



Research article

A model for evaluating the performance of compulsory education inputs in ethnic areas in China

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ABSTRACT

A scientific performance evaluation model is necessary to establish a performance evaluation index system for compulsory education in ethnic areas and to conduct objective and impartial evaluations. After conducting theoretical analysis and reviewing literature, it was determined that existing educational input performance evaluation models are general and fail to reflect the unique characteristics of compulsory education development in ethnic areas of China. Therefore, this study intends to improve their self-adaptability and degree of fit. Based on the features of China's ethnic areas and the current situation of compulsory education development, a trinity evaluation model of compulsory education input performance in ethnic regions was constructed using the classical performance evaluation theoretical framework. This model includes the "implementation topic - target concept - performance dimension." The government is the main organization responsible for organizing and implementing the entire performance evaluation, with publicness and responsiveness as the value idea of evaluation. The "4E" of enough, equity, efficiency, and effectiveness are the evaluation objectives, and input, allocation, output, and effect are the dimensions of the building of the performance evaluation index system. The "4E" evaluation objectives are integrated into the performance evaluation dimensions and index system. The reconstructed theoretical model of performance evaluation combines universality and specificity, highlights the dual attributes of "tool-value," realizes the organic combination of internal and external performance evaluation, illustrates the overall performance evaluation process and ensures objective, fair, and accurate performance evaluation results. It provides useful guidelines for further optimizing compulsory education investment policies and promoting high-quality and well-balanced compulsory education in China's ethnic areas.

1. Introduction

As a key element of "Two Assurances and Three Guarantees" in ethnic areas, compulsory education plays a significant role in broadening people's horizons and enhancing cultural quality, as well as a unique role in halting the intergenerational transmission of

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poverty in ethnic areas and enhancing personal and social benefits [1]. According to research findings, the popularity of basic education is strongly positively connected with the income distribution gap in nations or regions with low levels of economic growth, with elementary education having the highest social return of the three levels of education and its development providing the highest rate of private and social returns [2–4]. In China's ethnic regions, where education is largely underdeveloped, compulsory education has a fundamental, guiding, and general role as the beginning of the national education system. Compulsory education inputs encompass the allocation, management, and utilization of funds by governments at all levels to provide educational services and complete academic achievements for students in compulsory education [5]. This plays a crucial role in achieving a fair distribution of educational opportunities and resources, as well as bridging the gap between regional and urban-rural development of compulsory education in ethnic areas. If compulsory education is not adequately developed, it will be unable to drive the growth of higher levels of education, resulting in an increase in dropout rates and a vicious cycle. As a result, compulsory education inputs have become a key factor that affects the quality of compulsory education in these regions [6].

China is a diverse nation with various ethnic groups, languages, and cultures. Ethnic minorities play a crucial role in China's population, accounting for 8.89% of the total population (over 120 million people) according to the Seventh National Population Census of the People's Republic of China in 2020 [7]. The Chinese government officially recognizes 56 ethnic groups, including the Han majority and 55 ethnic minority groups. To enhance ethnic minority education in China, the central government has implemented a range of favorable policies to support these groups since the mid-1980s. Among these policies, the one that has been most widely discussed by researchers is the bonus points system for ethnic minority students enrolling in higher education [8].

China has made significant progress in providing education to its ethnic minority populations, and some of these regions have even achieved higher levels of development than the national average [7]. China has established a comprehensive education system for ethnic minority regions, starting from kindergarten, primary, secondary, vocational, and higher education. As of mid-2002, almost all school-age children in these regions have been enrolled in schools, which is equal to the national average. Ethnic minorities in China have received preferential treatment and policy privileges, which have had a significant impact on many aspects of their lives, such as family planning, employment, business development, and political representation [6]. In the context of education, these policies include preferential admissions, lower school fees, boarding schools, and remedial programs. The Chinese government has prioritized the expansion of ethical education in minority areas, considering the unique natural, historical, and social circumstances that influence ethnic education [9].

In recent years, particularly since the 18th Party Congress, China has undergone poverty reduction reforms, and governments at all levels have expanded their investment in compulsory education in ethnic areas [4]. Consequently, the basic balance of compulsory education in ethnic counties has been substantially achieved. By the end of 2020, 96.8% of China's counties had attained a balanced development of compulsory education, with 95.3% of those counties located in central and western China. This achievement primarily fulfills the fundamental goal of providing access to education [10]. Han et al. [6] argued that the growth of compulsory education has not kept pace with the demands of modern education in light of new developments. The shortage of talent and training impedes regional economic development and often leads to a negative cycle of poverty [11]. An equitable distribution of education resources can enhance the quality of compulsory education and improve teaching conditions in minority areas [12]. However, data monitoring and supervision indicate that the basic balance of compulsory education in China's ethnic areas is relatively low. Many schools have reached the upper limit of the national standard for the comprehensive coefficient of variation, and face challenges in fully guaranteeing the statutory growth. Additionally, there are issues with the unreasonable structure and use of public funding, excessive regional differences in funding levels, insufficient internal performance of education investment, and ambiguous external performance of education investment [13].

If the aforementioned issues are not addressed, it will be impossible to ensure the quality and balanced development of compulsory education in ethnic areas in China, as well as to demonstrate the principle of equity, which will exacerbate the regional development imbalance in various aspects such as economy and culture [3]. Therefore, it is necessary to construct a theoretical model for evaluating the performance of compulsory education inputs in ethnic areas [14]. The evaluation of China's compulsory education investment in ethnic areas needs to be intensified. The following factors make performance assessment of educational inputs crucial. First, it aids in determining the efficacy of educational programs and policies meant to enhance ethnic minorities' access to school. Secondly, it helps to assess the impact of these policies on the education outcomes of ethnic minority students, including enrollment rates, academic performance, and retention rates. Thirdly, it can help to identify any disparities or inequalities in educational opportunities between ethnic minority students and their non-minority peers. Finally, it can inform policymakers and educational practitioners of the successes and challenges faced in improving compulsory education in ethnic minority areas, leading to more effective policy design and implementation.

Literature on education in China's ethnic regions emphasizes the significance of compulsory education and its role in alleviating poverty and fostering social development [6]. When it comes to evaluating the efficacy of compulsory education inputs in these regions, however, research is lacking. Previous studies highlight some related issues like compulsory education [4,5,15–19], education inputs [20–22], and education resources [8,23,24]. Several studies also focus on the relationship between education inputs or resources and performance [3,8,25,26]. However, almost no study emphasizes on the assessment of the performance of compulsory education inputs in ethnic areas in China. This research gap is significant because it limits the capacity for data-driven policymaking and optimization in these areas, where there are frequently challenges associated with the allocation and use of public funds, regional funding disparities, and the internal and external performance of education investment.

This study seeks to address this weakness by developing a trinity evaluation model for compulsory education input performance in ethnic regions, based on the classical theoretical framework for performance evaluation. This model takes into consideration the distinctive characteristics of China's ethnic regions and the current state of compulsory education development, as well as the goals of

ensuring sufficient, equitable, efficient, and effective education inputs [22]. By combining these goals with the performance evaluation dimensions and index system, this study provides a full evaluation of how education inputs affect the performance of compulsory education in ethnic areas. This will lead to useful recommendations for improving compulsory education investment policies and promoting high-quality, well-balanced education in these areas.

2. Methodology

Both inductive and deductive techniques are used in the research to guarantee the validity of the assessment model [27]. Examining the body of research on education input performance assessment models is part of this methodology. A model was constructed based on the current status and unique characteristics of compulsory education in China's ethnic minority regions to evaluate compulsory education inputs. This model is designed to reflect the distinctive characteristics of compulsory education development in ethnic minority areas. We explain the details of the model construction in the following well-accepted methodological steps, such as a thorough evaluation of the existing literature, adaptation and reconstruction of the performance evaluation model, and explanation of the framework of compulsory education input performance evaluation model. The extant literature on education input performance assessment models was thoroughly reviewed using an inductive approach at first. It also set the framework for further research and gave a basis of knowledge. Next, a deductive method was used: a customized model was created to precisely assess the contribution of compulsory education, using the insights from the reviewed literature as well as the present state and distinctive features of compulsory education in China's ethnic minority areas. By using two different approaches, the research was able to demonstrate its robustness and provide a finely tailored model that captures the unique features and subtleties of compulsory education development in places inhabited by ethnic minorities.

The first step is a thorough evaluation of the existing literature, which entails looking at earlier research on mandatory schooling, educational resources, and their correlations with performance in relation to ethnic regions. This review helps to fill in any gaps in the body of knowledge, comprehend the distinctive qualities of China's ethnic regions, and provide the groundwork for the suggested model.

The second step entails the adaptation and reconstruction of the assessment model using the traditional theoretical framework for performance evaluation in order to guarantee its theoretical plausibility and practical applicability. The "implementation topic - target concept - performance dimension" trinity assessment model of compulsory education input performance in ethnic areas is created. The performance assessment dimensions and index system in this methodology integrate the "4E" evaluation goals of enough, equity, efficiency, and effectiveness. The rebuilt theoretical model emphasizes the two features of "tool-value" by fusing universality and specialization, which achieves the natural fusion of internal and external performance assessment.

The third step is the model's validation and improvement. The model has been developed using a solid theoretical framework. It is important to acknowledge that the model's design automatically encompasses the distinct characteristics and nuances of compulsory education development in regions populated by ethnic minorities. The design strength of this study is rooted on a comprehensive analysis of relevant literature and the careful adaptation of existing models to suit the unique circumstances of China's ethnic regions. To evaluate the precision and dependability of the suggested model in determining the effectiveness of compulsory education inputs in China's ethnic regions, empirical data is gathered from a variety of relevant sources, including government reports, working papers, and educational records. The efficacy of the model has been evaluated through field observation.

Finally, the verified model is then used to real-world situations in order to provide insights and suggestions for improving investment strategies for compulsory education in ethnic communities. The model may teach decision-makers and practitioners in education about the areas that need improvement by highlighting the strengths and shortcomings of present policies and practices, resulting in more effective policy creation and implementation. This comprehensive study technique not only offers a solid framework for the creation of the suggested assessment model, but it also helps to advance high-quality, well-balanced compulsory education in China's ethnic regions.

3. Evaluation of the existing literature

Performance evaluation theory originated in developed Western countries and was primarily used in economics. Later, it was gradually introduced to China and began to be utilized in other sectors of research. With the emergence of new public management theories, performance evaluation theories began to be used to assess the public sector's capacity and proficiency in providing public services. As illustrated below, various theoretical frameworks are currently employed to evaluate the performance of educational inputs.

3.1. "Economy-Equity-Efficiency-Effectiveness" conceptual framework

In the 1980s, the United Kingdom initiated fiscal system reform aimed at developing evaluation criteria for fiscal spending based on economy, efficiency, and effectiveness. This reform sought to measure the level of government performance in providing public services [28]. The "3E" evaluation criteria (efficiency, efficacy, and effectiveness) have moved away from a single evaluation notion and have constructed an indicator evaluation system utilizing various evaluation concepts [29]. This performance evaluation framework can motivate and compel government departments at all levels to perform their administrative duties more effectively to complete their tasks, which is a crucial step toward the establishment of an effective and people-oriented government. This framework has also assisted in alleviating the fiscal crisis that Western nations were experiencing at the time.

However, the “3E” evaluation index system primarily evaluates government management performance from the standpoint of enterprise management, based on instrumental rationality and emphasizing quantitative evaluation [30]. Government conduct is fundamentally different from that of businesses. Governments should pursue not just instrumental rationality but also value rationality, emphasizing the pursuit of public values. Thus, using the “3E” evaluation criteria to evaluate government management performance is simplistic [31].

In the post-public management era, the New Public Service and New Public Administration theories placed greater emphasis on the concept of public values, and the subsequent government performance evaluation system incorporated equity indicators, which gradually evolved into the “4 E s” evaluation method outlined by Flynn in 1997. In the field of education, the “4E” theoretical framework has been adopted to evaluate the performance of inputs, processes, and outcomes [31]. Due to the non-profit and non-market nature of the public sector, the “4E” theoretical framework must be recreated and debugged to align with the characteristics and context of the evaluated object [32].

Some scholars [6,33] believe that China has entered a new era and enough education input should not only focus on the total amount but also measure enough input increment by the relationship between supply and demand. Equity emphasizes the significance of group equity while focusing on geographical equity, and efficiency should adhere to the evaluation principle of combining internal and external efficiency [7]. The above evaluation goal concept should be applied to the specific evaluation process to construct a comprehensive and scientific evaluation system of input indicators for compulsory education.

3.2. Three-dimensional conceptual framework of “politics-economy-society”

The theoretical framework for evaluating government performance in providing public services emphasizes three primary dimensions: political performance, economic performance, and social performance [13,34]. These dimensions should be incorporated into constructing the evaluation index system. The framework evaluates government behavior through political, economic, and social macro performance, providing a comprehensive evaluation from multiple directions and perspectives. However, this approach has some disadvantages. Firstly, while the evaluation is more complete, it lacks depth and should enhance the applicability of its results. Secondly, constructing the indicator system using political, economic, and social dimensions may result in cross-conflicts, as the connotation of each dimension varies based on disciplinary features, compromising the scientificity and objectivity of the evaluation results. Thirdly, the framework places an emphasis on external performance evaluation while ignoring internal management performance evaluation, making it difficult to examine the causes of performance deviation.

In recent years, scholars have applied the “politics-economy-society” theoretical framework to evaluating educational input performance by developing an index system to evaluate the comprehensive performance of educational input to local politics, economy, and society [35]. However, without evaluating the internal management performance of the input and the direct output of educational outcomes, the complete picture of educational input performance cannot be gleaned.

3.3. “Comprehensive indicators – classification indicators – single indicators” framework

This theoretical framework is one of the most classic and commonly utilized analytical frameworks for evaluating performance in academic and professional settings. This framework groups comprehensive indicators, also referred to as first-level indicators, into a large category based on the attributes of the indicators. This includes both classification indicators and single indicators. The connotation includes a wide range and is at the top of the indicator system, determining the construction surface of the indicator system. Classification indicators, also known as secondary indicators, are defined under the connotation of comprehensive indicators and categorized according to many features of the comprehensive indicators, with a more precise and explicit connotation. Individual indicators, also known as tertiary indicators, are a subset of categorical indicators with distinct implications and straightforward measurement [36]. The evaluation theoretical framework of comprehensive indicators, classification indicators, and single indicators can clearly demonstrate the index rationalization procedure and has high application value for objects with numerous influencing aspects and intricate internal connections [37].

The advantage of this theoretical framework is its comprehensive indicator system, which allows for detailed and objective evaluation results. However, a disadvantage is that the indicator settings typically display parallel relationships instead of progressive ones. Currently, many scholars apply this framework to evaluate educational input performance by constructing indicator systems from various angles. However, the construction of these indicator systems tends to be relatively static, and the evaluation process focuses excessively on external results. As a result, there is a lack of an indicator system that can reflect the internal performance of educational input for a comprehensive evaluation that considers the educational input generation mechanism. This limitation also affects the practical application of the evaluation results of educational investment.

3.4. Balanced score card theoretical framework

The paper used the balanced scorecard theory as a framework to elucidate the comprehensive nature of assessment, including many dimensions such as financial and non-financial components, as well as internal and external performance indicators. Building upon the aforementioned background, the establishment of the “4E” framework aimed to refine and focus this all-encompassing viewpoint precisely on assessing the inputs of compulsory education in China’s ethnic areas.

The Balanced Scorecard (BSC) is a system developed in 1996 by Professor Kaplan of Harvard University and President Norton of Renaissance Global Strategy Group to focus on a company’s core competencies and potential competitive advantages [38]. The four

key strategic dimensions of finances, customers, internal operations, and learning and development are used to construct a comprehensive enterprise performance evaluation index system [29]. The theoretical framework of the Balanced Scorecard focuses on evaluating the performance of governments and organizations from four perspectives: finances, customers, internal operational processes, and learning and growth [39].

The merit of this theoretical framework is that it translates the organization’s macro-level strategic goals into specific and quantitative indicators. It also adheres to assessment principles of placing equal focus on process and results, combining internal and external performance, external benefits and process management, and financial investment and resource allocation. This makes the evaluation more comprehensive and can provide a panoramic view of the performance evaluation process. However, this theoretical framework primarily focuses on the evaluation of business management activities. If performance evaluation is to be conducted for government departments, the four dimensions of its composition must be reconstructed and debugged, or else it will not fit the value concept of government performance evaluation, because there are significant differences between government performance evaluation. The implementation process is constrained by factors such as the creation and quantification of indicators, the cost of implementation and so on [40].

Currently, the balanced scorecard theory is widely used to evaluate the performance of educational inputs, emphasizing the evaluation of outputs and achievements and attempting to use the evaluation results as the basis for the budget scale and growth rate of financial inputs for compulsory education [39]. However, a review of the literature reveals that when scholars apply the balanced scorecard theory to evaluate compulsory education input performance, many of them copy it verbatim without debugging and reconstructing it, which is manifestly inapplicable to the evaluation of education input subjects. Therefore, when evaluating the performance of compulsory education inputs, the balanced scorecard must be adjusted and improved to fit the product attributes of compulsory education and the value concept of government performance, and the indicator content must be revised layer by layer to establish a complete and scientific evaluation theoretical framework [37].

For instance, when evaluating the performance of compulsory education inputs, the original balanced scorecard theoretical framework was modified according to the nature and characteristics of basic public education, and a four-dimensional evaluation framework was constructed: society, financial, internal processes, and learning and development. This modified framework emphasizes the significance of the relationship between compulsory education inputs and society, the importance of financial management and control, the effectiveness of internal processes and management, and the promotion of teachers’ professional growth and students’ comprehensive development. It provides a more comprehensive and practical evaluation of compulsory education inputs, enabling the government to make sound decisions about financial investment and resource allocation, and ultimately promoting the continuous improvement of compulsory education quality [3].

Many scholars [6,7,41] apply current education input performance evaluation models to evaluate the performance of compulsory education input in ethnic areas in China without customizing them according to the characteristics of ethnic areas in China. This results in insignificant evaluation results. For instance, previous studies have utilized the “3E” evaluation criteria (economy, efficiency, and effectiveness) to evaluate the performance of public organizations [29,30]. Although these three factors are important for compulsory education inputs in ethnic areas, the original theoretical evaluation model must be modified and optimized. Evaluating the performance level of compulsory education input in ethnic areas requires objectives that can better test the performance level of compulsory education input in ethnic areas in light of the current situation in China. This situation is characterized by the total amount of compulsory education inputs in ethnic areas being disproportionately insufficient and their performance level being comparatively low. Thus, the evaluation objectives should focus on enough, equity, efficiency, and effectiveness.

The essence of providing basic education products and public education services to the public is achieved through the allocation of resources and scientific management processes in the education system. This process includes compulsory education inputs, operational management, output results, and external benefits, all of which follow the logic of compulsory education input performance production (Fig. 1).

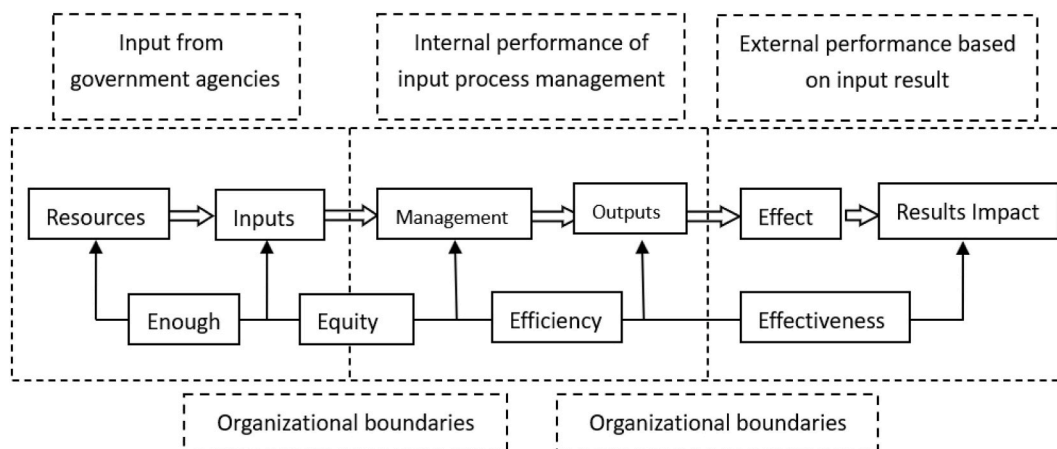


Fig. 1. The logical flow of compulsory education input performance generation in China’s ethnic areas.

However, the existing theoretical framework for evaluating compulsory education input performance is narrow in scope. From the perspective of the transmission mechanism, the performance of compulsory education input in ethnic communities has two aspects. First, it enhances the quality of education products, as shown by infrastructure improvements, an increase in compulsory education enrollment rates, and the number of qualified graduates, all of which are internal performance indicators [6]. Second, investment in compulsory education leads to personal and societal benefits, such as improved economic conditions, which are external benefits [19]. Increased internal performance typically yields external benefits through the transmission influence mechanism. Internal performance serves as the foundation for developing external benefits, while external advantages are reflected in internal performance improvement.

Previous studies, however, only equate compulsory education input performance with external performance, focusing primarily on increasing income, narrowing income gaps, and promoting economic growth [5,15,41]. They pay less attention to evaluating compulsory education input performance regarding internal performance and educational quality [42]. This includes evaluating whether the quantity and structure of inputs in urban and rural areas are reasonable and whether the efficiency of inputs and outputs is Pareto optimal. The current theoretical framework of evaluation lacks scientificity and objectivity in addressing these dimensions. Therefore, this study addresses these weaknesses by proposing a holistic framework that can be used in an ethnic area.

3.5. Comparative analysis of previous theories, limitations and necessity of new theory

The assessment of educational inputs in ethnic minority communities, specifically within the Chinese context, necessitates a tailored methodology that can effectively address their unique socio-cultural characteristics, available resources, and specific obstacles. The emergence of the “4E” theory arose as a response to this need, offering a novel framework for comprehending performance through the lens of four distinct domains. In this study, we conduct an in-depth comparison analysis with other well-established frameworks in order to determine its benefits and unique characteristics.

3.5.1. Economy-Equity-Efficiency-Effectiveness conceptual framework vs. 4E

Upon first examination, it seems that both the “4E” theory and the “Economy-Equity-Efficiency-Effectiveness” conceptual framework have common areas of focus. Both entities place a strong emphasis on the fundamental concepts of efficiency, effectiveness, and equity in their evaluation. These commonly held principles are considered essential frameworks for evaluating the effectiveness of government and public sector activities, especially in the field of education.

Nevertheless, what distinguishes the “4E” approach, particularly in the context of ethnic minority regions in China, is its deliberate emphasis on the concept of “enough.” The notion highlights the need of “enough” in educational input. Traditional frameworks, such as the “3E” framework, while effective in their evaluations, primarily prioritize the viewpoints of enterprise management. The larger analysis often overlooks the specific and intricate requirements and dynamics, particularly significant in ethnic areas. In regions with ethnic populations, it is crucial to assess enough resources, given the often-unequal access and availability of educational resources in comparison to non-ethnic communities.

3.5.2. Three-dimensional conceptual framework of “politics-economy-society” vs. 4E

Although both frameworks emphasize a holistic approach that incorporates several elements into the review process, they vary in terms of their level of detail and specificity. The paradigm known as “Politics-Economy-Society” provides a macro-level view by including indicators related to politics, economy, and society. Nevertheless, the expanded perspective of this approach may sometimes oversimplify or even confuse crucial details that are vital for understanding ethnic minority regions. On the other hand, the “4E” idea is specifically designed to meet individual needs. The inherent distinctiveness of this study enables a more detailed analysis of the educational landscape within ethnic regions of China. The comprehensive examination of this subject has significant implication, given that regions with ethnic minority populations often encounter distinct obstacles, ranging from linguistic hurdles to cultural assimilation and the distribution of resources.

3.5.3. Comprehensive indicators – classification indicators – single indicators framework vs. 4E

Both the “4E” theory and this framework emphasize the need of using an organized and methodical approach to performance assessment [36,37]. However, when used in the context of ethnic minority regions, the general “comprehensive indicators” framework may exhibit a certain degree of rigidity. The inherent value of the “4E” hypothesis resides in its inherent dynamism. The instrument in question has a malleable nature, allowing it to effectively navigate the complex landscape of ethnic schooling inside China. The granular emphasis of this approach allows for differentiation between superficial outcomes and the intrinsic indicators that are crucial for ethnic areas.

3.5.4. Balanced score card theoretical framework vs. 4E

The Balanced Scorecard, known for its comprehensive methodology, is widely recognized as a beneficial instrument, particularly for collecting a wide range of performance indicators, including both financial and non-financial aspects [39]. Nevertheless, it is inherently focused on business. The potential incongruence arises when attempting to apply the ideas of superimposition to public sectors, particularly within educational sectors located in ethnic minority communities [40].

The hypothesis known as the “4E” theory emerges as a prominent framework in this context. The adaptation of the system is not only a result of natural processes, but rather a deliberate and intentional design. The theoretical framework known as the “4E” theory was first developed with a specific emphasis on the ethnic areas of China. This approach was designed to ensure that each criterion

within the theory aligns with the distinct socio-cultural and educational characteristics of these particular regions.

3.5.5. *Limitations and necessity*

Several constraints of the current frameworks are magnified when examined from the perspective of ethnic minority regions. First, the “3E” criteria, although comprehensive, are typically limited to business management viewpoints, perhaps neglecting the complexities of ethnic regions [31]. Second, broad frameworks may sometimes lack depth, which may possibly undermine the scientific rigor and impartiality that are crucial for accurately assessing ethnic areas [34]. Third, business-oriented techniques such as the Balanced Scorecard may not be easily applicable to the public sector, particularly in ethnic situations [40].

While these models offer valuable insights for assessing the performance of compulsory education input in ethnic minority areas in China, they don’t adequately articulate the unique characteristics and goals of such education investments. To address this, the paper evaluates the existing models’ limitations and delves into the intricacies of input performance in China’s ethnic minority regions. This informed the reconstruction of the prevailing evaluation models, leading to the introduction of the new “4E” theory. This innovative theory integrates the valid components of the pre-existing models but tailors them to the specific context of ethnic minority regions, thus offering a more precise reflection of the state of compulsory education in these areas.

4. **Adaptation and reconstruction of the performance evaluation model**

Our analysis shows that most existing classical theoretical models of educational input performance evaluation provide generalized evaluations that can be used as references for evaluating compulsory education input performance in ethnic areas in China. However, these models are inadequate in reflecting the peculiarities of compulsory education input performance evaluation in ethnic areas, in terms of implementation subjects, target concepts, and performance dimensions. Replicating these models without adapting and improving them will lead to poor application and evaluation results. Therefore, to enhance the scientificity and precision of the evaluation results, we propose to debug and reconstruct the existing evaluation model from three perspectives: (1) establishing the implementation subject, (2) reshaping the target concept, and (3) optimizing the performance dimensions, based on the geographical characteristics of China’s ethnic areas, the characteristics of compulsory education as a public good, and the results of China’s inspection on the basic balance of compulsory education and implementation opinions on high-quality and well-balanced compulsory education (Fig. 2).

The three-dimensional theoretical model comprises a ring, five longitudinal lines, and two latitudinal lines that represent the theoretical process of performance evaluation. The government plays a central and directing role in performance review, and is primarily responsible for its implementation. The two latitudinal lines represent the values of publicness and responsiveness, which collaborate throughout the performance evaluation process to ensure the effective provision of fundamental public education services

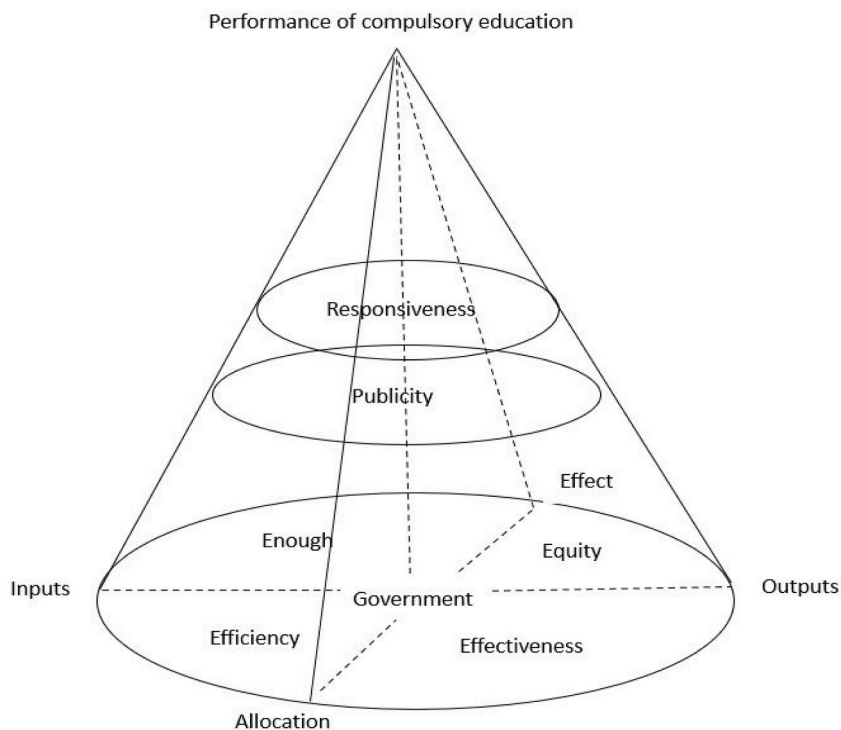


Fig. 2. Theoretical model for evaluating the performance of compulsory education inputs.

throughout China’s ethnic areas. The four longitudinal lines in the outer ring, inputs, allocation, outputs, and effect, reflect the core features of the entire performance evaluation, as well as guidelines and standards for constructing the evaluation index system. The bottom ring consists of four key plates that determine the goal and direction of performance evaluation: enough, equity, efficiency, and effectiveness.

This study adheres to the principle of combining universality and specificity, and the reconstructed evaluation theory model compensates for the deficiencies of the existing performance evaluation model, fully reflecting the characteristics of compulsory education in ethnic areas. The model integrates the organic unity of instrumental rationality and value rationality, ontology, and value theory. It emphasizes the inter-embedding and inter-construction of evaluation objectives and evaluation criteria, and highlights the attributes of public goods and the concept of public value. In conclusion, the reconstructed theoretical model of performance evaluation can more accurately reflect the characteristics of the evaluation object and evaluation content, and has high practical value. According to the comprehensive nature of performance evaluation, Pidd [43] has argued that categorization and comprehensive evaluations should be organically combined in the evaluation of public services. To achieve this, the dimensions and indicators of performance evaluation should be incorporated into the “4E” evaluation target section of the classification evaluation, and a scientific evaluation index system should be developed to comprehensively evaluate the performance [43]. Building on this framework and taking into account the practice of compulsory education inputs in China’s ethnic areas, this paper proposes that the goal of “enough” is primarily reflected in input, “equity” is primarily reflected in input and allocation, “efficiency” is primarily reflected in input, allocation, and output, and “effectiveness” is primarily reflected in effect. Table 1 illustrates the connection between specific evaluation index dimensions and evaluation objectives. By adopting this approach, the evaluation of compulsory education input performance in ethnic areas can be more comprehensive and accurate.

5. Explanation of the framework of compulsory education input performance evaluation model

5.1. Clarify the subject of implementation

The uniqueness of the evaluation subject in China’s ethnic regions are in several aspects, such as socio-cultural context, stress on equity, public value and responsiveness, and diverse educational goals. The socio-cultural settings of China’s ethnic areas differ from those of other regions. This implies that while the government serves as the principal assessor in both cases, different ethnic areas may have different standards, benchmarks, and weights assigned to different assessment characteristics. Evaluation models for ethnic areas place additional stress on equity because of the tendency of ethnic groups’ economic growth to lag behind and the notable differences in the development of compulsory education between urban and rural areas. In ethnic communities, evaluations must take into account justice, recompense for marginalized groups, publicness, and responsiveness in addition to efficiency and productivity. This expands the scope of the examination beyond the government to include specialists in ethnic education, local community leaders, and other stakeholders who are familiar with the unique characteristics of these areas. In addition to pursuing mainstream educational objectives, mandatory education in ethnic areas also seeks to protect and advance regional languages, customs, and cultures. Consequently, assessments concerning the conservation of cultural heritage may also be included in these evaluations, even if this may not be the main emphasis in non-ethnic communities.

The evaluation subject is the central factor in the performance evaluation process, and all other aspects of the performance evaluation system must be organized and linked through it. This study examines the input of compulsory education in China’s ethnic regions, with the government serving as the evaluation subject based on the preceding conceptual definition and features of compulsory education as a public good. Compulsory education plays a critical role in enhancing human resources and achieving economic and social development in China’s ethnic areas, as well as consolidating the sense of community for the Chinese nation. Therefore, the government must play a prominent role in its implementation and evaluation, as compulsory education is the last line of defense for livelihood projects in China’s ethnic areas.

This paper primarily focuses on the performance evaluation conducted by higher-level governments and relevant government officials on the implementation of compulsory education inputs by lower-level governments and officials. Evaluation subjects can be classified as internal or external. Internal subjects primarily refer to finance and fund-utilizing departments, while external subjects, such as legislative bodies and audit departments, have a supervisory function over the government’s duties and responsibilities and can effectively motivate and stimulate governments at all levels to perform their duties and responsibilities more effectively [3]. The evaluation object or target should be county-based, and the performance evaluation of compulsory education fund investments in ethnic areas should follow the principle of matching authority and financial power for the division of authority and responsibility. However, it should be noted that financial resources are the monetary manifestation of human and material resources, and when

Table 1
Corresponding table of evaluation index dimensions and evaluation objectives.

Items	Input	Allocation	Output	Effect
Enough	✓			
Equity	✓	✓		
Efficiency	✓	✓	✓	
Effectiveness				✓

Source: author’s contribution

educational funds enter the educational system, resource utilization efficiency is optimized through the rational allocation of human, material, and financial resources within the system [6]. As a result, this paper aims not only to evaluate the economic results of compulsory education investment from a financial standpoint but also to adhere to the multi-dimensional evaluation principle. The paper takes the input, process, output, and effect as a whole, according to the performance principle of government management, in order to complete the performance evaluation of compulsory education investment based on the mutual embedding and construction of evaluation objectives and index dimensions [44].

5.2. Remodeling the value concept

Value orientation refers to the set of value standards and conceptual choices that guide individuals in decision-making and behavioral activities. It serves as the ideological foundation for ensuring that the direction of performance evaluation stays on track and is also an important basis for determining whether performance objectives have been met. In the case of compulsory education, as one of the government's basic public services, it is essential for ethnic areas to ensure that the embodiment of public values is prioritized [45].

Publicness and responsiveness are the guiding value concepts in the performance evaluation of compulsory education input for China's ethnic minority areas, informing the construction of evaluation dimensions and objectives. This paper integrates these concepts through four objectives: enough, equity, efficiency, and effectiveness. Furthermore, the four dimensions of configuration, output, effect, and result all reflect these values of publicness and responsiveness. In this context, the evaluation dimensions and goals intrinsically resonate with the principles of publicness and responsiveness. This paper takes publicness and responsiveness as its value orientation when evaluating the performance of compulsory education inputs. Publicness refers to the fact that compulsory education is a pure public good that should first aim to meet the development requirements of compulsory education in ethnic areas to the greatest extent possible. It should also consider the relationship between goals and processes, results and effectiveness of results in compulsory education investment in ethnic areas. In other words, publicness should be reflected in the specific evaluation procedure of compulsory education input performance, which should involve both quantitative and qualitative evaluations, and should ensure that public value is reflected. In this study, "publicness" refers particularly to the uniform community ideals, cultural conservation, and fair representation that are often more prominent in ethnic areas because of their distinct socio-cultural makeup. In ethnic areas, publicness refers to more than only publicly financed and accessible education, even if compulsory education is a state-provided public benefit in both ethnic and non-ethnic segments. A key component of this is making sure that the many cultures, languages, and customs of the ethnic populations living in these areas are respected and included into education. While, curricula and instructional strategies may be more uniform in non-ethnic areas and do not have to take into account as many different cultural factors.

The academic perspective presented by Hanushek and Raymond [46] offers valuable insights and serves as a reference for the selection and construction of evaluation dimensions in this study. For example, the evaluation of efficiency should also focus on the evaluation of equity. Furthermore, the evaluation of educational outcome output and quality improvement should be prioritized alongside the evaluation of external benefits [46]. By emphasizing the publicness and responsiveness of compulsory education input performance evaluation, this paper provides a sound theoretical foundation for ensuring that the evaluation process remains aligned with public values and that the government can effectively carry out its tasks and responsibilities in ethnic areas.

The second is responsiveness. Responsiveness in ethnic areas is defined as the system's capacity to adjust and meet the specific requirements and goals of the ethnic groups. Since those various areas have developed differently when it comes to obligatory schooling, this is quite important. From conventional curriculum to localized demands, responsiveness bridges the gap and guarantees that education stays relevant and helpful for the communities. The supply and demand relationship helps determine whether the government has met the needs of people in terms of investing in compulsory education in ethnic areas and allocating educational resources for school-age students. While compulsory education in China's ethnic communities has achieved county-level balance and the right to education is guaranteed, there is still a gap in achieving well-balanced development throughout the country. The infrastructure remains weak, and there is a demand for high-quality education. Therefore, it is important to understand and respond to society's expectations and needs when investing in compulsory education. This is where the concept of responsiveness comes in. It can help identify flaws in policy implementation and resolve them promptly by collecting citizens' preferences through the political process.

5.3. Optimization of evaluation objectives

Clarifying performance evaluation objectives is the logical starting point for developing a performance system for compulsory education inputs in ethnic areas of China. It is also the foundation and prerequisite for maximizing the motivating and restraining impacts of performance evaluation. Governments at all levels are the main subjects of investment and management organization from the standpoint of the process of compulsory education investment in ethnic areas. The "4E" principle of new public management provides methodological guidelines for evaluation practice [31]. Among these guidelines, economy, efficiency, and equity are gradually becoming the primary criteria for compulsory education input performance evaluation in China [15]. The evaluation procedure not only monitors the process of government education investment but also offers evaluation results to the government to optimize education investment. However, it is essential to clarify the connotation of performance evaluation of educational investment in different areas, periods, and levels, as well as the aims of performance review. Evaluation objectives must be established scientifically and objectively based on the features of the evaluation objects to have reference value.

Compulsory education in China's ethnic regions continues to face profound challenges in the post-poverty era. These include

inadequate and insufficient investment in compulsory education, a large disparity in compulsory education investment between regions and urban and rural areas, low quality and balance of basic public education services, and an unreasonable structure, direction, and proportion of compulsory education resource investment, low operational efficiency, and serious resource waste [13]. In response to these unresolved issues, this paper aims to develop a new “4E” standard consisting of enough, efficiency, effectiveness, and equity as the evaluation objectives for compulsory education input performance in China’s ethnic regions [31]. The evaluation index system was constructed concurrently based on the “4E” categorization evaluation objectives to completely analyze the performance of compulsory education inputs in ethnic areas.

5.4. Perfecting the evaluation dimension

To ensure the feasibility of the evaluation, this paper considers the unique geographic characteristics of ethnic regions in China and the fact that compulsory education is a pure public good. Based on this, the paper asserts that governments at all levels, especially county-level governments, should continue to be the primary source of compulsory education investment in ethnic regions. The study mainly assesses the performance of investment obligations, operation, and administration of compulsory education at all levels of government, with a special emphasis on county-level governments, using the previously created theoretical model of performance assessment. When assessing the input performance of compulsory education, this model considers the two value orientations of assessment as well as the geographical reality of “ethnic areas” and the “input-allocation-output-effect” process. The goal of this model’s construction is to provide a thorough and practical method for assessing the effectiveness of investments made in compulsory education in ethnic communities. The model’s sensitivity to the distinct conditions and features of these places is ensured by the incorporation of the “input-allocation-output-effect” process and the geographical reality of ethnic areas. Furthermore, the model offers a clear framework for assessing the efficacy of government practices and policies linked to compulsory education in ethnic communities by concentrating on the performance of government investment obligations, operation, and administration.

The evaluation system begins with inputs, which refer to all financial inputs from governments at all levels to ethnic areas in accordance with the compulsory education strategy layout. Compulsory education development is a complex system. Although financial input is the premise and foundation of compulsory education development, the role must be played through the optimization and allocation of human, material, and other resource elements. These elements ultimately translate into compulsory education input performance and promote high-quality and well-balanced development of compulsory education in ethnic areas in China. Following this evaluation logic, this paper considers input, allocation, output, and effect as the fundamental components of compulsory education input performance evaluation in ethnic areas of China [47]. Based on these basic dimensions of evaluation, a complete multi-dimensional index system is designed using a hierarchical approach based on the actual development of compulsory education in ethnic areas, fully reflecting the characteristics of ethnic areas. The system can simultaneously meet the performance evaluation standards of higher-level governments for local governments and of local governments for schools.

6. Analysis of the advantages of compulsory education input performance evaluation model in ethnic areas of China.

5.5. Manifesting the “tool-value” dual attribute

Existing literature and evaluation practice tend to overemphasize instrumental rationality, which uses economic reasoning to evaluate input performance through panel data, and commit the operational error of “instrumental” unipolarity [48]. However, this paper argues that the performance evaluation of investments in compulsory education in minority areas closely mirrors the government’s evaluation of compulsory education development and management. Because it is a state action, it must represent the fiscal politics concept of public value. In addition to the instrumental evaluation of investments in compulsory education in minority areas, the “justice” index of input distribution must be considered.

In other words, when evaluating the performance of compulsory education in ethnic areas, it is essential to focus not only on high efficiency and high output, but also on whether the evaluation has reflected the process of equity and compensation for vulnerable groups, as well as whether it has achieved publicness and responsiveness. This is especially important given that the economic growth of ethnic communities is relatively lagging, and the disparity in compulsory education development across regions and urban and rural areas is considerable. Therefore, the performance evaluation model of compulsory education input established in this research takes into account both instrumental and value rationality, including the aforementioned criteria, to ensure the operability and equity of the evaluation in light of the geographical specificity of ethnic regions in China and the attributes of compulsory education as a pure public good.

5.6. Realization of integration between internal and external performance evaluation

The performance of compulsory education investment has two essential characteristics: first, it improves the internal efficiency of education by enhancing teaching instruments and equipment, teacher qualification, and reducing dropout rates. Second, it enhances the external benefits of education through the transmission mechanism of compulsory education investment, where investment in compulsory education improves internal efficiency, which in turn enhances the quality of training students, resulting in human capital accumulation that promotes local economic and social development [6]. The current theoretical models and evaluation methods mainly focus on the latter, examining how compulsory education investment can increase human capital accumulation and promote macroeconomic growth (primarily GDP) [11]. However, this approach tends to prioritize “quantitative inspection” over “qualitative inspection.”

To address this limitation, the performance evaluation model of compulsory education input in ethnic areas examined in this paper considers both levels of performance. This includes analyzing the effectiveness of compulsory education investment in promoting economic growth and examining the sufficiency, efficiency, and equity of compulsory education input in improving the quality and level of compulsory education itself. By using the logical mechanism of the performance of compulsory education investment, we systematically and exhaustively assess the two-level connotations of internal performance and external advantages of investment in compulsory education in China's ethnic areas.

5.7. A panoramic view of the overall process of performance evaluation

Existing evaluation models for compulsory education input performance lack systematicity and comprehensiveness. Some scholars evaluate specific aspects such as enough, equity, efficiency, and effectiveness using certain theoretical models and methods but without a detailed evaluation index system. As a result, their evaluations lack scientific rigor, systemic coherence, and holistic completeness, and provide weak practical guidance. Other scholars establish a detailed index system and conduct a comprehensive evaluation, but only present a single numerical result without integrating the evaluation dimensions and indicators with enough, equity, efficiency, and effectiveness, leading to insufficient practical guidance. To address these shortcomings, the current theoretical model combines classification-specific evaluation and overall comprehensive evaluation. Specifically, after evaluating the enough, efficiency, equity, and effectiveness of compulsory education inputs in ethnic areas, the model conducts an overall evaluation using a comprehensive index system based on the evaluation dimensions. This approach not only presents a detailed performance level but also analyzes the causes of performance deviations and identifies corrective measures.

6. Conclusion

This study comprehensively considers two characteristics of ethnic areas and compulsory education and develops a performance evaluation model that is suitable for evaluating the investment in compulsory education in Chinese ethnic areas. The research took insights from previous performance assessment models and used them to construct this model. With regard to assessment ideas, aims, dimensions, subjects, and objects, the theoretical model is a three-dimensional mesh model. The model's main features are explained in the sections that follow.

First, the assessment goals have been updated to more appropriately represent the current situation of compulsory education inputs in ethnic communities. This revision is based on the "4E" evaluation objectives. The word "economic" is substituted with "enough" in the goals.

Second, the research examines the multifaceted link between schooling inputs and results. Accordingly, the assessment method considers input, allocation, output, and effect in order to provide a thorough picture of the input performance of compulsory education as it is now.

Finally, the model's evaluation notion integrates both technical and value reason. The theoretical model of performance assessment is guaranteed to be scientific and impartial by this method, which also takes into account public value traits like accessibility and public goods supply satisfaction.

The performance assessment methodology for mandatory education inputs in China's ethnic regions has been modified and adjusted to properly account for the features of these locations as well as the growth stage of compulsory education. Establishing a strong basis for performing the performance assessment of obligatory education inputs in ethnic regions in a scientific manner, it offers methodological direction for adjusting the logical framework of the evaluation system to the particular index system. This, in turn, promotes the progress of compulsory education in ethnic areas in China from basic balance to the goal of high-quality and well-balanced education.

The methodology also aids in the ongoing optimization of the scope and outcomes of compulsory education inputs in ethnic communities and enhances internal management effectiveness in the inputs process. This creates a strong basis for assessing the effectiveness of compulsory education in ethnic regions scientifically, strengthening internal management performance, and continually improving the outputs of these inputs. Ultimately, this promotes the progression of compulsory education in ethnic areas in China from basic balance to the goal of high-quality and well-balanced education.

This study has several limitations. First, the generalizability of the findings may be limited to places characterized by distinct socio-cultural dynamics due to its specific focus on ethnic minority areas in China. Second, while the "4E" theory and other frameworks were approached from a comparative perspective, a more extensive examination of other notions has the potential to provide more profound understandings. Third, although our methodology is based on a thorough examination of the existing research and theoretical adaptation, we acknowledge the constraint of lacking substantial empirical validation in the study. Fourth, this study is based on inductive and deductive approach. So, we could not add primary data to validate the proposed model. Future studies should be based on the primary data collected from the relevant stakeholders to get key insights. Fifth, the dynamic nature of the educational environment necessitates a potential adjustment in the model's applicability over time. Finally, unintended biases, whether they arise from the interpretation of data or the selection of participants, have the potential to impact the results of the research.

Future research should include the exploration of compulsory education performance models in various nations that have ethnic minority backgrounds. A proposal is put out to conduct longitudinal research spanning several years in order to monitor and analyze the evolving characteristics of schooling in ethnic regions. Enhancing cultural immersion may contribute to the refinement of the model in order to better accommodate distinct ethnic variations. In light of the expeditious technical advancements in the field of education, it is essential to thoroughly analyze the ramifications of these developments in ethnically diverse locations. Finally, the

ongoing input from stakeholders in the field of ethnic education will guarantee the continual development and significance of the model.

Data availability statement

Data will be made available on request.

CRedit authorship contribution statement

Bo Yang: Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Yi Tan:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation. **Md Nazirul Islam Sarker:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis. **Wenjing Deng:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation. **Junhui Yuan:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis. **R.B. Radin Firdaus:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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