

# Research on the Impact of Education Funding on Education Digitalization

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**Abstract:** The digitization of education requires the support of educational funds. This article uses relevant data on China's education funding investment and education digitalization from 2013 to 2021 to construct an evaluation index system for education digitalization based on AHP method empowerment. The benchmark regression method was used to analyze the impact of China's education funding investment on the digitization of education in China. Research has found that all educational expenses have a significant positive impact on educational digitization. And based on this, relevant prospects are proposed.

**Keywords:** Education funding, Digitalization of education, Evaluation index system

## 1 Introduction

China's education system handles the world's largest number of students, but there is a certain imbalance in the allocation of educational resources, especially between urban and rural areas, as well as between the eastern and central and western regions. At the same time, since entering the 21st century, the global digital wave has swept across various industries, and the education field is no exception. In order to improve the quality and efficiency of education, many countries and regions have begun to invest more funds in the digital construction of education.

As the world's largest developing country, China has a particularly prominent demand for digital education, which can alleviate uneven resource distribution, improve education quality, and also provide favorable support for personalized and innovative education. However, the investment in digitalization of education requires a large amount of funding support. How to reasonably use and effectively allocate these funds, as well as how to evaluate the effectiveness of these investments, are issues that require in-depth research.

The investment in education funds not only involves the construction of hardware facilities in schools, such as computers, the internet, interactive electronic whiteboards, but also involves teacher training, digital development of courses, and so on. Therefore, the efficiency of educational funding investment is directly related to the breadth and depth of educational digitization, and will also affect whether educational digitization can achieve its potential.

Overall, the study of the impact of Chinese education funding on educational digitization has significant theoretical and practical significance. On the one hand, it can provide scientific

decision-making references for policy makers; On the other hand, it can also clarify the direction and focus of investment for educational practitioners.

## 2 Literature review

Digitalization of education is an important trend in the global education community in the 21st century, which has a significant impact on the quality and efficiency of education. In the process of schools transitioning from traditional teaching models to digital education, the rational use and allocation of educational funds is crucial. Osarenren-Osaghae & Ibor (2018) pointed out that education funds can be used for equipment procurement, software development, teacher training, and educational research, all of which play a key role in promoting digital education [1]. Their research suggests that policy makers should prioritize investment in education funds to ensure that schools can fully utilize digital technology to improve education quality.

In recent years, many research papers have focused on the relationship between education funding and education digitization. Zaborovskaia et al. (2020) found through multiple case studies that the increase in educational funding has a positive impact on the promotion of educational digitization [2]. Their research shows that an increase in educational funding can provide more digital learning resources and equipment, provide more support and training opportunities for teachers and students, and promote the development of digital education.

In addition, the reasonable allocation of education funds is also a key factor in promoting the digitization of education. O'Doherty et al. (2018) pointed out in their study that education funds should be used to purchase high-quality digital learning resources and tools, and provide corresponding training and support for teachers [3]. They believe that the effective use of educational funds can help schools achieve better digital education outcomes and improve students' learning outcomes.

The Chinese government has always been at the forefront in using education funds to promote education digitization, and there have been many studies analyzing and exploring this. According to Keane & Keane (2020), educational funds are used to purchase and maintain digital educational equipment, such as computers, tablets, and interactive whiteboards [4]. These devices have improved the quality and efficiency of teaching and promoted students' autonomous learning. Ren et al. (2022) emphasized the importance of educational funding in software development and updates, including online learning platforms, teaching resource libraries, etc., which can effectively enhance students' learning interest and effectiveness [5]. Furthermore, educational funds are also used for digital education and training of teachers (Erlangga, 2022) [6]. By investing funds in training, teachers' information technology education abilities are improved, thereby better utilizing digital tools for teaching.

Although many studies have explored the relationship between education funding and education digitization, there are still some important aspects worth further research. Firstly, more research is needed to explore how to better utilize educational funds to achieve more effective digitization of education. Secondly, the effectiveness of educational funding in the practice of digital education should also be evaluated to understand whether investing in educational funding can truly improve students' learning outcomes. In view of this, this article intends to analyze the impact of China's education funding on education digitization, evaluate the impact of China's

education funding investment on education digitization, and provide theoretical support for subsequent research.

### 3 Model setting and data

This study uses data on China's education funding investment and education digitization from 2013 to 2021, sourced from the National Bureau of Statistics of China.

To verify the impact of China's education funding investment on education digitization, this article uses China's education funding as the explanatory variable and education digitization as the dependent variable. Among them, educational digitization can be classified and analyzed from four aspects, namely the number of computers used at the end of education (Wu et al., 2015)<sup>[7]</sup>, the number of computers used per 100 people in education (Li & Chen, 2016)<sup>[8]</sup>, the number of websites owned by educational enterprises (Chen & Wang, 2016)<sup>[9]</sup>, and the number of online undergraduate admissions (Yang & Zhang, 2016)<sup>[10]</sup>. And based on these four aspects, a digital evaluation index system for education is constructed (Figure 1).

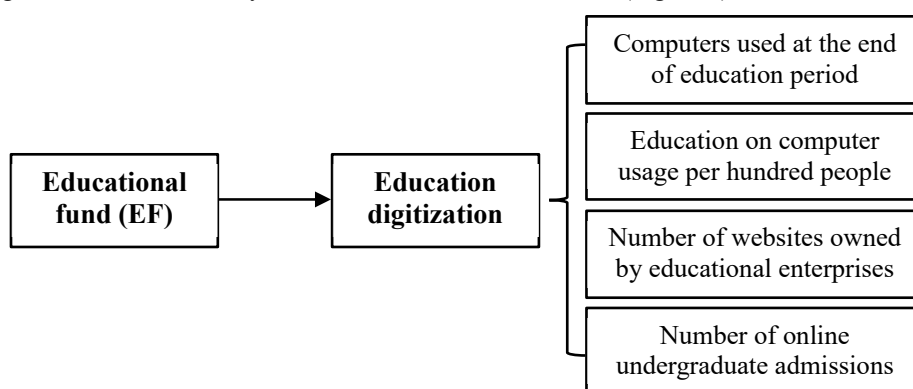


Fig. 1 Mechanism model of the impact of educational funding on educational digitization

The specific setting model is:  $ED = aEF + e$ .

According to this formula, we need to analyze the regression of Educational fund (EF) to Education digitization (ED), and test the significance of regression coefficient  $a$  (that is, test  $H_0: a=0$ ).

## 4 Construction of digital evaluation index system for education

### 4.1 Indicator selection

Education digitization can be classified and analyzed from four aspects. One is that we can examine the number of computers used at the end of education, which can reflect the level of investment of schools or educational institutions in digital education (Miao & Wu, 2017)<sup>[11]</sup>. The second is that the number of computers used by every hundred people in education is another important indicator, which can reflect the popularity of digital education and the level

of digital literacy of the entire population (Wang & Hu, 2018) [12]. Thirdly, the number of websites owned by educational enterprises indicates the importance and participation of enterprises in digital education (Zhang & Liu, 2019) [13]. Fourthly, the number of online undergraduate admissions can reflect the digital development of higher education (Liu & Jiang, 2018) [14].

#### 4.2 Index weighting based on AHP method

To avoid interference from data units in data analysis, this article uses the "extreme normalization" method to perform dimensionless processing on the data. Due to space limitations, I will not elaborate further. After obtaining dimensionless data, start calculating weights. For data analysis, the selected indicators will be numbered as the number of computers used at the end of the education period (TC), the number of computers used per 100 people in education (PC), the number of websites owned by education enterprises (EW), and the number of online undergraduate admissions (WU). When calculating weights using the Analytic Hierarchy Process (AHP), the first step is to construct a judgment matrix (Table 1).

**Tab. 1** AHP Analytic Hierarchy Process Judgment Matrix

Avg.	Terms	TC	PC	EW	WU
0.538	TC	1	0.876	0.751	1.215
0.615	PC	1.142	1	0.858	1.387
0.716	EW	1.331	1.166	1	1.616
0.443	WU	0.823	0.721	0.619	1

Data source: Calculated based on Stata.

From Table 2, it can be seen that for the number of computers used at the end of the education period, the number of computers used per 100 people in education, the number of websites owned by education enterprises, and the number of online undergraduate admissions, a 4-order judgment matrix was constructed for AHP hierarchical analysis (calculated using the sum product method). The eigenvectors obtained were (0.931, 1.063, 1.239, 0.767), and the corresponding weight values of the total 4 items were: 23.280%, 26.575%, 30.979%, and 19.166%, respectively. In addition, by combining the feature vectors, the maximum feature root (4.000) can be calculated, and then the CI value (0.000) [ $CI = (\text{maximum feature root } n) / (n-1)$ ] can be calculated using the maximum feature root value. The CI value is used for consistency testing as follows.

**Tab. 2** AHP Analytic Hierarchy Process Results

Terms	Eigenvector	Weight	Max. eigenvalue	CI-Value
TC	0.931	23.280%	4.000	0.000
PC	1.063	26.575%		
EW	1.239	30.979%		
WU	0.767	19.166%		

Data source: Calculated based on Stata.

When using the Analytic Hierarchy Process (AHP) for weight calculation, consistency testing analysis is required. Consistency testing requires the use of two indicator values, CI and RI; The CI value has been calculated, and the RI value can be queried according to Table 3. This study constructed a 4-order judgment matrix, corresponding to the random consistency RI value of 0.890 that can be queried in the above table. The RI value is used for the consistency test calculation below (Table 3).

**Tab. 3** Random Consistency RI

<i>n</i>	3	4	5	6	7	8	9
RI	0.52	0.89	1.12	1.26	1.36	1.41	1.46
<i>n</i>	10	11	12	13	14	15	16
RI	1.49	1.52	1.54	1.56	1.58	1.59	1.5943
<i>n</i>	17	18	19	20	21	22	23
RI	1.6064	1.6133	1.6207	1.6292	1.6358	1.6403	1.6462
<i>n</i>	24	25	26	27	28	29	30
RI	1.6497	1.6556	1.6587	1.6631	1.6670	1.6693	1.6724

Data source: Calculated based on Stata.

Generally, the smaller the CR value, the better the consistency of the judgment matrix. Generally, if the CR value is less than 0.1, the judgment matrix meets the consistency test; If the CR value is greater than 0.1, it indicates that there is no consistency, and the judgment matrix should be adjusted appropriately before further analysis. The CI value calculated for the 4th order judgment matrix is 0.000, and the RI value is 0.890. Therefore, the CR value calculated is  $0.000 < 0.1$ , indicating that the judgment matrix in this study meets the consistency test and the calculated weights have consistency (Table 4).

**Tab. 4** Summary of Consistency Inspection Results

Max. eigenvalue	CI-Value	RI-Value	CR-Value	Consistency inspection results
4.000	0.000	0.890	0.000	Pass

Data source: Calculated based on Stata.

## 5 Analysis of empirical results

This article uses benchmark regression analysis to study the impact of educational funding on educational digitization, whether there is an impact relationship, and how the impact direction and degree are.

From Table 5, it can be seen that using education funding as the independent variable and education digitization as the dependent variable for linear regression analysis, it can be seen from the above table that the model formula is: Education Digitization =  $-0.913 + 0.000 * \text{Education Funding}$ , with a R-squared value of 0.941, which means that education funding can explain 94.1% of the changes in education digitization. When conducting an F-test on the model,

it was found that the model passed the F-test ( $F=11.248$ ,  $p=0.000<0.05$ ), indicating that education funding will definitely have an impact on education digitization.

The final specific analysis shows that the regression coefficient value of education expenditure is 0.000 ( $t=10.547$ ,  $p=0.000<0.01$ ), indicating that education expenditure will have a significant positive impact on education digitization. Summary analysis shows that all educational expenses will have a significant positive impact on the digitization of education.

**Tab. 5** Linear Regression Analysis Results - Simplified Format

	Regression coefficient	95% CI	Collinearity diagnosis	
			VIF	Tolerance
a	-0.913** (-6.251)	-1.199 ~ -0.627	-	-
EF	0.000** (10.547)	0.000 ~ 0.000	1.000	1.000
Sample size		9		
$R^2$		0.941		
Adjust- $R^2$		0.932		
F-Value		$F(1,7)=111.248, p=0.000$		

(Dependent variable: Education digitization, D-W value: 0.837, \*  $p<0.05$  \*\*  $p<0.01$ , t-value in parentheses)

Data source: Calculated based on Stata.

## 6 Research conclusions and implications

### 6.1 Conclusions

The digitization of education has become one of the important fields of education reform today, and the impact of education funds on the digitization of education has also received much attention. By studying the impact of Chinese education funding on educational digitization, we can promote the development of educational digitization and improve the quality and efficiency of education.

Education funding is one of the important guarantees for achieving digital education. Research has found that there is a certain correlation between the level of investment in education funds and the level of development of education digitization. Higher investment in education funds can provide better hardware facilities, software resources, and teacher training, thereby promoting the implementation and application of digital education.

### 6.2 Implications

After conducting in-depth research on the impact of Chinese education funding on education digitization, we have come up with some policy recommendations to promote the development of education digitization, improve education quality and efficiency.

Firstly, there is a certain correlation between the level of investment in education funds and the level of development of education digitization. It is recommended to increase investment in education funds, especially with special funding for projects and needs related to digital

education. The government can increase financial support for schools to purchase advanced educational technology equipment, build digital classrooms and laboratories, etc.

Secondly, the development of digital education needs to be combined with the reasonable allocation of educational funds. In the allocation of educational funds, more attention should be paid to supporting and tilting the digitization of education. By formulating relevant policies and taking the lead, digital education projects can be launched in some developed areas or key schools to demonstrate and lead the development of other regions and schools.

In addition, the development of digital education needs to be combined with the active participation of social forces. In addition to government financial support, various forces such as enterprises, social organizations, and individuals can also be encouraged and guided to participate in the digitization of education. By introducing social investment and promoting public-private partnerships, we can increase the funding sources and technical support for digital education projects.

Finally, the development of digital education needs to be linked to the overall promotion of education reform. When formulating policies and projects for digitalization of education, it is necessary to be consistent with the overall goals of education reform and continuously promote the transformation and innovation of education models.

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