management, education, and guidance system, which can also be called the management training system The independence of the student management and training system has prompted the emergence of work arrangements and positions in schools with functions such as management, guidance, and education as individual goals (Silver, 2013).

Take China as an example. In 1903, the school set up a "supervisor" responsible for students' character education. Later it was renamed "Administrator" and "Director Teacher." After 1938, the person responsible for managing a class in the school was renamed "Class Tutor." After the founding of China, under the influence of the former Soviet Union's head teacher system, the original elementary and middle school teachers and mentors were all changed to "head teacher" (Chen, 2007).

At present, elementary and middle schools in various countries have particular management positions for students. However, there are differences in their specific work objects or scope of work. In the United States, most elementary schools implement the head teacher "package system." The package teacher is responsible for the students' daily management, education, and guidance and responsible for the teaching of all subjects in a class. Usually, the teacher's office is the classroom where the students attend classes. All students' teaching activities are carried out in a classroom. Therefore, the student management, guidance, and education functions at the elementary school stage are basically undertaken by the package teacher.

In American middle schools, exceptionally comprehensive high schools, the schools implement the "selection system" in the curriculum and the "credit system" in the school system. Therefore, students do not have a fixed class, so the head teacher responsible for student management and guidance is not specified, but a counselor[1], homeroom teacher[2], dean, and the students themselves and social forces. Separate implementation and joint responsibility (Hammerness, 2011).

In the French school system, "teaching" and "educating" are two separate functions, and the inspector is an exceptional collaborator in ordinary French secondary schools. The school inspector's activities are basically to supervise and inspect students' behavior inside and outside the school and maintain school discipline. Due to the increasingly severe educational problems in schools, French elementary and middle schools have replaced the "supervisors" administrators — education consultants. Educational consultants focus on students' management and guidance and act as an inspiration and advocate (Belinda, 2013).

In China, the elementary and middle school head teacher system is a characteristic and essential part of national basic education. After 1949, to adapt to the needs of social development and accelerate the training of new generations needed for social development, based on learning the experience

of the Soviet Union, elementary and middle schools in China generally implemented the head teacher system. They promulgated the "Interim Middle Schools Regulations (Draft)" in 1952. The "Draft" clearly stipulates that "each class of the middle school has one head teacher, who the principal selects from among the teachers in each class. Under the leadership of the dean, he is responsible for contacting the teachers in the class, referring to the life and study of the students...". Since then, the head teacher system and the head teacher's basic responsibilities have been formally determined in China. Later, in 1979, the "Requirements on the Work of Head Teachers" was issued to clarify further the scope of duties of the head teacher's work and the specific requirements for self-construction (Xu, 1989).

In 2009, in response to head teachers' responsibilities and tasks, the Ministry of Education issued the "Work Regulations for Elementary and Middle School Head Teachers" (Ministry of Education of China, 2009). According to the "Regulations," each elementary and middle school class should be equipped with a head teacher. The head teacher is selected and hired by the school from the class teachers, and its job responsibilities should include the following aspects:

(i) First, get a comprehensive understanding of every student in the class and deeply analyze the students' thinking, psychology, study, and living conditions. Care for all students, treat every student equally and respect student personality. Adopt various ways to communicate with students, carry out targeted ideological and moral education, and promote the comprehensive development of students' morality, intelligence, and physical beauty.

(ii) Carefully maintain the class' daily management and the class' order, cultivate students' sense of rules, sense of responsibility, and sense of collective honor, and create a collaborative atmosphere of democracy, harmony, solidarity, and mutual assistance a healthy and progressive atmosphere.

(iii) Organize and guide various class activities such as class meetings, team meetings (days), cultural and sports entertainment, social practice, spring (autumn) tours, etc. Pay attention to mobilizing students' enthusiasm and initiative and do an excellent job in safety protection.

(iv) Organize students' comprehensive quality evaluation work, guide students to carefully record growth records, realistically evaluate student conduct, and make recommendations for rewards and punishments to the school.

(v) Frequently communicate with teachers and other faculty and staff, actively contact students' parents and the communities where students live and strive to form an educational synergy.

It can be seen that, compared with European and American schools in class, students are scattered among the schools, living in individual forms or temporary classroom organizations. Chinese elementary and middle schools live in schools as 'classes.' Classes are a teaching community and a living community and administrative management unit. This allows Chinese classes

to carry a unique educational advantage in educating people, and it also makes head teacher positions in China irreplaceable (Xiong & Sun, 2017). Compared to one post in other countries, head teachers in China may hold multiple posts. It is necessary to reflect teaching and educating people through teaching work, reflect management and education through class organization and management, and reflect service and education in students' development and service. Also, many excellent head teachers carry the vital mission of "leading parents to assist education." They assume Western countries' responsibility to guide parent educators' identity from the national system level (Wang, 2019).

The particularity of head teachers' duties and labor in China determines that teachers engaged in head teacher work should have strong professional qualities, such as excellent teaching ability, class management ability, moral reflection ability, and spiritual care ability. Among the many professional literacy requirements, strong teaching ability has become the primary criterion for head teacher positions. Especially influenced by the traditional teaching ideology of "integration of training and education" and examination-oriented education, class teachers are mostly core subject teachers. More schools and parents believe that the core subject teacher[3] has extended contact with students and can have more time to understand students effectively and coordinate the education work of teachers and parents of students (Shi, 2021).

With the advancement of quality education in China, especially in 2019, the State Council promulgated the "Opinions of the Central State Council on Deepening Education and Teaching Reform and Comprehensively Improving the Quality of Compulsory Education." It must comprehensively develop quality education, focusing on academic instruction, moral education, physical education, aesthetic education, and labor education. More and more schools have begun to use non-core subject teachers as head teachers. However, the school's innovation has not been recognized by all parents, and even some parents have distrust and opposition to the entire teaching work because the associate teacher is the head teacher. The debate about who is the head teacher has intensified in China, but the academic community has not given sufficient evidence.

Using evidence as the basis for selecting and improving programs can promote education innovation, evaluation, and gradual improvement (Slavin et al., 2021). In this issue of the journal, Bai et al. (2021) discussed whether a physical education teacher's head teacher will adversely affect student performance. They use a combination of rigorous experimental research and qualitative research to evaluate the effect of physical education teachers as head teachers. In the research method, this article summarizes previous research shortcomings that only experience but not evidence. While responding to social concerns provide a scientific basis for optimizing head teacher staffing and improving class management in China.

Notes

1. *In American middle schools, tutors are full-time teachers between teachers and administrators. They do not teach classes, but their work is precise and specialized, with fixed objects and work scope.*
2. *Homeroom teacher: Some high schools in the United States have arranged "homeroom" in the students' curriculum. The family room gathers the students enrolled in the same grade to facilitate some student management activities.*
3. *Affected by China's examination system, in basic education courses, examination subjects are called core subjects, and subjects that do not take examinations are called non-core subjects. Generally speaking, the core subjects include Chinese, mathematics, English, politics, history, physics, biology, geography, and chemistry. Non-core subjects include music, art, sports, etc.*

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ORIGINAL ARTICLE

Is It Reliable for Physical Education Teacher to be A Head teacher? A Mixed-Method Study*

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Abstract*. To discuss physical education (P.E.) teachers serving as head teachers, it should be reasonable and evidence-based. Previous studies did not provide sufficient scientific evidence to answer this hotly debated question. Therefore, this study first adopted rigorous experimental research methods, focusing on analyzing whether a P.E. teacher serving as a head teacher would affect student performance. On this basis, the robustness of the experimental results was verified through qualitative research. The results showed that a P.E. teacher serving as a head teacher would not adversely affect students' academic performance and maybe more conducive to students' overall development. Based on this conclusion, we further suggested how to improve the appointment and management of head teachers.*

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**: A head teacher, aka Ban Zhu Ren in Chinese, is a teacher who is fully responsible for the learning, health, and life of the students of a class in a school. She/He is the organizer, leader and educator of a class, as well as the coordinator of teaching and education work of all the teachers in a class.*

Question

WHETHER a physical education (P.E.) teacher can serve as a head teacher is not a new question. On the one hand, "non-core subject" teachers, including P.E. teachers, have long been used as head teachers; on the other hand, there has never been any policy or regulation in China that prohibits P.E. teachers from serving as head teachers. However, in reality, "non-core subject teachers," including P.E. teachers as head teachers, have indeed become a "problem." In recent years, the topic of P.E. teacher serving as head teacher has become a hot topic of public attention. Students tend to "despise" non-core subjects psychologically, regard non-core subject classes as relaxing time; their teachings of non-core subject teachers are also ignored. It creates numerous obstacles to the class management of non-core subject teachers (Shi, 2021). What is more, parents complained to the local administrative department because the school arranged a P.E. teacher as the head teacher and worried that this would affect the student's academic performance. Although the government and schools do not support such complaints, the incident itself reflects parents' anxiety about class management under the fierce academic competition (Zhao, 2020). In this case, merely dismissing the complaint or giving a general explanation is often challenging to eliminate the parents' doubts; simplistically accusing the parents of "unreasonable" is even more detrimental to the problem's solution. When dealing with such problems, administrators should not only be rational but also have evidence. If we can come up with more evidence of the effectiveness of P.E. teachers as head teachers, regardless of whether this evidence is in line with our expectations, it will make our decision-making and management based on science, which can dispel doubts and improve class management.

So far, researchers have analyzed the phenomenon of P.E. teachers serving as head teachers. This kind of authors are mostly front-line managers and teachers, and related researches were basically theoretical discussions and experience summaries. In terms of research content and conclusions, most of them discussed the advantages, strategies, and significance of P.E. teachers as head teachers. They thought that the P.E. teacher's role as a head teacher was a breakthrough P.E. teacher's spiritual character, life attitude, and sports emotions make the obvious superiority for P.E. teacher to be a head teacher (Qi & Wang, 2020). Some studies also explored from the perspective of moral education and the cultivation of students' core literacy. It is believed that P.E. teacher as a head teacher helps to shape students' positive, tenacious and unyielding mental outlook with rich sports emotions, and then cultivate students' good moral qualities, thereby promoting students' all-round development (Gong & Zeng, 2020). At the same time, some studies have discussed the shortcomings of P.E. teacher as a head teacher. For example, because the P.E. teachers have fewer class hours, she/he often does not have enough grasp of the classroom situation, and it is difficult to have more in-depth contact and understanding of students. P.E. teachers' knowledge has limitations, which is not conducive to helping students improve their academic performance. The relatively "weak" status of P.E. teachers is not conducive to coordinating the rela-

tionship with other teachers in the classroom, thereby affecting the authority of class management (Chen, 2014).

What needs to be pointed out is that despite the constant discussion about who the head teacher is, in reality, there is a need to evaluate the effectiveness of P.E. teacher as the head teacher. Nevertheless, so far, there are few rigorous empirical studies on this issue in existing studies. Relevant discussions are mostly experience summaries or value discussions. The lack of rigorous scientific evidence makes it difficult for both researchers and managers to respond effectively to this problem in the class management process. In response to this, this research will analyze the effect of P.E. teacher as a head teacher through an experimental study, supplemented by qualitative research evidence, especially its impact on students' academic performance. While responding to public concerns provide a scientific basis for optimizing head teachers' staffing and improving class management.

Experimental Methods

Ideas

Although in reality, the influence of head teachers on students is manifold. However, considering that the current public opinion is mainly concerned with the impact of P.E. teacher as a head teacher on student performance, the dependent variable investigated in this study was student academic performance. The core question to be answered was: Will a P.E. teacher acting as a head teacher hurts students' academic performance as some parents worry about? To this end, our primary research idea was to analyze the impact of PE teacher as a head teacher by comparing the academic performance of PE teacher as a head teacher class and non-PE teacher as a head teacher class under the control of related confounding variables.

In this study, since many factors affect student performance, the head teacher candidate is the only one-factor affecting student performance. If the relevant influencing factors are not controlled, the results obtained are not reliable how to eliminate the influence of confounding variables and get more robust conclusions that can reveal causal (rather than related) relationships have always been complicated in social science research. However, experimental research is often a common way to solve this problem. The current leader in evidence-based education research, Professor Robert Slavin of Johns Hopkins University in the United States, believes that well-designed experimental research can control confounding variables and reveal causality. Therefore, it is very suitable for the value judgment of different educational interventions (Slavin, 2020). The basic principle is to construct an experimental group and a control group with small differences in confounding variables and the intervention variables to evaluate the intervention's effect. Because of the samples constructed in this way, there is no significant difference in the confounding variables between the experimental and control groups. If, after the end of the experiment, there is a significant difference between the two groups of experimental results, it can be judged that the intervention variable is most likely to be the cause of the difference (Angrist & Pischke, 2009).

Based on this idea, in the research process, we regard different head teacher candidates as the basis for grouping. The class with P.E. teacher as head teacher is regarded as the experimental group; the class with the non-P.E. teacher as head teacher is regarded as the control group. In the case of well-controlled confounding variables, the influence of P.E. teacher as a head teacher on students' academic performance was investigated by analyzing the difference in academic performance between the two during the experiment period.

Subjects

This research object is the middle school department of Lianyungang Huajie Experimental School Affiliated with Nanjing Normal University. The school is a nine-year consistent private school, of which the middle school has 54 classes and 11 P.E. teachers. The average age of school teachers is about 27 years old, and most teachers have a teaching experience of 4-5 years. The reason for choosing a middle school is that middle school students in China face more significant pressure to enter high school than elementary school students. In this case, schools and parents will be more cautious when facing P.E. teachers as head teachers. Previous studies have also shown that because middle school students are in a rapid physical and mental development stage, teachers' management styles often significantly impact students (Wang et al., 2009).

Since the school is a boarding school, head teachers' workload is relatively large, and most are female teachers. There are often teachers who are unable to undertake class management due to personal or family reasons. In response to this situation, the school has reformed head teacher selection many years ago, boldly enabling P.E. teachers to take up the work of head teachers. At present, except for two female P.E. teachers who are not head teachers due to pregnancy; all other P.E. teachers are head teachers. In the three grades of the middle school, including the graduating class, P.E. teachers serve as head teachers, which provide a good research foundation for this study.

Study Procedures

A well-designed experimental study has stricter standards, including control of pre-test differences and confounding variables, sufficient sample size, and a long experimental period (Cheung & Slavin, 2016). Based on the above research ideas, we will use one academic year to carry out experiments from September 2019 to June 2020. To control the differences between groups, the school randomly sorted students and teachers into classes based on the seventh-grade placement test results and the final results of the eighth and ninth grades of the previous academic year. It aimed to ensure no significant differences in each class's pre-test scores, the teacher's teaching experience, ability, and the students' family background.

During the experiment, we collected five results, including the results of the placement test, the midterm, and the final results of the two semesters. Simultaneously, through interviews, field observations, text and video analysis, and other qualitative

research methods, the head teacher's work materials are obtained to more robustly verify the experimental results and describe their work more comprehensively.

Results

In June 2020, after an academic year of experiments, we obtained the final experimental results. To eliminate the influence of the test paper's difficulty and the distribution of data, we processed the original score of the test and converted it into a percentile. The advantage is that the academic progress or regression of students can be evaluated according to the changes in their percentile grades, so as to eliminate the influence mentioned above caused by different testing tools (Kolen & Brennan, 2014).

Table 1 shows that at the beginning of the experiment, the performance gap between the experimental group and the control group in each grade was tiny, and all independent sample T-tests were not significant. To measure the difference between the experimental and control groups more accurately, we also calculated the effect size of the difference between the groups based on the results of the independent sample T-test. The reason for estimating the effect size was that the traditional null hypothesis test results were often greatly affected by the sample size, and the effect of independent variables could not be measured. Cohen believed that people often only paid attention to whether the results were "significant." It seems that as long as the p-value was less than 0.05, the study results were valuable. This confused the difference between significance and practical effect. Even if the experimental result was significant, it did not mean that the independent variable's effect was sufficiently "large" (Cohen, 1992). Therefore, the calculation of effect size was first introduced in psychology, and different types of effect sizes were used to express the size of experimental effects. In this study, Cohen's d value was used as the effect size to measure each stage's practical effect.

The specific calculation method is:

$$d = (\bar{y}_1 - \bar{y}_2)/\delta_{pooled} \qquad (1)$$

Among them, $\bar{y}_1$ and $\bar{y}_2$ are the mean values of the experimental and control groups, respectively, and δ_{pooled} is the pooled variance. The larger the value of d, the more significant the difference between groups caused by the independent variable. Cohen once suggested using 0.2, 0.5, and 0.8 as critical points to distinguish small, medium, and large effect sizes and combine previous research and actual conditions to interpret the observed effects (Zheng et al., 2011). Based on this, we calculated the results of the independent sample T-test of each test and calculated the effect size. The specific calculation results are shown in **Table 1**.

Table 1 shows that the difference between each grade group's effect size is minimal at the pre-test. This means that we have the reasonable control of the pre-test differences. After randomization, there was no significant difference between the experimental group and the control group. The difference between the experimental and control groups was mainly due to the head teacher's different subjects. If there was (or no)

Table 1. Experimental Results of the Influence of Physical Education Teachers as Head Teachers on Student Performance.

	7th Grade					**8yh Grade**					**9th Grade**				
	Placement Test					Placement Test					Placement Test				
	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES
Exp	202	0.50	0.29	0.07	0.01	125.00	0.50	0.30	-0.13	-0.01	201.00	0.50	0.29	0.05	0.00
Ctrl	805	0.50	0.29			711.00	0.50	0.29			613.00	0.50	0.29		
	2019-2020 School Year First Semester					2019-2020 School Year First Semester					2019-2020 School Year First Semester				
	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES
Exp	199	0.53	0.29	1.67	0.13	131.00	0.46	0.29	-1.84	-0.17	206.00	0.52	0.29	1.19	0.10
Ctrl	861	0.50	0.29			723.00	0.51	0.29			616.00	0.50	0.29		
	2019-2020 School Year End of the First Semester					2019-2020 School Year End of the First Semester					2019-2020 School Year End of the First Semester				
	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES
Exp	197	0.53	0.30	1.70	0.13	129.00	0.48	0.31	-0.92	-0.09	206.00	0.52	0.29	1.29	0.10
Ctrl	854	0.49	0.29			719.00	0.51	0.29			614.00	0.49	0.29		
	2019-2020 School Year Second Semester					2019-2020 School Year Second Semester					2019-2020 School Year Second Semester				
	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES
Exp	195	0.51	0.30	0.53	0.04	124.00	0.46	0.28	-1.74	-0.17	204.00	0.52	0.29	1.10	0.09
Ctrl	836	0.50	0.29			708.00	0.51	0.29			608.00	0.50	0.29		
	2019-2020 School Year End of the Second Semester					2019-2020 School Year End of the Second Semester					2019-2020 School Year End of the Second Semester				
	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES	No.	Avg	SD	T	ES
Exp	196	0.51	0.30	0.44	0.03	126.00	0.46	0.30	-1.58	-0.15	202.00	0.51	0.29	0.72	0.06
Ctrl	838	0.50	0.29			708.00	0.51	0.29			595.00	0.49	0.29		

Note: The T value in the above table results from the independent sample T-test of the experimental group and the control group. The p values corresponding to all T values are more significant than 0.05, which is concise. No p-value is reported in the table. Exp: Experiment; Ctrl: Control; Avg: Average; SD: Standard Deviation; ES: Effect Size; T: T Value.

significant (or insignificant) difference in performance between the experimental and control groups during the experiment or at the end of the experiment, we could judge that the difference in selecting head teacher caused this change.

The results in **Table 1** show that the difference between the experimental group and the control group's previous examination results is not apparent in the entire experiment process. Among them, when the seventh grade was divided into classes, the experimental group had a fragile performance advantage compared to the control group; the ninth grade experimental group and the control group had almost the same performance, and the effect sizes of the two grades were 0.01 and 0, respectively. By the end of the study in June 2020, the independent sample T-test results of the two grades were still not significant, and the effect sizes had become 0.03 and 0.06, respectively, indicating that the experimental group where the P.E. teacher served as head teacher had further expanded its performance advantage compared with the control group, but the expansion of such advantages were fragile and did not show statistical significance. In the

pre-test of the eighth grade, the experimental group had an extremely weak disadvantage compared with the control group, and the difference was also not significant ($T = -0.13$, $p > 0.05$). At the end of the study, the effect size of the eighth grade changed from -0.01 to -0.15, indicating that the performance disadvantage of the experimental group was getting bigger, but it was still tiny, and the performance difference with the control group was still not significant ($T = -1.58$, $p > 0.05$).

Further Verification and Discussion of Experimental Results

This study indicates no adverse effect on student performance in this experimental school due to the large number of P.E. teachers being used as head teachers. Compared with previous theoretical discussions, this study was based on a relatively rigorous experimental design, which provided a scientific basis for answering the question "Is it reliable for P.E. teacher to serve as a head teacher?" However, as some scholars have pointed out, although experimental research can accurately assess intervention variables' effects and make causal inferences, it is challenging to demonstrate educational practice's richness (Lather, 2004). Although we have evaluated the effect of P.E. teacher as a head teacher through experimental research, we still have no way to answer under what circumstances and why P.E. teacher as a head teacher will help students grow? In response to such problems in social science research, researchers are paying more attention to the application of mixed-method research. It is hoped that through the comprehensive application of quantitative research and qualitative research, the advantages of both can be fully utilized to provide more robust evidence for research problems (Creswell & Clark, 2017). While implementing the experiment, this study also collected relevant qualitative data to verify the experimental results' reliability further.

Before and during the experiment's implementation, we conducted interviews with school-level leaders of the experimental school, P.E. teacher as a head teacher, and randomly selected students through semi-structured interviews. The interview's main questions focused on the school's class management system and measures, the work mode of the P.E. teacher as a head teacher, and the effectiveness of class management work. The basic situation of the interviewees is shown in **Table 2**.

Through such interviews, we hope to characterize further the work characteristics and internal mechanism of P.E. teachers as head teachers. In fact, not many schools use P.E. teachers as head teachers on a large scale like the experimental school observed in this research. There are many reasons why this school can do this and achieved good results:

First, the school does not treat P.E. teachers differently in terms of management philosophy. It fully trusts P.E. teachers and provides them with opportunities to manage classes to achieve better development.

P.E. teacher was initially used as a head teacher to solve the head teacher shortage caused by female teachers' pregnancy and childbirth. In the beginning, the school was under much pressure. Fortunately, the initial attempts have achieved good

Table 2. Basic Situation of Interviewees.

Serial Number	Identity	Description	Interview Time
XLD01-03	School Leader	Including the school principal, the deputy principal in charge, and the school director	Completed many times. It takes about 40-80 minutes per person, for a total of about 160 minutes.
BZR01-11	Head Teacher	A physical education teacher serving as a head teacher	20-30 minutes per person, totaling about 270 minutes. Some of the interviewed class teachers provided written materials.
XS01-18	Student	Six people were randomly interviewed in each grade, from the first to the third grade.	10-15 minutes per person, about 200 minutes in total.

results. This makes us more confident in appointing P.E. teachers as head teachers, from the initial passive response to the active arrangement. On the one hand, it solves the problem of head teacher shortage; on the other hand, it also dramatically mobilizes PE teachers' enthusiasm to work and provides more for the development of "non-core subject" teachers, including PE teachers. Letting all P.E. teachers serve as head teachers has become routine management of head teachers in our school. (XLD01)

In 2020, the first pacesetter head teacher selection, the school had a total of seven head teachers selected, of which there are four P.E. teachers. These P.E. teachers stood out from head teachers' work and become role models for head teachers throughout the school. (XLD03)

Second, this school also adopts a series of management measures such as formulating and implementing the head teacher work standards, establishing head teacher work files, forming a class management and work team led by the chief head teacher and strengthening head teacher work evaluation and incentives to ensure that all head teachers can complete their work tasks with high quality.

In the long-term management practice, we have realized that which subject the head teacher teaches is not a decisive factor in determining the head teacher's performance. Instead, it needs to rely on a complete set of head teacher management systems so that anyone can achieve the expected results in the position of the head teacher. Regarding the P.E. teacher as the head teacher, in terms of system design, we strive to ensure the head teacher's core position in the class management process and give the head teacher greater weight in class management. Simultaneously, to prevent head teachers from using their powers to allocate more time to their subjects, in the design of the incentive system, we adopt a way of rewarding the team and not individuals for class management. That is, no matter how good the head teacher's subject is, it is useless. Only when the class work is promoted as a whole, and the students develop in a balanced manner in all aspects, the class management team will be rewarded. (XLD01, XLD02)

We attach great importance to the regular management of head teachers. Since the teachers in our school are relatively young, they generally have the problem of inexperience in class work. In response to this, on the one hand, we adopt the old-fashioned and model-setting approach to promote the growth of head teachers. On the other hand, we have established a complete standardization process for head teacher work to ensure that no matter who serves as a head teacher, we will ensure the "bottom line" as long as we follow this standard" achievement. There will be no severe deviations in class management due to individual differences in head teachers. (XLD03)

Third, the school organized a large number of targeted training so that P.E. teachers could obtain the support of relevant management knowledge and skills through learning and training before and after taking on the head teacher position.

In addition to regular full-staff training and expert lectures, we will implement the "Head teacher Qinglan Project" in a voluntary and designated manner within one month of the beginning of each new school year, based on the configuration of the class management team. Through targeted assistance from experienced head teachers, we can improve young head teachers' working abilities and accelerate their professional growth. P.E. teacher will encounter various problems in the actual class management work. The school has a dedicated person to collect the difficulties and confusions encountered by head teachers in class management by grades, summarize and sort out common problems; use head teacher studios, seminars, and other forms to conduct discussions. In this way, the head teacher can effectively solve the problem through multi-party consultation. (XLD03)

Finally, in the field investigation process, we also found the unique phenomenon of P.E. teachers as head teachers mentioned in the previous literature. For example, we found that the classes managed by P.E. teachers pay more attention to sports activities, the ways of teacher-student interaction are more flexible and diverse, and the class atmosphere and teacher-student relationship are more harmonious (XS01-18). This means that in addition to grades, a P.E. teacher acting as a head teacher can also bring more benefits to students for all-round development. This may also be the reason why the P.E. teacher's class performance as a head teacher did not fall behind (Zhou et al., 2018).

Children like sports. As a head teacher, P.E. teacher makes it easier to give play to their professional skills and talents, win the recognition and love of children, and create a good teacher-student relationship and class atmosphere. (BZR03, BZR05)

P.E. teacher as a head teacher has advantages. Because P.E. teacher does not need to correct homework, the pressure of schoolwork is not as tremendous as the core subject teacher. This gives us more energy to pay attention to students and put more time and energy into class management. (BZR01, BZR02, BZR11)

P.E. teacher serves as a head teacher because it rarely forms a competitive relationship with other teachers in performance appraisal, appraisal, and title promotion, so it is easier to coordinate the teacher's relationship. Moreover, because P.E. teacher is relatively abundant in time and energetic, she/he often invests more in home-school cooperation. Over the years, no one of our school's parents questioned the P.E. teach-

er's role as a head teacher, and parents have highly recognized this management measure. (BZR01-08, XLD03)

These survey results further explain why P.E. teacher serves as a head teacher and why it does not cause students' academic disadvantages. At the same time, it also shows to a certain extent that P.E. teacher has unique advantages when engaged in class management. However, since we failed to measure the teacher-student relationship and class atmosphere during the experiment, we can only obtain empirical observation results at present. More detailed studies in this area are needed in the future.

Conclusions and Suggestions

The most critical finding and conclusion of this research are that a P.E. teacher serving as a head teacher will not affect students' academic performance. Not only that, in terms of promoting the overall development of students, may P.E. teacher has more advantages as a head teacher. Our study provides scientific evidence for the discussion of general topics and improves the head teacher's configuration and management.

First of all, at the conceptual level, prejudice and discrimination against "non-core subject" teachers, including P.E. teachers as head teachers, should be eliminated. Fundamentally speaking, the reason for this understanding is mainly due to the one-sided pursuit of academic performance. In management, the school should adhere to the correct teaching concept, strengthen the communication and exchange with parents, guide the parents with correct educational concepts, do an excellent job of clearing and explaining, and dispel unnecessary parents' anxiety.

Second, optimize the head teacher management to provide a good atmosphere and environment for P.E. teachers to serve as a head teacher. This research has proved that who is the head teacher may not be an essential issue. The critical question should be how to make anyone in the head teacher position indeed do an excellent job as a head teacher and grow. In this study, the experimental school has ensured the head teacher's management work's quality and effectiveness through training, incentives, and system construction. This may be a useful experience worth learning from.

Third, give full play to the role of "non-core subject" teachers in educating people and realizing their work's value. This requires appointing "non-core subject" teachers like P.E. teachers as head teachers and giving full play to these subject teachers' expertise. This enables them to use more colorful class management methods to create a united and progressive class atmosphere, achieve the educational goals of establishing morals and nurturing people, and promote students' all-round development.

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ORIGINAL ARTICLE

An Empirical Study on the Impact of Individual Local Political Elites and Decision-Making Collective on Educational Fiscal Expenditure in China

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Abstract. *Under the current decentralization system in China, individual characteristics of the local political elites and collective characteristics of the standing committees of the local party have an impact on local education fiscal policy. Yet published research on the similarities and differences between the collective influence of the Standing committee and the individual influence of the political elite are lacking. To address this gap in the literature, our study discussed the impact of local political elites represented by the mayor and the secretary and the collective of standing committees of the local party on education fiscal expenditure. We construct multiple regression models and analyze the R^2 Change of variables is based on the cross-sectional data from 2015 of 283 prefecture-level administrative units in China. We find that both political elites and the standing committees have significant impacts on fiscal expenditure in education, and that the influence of the latter is greater than that of the former. The effect of individual characteristics and collective characteristics on education fiscal expenditure is not completely consistent across prefectures. China's prefectural governments implement China's unique principle of democratic centralism when they make decisions on local spending for education and the collective decision-making under the leadership of the committee plays an important role in education fiscal expenditure. Based on this, we put forward policy suggestions to further develop the principle of democratic centralism and to optimize optimizing the local government education supply and evaluation mechanism.*

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***Keywords**: Official Personal Characteristics; Collective Characteristics of Standing Committee of Local Party; Democratic Centralism; Education Fiscal Expenditure*

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Introduction

WITH decentralization reform in China, Chinese local governments face unique incentives and constraints given their institutional design. As a result, mainstream Western fiscal decentralization theory provides little insight into China's problems, leading Yingyi Qian (1996) and others to argue that Chinese decentralization system design differs from that of the Western. "Chinese-style fiscal federalism" is the result of the unity of economic decentralization and political centralization (Blanchard & Shleifer, 2001). While implementing economic decentralization, the party and higher-level government organizations maintain control of the incentives and constraints on the party and government organizations at lower levels through organizational personnel arrangements based on local development performance (often expressed as local economic growth performance) (Li & Zhou, 2005). Such institutional design has allowed localities to allocate more energy and resources to areas conducive to economic growth in the process of "competing for growth" which has mobilized local governments to develop the economy through initiatives that promote high-speed growth of the local economy, but has also brought problems for local education, health care, environmental protection, and investment resources, etc. (Fu & Zhang, 2017; Wang & Zhou, 2013; Xu, 2011; Yu, 2017; Zhou, 2006; Qiao, et al., 2005) . On the other hand, compared with the Western countries, China's local government officials have greater discretionary power in the process of intergovernmental competition and local governance, especially in the use of funds and budgetary arrangements. With this greater flexibility, China's local governments exhibit a clear "soft budget" in terms of local fiscal expenditures. This means that local officials can take more flexible measures to deal with local affairs based on their own experience and preferences (Yang & Zheng, 2013; Zhang, 2008).

Given this local flexibility, many scholars have paid attention to the relationship between the personality traits of officials and local governance. Xianbin Wang (2009), Li'an Zhou (2005), Tingjin Lin (2009), Xianxiang Xu (2008), Ran Song (2016), Yini Jiang (2017) and others use the analysis of government behavior from provincial, city and county levels as a starting point to discuss demographic characteristics of local officials, such as gender, age, education, and the relationship between work experience and the supply of public goods such as education, which provides new perspectives and ideas for interpreting China's local governance model. However, such empirical researches, while paying attention to the influence of individual traits of officials, fail to connect this with collective decision-making of local governance in China. As democratic centralism is the fundamental organizational and leadership system of the local government, current researches are clearly insufficient to fully describe China's local governance characteristics. Given the organization of democratic centralism and decision-making principles, decisions on education finance must be made through a few democratic processes that are subject to the majority (Zhu & Hu, 2014). Therefore, accurately describing the decision-making behavior and characteristics of Chinese local government officials requires a focus on the relationship between the collective charac-

teristics of decision-making body and their relationship with the individual characteristics of political elites.

A proper description of the collective characteristics of local leadership is fundamental to such kind of researches. Some early researches have been explored this theoretical logic regarding the collective as a rational decision maker, such as the Logic of Collective Action (Olson, 2014). From this perspective, the government can be regarded as a "personified" individual. In recent years, some foreign studies have begun trying to describe the characteristics of decision-making collectives quantitatively. The basic idea is similar to the above theoretical logic; that is, by considering the collective as an "individual" with certain characteristics, and then using the corresponding indicators (i.e., the composition of the collective average individual characteristics) the collective can be described (Alesina et al., 2015). Most such researches in China are still at the stage of theoretical discussion. Some scholars analyzing public finance behavior have reported on officials stating that personal motives partially affected government group motivation (Cao et al., 2014). Others start from the concept of "collective leadership" and describe the dimensions and characteristics of collective decision-making (Yang et al., 2014). To date, however, there have been few studies on the influence of collective leadership in China, and high-quality empirical research is especially lacking (Cai & Yao, 2018; Zhang, 2014).

This paper considers the local government decision-making body in terms of individuals of political elite and collective of the party committee. Government officials discuss the impact of individual and collective decision-making on education spending and its financial interactions. Finally, an analysis of the local government's supply behavior of public goods, such as education, is considered. In the public fiscal expenditures, only the education fiscal expenditure item has the target stipulated explicitly by the government, moreover, the education publicity and the education finance expenditure with lag behind effect can reflect the local official's fiscal expenditure preference more. For these reasons, this article focuses on the following questions: What are the similarities and differences between the political elite and the party committee's standing committee, and how do they interact? What is the impact of the demographic characteristics and job experience characteristics of officials on the education fiscal expenditure? What specific characteristics have a critical impact on the education fiscal expenditure? Answering these questions can provide a deeper understanding of the influence of local officials on education finance, and will allow a better interpretation of the behavioral motives of local officials under the "Chinese-style decentralization" system. Ultimately, this can help local political elites and party committee to make scientifically-based decisions.

Methods

Research design

The 2015 prefecture-level administrative units are used as the research subject, and data are collected on the personal characteristics of the mayor, the municipal party commit-

tee secretary and the members of the standing committee of the party committee for use in a regression models for analysis. We chose prefecture-level administrative units as our research objects because of the availability of data and the need for research methods. First, provincial data cannot meet sample size requirements and county-level data is difficult to obtain; thus, only prefecture-city level data met research needs. Second, although China has a "Provincial County" financial management system, with only three provincial cities and counties in the administrative relationship, the local government level bears an important responsibility for the development of local education. Third, the logic of local government behavior between leading individuals and collectives in the supply of education are present at provincial prefecture and county levels, the prefecture level can also explain this logic. Therefore, the administrative units at the prefecture level are reasonable as the research subjects of this study.

This paper therefore uses the data of prefecture-level administrative units in China to compare and analyze the behaviors of prefecture-level political leaders in financial expenditures on education, including the party committee secretary, the mayor (including the heads of autonomous league, governors of the autonomous prefectures)[1] and the decision-making collectives of the party committee. The basic characteristics of the collective committee of the party committee at the prefecture level are described using the "personification" method and averaging of individual committee member traits, and combined with the demographic and experience characteristics of the party committee secretary and the mayor as independent variables to establish six regression models. These models explore the relationship between individual and collective characteristics of political leaders at the prefecture level and fiscal expenditures for education. The variables of this study are designed as follows.

Dependent variables

China's assessment of the financial responsibility of local government education is mainly based on two indicators: the proportion of education fiscal expenditure relative to GDP should be greater than 4% and the proportion relative to the fiscal expenditure should be greater than 15% (Government Central Committee, 1993; National Education Commission, 1993). These two indicators can not only describe the total level and effort of local government on education and financial expenditure, but also express the spending preference of local governments. Thus, we use "educational fiscal expenditure as a share of GDP" and "educational fiscal expenditure accounts for the proportion of fiscal expenditure" as two dependent variables in each group model.

Independent variables

The collective level Party committee as a decision-making body is based on personal characteristics of the political elite personnel to generate a quantitative description of the collective identity of officials (Alesina et al., 2015). It includes not only demographic variables such as gender, nationality, age, years of education, and professional back-

ground, but also the characteristics of the tenure of office, promotion rate, and working in the household registration area or not.

Control variables

This study sets the level of local economic development, regional categories, population size, education needs, fiscal expenditure decentralization, and fiscal control variables, such as autonomy. The level of economic development is expressed in terms of local per capita GDP. China is divided into three major regions of East, Central and West, which are modeled by virtual variables (using the western region as the reference group). Population size is represented by the permanent population at the end of the year. The number of students enrolled in the city is used to indicate education needs. The financial expenditure decentralization index and the financial autonomy index are used as proxies for the local government's financial operation characteristics.

Data Processing

Resumé and socio-economic data in 2015, obtained from the national-level administrative units for the party committee officials, were used for analysis. An information table was generated for officials using the party committee leadership directory in the yearbook, from searching resumés for standing committee members from People's Daily, Xinhua, and the government portals directory list, and using the socio-economic data and education finance data from the China City Statistical Yearbook (2016) and local statistical yearbooks.

In 2015, 334-prefecture-level administrative units were present in China; analysis excluded areas where the data were scarce[2]. The term of office of the standing committee of each party committee is typically five years. A small number of members of the standing committee may change during a non-change year, and the leadership role of the new standing committee then takes some time to take effect; thus, members of the standing committee of the prefecture-level local party who were changed in 2015 and have served for less than half a year were excluded. After personal information was extracted for members, standing party committee-level characteristics for the group were calculated as the average individual characteristic or as a proportion. In this way, the personal data from 3,482 prefecture-level party committee members were combined into 314 values of the collective characteristics of the standing committee members of the prefecture-level party committee. The specific calculation method for each variable is shown in **Table 1**. To match the political elite and the standing committee, samples with missing values are deleted[3]. Finally, the Pauta criterion for excluding outliers was applied[4]. Using the obtained 283 sets of complete matching samples, we ran the following descriptive statistical analysis.

Results

Basic Descriptive Statistical Analysis

Table 1. Variable Setting and Descriptive Statistical Analysis.

	Variable	Abbr.	Metric Method		Mean	SD	Minimum	Maximum
Dependent Variable	Education expenditure as a percentage of GDP (%)	EX_GDP	Education expenditure as a percentage of GDP = education expenditure / GDP * 100		3.812	1.892	0.857	10.718
	Education expenditure as a share of fiscal expenditure (%)	EX_FE	Education expenditure as a percentage of local fiscal expenditure = education expenditure / fiscal expenditure * 100		17.722	3.774	4.836	27.501
Independent Variable – Political Elite Individual Characteristic	Gender	G	1=female; 0=male	Secretary	0.060	0.238	0.000	1.000
				Mayor	0.081	0.274	0.000	1.000
	Nationality	N	1=minority; 0=han	Secretary	0.081	0.274	0.000	1.000
				Mayor	0.127	0.334	0.000	1.000
	Age	A	Age = December 2015 - date of birth	Secretary	53.812	3.233	43.090	61.020
				Mayor	51.567	3.449	40.040	60.000
	Education (years)	EY	Education Year = full-time education year + in-service education year (excluding short-term training)	Secretary	19.583	3.037	12.000	31.000
				Mayor	19.996	3.058	13.000	31.000
	Education Major	EM	1=social science; 0=natural science	Secretary	0.604	0.490	0.000	1.000
				Mayor	0.580	0.495	0.000	1.000
	Serve in the household registration area	SHRA	1=yes; 0=no	Secretary	0.544	0.499	0.000	1.000
				Mayor	0.661	0.474	0.000	1.000
	Current position tenure	CPT	Current tenure of office = December 2015 - date of the current position	Secretary	2.254	1.547	0.060	8.090
				Mayor	2.081	1.508	0.050	9.100
	Promotion rate	PR	Promotion rate = 1 / pre-service years of service	Secretary	0.034	0.007	0.024	0.067
				Mayor	0.037	0.008	0.024	0.084
Independent Variables – Collective Characteristic of the Standing Committee the Party	Female share (%)	FS	Female share = number of women / total number * 100		9.194	6.959	0.000	30.000
	Minority share (%)	MS	Minority share = number of ethnic minorities / total number of people * 100		7.844	13.662	0.000	57.143
	Average age (years)	A_A	Average age = sum of age / total number of people		51.996	1.714	48.275	57.146
	Average Education (years)	A_EY	Average education year = sum of years of education / total number of people		18.508	1.143	15.000	22.667
	The proportion of social science (%)	PSS	The proportion of social science majors = number of social science profes-		54.602	18.876	0.000	92.857

			sionals / total number * 100				
	The average proportion of officials serving in household registration area (%)	AP_SHRA	The average proportion of officials serving in household registration area = number of domiciled tenure / total number of people	25.851	16.525	0.000	83.333
	Average current position tenure	A_CPT	Average current tenure of office = total number of current tenure / total number of people	2.612	0.764	0.489	4.777
	Average promotion rate	A_PR	Average promotion rate = sum of promotion rates / total number of people; among them, promotion rate = 1 / pre- working years	0.040	0.004	0.028	0.067
Control Variable	Per capita GDP of each city (10,000 CNY/person)	Per_GDP	Per capita GDP of each city = GDP per year / permanent population at the end of the year	4.965	2.931	1.217	20.716
	East area	E	1=eastern; 0=others	0.364	0.482	0.000	1.000
	Central area	C	1=Central; 0=Others	0.382	0.487	0.000	1.000
	Permanent population at the end of the year (10,000 people)	PP	The city's permanent population at the end of the year	414.829	256.210	24.390	1465.750
	Urbanization rate (%)	UR	Urbanization rate = urban household registration population at the end of the year / total household registration at the end of the year *100	53.451	14.333	11.212	100.000
	The proportion of students enrolled in the city (%)	PSE	The proportion of students enrolled in the city = the number of students at all levels of the city at the end of the year / the number of registered households at the end of the year * 100	14.726	4.683	1.472	39.125
	The city's fiscal expenditure decentralization index (%)	FED	The city's fiscal expenditure decentralization index = the city's fiscal expenditure / the province's fiscal expenditure * 100	6.841	4.886	0.889	30.560
	Financial autonomy (%)	FA	Financial autonomy = the city's fiscal revenue / the city's fiscal expenditure * 100	45.651	22.025	9.242	103.843

Due to the fact that some data of the Standing Committee of some party committees cannot be collected, the missing official information is not included in the calculation.

Among the leaders at the prefecture-level in China, there are fewer female and minority members, and male still are the majority of local leaders. The average age of the secretary is 53.81 year-old, which is greater than the average age of the mayor and the standing committee. The political elites have a higher education level than the standing

committee, but the vast majority party members have higher education experience. The background of political elite is more balanced; members of the standing committee have mostly social science backgrounds. Approximately half of the secretaries and mayors are working in the household registration areas, but only 25.85% of the party committee members are native. The serving term of secretaries and mayors is 2.254 and 2.081 years respectively, which are shorter than that of the political elite of the party committee. All members of three decision-making bodies basically started to take up their current positions in the last year of change of leadership, namely around 2012, which shows which shows the consistency of the collective party committee. The rate of promotion of the political elite was 0.034 and 0.037 for secretaries and mayors, respectively, indicating that the collective promotion of the party committee is in a slower rate.

Regression Analysis

Multiple sets of regression models are analyzed for similarities, differences and interactions between the local political elites and the party committee standing committees on the impact of education financial expenditures. Using Stata14.0 software to analyze the characteristics of the three leading subjects and the cross-sectional data of education fiscal expenditures of 283 prefecture-level administrative units in China in 2015, the regression results are shown in **Table 2**. All models passed the collinearity test, and the heteroscedasticity was processed by Weighted Least Squares (WLS) for models 1, 2, and 4 according to the White test results, and robust regression results were obtained.

The six models in **Table 2** reveal that prefecture-level officials and the local party committee members have a certain degree of influence on educational expenditures, but after controlling for common variables; regression coefficient analysis indicates that the mechanism of influence is not completely consistent. For example, in the regression model of the prefecture-level secretary, individual characteristics of the secretary has no significant effect on the proportion of the education fiscal expenditure in GDP, but has a significant effect on the proportion of education fiscal expenditure in the general public budge expenditures. Specifically, the secretary from the minority nationality has a significant negative impact on the education fiscal expenditure. Model 2 showed that when the secretary is of minority nationality, then the expenditures in education decrease by 1.3296%. In addition, the secretary who works in the household registration area is more likely to increase financial expenditures on education; that is, the secretary of the post has a geographical bias in the education and financial expenditure. It is worth noting that the faster the political promotion, the lower the support for education finance; the reverse effect is particularly obvious.

Judging from the regression model of prefecture-level mayors, the personal characteristics of the mayor have a significant impact on the proportion of education finance relative to GDP and fiscal expenditure. Models 3 and 4 show these results: controlling for other conditions, women mayors increase education fiscal expenditures as a proportion of GDP by more than 0.5788% compared to male mayors. Fiscal expendi tures on education for minority nationality mayors show a complex relationship; the mayor of a minority nationality increases fiscal expenditures on education by 0.9591%

Table 2. Regression Model of the effect of the Collective Characteristics of Political Elites and Party Committees on Education Financial Expenditure.

	Secretary		Mayor			Standing Committee Collective	
	Model 1	Model 2	Model 3	Model 4		Model 5	Model 6
	EX_GDP	EX_FE	EX_GDP	EX_FE		EX_GDP	EX_FE
G	0.0651	-0.3164	0.5788**	1.0087	FS	0.0068	-0.0215
	-0.22	(-0.44)	-2.15	-1.32		-0.65	(-0.83)
N	0.5044	-1.3296***	0.9591***	-0.9783*	MS	0.0214***	-0.0237
	-1.15	(-2.77)	-4.01	(-1.73)		-3.45	(-1.55)
A	-0.0055	-0.0767	-0.016	-0.0319	A_A	-0.0617	-0.0438
	(-0.25)	(-1.04)	(-0.54)	(-0.44)		(-1.13)	(-0.32)
EY	-0.0095	-0.0125	-0.0652***	-0.0646	A_EY	-0.1259*	-0.1433
	(-0.49)	(-0.22)	(-2.68)	(-1.13)		(-1.81)	(-0.83)
EM	0.062	-0.2158	0.2418	0.054	PSS	0.0093**	0.0139
	-0.45	(-0.61)	-1.62	-0.15		-2.23	-1.36
SHRA	-0.2068	0.7371**	-0.1605	-0.7019*	AP_SHRA	0.0057	0.0097
	(-1.59)	-2.21	(-1.02)	(-1.80)		-1.23	-0.84
CPT	0.0342	0.0828	0.0314	-0.0075	A_CPT	0.0978	0.2381
	-0.82	-0.73	-0.61	(-0.06)		-0.9	-0.89
PR	-1.0749	-92.8285***	-4.065	-25.8372	A_PR	-32.1286*	-98.0084**
	(-0.13)	(-2.95)	(-0.34)	(-0.88)		(-1.67)	(-2.06)
Per_GDP	-0.2121***	-0.2582**	-0.1960***	-0.3256***	Per_GDP	-0.2219***	-0.2384**
	(-4.91)	(-2.30)	(-4.19)	(-2.66)		(-4.70)	(-2.05)
E	-0.6477***	0.2755	-0.4899**	0.476	E	-0.4209*	0.4245
	(-2.89)	-0.49	(-2.25)	-0.8		(-1.90)	-0.78
C	-0.9813***	-2.5500***	-1.0390***	-2.1664***	C	-0.9761***	-2.1753***
	(-4.53)	(-5.14)	(-5.36)	(-4.23)		(-4.95)	(-4.47)
PP	-0.0005	0.0048***	-0.0002	0.0051***	PP	-0.0007*	0.0048***
	(-1.36)	-5.23	(-0.53)	-5.31		(-1.74)	-4.82
UR	-0.0154**	-0.0254	-0.0182**	-0.0358*	UR	-0.0219***	-0.0462**
	(-2.23)	(-1.37)	(-2.30)	(-1.80)		(-2.68)	(-2.29)
PSE	0.0149	0.2487***	0.0319*	0.2122***	PSE	0.0208	0.2334***
	-1.06	-6.35	-1.81	-5.35		-1.18	-5.34
FED	0.0317	-0.1722***	0.0374*	-0.1776***	FED	0.0550**	-0.2757***
	-1.55	(-3.06)	-1.78	(-3.14)		-2.31	(-4.69)
FA	-0.0200***	0.0037	-0.0264***	0.0121	FA	-0.0183***	0.0155
	(-4.88)	-0.25	(-4.24)	-0.81		(-2.81)	-0.97
Constant	7.4100***	23.8894***	8.9141***	21.6963***	Constant	12.7566***	25.3126***
	-4.89	-4.95	-4.51	-4.48		-3.73	-3
Observations	283	283	283	283	Observations	283	283
R-square	0.6	0.485	0.621	0.413	R-square	0.619	0.418
Ad R^2	0.576	0.454	0.598	0.378	Ad R^2	0.596	0.383
F	24.9212	15.6637	27.1867	11.7111	F	27.0424	11.9181

*t is the value in parentheses; * indicates p < 0.10, ** indicates p < 0.05, and *** indicates p < 0.01.*

of GDP, but reduces education finance relative to the proportion of fiscal expenditure by 0.9783%. Education expenditure is affected by the number of years of education the mayor has – where mayors have more education, less is spent on education. A significant negative effect of a domicile serving mayor occurs, that is, the local mayor doesn't have regional favoritism in the education financial expenditure, inversely, it restricts the education financial expenditure level.

Judging from the regression model of the leaders of the prefecture-level standing committee, the collective characteristics of the standing committee of the party committee have a significant impact on the proportion of education finance relative to GDP and fiscal expenditure. In Models 5 and 6, it can be seen that gender structure, average age, average tenure, and average household registration ratio of the standing committee of the prefecture-level party committee do not significantly affect local education fiscal expenditures. The proportion of minority nationalities, the average years of education, the professional background and the average rate of promotion all significantly affect fiscal expenditure for education. Specifically, the party committee and the collective members of minority groups is positively correlated with proportion of education expenditure relative to GDP, indicating that members of the standing committee of minority background are more likely to approve education expenditures. Prefecture-level party committee members with more years of education on average are less likely to increase education spending. In the prefecture-level party committee collective, the more members that had a background in social sciences, the more the collective spent on education. In party committees that had a faster average promotion rate, the standing committee of the collective spent more on education.

The collective characteristics of political elites and party committees have a consistent influence on expenditures in education. First, the national characteristics of the secretary, the mayor and the standing committee collectively have a significant and complex relationship to education expenditure. Models 2 and 4 showed that party secretaries and mayors from minority nationalities tend to reduce the proportion of education finances relative to local officials from the Han nationality. However, models 3 and 5 indicate that officials from minority nationalities will reduce the proportion of fiscal expenditures relative to GDP. This shows that the identity of minority officials of local officials can increase the overall level of education and financial expenditures, whether for individual officials or standing committees. However, their efforts they exert are insufficient under the limited financial conditions, and they would like to use other basic public fiscal expenditures to take over the education finance. Second, both Models 3 and 5 showed that the higher the education level of the officials, the less enthusiastic they are about financial expenditures on education. This shows that highly educated officials have high expectation of achievement and relatively strong promotion motivation. Third, models 2, 5, and 6 showed that the promotion rate of the secretary and the party committee is significantly negatively correlated with financial expenditures on education. This shows that with a better development situation, officials do not increase education expenditure; the secretary and the standing committee have similar views on promotion. Officials promotion assessment and non-financial situation of education

occupies an important portion, education has not been given sufficient attention in local development. Fourth, regardless of whether the local political elite is an individual or a collective, financial expenditures on education are not affected by the age of the official or the length of the current term of office.

The individual characteristics of the political elite and the party committee's standing committee also have inconsistent effects on education expenditures. For example, genders have inconsistent impact. Model 3 shows that female mayors can significantly affect education expenditures, but models 5 and 6 show no significant gender effects in the standing committee. Secondly, the influence of professional background characteristics is inconsistent. Models 1, 2, 3, and 4 showed that the professional background of the secretary and the mayor does not have a significant effect on fiscal expenditures in education, but model 5 shows that the collective professional structure of the standing committee does have a significant effect on the fiscal expenditure of education. In particular, members of the standing committee with social science professional backgrounds have a strong preference for educational expenditures. Furthermore, the characteristics of serving in the household registration area or not does not affect this relationship. Model 2 and 3 show that a geographical favoritism exists for the secretary but the mayor that act in opposition. Models 5 and 6 show the standing committee of the collective centralized decision-making process, because the individual is subject to the influence of other officials of the standing committee, and such geographical favoritism disappears. This shows that the characteristics of the officials working in the household registration area have a significant impact on the education fiscal expenditure. However, due to inconsistent motivation and demand for the individual's promotion, there is an inconsistent attitude toward the public fiscal expenditures on education.

In general, influence of the political elite individual and the party committee standing committee on the educational fiscal expenditure is affected by nationality, years of education and the rate of promotion. Gender and working in the household registration area at the individual level also affect spending on education, but this effect disappears after the collective "personification" is taken into consideration. Professional background characteristics are not significant at the individual level of the political elite but are significant at the collective level. Age and term characteristics have no significant effect.

The Degree of Influence of Each Variable: ΔR^2-based Calculation

After comparing and analyzing the relationship between the personal characteristics of political elites and the influence of the collective characteristics of the standing committee on the fiscal expenditure of education, moreover for clarifying what the impact is of demographic characteristics and job experience characteristics on the education fiscal expenditure, and what specific characteristics have a critical impact on the fiscal expenditure of education, we use ΔR^2 (R Square Change)to analyze the amount of change index; which is majorly used to measure the impact of explanatory variables on the de-

Table 3. R^2 Change of the Effect of the Secretary's Individual Characteristics on the Financial Expenditure of Education.

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Change Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Model 1	Demographic Characteristics	0.23	0.053	0.036	1.857	0.053	3.108	5	277	0.01
	Job Experience Characteristics	0.279	0.078	0.051	1.843	0.025	2.475	3	274	0.062
	Control Variables	0 .760	0.577	0.552	1.267	0.499	39.212	8	266	0
Model 2	Demographic Characteristics	0.111	0.012	-0.006	3.784	0.012	0.685	5	277	0.635
	Job Experience Characteristics	0 .263	0.069	0.042	3.693	0.057	5.598	3	274	0.001
	Control Variables	0.628	0.395	0.358	3.023	0.325	17.874	8	266	0

DF: Degree of Freedom; AR^2: Adjusted R^2; SEE: Standard Error.

Table 4. R-Variation of the Effect of the Mayor's Individual Characteristics on Education Financial Expenditure.

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Change Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Model 3	Demographic Characteristics	0.371	0.137	0.122	1.773	0.137	8.823	5	277	0.000
	Job Experience Characteristics	0.384	0.147	0.122	1.772	0.01	1.069	3	274	0.363
	Control Variables	0 .788	0.621	0.598	1.2	0.473	41.461	8	266	0.000
Model 4	Demographic Characteristics	0.16	0.025	0.008	3.759	0.025	1.447	5	277	0.208
	Job Experience Characteristics	0 .182	0.033	0.005	3.764	0.008	0.735	3	274	0.532
	Control Variables	0.613	0.376	0.338	3.07	0.342	18.224	8	266	0.000

DF: Degree of Freedom; AR^2: Adjusted R^2; SEE: Standard Error.

Table 5. R-Variation of the Effect of the Collective Characteristics of the Standing Committee on the Education Financial Expenditure.

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Change Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Model 5	Demographic Characteristics	0.42	0.176	0.161	1.733	0.176	11.849	5	277	0.000
	Job Experience Characteristics	0.444	0.197	0.174	1.72	0.021	2.383	3	274	0.070
	Control Variables	0 .787	0.619	0.596	1.202	0.422	36.867	8	266	0.000
Model 6	Demographic Characteristics	0 .260	0.067	0.051	3.677	0.067	4.004	5	277	0.002
	Job Experience Characteristics	0.285	0.081	0.054	3.67	0.014	1.36	3	274	0.255
	Control Variables	0.646	0.418	0.383	2.965	0.336	19.207	8	266	0.000

DF: Degree of Freedom; AR^2: Adjusted R^2; SEE: Standard Error.

pendent variable contrast level (Chen & Huan, 2010; Hanaysha et al., 2011). It is a measure of the contribution of each dependent variable to the independent variables (Johnson et al., 2004). The calculation formula is:

$$\Delta R^2 = R^2_{current} - R^2_{previous}$$

Where current is a model with an additional explanatory variable but is otherwise identical to the model previous. ΔR2 thus represents the contribution or additional explanatory power of the latest predictor variable on the dependent variable in the model interpretation.

Based on the nature and connotation of official characteristic variables, this study divides the independent variables into three dimensions and brings them into the regression model. Gender, nationality, age, years of education and professional background variables represent basic information for the officer, referred to as demographic characteristics, while serving in the household area, current tenure and promotion rate, serving as official's work experience characteristics. Socioeconomic background is used as the control variable. The ΔR^2 in each dimension was calculated using SPSS 24.0 and the results were presented below:

Among the models, model 1 (**Table 3**) reveals that demographic characteristics of the secretary can explain 5.3% of education expenditure relative GDP ($\Delta R^2 = 0.0053$, $n = 277$, $p < 0.05$) and the explanatory power of the job characteristics is 7.8% ($\Delta R^2 = 0.025$, $n = 274$, $p < 0.1$). Thus, secretary individual demographic characteristics and work experience characteristics have significant explanatory power on education expenditure, with demographic characteristics explaining a greater proportion of education spending than work experience characteristics. The secretary has a relatively strong effect on education financial expenditure, explaining 6.9% of the entire model ($\Delta R^2 = 0.057$, $n = 274$, $p < 0.01$), while population statistical characteristics had no significant influence. This suggests that demographic and work experience characteristics of secretaries need to be paid peculiar attention because it will significantly explain the financial supply of local education.

From **Table 4**, in individual statistical characteristics of the population, only the mayor had any influence on financial education ($\Delta R^2 = 0.137$, $n = 277$, $p < 0.01$). This shows that the influence of the individual characteristics of the mayor on the financial expenditure in education mainly comes from its demographic characteristics, but the impact of work experience characteristics is relatively limited.

In model 5 of the collective characteristics of the party standing committee on the proportion of education fiscal expenditure in GDP, demographic characteristics ($\Delta R^2 = 0.176$, $n = 277$, $p < 0.01$) and work experience characteristics ($\Delta R^2 = 0.021$, $n = 274$, $p < 0.1$) are significant factors (**Table 5**). For the proportion of education fiscal expenditure in public fiscal expenditures, only demographic characteristics have significant influence ($\Delta R^2 = 0.067$, $n = 277$, $p < 0.05$). This shows that the characteristics of the two dimensions of the standing committee are important factors influencing the state of education fiscal expenditure, but comparing models 5 and 6 shows that demo-

Table 6. The R^2 Changes of the Secretary's Individual Characteristics on the Fiscal Expenditure (% of GDP) of Education.

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Adjusted Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Demographic Characteristics	N	0.202	0.041	0.037	1.856	0.041	11.93	1	281	0.001
	EY	0.222	0.049	0.042	1.851	0.008	2.458	1	280	0.118
	A	0.226	0.051	0.041	1.853	0.002	0.540	1	279	0.463
	EM	0.228	0.052	0.038	1.855	0.001	0.356	1	278	0.551
	G	0.23	0.053	0.036	1.857	0.001	0.292	1	277	0.590
Job experience Characteristics	SHRA	0.257	0.066	0.046	1.848	0.013	3.843	1	276	0.051
	CPT	0 .266	0.071	0.047	1.847	0.005	1.342	1	275	0.248
	PR	0.279	0.078	0.051	1.843	0.007	2.213	1	274	0.138
Control Variable		0 .760	0.577	0.552	1.267	0.499	39.212	8	266	0.000

DF: Degree of Freedom; AR^2: Adjusted R^2; SEE: Standard Error.

Table 7. the R^2 Changes of the Secretary's Individual Characteristics on the Fiscal Expenditure of Education (The Proportion of Fiscal Expenditure).

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Adjusted Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Demographic Characteristics	N	0.202	0.041	0.037	1.856	0.041	11.93	1	281	0.001
	EM	0.222	0.049	0.042	1.851	0.008	2.458	1	280	0.118
	EY	0.226	0.051	0.041	1.853	0.002	0.54	1	279	0.463
	G	0.228	0.052	0.038	1.855	0.001	0.356	1	278	0.551
	A	0.23	0.053	0.036	1.857	0.001	0.292	1	277	0.590
Job Experience Characteristics	PR	0.257	0.066	0.046	1.848	0.013	3.843	1	276	0.051
	SHRA	0 .266	0.071	0.047	1.847	0.005	1.342	1	275	0.248
	CPT	0.279	0.078	0.051	1.843	0.007	2.213	1	274	0.138
Control Variable		0 .760	0.577	0.552	1.267	0.499	39.212	8	266	0.000

DF: Degree of Freedom; AR^2: Adjusted R^2; SE: Standard Error.

graphic characteristics ($\Delta R^2 = 0.176$, $\Delta R^2 = 0.067$) contribute more than do work experience characteristics ($\Delta R^2 = 0.021$, $\Delta R^2 = 0.014$). This indicates that for the collective identity, demographic characteristics have stronger explanatory power, but it is not sufficient to fully explain fiscal education supply factors if without consideration of the collective identity.

Although it is known that it is necessary to focus on the demographic and tenure characteristics of the secretary by calculating R^2 change in each dimension, the demographic characteristics of the mayor, and the demographic and work experiences

Table 8. The R^2 Changes in the Effect of the Mayor's Individual Characteristics on Educational Fiscal Expenditure (% of GDP).

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Adjusted Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Demographic Characteristics	N	0.322	0.103	0.1	1.795	0.103	32.419	1	281	0.000
	EM	0.346	0.12	0.113	1.781	0.016	5.151	1	280	0.024
	A	0.364	0.133	0.123	1.772	0.013	4.147	1	279	0.043
	EY	0.368	0.136	0.123	1.771	0.003	1.041	1	278	0.309
	G	0.371	0.137	0.122	1.773	0.002	0.518	1	277	0.472
Job Experience Characteristics	SHRA	0 .381	0.145	0.126	1.768	0.008	2.441	1	276	0.119
	CPT	0 .382	0.146	0.124	1.77	0.001	0.392	1	275	0.532
	PR	0 .384	0.147	0.122	1.772	0.001	0.386	1	274	0.535
Control Variable		0 .788	0.621	0.598	1.2	0.473	41.461	8	266	0.000

DF: Degree of Freedom; AR^2: Adjusted R^2; SE: Standard Error.

Table 9. The R^2 Changes of the Effect of the Mayor's Individual Characteristics on the Fiscal Expenditure of Education (The Proportion of Fiscal Expenditure).

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Adjusted Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Demographic Characteristics	N	0 .143	0.021	0.017	3.741	0.021	5.89	1	281	0.016
	G	0 .152	0.023	0.016	3.743	0.003	0.781	1	280	0.378
	EM	0 .156	0.024	0.014	3.747	0.001	0.317	1	279	0.574
	A	0 .160	0.025	0.011	3.752	0.001	0.31	1	278	0.578
	EY	0 .160	0.025	0.008	3.759	0	0	1	277	0.983
Job Experience Characteristics	SHRA	0 .174	0.03	0.99	3.756	0.005	1.34	1	276	0.248
	CPT	0 .179	0.032	0.007	3.76	0.002	0.518	1	275	0.472
	PR	0 .182	0.033	0.005	3.764	0.001	0.355	1	274	0.552
Control Variable		0 .613	0.376	0.338	3.07	0.342	18.224	8	266	0.000

DF: Degree of Freedom; AR^2: Adjusted R^2; SE: Standard Error.

characteristics of the standing committee. However, we still do not know which characteristic independent variables would produce the greatest impact on the fiscal expenditure of education. Next, we use the stepwise method to calculate the ΔR^2 of all characteristic independent variables.

Among the demographic characteristics, the contribution rate of nationality characteristics is the largest ($\Delta R^2 = 0.041$, $n = 281$, $p < 0.01$; **Table 6**). When combined with the regression coefficients in Table 2, it can be concluded that the secretary originated from minorities nationality will inhibit education expenditure to a large extent,

Table 10. The R^2 Changes of the Effect of the Collective Characteristics of the Standing Committee on the Education Fiscal Expenditure (GDP Ratio).

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Adjusted Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Demographic Characteristics	N	0 .143	0.021	0.017	3.741	0.021	5.89	1	281	0.016
	G	0 .152	0.023	0.016	3.743	0.003	0.781	1	280	0.378
	EM	0 .156	0.024	0.014	3.747	0.001	0.317	1	279	0.574
	A	0 .160	0.025	0.011	3.752	0.001	0.31	1	278	0.578
	EY	0 .160	0.025	0.008	3.759	0	0	1	277	0.983
Job Experience Characteristics	SHRA	0 .174	0.03	0.99	3.756	0.005	1.34	1	276	0.248
	CPT	0 .179	0.032	0.007	3.76	0.002	0.518	1	275	0.472
	PR	0 .182	0.033	0.005	3.764	0.001	0.355	1	274	0.552
Control Variable		0 .613	0.376	0.338	3.07	0.342	18.224	8	266	0.000

DF: Degree of Freedom; AR^2: Adjusted R^2; SE: Standard Error.

Table 11. The R^2 Changes of the Effect of the Collective Characteristics of the Standing Committee on the Fiscal Expenditure of Education (The Proportion of Fiscal Expenditure).

Dependent Variable	Independent Variable Dimension	R	R^2	AR^2	SE	Adjusted Statistics				
						ΔR^2	F	DF1	DF2	Significant F
Demographic Characteristics	MS	0 .198	0.039	0.036	3.705	0.039	11.455	1	281	0.001
	PSS	0 .250	0.063	0.056	3.666	0.023	7.015	1	280	0.990
	A	0 .257	0.066	0.056	3.667	0.003	0.975	1	279	0.324
	EY	0 .259	0.067	0.054	3.671	0.001	0.38	1	278	0.538
	FS	0 .260	0.067	0.051	3.677	0	0.064	1	277	0.800
Job Experience Characteristics	PR	0 .269	0.072	0.052	3.674	0.005	1.48	1	276	0.225
	A_CPT	0 .280	0.079	0.055	3.668	0.006	1.849	1	275	0.175
	A_SHRA	0 .285	0.081	0.054	3.67	0.003	0.75	1	274	0.387
Control Variable		0 .646	0.418	0.383	2.965	0.336	19.207	8	266	0.000

DF: Degree of Freedom; AR^2: Adjusted R^2; SE: Standard Error.

and that this feature should be focused more than any other demographic characteristics of the secretary.

In the secretary's tenure characteristics, the promotion rate contributed the largest component ($\Delta R^2 = 0.052$, $n = 276$, $p < 0.01$), making it the most important focus (**Table 7**). From this, it can be inferred that the secretary is overly concerned with personal political promotion, and this concern is unfavorable toward improving the fiscal expenditure on education.

Tables 8 and **9** revealed that nationality in the demographic characteristics contributed the most for the mayor ($\Delta R^2 = 0.103$, ΔR^2 change = 0.021), along with the professional background and age ($\Delta R^2 = 0.016$, $\Delta R^2 = 0.013$). This indicates that the difference in the individual characteristics of the mayor on education finance expenditure mainly comes from nationality, professional backgrounds, and age; but not the work experience characteristics.

Among the collective demographic characteristics of the standing committee, the contribution rate of nationality is the largest ($\Delta R^2 = 0.127$, $\Delta R^2 = 0.039$; **Table 10** and **11**, respectively), followed by professional background ($\Delta R^2 = 0.023$, $\Delta R^2 = 0.023$), and then the average years of education ($\Delta R^2 = 0.011$) and average age ($\Delta R^2 = 0.013$); in the work experience characteristics, the current tenure had the highest contribution ($\Delta R^2 = 0.012$, $n = 276$, $p < 0.05$). Thus, in the standing committee of the party committee, demographic characteristics are an important influencing factor on the state of education fiscal expenditure, and its importance is greater than the characteristics of work experiences.

By comparing ΔR^2, it can be seen that the state of education fiscal expenditure is affected by the demographic characteristics of political elites and the collective characteristics of the standing committee. Each subject has its own key characteristics; it is necessary to pay attention to the nationality characteristics and promotion rate of the secretary; the nationality, professional background, and age characteristics of the mayor; the nationality, professional background, average years of education, average age, and average years of service of the Standing Committee. It can also be found that nationality characteristics in the political elite and the party committee standing committee are always the more important factors affecting the state of education and financial expenditure; for the collective, in addition to the nationality, the professional background, the average years of education, and the average age are also very important; in the impact of the tenure characteristics on the financial expenditure of education, the secretary is more likely to be affected by the rate of promotion, whereas the Standing Committee is more likely to be limited by the average length of current tenure.

Discussion

Regression results (**Table 2**) on the effects of the political elite's individual characteristics and the standing committee's collective characteristics on expenditures on education have similarities and differences. The ΔR^2 in each dimension responds to which type of characteristic has a greater impact; the ΔR^2 of each independent variable further presents the influence of each characteristic reflecting the importance and explanatory power of each feature. Based on the empirical analysis above, we draw four main conclusions as follows.

First, local officials from minority nationalities can increase education fiscal expenditure in terms of the proportion of GDP, while at the same time restraining this expenditure relative to public fiscal expenditures. In fact, local officials from minority nationalities are mostly distributed in administrative areas with settlements of minority nationalities. Although the underdeveloped economic, the mandatory requirement of

education, the regional education financial expenditure lever is higher than the overall economic development level, and occupies an important position. However, due to the urgent need for public financial expenditures in the construction of basic public facilities and medical security in these areas, education has not maintained a priority in terms of limited public finances. This is exactly a direct reflection of the urgent needs in China's minority nationality areas, such as economic development and the contradictory public finance expenditures (Yao, 2008). It is precisely because of the realistic meaning of nationality, the characteristics of nationality have a high explanatory power, which, in turn, has a significant impact on both political elites and party committee members.

Second, the years of education of local officials are negatively correlated with fiscal expenditures on education, i.e. officials with higher education levels do not pay attention to funding education. This result agrees with Tingjin Lin (2009), Ran Song (2016), and Dingxing Wang (2017) who also found that for mayor or prefecture-level city secretary, the higher the education level was, the less local education expenditure was. Thus, elites with higher education do not improve the local leaders' passion for investing in public education. Instead, it implies that the diminishing marginal benefit of the official's own education experiences produces a negative impact on the personal cognition. Local officials, no matter on the individual or collective level, have strong desire for the political promotion, therefore, the rate of promotion has a greater influence on the secretary's decision-making of education fiscal expenditures, but this same effect is not significant for the mayor. The secretary has a stronger desire of promotion than the mayor, the reason is that the prefecture-level secretary is already the highest-ranking official at the prefecture level, so the next promotion target is a breakthrough from the prefecture level to the provincial level, and subsequently the competition is obviously more intense than that of the peers at the same level, which eventually requires more prominent political performance. Besides, given the restrictions on the age of promotion, they will easily neglect the public expenditure of education that generally has a lag of efficiency, and pay more attention to the "dominant" performance project in economic development. For the mayor, the next step is to promote further to the higher prefecture-level as a party committee secretary, the internal promotion base of the same level unit and the pressure are small, so, it is easier for them to take into account the education in the public fiscal expenditures, and to guarantee a certain fiscal expenditure in education.

Third, the political elite has a geographically-biased effect at the individual level, i.e. in terms of the special demographic characteristics of gender and serving in the household registration area or not, individual political elites tend to bring in their own emotional factors to educational financial decision-making, confirming the results of Persson and Zhuravskaya (2016) and Yiming Wang (2015). Relatively speaking, the standing committee of the party can avoid personal sensibility in collective decision-making, and is more likely to provide advice more rationally.

Finally, the differences in the professional background of the local political elites at the individual level do not significantly lead to decision-making differences. However, at the collective level, due to the collective efforts, each member can express

their own point of view on the basis of their personal cognition that depicts a significant impact of professional background, which exactly confirms the view that the local officials at the prefecture-level are "complementary" in administrative skills (Chen, 2017). Meanwhile, members of the Standing Committee who have the social science background are more inclined to spend on education than those with natural science background when make a decision collectively. This may be due to the impact of professional curriculum and professional ability, which makes them be more professional in interpreting local social phenomena and policies at length, and be greater in the preference of education development.

In summary, the prefecture-level government is affected by the different characteristics of the secretary, mayor and standing committee of local party when deciding financial expenditure on education, but the chief executive effect of the secretary and the mayor changes during the operation of the democratic centralism. Comparative analysis of models and ΔR^2 reveal that, individually, the political elites have only a few characteristics that have significant impact and explanatory power, but the Standing Committee has more collective characteristics that produce more significant influence and stronger explanatory power. This shows that the influence of the collective characteristics of the Standing Committee on education expenditure is more significant. The potential reason for this may be attributed to the stronger promotion desire of the political elite in comparison to the collective, and such promotion impulse has been "buffered" to some extent in the collective decision-making process. This also proves, at least in part, that prefecture-level governments adhere to and implement the principle of democratic centralism in the local education fiscal expenditures such as providing education as the public goods, and the collective decision-making under the leadership of the party committee plays a leading role in deciding the supply of education.

Conclusions and Recommendations

Based on the 2015 data of 283 prefecture-level administrative units in China, we found that local governments embody collective leadership in education finance decision-making. Local political elites and party committee leaders have a significant impact on education expenditures, with the influence of the latter greater than that of the former. The way in which individual characteristics and collective characteristics affect education fiscal expenditure is not completely consistent; however, nationality is always an important and significant influencing factor.

Our findings not only have important theoretical significance, but also have crucial reference value to further improve the choice of local leadership behavior, to optimize of local education financial decision-making, to understand the influence of local party and government leaders on education finance and the behavioral motives of local officials under the "Chinese-style decentralization" system, and to improve the supply of local education, Based on this, we make the following brief policy recommendations.

First, rationally allocate of the structure of both local party and government officials and the standing committee, in order to reduce bias of education financial deci-

sion-making. Our data showed that the demographic characteristics of both political elites and standing committees have significant impacts on the fiscal expenditure of education. The influence of the individual characteristics of political elites will be restricted by other members of the collective, and their influence will change in collective decision-making. For example, the differences in the professional background of the local political elites at the individual level do not significantly lead to decision-making differences, but at the collective level it can produce significant impact; however, the localization of the political elite disappeared at the collective level of the party committee. Considering that officials with different characteristics have their own advantages, we believe that the Standing Committee with complementary "skills" and "characteristics" should be able to comprehensively grasp the needs of local education development and rationally arrange local education and financial expenditures. Therefore, the leadership team should be structured with special attention by combining the demographics and work experiences, and so strengthening the guarantee of financial expenditure for education from the composition of officials.

Second, adhere to democratic centralism, give full play to the advantages of collective decision-making, and encourage stakeholders to participate in education and financial expenditure decision-making consultation. Our empirical results showed that the influence of local political elite characteristics on education expenditures is concentrated in a few individual characteristics, while the characteristics of standing collectives are relatively uniform; that is, local governments insist on democratic concentration in educational financial decision-making – the embodiment of the system. Moreover, the political elite's desire for political performance is significantly higher than that of the standing committee, indicating that officials may not fully guarantee their publicity in decision-making. Therefore, in the decision-making process, the democratic system should be fully implemented, and the decision-making process strictly observed. The core leader, as the "squad leader" and the collective "squad", must unite and work together to make a scientific and rational decision on education fiscal expenditure (Hu & Yang, 2018).

Third, increase education fiscal support for the poverty-stricken areas, supporting financial assessment and supervising administrative measures to ensure education "precise poverty alleviation". In the individual model of the political elite and the collective model of the standing committee, nationality characteristic has the greatest explanatory power. As mentioned above, there exists dilemma of education fiscal expenditure in the underdeveloped minority nationality areas In recent years, a series of education poverty alleviation policies such as the "Poverty Alleviation and Implementation Program for Deprivation of Poverty in Deep Poverty Areas (2018-2020)" are strengthening education support for minority nationalities, and guarantee special funds for education and local government funds to be timely available will enable the goal of education financial support to be truly achieved (The Ministry of Education's State Council Office, 2018). Therefore, The Third-party Evaluation Agencies should be created to guarantee an open and transparent process to improve the financial situation of education in poverty-stricken areas.

Fourth, innovate better evaluation mechanisms for appointment and removal of local government officials, convert public satisfaction with the education supply situation into performance appraisal and appointment criteria, and encourage local governments to increase education expenditure. Our empirical study revealed that government spending behavior on education finance varies by geographical, nationality and other social logic, promotion and other bureaucratic logic and by personnel incentives and other marketing logic. As the attitudes of official education expenditure are easily affected by personnel evaluation systems, so we recommend reforming the organization and personnel system as a starting point, it is possible to start with the reform of the organization and personnel system, start with "incentive engagement", and innovate in inspiring and restricting government behavior, and improve the enthusiasm of local governments in education and financial investment. For example, the provision of education as a "soft" public goods is included in the performance evaluation - not only the performance during the current term, but also the prior performance to avoid the short-term surface project, and give far greater weight of public satisfaction etc., so as to form a multi-faceted assessment system, to build up local government and diversified action logic, and to promote local governments to make reasonable behavioral choices in public education supply.

Notes

1. *For convenience, this article refers to the mayor, the governor, the governor, and the executive head of the General Administration of Administration as the mayor.*
2. *Among the 334 prefecture-level administrative units, there are 291 prefecture-level cities, 10 regions, 30 autonomous prefectures, and 3 alliances. There are 20 prefecture-level administrative units with serious socio-economic data missing: Alashan League, Shannan Distric , Sansha City, Shigatse City, Ganzi Prefecture, Nagqu District, Liangshan Prefecture, Ali District, Qiannan Prefecture, Linzhi City, Wenshan state, Golog prefecture, Chuxiong, Yushu prefecture, Diqing, Haixi, Lhasa, Kezilesukeerkezi states, Chamdo, Turpan City.*
3. *Delete 24 samples of missing features of the secretary or executive head, namely Shenyang City, Benxi City, Dandong City, Jinzhou City, Panjin City, Jilin City, Siping City, Liaoyuan City, Tonghua City, Songyuan City, Daxinganling Region, Zhangzhou City, Putian City, Sanming City, Nanping City, Xinyu City, Jieyang City, Yuxi City, Baoshan City, Zhaotong City, Nujiang Prefecture, Hainan Tibetan Autonomous Prefecture, Shizuishan City, Yili Kazakh Autonomous Prefecture.*
4. *Excluding the seven outlier samples of education fiscal expenditure as a percentage of GDP: Huangnan, Linxia, Gannan, Dingxi, Guyuan, Kashgar, and Hotan.*

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ARTICLE

Evaluation of the Development Level of Information and Communications Technology in Education Based on the Entire-Array-Polygon Indicator Method: Taking the Questionnaire Survey Data of 13 Cities in Province W as an Example

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Abstract. *The objective assessment of the development level of information and communications technology (ICT) in education can support the government in formulating and implement ICT policies. The article first introduced the Entire-Array-Polygon (EAP) indicator method and then designed an evaluation indicator system which containing five first indicators and 31 secondary indicators. Finally, using the questionnaire survey data of 13 cities in Province W as an example, the EAP indicator method was used to carry out on the evaluation of ICT development level. The study drew the following conclusions: EAP indicator method can objectively assess the development level of ICT; the overall development level of ICT in the 13 cities in Province W is average and above, and most of them are level II. When using the EAP indicator method to assess the development level of ICT, experts do not need to determine the indicator's weight. Also, this method presents the evaluation results more concisely and intuitively, so it can be promoted as an essential method of evaluating on the development level of ICT in education.*

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Introduction

THE evaluation of ICT is an important of the development of ICT in Education, runs through the entire its construction process and is an essential guarantee for its healthy and orderly development (Xu et al., 2018). Through the evaluation, the implementation of related planning and policies can be clarified, and then the problems in the process can be found, which provides a basis for its formulation of the next stage of planning and resource allocation (Wu et al., 2017). The evaluation of its development level is a multi-attribute comprehensive assessment. Its purpose is to assess the status quo of ICT development, clarify development needs, and provide a basis for developing development plans or goals for the next stage. The evaluation process is complicated, and the objects involve educational administrative departments, schools, teachers, and students (Wu et al., 2018).

The main methods for its evaluating on the development level include the Analytic Hierarchy Process and the Delphi method (Lv & Ke, 2020; Yin et al., 2020). However, in using these methods to evaluate on its development level, the determination of indicator weights is subjectively arbitrary, which leads to deviations between the evaluation results and the actual situation. This study introduces the EAP indicator method into the ICT development level evaluation in response to the above problems.

Entire-array-polygon (EAP) indicator method is an objective, comprehensive evaluation method. There is no need to subjectively determine each indicator's weight value in the evaluation process, which can reduce subjective factors' influence on the evaluation results and make the evaluation results more objective and accurate (Wu et al., 2005). Also, this method presents the evaluation results more concisely and intuitively. There are both single index value and comprehensive index value, which is convenient to reflect the evaluation object's comprehensive status objectively. This study uses the questionnaire survey data of 13 cities in Province W as an example and uses this method to evaluate the development level of ICT. It is expected to reference Province W's relevant departments to formulate ICT development plans or goals.

EAP Indicator Method

The EAP indicator method is a comprehensive evaluation of the object evaluated based on the relationship between the upper limit, critical value, and lower limit of the evaluation index value. And then realize the vertical and horizontal comparison of the same index or dimension (Kosajan et al., 2018). The basic idea is as follows: Suppose there are a total of n indicators (standardized values), and use the upper limit value of these indicators as the radius to construct a central n-sided polygon whose vertices are a full array of n indicators connected end to end. There are a total of n indicators that can form (n-1)!/2 irregular central n-sided polygons. The comprehensive index is defined as the ratio of the mean value of the area of all irregular polygons to the area of the central polygon.

Standardization of Indicators

The standardization of the indicators can be realized by the hyperbolic function f(x), as shown in formula (1). Among them, a, b, and c are the parameters of f(x).

$$f(x) = \frac{a(x+b)}{x+c}, a \neq b, x \geq 0 \qquad (1)$$

According to the above conditions, the hyperbolic standardized function F(x) can be obtained, as shown in formula (2). Among them, U represents the upper limit of indicator x, L represents the lower limit of indicator x, T represents the critical value of indicator x (usually the mean value), F(x) satisfies F(L) = -1, F(T) = 0, F (U) = 1. F(x) maps the index value between L-U to between -1 and 1. The growth rate after the mapping has changed: when it is lower than the critical value, the standardized growth rate gradually decreases; when it is higher than the critical value, the standardized growth rate gradually increases.

$$F(x) = \frac{(x+b)(x-T)}{(U+L-2T)x+UT+LT-2UL}, a \neq 0, x \geq 0 \qquad (2)$$

According to the EAP indicator method's basic idea, each indicator needs to be standardized before calculating the comprehensive index. The standardization process of indicator xi is shown in formula (3). S_i is a standardized value of the indicator, and U_i, L_i, and T_i are the maximum, minimum, and average values of the indicator x_i, respectively.

$$S_i = \frac{(U_i-L_i)(x_i-T_i)}{(U_i+L_i-2T_i)x_i+(U_i+L_i)T_i-2U_iL_i} \qquad (3)$$

Comprehensive Index Calculation

After the indicators are standardized, the total index S value can be calculated by the formula (4). S_i is the i-th indicator value, S_j is the j-th indicator value ($i \neq j$), and n is the number of indicators. According to the basic idea of the EAP indicator method, S's value is between [0, 1], and the larger the value of S, the better.

$$S = \frac{\sum_{i\neq j}^{i,j}(S_i+1)(S_j+1)}{2n(n-1)} \qquad (4)$$

Based on the EAP indicator method's quartile classification standard, the ICT development level can be divided into four levels: I, II, III, and IV, which represent excellent, good, fair, and poor, respectively in **Table 1**.

Table 1. ICT in Education Development Level Classification.

Level	I	II	III	IV
S Value	[0.75, 1.00]	[0.50, 0.75)	[0.25, 0.50)	[0.00, 0.25)
Qualification	Excellent	Good	Fair	Poor

Design of ICT in Education Development Level Evaluation Indicator System

This research follows scalability, accessibility, and comprehensiveness and has designed an evaluation indicator system of ICT development level. The formation process is as follows:

(i) Construction of Core Indicator System. Based on the development strategy needs of China's "ICT Ten-Year Development Plan (2011-2020)", "ICT 13th Five-Year Plan" and other documents and its exact requirements for core indicators, it refers to the typical foreign School Technology and Readiness Chart (STaR) , the Self-Review Framework (SRF) and ICT application maturity model (Texas Education Agency, 2006; BECTA, 2009; Solar et al., 2013). This study proposed a core indicator system of ICT with 32 indicators in five dimensions: ICT infrastructure, digital resources, ICT usage, ICT management, and guarantee mechanisms (Wu, et al., 2014).

(ii) This study supplemented ICT development level evaluation's scalability indicators based on this ICT core indicator system, combined with the current research status of ICT development level evaluation in domestic and overseas. Taking the eastern Province S as an example, research on ICT performance evaluation at the district and county level was carried out (Lu et al., 2015).

(iii) According to the development requirements of the ICT 2.0 stage, the core indicator system will be further improved. Based on the expanded core indicator system, combined with the requirements of Province W's 2019 related policy documents, this research organizes experts, education management leaders, school ICT managers, and frontline teachers to focus on the availability and comprehensiveness of individual indicators discussion.

This study has constructed an evaluation indicator system of its development level with five primary indicators and 31 secondary indicators through the above steps. It is used to evaluate the development level of ICT in Province W (Wu et al., 2020), as shown in **Table 2**.

The Evaluation Case of ICT in Education Development Level Based on EAP Indicator Method

Table 2. ICT in Education Development Level Evaluation Index System.

First-Level Index	Secondary Indicators
Infrastructure	1. Proportion of multimedia classrooms
	2. Proportion of schools with innovative laboratories
	3. Average number of terminals per 100 students
	4. Number of teaching information terminals held by teachers
	5. Percentage of schools connected to the Internet
	6. Proportion of schools with full coverage of wireless networks in schools
Digital Resources	7. Proportion of schools with digital resources supporting disciplines
	8. Proportion of schools with a school-based resource database
	9. Proportion of schools with online space
	10. Percentage of students who have opened a student online learning space
	11. Percentage of teachers who have opened teacher online learning space
	12. Proportion of schools connected to the public service platform of provincial education resources
Teaching Application	13. Proportion of schools with normalized application of school cyberspace
	14. Proportion of schools with all classes able to use digital education resources
	15. Proportion of schools that can use information technology to teach and achieve daily routines
	16. The proportion of teachers who frequently use multimedia teaching resources in teaching
	17. Average utilization rate of multimedia classrooms
	18. The average number of lessons per teacher in the past year
Management Informatization	19. Proportion of schools with normalized application of management information system
	20. Proportion of schools carrying out the application of basic data of management information
	21. Proportion of schools that use school-level public service platforms to release information
	22. Proportion of schools with cyber security systems
	23. Proportion of schools with full coverage of the campus by the security monitoring system
	24. have a school proportion cartoon
	25. School informatization funds accounted for the proportion of education funds in the same period
Guarantee Mechanism	26. Proportion of schools with school-level leaders in charge of informatization construction
	27. The proportion of teachers who participated in school-based information training in the past year
	28. Proportion of schools where school leaders participate in informatization training at or above the provincial level
	29. Percentage of schools with full-time teachers of information technology courses
	30. Proportion of schools with full-time informatization personnel
	31. Proportion of schools implementing measures to improve teachers' information technology application capabilities

The ICT development level is mainly characterized by the dimension index and the comprehensive index. The EAP indicator method is used to measure and calculate the index value. It is derived based on the upper limit, lower limit, the critical value of each indicator, and the relationship between them, so that horizontal or vertical comparison between indexes can be realized. For the multi-dimensional, multi-level, and relatively complex systematic assessment of the development level of ICT, the EAP indicator method can be used to realize the assessment object's mapping from high-dimensional

Table 3. Evaluation Results of ICT in Education Development Level and Its Classification.

City Code	ICT Dimension Index (Level)					ICT Comprehensive Index (Level)
	Infrastructure	Digital Education Resources	Teaching Application	Management Information	Guarantee Mechanism	
W1	0.74 (II)	0.85 (I)	0.64 (II)	0.56 (II)	0.74 (II)	0.74 (II)
W2	0.45 (III)	0.24 (IV)	0.49 (III)	0.74 (II)	0.26 (III)	0.43 (III)
W3	0.73 (II)	0.42 (III)	0.80 (I)	0.37 (III)	0.33 (III)	0.54 (II)
W4	0.67 (II)	0.61 (II)	0.65 (II)	0.82 (I)	0.74 (II)	0.72 (II)
W5	0.55 (II)	0.81 (I)	0.64 (II)	0.77 (I)	0.96 (I)	0.74 (II)
W6	0.30 (III)	0.58 (II)	0.42 (III)	0.23 (IV)	0.16 (IV)	0.34 (III)
W7	0.44 (III)	0.20 (IV)	0.32 (III)	0.46 (III)	0.72 (II)	0.46 (III)
W8	0.15 (IV)	0.80 (I)	0.56 (II)	0.17 (IV)	0.30 (III)	0.36 (III)
W9	0.19 (IV)	0.37 (III)	0.39 (III)	0.23 (IV)	0.46 (III)	0.34 (III)
W10	0.23 (IV)	0.28 (III)	0.30 (III)	0.27 (III)	0.21 (IV)	0.27 (III)
W11	0.66 (II)	0.59 (II)	0.50 (II)	0.81 (I)	0.68 (II)	0.67 (II)
W12	0.63 (II)	0.59 (II)	0.47 (III)	0.65 (II)	0.64 (II)	0.61 (II)
W13	0.47 (III)	0.43 (III)	0.36 (III)	0.86 (I)	0.33 (III)	0.49 (III)
Average	0.48 (III)	0.52 (II)	0.50 (II)	0.53 (II)	0.50 (II)	0.52 (II)

to low-dimensional space. Map 31 second-level indicators to 5 first-level indicators, map from 5 first-level indicators to a comprehensive index, and obtain the classification and ranking information of the evaluation object in the low-dimensional space. In the entire development level evaluation process, there was no need to subjectively determine the weights of the 31 secondary indicators to make the evaluation results more objective, scientific, and reasonable.

This study used the questionnaire survey data of 13 cities in Province W as an example, using the EAP indicator method to evaluate its development level of Province W comprehensively. By comparing and analyzing its development level and classification of 13 cities in Province W, it is possible to fully grasp the ICT development status of Province W. This provides a reference for the formulation and implementation of ICT policy plans in the next phase.

Data Sources

This research has compiled the "elementary and middle school ICT development status survey questionnaire based on this index system." The content includes necessary information, ICT infrastructure, digital resources, ICT teaching application, ICT management informatization, and guarantee mechanism. To objectively reflect the development status of elementary and middle school ICT construction and application, each item is set as an objective question, and the question types are fill-in-the-blank, single-

answer, and multi-answer multiple-choice. In October 2019, this study adopted the stratified random sampling method and carried out a one-month questionnaire survey through the online questionnaire. The questionnaire was filled out by the person in charge of the elementary and middle school ICT work in 13 cities in Province W (such as principals, directors of ICT centers). After the survey, the study received 5,968 questionnaires, of which 5,285 were valid, and the effective rate was 88.56%.

Evaluation Results and Analysis

This study's operation process to evaluate its development level of Province W was as follows: (i) According to the related evaluation indicator system, the original values of 31 secondary indicators were calculated using Excel. (ii) Regarding the maximum, minimum, and average values of each secondary indicator as to the upper limit, lower limit, and critical value, respectively, using the R Software, standardize each secondary indicator according to formula (3), and calculate each secondary indicator's standardized value. (iii) Calculate the ICT dimension index value and the comprehensive index value of 13 cities in Province W according to the standardized value of each secondary indicator, using the R software and formula (4); and according to the value range of S in **Table 1**, the ICT development level of 13 cities in Province W was classified.

The specific development level assessment results and their classification are shown in **Table 3**. It shows that the ICT development level of the 13 cities in Province W is generally average or above. Among them, W1 has the highest level of ICT development. The main reason is that W1 is a provincial capital city with a relatively good level of economic development. Chen et al. showed that the regional economy is the necessary foundation for its development (Chen & Zhi, 2018). Therefore, the right economic conditions provide adequate support for W1's development.

Among the five first-level indicators, the dimension index of ICT infrastructure was relatively low. It is the supporting condition for the development and provides a fundamental guarantee for schools to carry out ICT teaching and management. The development of infrastructure in Province W is relatively low, with mobile terminals accounting for only 7.34% of students' ICT terminals, and the average number of terminals per 100 students is only 6.77. This can only meet some students' needs to use ICT to carry out learning activities, and to a certain extent, hinder the school's ICT application level.

In terms of digital resources, Province W has developed well. Among them, W1 has the highest level of development of digital resources. The main reason is that W1 is a national education cloud pilot city, and its convenient education cloud services provide support for the construction and application of digital resources. ICT usage is the focus of ICT construction and a necessary means to improve teachers' and students' information literacy. Province W has developed well in terms of teaching application. At present, 90.21% of elementary and middle schools in Province W can realize the normalized application of ICT to assist teaching of Chinese, mathematics, and English in classroom Some cities have even reached 98.89%.

ICT management is a crucial way to promote the modernization of the school governance system and governance capabilities. The average value of the ICT management index of 13 cities in Province W is the highest (up to 0.53), indicating that Province W has developed well in school ICT management such as management data applications, campus all-in-one cards, and network security systems. The survey data also shows that 7.29% of elementary and middle schools in Province W use campus all-in-one cards, and 77.04% of elementary and middle schools have achieved full coverage of the campus network through the application of security monitoring systems (such as school gates, teaching buildings, and office areas).

The guarantee mechanism is the foundation of its development and the key to the implementation of ICT-related plans. Province W has developed well in terms of guarantee mechanisms. Over 92.86% of elementary and middle schools are supervised by school-level leaders in the construction of ICT in schools, which has promoted ICT in teaching and management to a certain extent. In turn, the overall level of ICT in schools development has been improved.

Conclusions

This study introduced the EAP indicator method into the evaluation of its development level. Based on the questionnaire survey data of the ICT development status of and middle schools in 13 cities in Province W, the ICT development level of Province W was comprehensively evaluated. Furthermore, each city's evaluation results were graded, and the development status of ICT in each city was compared and analyzed. The main conclusions obtained are as follows:

The EAP indicator method can objectively assess the development level of ICT. The EAP indicator method is a quantitative comprehensive evaluation method whose evaluation results are less affected by subjective factors. When using this method to evaluate the development level of ICT, experts are not needed to determine the weights of indicators; only the upper limit, lower limit, and critical value related to decision-making should be determined. This reduces the subjectivity in the evaluation process to a certain extent to reflect the current development of ICT more objectively. Simultaneously, the EAP indicator method presents the evaluation results of the ICT development level only and intuitively. It has both a single indicator value and a total indicator value, which provides convenience for problem diagnosis and policy guidance. Meanwhile, the EAP indicator method is simple and easy to understand, and the calculation process is simple. The EAP indicator method is also convenient to use a computer for programming to realize the participating factors' quantitative processing.

The overall development level of ICT in 13 cities in Province W is average and above, and most of them are at level II. Among them, the digital resources dimension and the ICT management dimension have developed well, the ICT usage dimension and the guarantee mechanism dimension have developed generally, and the ICT infrastructure dimension has developed relatively weakly. To further improve ICT development, an elementary and middle school in Province W should focus on constructing school ICT infrastructure. This ensures that the school has a good ICT teaching and manage-

ment environment and supports teachers and students to use ICT to carry out teaching and management activities. Simultaneously, it is also necessary to carry out certain targeted and practical teacher ICT training activities to comprehensively improve the elementary primary and middle school teachers' ability to use ICT to carry out teaching. Besides, various forms of ICT training activities such as "school-based training" and "short-term concentrated training" can also be carried out to focus on improving elementary and middle school teachers' ICT teaching design and curriculum resource integration capabilities.

The above conclusions show that the use of the EAP indicator method can objectively and comprehensively evaluate the development of ICT in Province W and can achieve the purpose of horizontal and vertical comparison of the ICT development level of 13 cities in Province W. Besides, the EAP indicator method also reduces the subjectivity in the evaluation process to a certain extent, making the evaluation results concise and intuitive. However, due to the limited survey time, the questionnaire survey data was discontinuous in time. This study did not research time series, so the dynamic assessment of ICT development level from a time perspective will focus on subsequent research.

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NEWSLETTER

The Effect of Migrant Students on Local Students' Academic Performance

By Liu, Z., & Guo, R.
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WHETHER the aggregation of migrant students in schools will affect the academic development of local students is a valuable and practical problems. Based on the survey data of grade 9 students collected by CEPS2013-2014 (China Education Panel Survey) and the balance test, this article simulated scenario of random class-division within the same school by adding the fixed effect and deleting samples of non-random class-division, estimated the effect of the proportion of migrant students on the academic performance of local students.

The results are as follows:

- In the same class, the proportion of migrant students with non-agricultural household registration does not affect the academic performance of local students.
- The proportion of migrant students with agricultural household registration statistically negatively affect the academic performance of female local students, local students with better ability, local students studying in the best local schools, and local students in municipalities or provincial capital cities. However, this influence is not universal which only statistically significant, and the practical influence is relatively small.
- This negative effect may be due to the spillover effect caused by migrant students' less participation in extra-curricular tutoring, what's worse, the increase in the proportion of migrant students will enhance the difficulty of class management and force teachers to adjust teaching methods.

Base on the empirical study researchers suggested that: the government should strive to reduce the institutional barriers that restrict migrant students to receive education in the migratory place. Also, in the process of education resource allocation, the government should incline to the schools where migrant students are more concentrated, so as to neutralize the negative impact of the reverse peer effects.

Source: Peking University Education Review, 2020; 18(4): 71-102 + 187.

NEWSLETTER

Which is More Important, Schooling or Parenting?

By Hu, Y., & Yuan, J.
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BASED on the questionnaire and assessment from elementary and middle schools in 16 cities of 5 provinces in eastern and central China, a study published in *Journal of East China Normal University (Educational Science)* explored the impact of parenting and schooling on students' standardized test scores, through the hierarchical linear model (HLM). Also, the researchers employed Shapley and Owen decomposition method to identify the input factors that have a greater impact on school output. Furthermore, identify whether there are differences in the impact of parenting and schooling on primary school students and secondary school students' academic performance. Lastly, according to the results, several suggestions are listed.

The study adopted academic performance as the dependent variable and set the input of parenting and schooling as independent variables. In the aspect of parenting input, parental participation and educational expectations act as the proxy variables of social capital, while the time of spending on private supplementary tutoring acts as a proxy variable of economical capital. As for schooling input, the quality and quantity of teachers and school conditions as proxy variables:

- Parenting factors are more important for primary school students while schooling factors are more important for secondary ones.
- Parental participation and educational expectation have significantly positive effects on students' academic performance. What's more, parental participation contributes more to the variance of average academic performance in primary schools, while parental educational expectation has a greater contribution to the variance of average academic performance in secondary schools.
- In addition to the student-teacher ratio, school input factors such as school conditions and teacher quality have significantly positive effects on students' academic performance. Comparing with school conditions, teacher quality contributes more to the variance of average academic performance in primary and secondary schools. Moreover, compared with primary schools, teacher quality has a greater contribution to the variance of average academic performance in secondary schools.

Source: Journal of East China Normal University (Educational Science), 2021; 39(1):1-25.

NEWSLETTER

Can Vocational Education Improve the Income Gap between Urban and Rural Areas?

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DUE to the rapid growth of China's economy, the problem of the excessive income gap between urban and rural residents gradually emerged, and it has become the principal element that hinders the further development of China's economy and society. In order to effectively prevent the further expansion of the urban-rural income gap, lots of scholars have conducted relevant research. Recently, an article published in *Education & Economy* deeply explored the impact of vocational education on the urban-rural income gap. Based on the human capital theory and the provincial panel data from 2007 to 2018, this paper estimated the Theil index of the urban-rural income gap, using the System GMM model to evaluate the impact of the development of vocational education on the urban-rural income gap.

For further analysis, the researchers established the regression model and the results are as follows:

- After controlling a series of factors that affect the income gap between urban and rural areas, it is noticeable that the scale expansion and quality improvement of vocational education are helpful to narrow the income gap.
- Cross-comparing data of the eastern, central, and western regions, the analysis shows that the impact of vocational education development on the urban-rural income gap in the eastern region is relatively small, while the impact in the western region is far greater than that in the eastern region.
- To bridge the income gap in the eastern region consists in expanding the scale of vocational education, while in the central region mainly relies on improving the quality of vocational education, however, both the scale and quality of vocational education in the western region can narrow the income gap between urban and rural areas.

According to the research results, the author put forward some suggestions for the development of vocational education in China:

- The development of vocational education in the western region is the most efficient way to bridge the income gap between urban and

rural areas, therefore, it is helpful for the policy effects if political decision-making properly inclines to the western region.

- As for the eastern and central regions, the effects of the scale and quality of vocational education is different. The eastern region should pay attention to the investment of educational finance, expanding the scale of vocational education, and providing vocational training for more people. And the central region should concentrate on the innovation of educational methods and management, for instance strengthening management or teaching students in accordance with their aptitude to improve students' vocational ability.

Source: Education & Economy, 2020; 36 (6): 51-58.

NEWSLETTER

The Influence of Advanced Learning Experience in Secondary School on the Performance in Top-notch University

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ACCORDING to the survey data of fundamentals collected from a total of 1,359 students from 6 top universities in China, this article used the Multiple Linear Regression model and Ordinal Logistic Regression model to explore the cohesive mechanism of secondary school and university, on the basis of cultivating STEM talents, resource constraints, and China's condition.

The main research results are as follows:

- Experiences like winning an Olympic competition, finishing a scientific research project, and studying in advance are considered as the three kinds of advantages to developing students' innovation abilities. Students with these experiences significantly creative and positive when introducing what they think to others in college, what's more, they tend to strive for the resources required to achieve their scientific ideas.
- The difference between students participating in Olympic competition and those who have not prominently reflected in their academic performance, but the former's learning motivation in the university was not significantly stronger than that of the latter.
- Students who had the opportunity to study college education in secondary school were generally more confident than others.
- It is also noticeable family socioeconomic status has a significant impact on the motivation of top students to study in university. The cultivation of talents seems to be an educational issue; however, it is actually related to many non-educational factors such as social stratum differentiation and economic conditions.
- Finally, the imbalance of China's economic development always affects the distribution of high-quality educational resources and the educational choices of talented students. Talented secondary school students in Beijing and Shanghai have started to break away from competitions while devoting themselves to science and innovation

learning, which is highly dependent on educational resources. Provincial capitals or municipalities directly under the central government are abundant with educational resources, while students in other cities are more likely to succeed in advanced learning in secondary school only through academic competitions.

Source: Peking University Education Review, 2020; 18(4):129-150+188.

NEWSLETTER

The Important Role of Education in the Targeted-Poverty Alleviation

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A SURVEY published in *Journal of East China Normal University (Educational Sciences)* selected peasant households (including the poverty and non-poverty families) from contiguous poor areas in northwestern China and analyzed the data through four dimensions of the relationship between the rural family economy and the of educational development.

The results are as follows:

- The income or consumption structure of peasant households is relatively simple and the development difference between poverty and non-poverty families is significantly obvious. The deepen degree of the poverty family, the heavier burden it carries in educational investment, while the input intensity increase gradually.
- Education has a significant positive effect in promoting the economic development of peasant households. What is worse, for the peasant households, a lower level of human capital will cause a significant in the quality structure of human resources and subsequent intergenerational transmission, along with the severe aging of the population.
- The main factors behind the poverty among different peasant households are basically the same, but the attribution tendency is obvious. They are satisfied with the intensity and methods of poverty alleviation; however, problems like the lack of precise supply, knowledge, and goal establishment still exist.
- The vast majority of the poverty and non-poverty families believe that education can make their children develop better and improve the family economic status, and they all hope that their children can receive undergraduate education. Most of the former consider that participation in skill training is useful for getting rid of poverty and become better off, while the latter believe conversely. In terms of urgent and important educational details, they value the financial aid for education, daily health care, and disaster prevention and mitigation.

Source: Journal of East China Normal University (Educational Sciences), 2020; 38(12):109-120.

NEWSLETTER

Is Critical Thinking Teachable?

By Leng, J., & Lu, X.
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CRITICAL thinking, as an indispensable ability for talents in the 21st century is helpful for people to think logically and independently, screen information, and make decisions quickly in the information society. Whether critical thinking is teachable or not has always been a controversial topic in the academic world. A recent study published in *Open Education Research* selected 79 experiment or quasi-experimental research literature from China and abroad as the research objects, explored the differences of critical thinking teaching effects and the teachability of critical thinking from the aspects of the discipline, teaching stage, the number of participants, technical intervention, countries, testing methods and so on.

The results show that:

- The effect of critical thinking teaching varies significantly among different disciplines and teaching stages, it works the best in Mathematics and in high school education.
- The longer the cycle of critical thinking teaching is, the better the enhancing effects will be.
- Teaching intervention has the same effect on whatever the participants' number, and there is no significant difference in the improvement of students' critical thinking with or without technical intervention;
- The teaching effect of critical thinking among different countries is significantly different, and the improvement of critical thinking ability measured by the self-compiled tools of standardized tests is more obvious.

Suggestions:

- Extend the integration range of critical thinking and disciplines.
- Professors of critical thinking should be introduced into basic education, and the continuity and systematization of teaching should be maintained.
- In the teaching of critical thinking, teachers should not blindly follow the trend of technology and abandon the traditional teaching methods.

- Use multiple assessment tools to measure changes in critical thinking. Evaluation tools are one of the variables that affect the effectiveness of students' critical thinking.

In conclusion, through the comprehensive analysis of the existing research data, this study obtained that the combined effects of teaching intervention effect on students' critical thinking values, with the quantitative results, show that critical thinking can be taught, and found that subject, learning, teaching period, the technology involved in various cultures, and assessment tools for the students' critical thinking teaching effect has certain adjustment.

Source: Open Education Research, 2020; 26(6):110-118.

NEWSLETTER

The Effect of Harsh Parenting on Smartphone Addiction of Adolescents

By Qi, D., Lin, Y., & Liu, Q.
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BASED on the questionnaire statistical results of 3,219 students from two non-boarding key secondary schools from Wuhan and Shiyan, the study published in *Psychological Development and Education Research* established the mediation effect model, regulating effect model, and intermediary effect model with regulation to explore the mediating effect of core self-evaluation in the process of smartphone addiction through harsh parenting among adolescents, and also the regulating effect of friendship quality. The main results are as follows:

- According to the analysis of harsh parenting, core self-evaluation, friendship quality. And smartphone addiction, it is concluded that all the variables were significantly correlated. Thereinto, harsh parenting has a significant negative correlation among core self-evaluation and friendship quality; core self-evaluation has a significant negative correlation among smartphone addiction and friendship quality; harsh parenting smartphone addiction; core self-evaluation was significantly positively correlated to friendship quality.
- A mediating effect model was established with harsh parenting as the predictive variable, smartphone addiction as the dependent variable, core self-evaluation as the mediating variable, and gender & grade as the control variables. The results showed that core self-evaluation plays a partial mediating effect between harsh parenting and smartphone addiction.
- A moderating effect model was established with harsh parenting as the independent variable, friendship quality as the moderating variable, core self-evaluation as the dependent variable, and gender & grade as the control variables. The results showed that friendship quality had a significant moderating effect on the prediction effect of harsh parenting on core self-evaluation. For the high friendship quality group, the core self-evaluation of adolescents decreased significantly with the increase of harsh parenting degree, while comparing

to the low friendship quality group the decline degree of the high friendship quality group was considerably high.

- Using the structural equation technology to conduct the integrated model examination of the two steps above-mentioned. The results showed that harsh parenting had a direct effect on adolescent smartphone addiction and also an indirect effect on adolescent smartphone addiction through core self-evaluation. Meanwhile, the effect of harsh parenting on core self-evaluation was moderated by friendship quality.

Source: Psychological Development and Education, 2020; 36(6):677-685.

NEWSLETTER

The Impact of the New College Entrance Examination Reform on Inequality of Educational Opportunities

By Zhang, W., Ha, W., & Zhu, H.
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RECENTLy, an empirical study published in *Research in Educational Development* conducted the variance analysis of students' different social strata around the new college entrance examination reform based on the survey data of 2016-2019 freshmen cohorts in a key state university and also explored the compensation effects of career education in senior high schools.

The research findings are as follows:

- The early trail of the reform put the background selection much more severe, while students from the advantageous social level occupy the dominant position. The complexity of the reform, such as mark-giving methods and college application processes forced students to collect adequate and effective information to make the proper decisions. However, the disadvantaged students who relatively lack in the family economy, culture, and social capital are very likely to face the situation of asymmetric information or even the social stratum dilemma.
- The career education in high schools shows a positive effect on the participation of parents in college preparation for their children, but it has not yet shown significant compensation effects. However, school career education has shown signs of narrowing the gap in parental involvement between classes.

The study suggests that it may be just because of the exploratory period of school career education in the reform process and the lag period of its effectiveness, which highlights the role and the role played by family capital in this competition. This just emphasizes that under the background of the new college entrance examination system, continuing to effectively promote school career education plays an important regulating role in students' development and the realization of real educational equity

Source: Research in Educational Development, 2020; 40(Z1):57-66.

NEWSLETTER

How to Design Graphical Scaffolds to Support STEM Teaching Effectively?

By Cai, H., Dong, H., & Wang, Q.
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A META-ANALYSIS study published in *e-Education Research* was conducted to explore the effectiveness of the graphical scaffolds in the teaching of STEM courses by in-depth, analyzing 30 experimental and quasi-experimental studies.

The research findings are as follows:

- Graphical scaffolds have a moderately positive effect on learners' learning in STEM courses. It can not only improve learners' cognitive perception and academic motivation but also reduce cognitive load and improve learners' abilities of spatial representation and problem-solving. However, graphical scaffolds in STEM courses have no significant positive effect on learners' metacognitive ability and self-efficacy.
- Visualize information, knowledge structure, dynamic knowledge, thoughts, learning process, and graphical scaffolds have different positive effects on improving students' results in STEM courses. The factors above show a moderately positive effect on the shallow and deep understanding of learners, and they can reduce the cognitive load of learners.
- From the perspective of the learning phases, the integration of graphical scaffolds in the STEM curriculum has a relatively strong impact on students' learning in elementary and high school, a moderate impact on it in junior high school, and a low impact on college students. From the perspective of subjects, the integration of graphical scaffolds in STEM courses has a moderately high impact on the learning of mathematics and engineering courses, and a moderate impact on the learning of technology and science courses. From the perspective of teaching methods, compared with project-based learning and problem-solving learning, inquiry-based learning, and collaborative learning have a positive impact on learners' learning results.

- Research implication: First, teachers should consciously design graphical scaffolds to improve the cognitive, skill, and emotional aspects of learning quality. Second, teachers should design graphical scaffolds in a personalized way. On the one hand, teachers should design graphical scaffolds by consideration with the emphasis of learning goals. Thirdly, teachers can design graphical scaffolds to structure collaborative inquiry instruction pertinently by analyzing the characteristic of domain-specific knowledge and learners.

Source: e-Education Research, 2020; 41(10): 73-81.

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