

Strategies, methods and policy support to improve students' academic achievement and career development across academic periods

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Abstract: This study explores the strategies, methods and impacts of personalized education implemented at different school stages (from kindergarten to high school). Aiming to solve the problem that the traditional education model ignores individual differences among students and based on empirical analysis, this study explores the effect of personalized education on students' academic achievement, career planning and personal development through cross-stage long-term tracking methods. Using cross-stage long-term tracking methods and experimental grouping of the entire K12 school, combined with artificial intelligence and big data tools, quantitative and qualitative data are analyzed to develop new assessment tools and scales. Data analysis will cover descriptive statistics, multivariate analysis, content analysis, and case studies to evaluate the impact of personalized education on students and test multiple hypotheses. The study also highlights the importance of ethical standards to ensure informed consent and privacy protection of participants.

Key words: personalized education; cross-study tracking; educational theory; educational data analysis

1 Introduction

In today's era of globalization and knowledge-based economy, education has attracted much attention. However, the existing education model often ignores the individual differences of students, affecting their learning and future. Personalized education emphasizes teaching students in accordance with their aptitude and is considered to be the key to improving the quality of education [1][2]. However, there are still challenges in implementing personalized education, which requires improvements in education systems, resource allocation, and teacher training and evaluation systems. Some studies have shown that personalized education has a positive impact on students' long-term development, but there is still a lack of research on cross-school years and long-term observation. Therefore, this study aims to explore the effectiveness and impact of personalized education from kindergarten to high school to support students' academic, career planning and personal development. The study predicts that personalized education will improve academic achievement, promote career planning and personal growth, provide guidance for school administrators, policymakers and parents, while narrowing the gap in educational opportunities and improving educational equity. This study is of great significance for understanding educational implementation effects, filling research gaps, and guiding future educational policy and practice.

2 Theoretical basis

In terms of educational psychology theory, based on Piaget's cognitive development theory and Bruner's teaching

theory, this study focuses on students' cognitive abilities and learning styles at different stages of education. Vygotsky's zone of proximal development theory emphasizes a focus on the gap between students' current abilities and potential, and Kolber's learning style theory highlights the importance of personalized education in adapting to students' unique learning styles.

In terms of career development theory, this study uses Super's career development theory and Holland's career interest theory to conduct an in-depth study of students' career interest development and career planning to provide theoretical support for personalized education [3].

In terms of social-emotional learning theory, drawing on Goleman's emotional intelligence theory, this study emphasizes the key role of emotional intelligence in learning, decision-making, and social interaction, supports the cultivation of emotional intelligence in personalized education, and promotes students' all-round development.

In terms of educational equity theory, using Kuhn's just-world theory as a framework, this study explores ways to solve the problem of inequality in education, emphasizing the need to provide equal educational opportunities for all students, and providing theoretical support for the educational equity of personalized education.

In terms of self-determination theory and constructivism learning theory, based on Deci and Ryan's self-determination theory and Vygotsky's sociocultural theory, this study emphasizes the importance of autonomy, social interaction and cultural background in the learning process, and proposes that personalized education should promote students' self-regulated learning abilities and provide a supportive sociocultural environment.

3 Research innovations

This study innovatively proposes an educational intervention model that not only focuses on academic performance, but also comprehensively covers multiple dimensions such as cognitive development, social emotions, interests and specialties, study habits, and personality characteristics. This comprehensive perspective helps to more comprehensively understand the effects of personalized education at different school stages (kindergarten to high school) and its impact on students' overall development [4][5]. The research emphasizes the key role of teachers in personalized education and explores ways to adjust teaching strategies to meet students' individual needs. It also emphasizes the importance of home-school cooperation and parent-child communication in supporting students' individualized growth, as well as the relationship between family and school and synergistic effects of educational strategies. The impact of personalized education on students' long-term development is explored, and ways to improve equity in educational opportunities through strategies are analyzed. The study will also evaluate the effectiveness and challenges of long-term follow-up study designs to reveal the lasting effects of personalized education.

This study innovatively adopts a cross-stage long-term tracking method, integrating different educational stages into the same research framework, and conducting a 5-year follow-up investigation. This helps capture the long-term effects of educational interventions and assess how these interventions have sustained impacts at different school stages. This study uses the entire K12 school as the experimental group instead of a single grade or class to better study the impact of the overall school culture on the effectiveness of educational intervention, avoiding sample contamination under the same school, and more comprehensively evaluating the impact of changes in the school environment on the role of student behavior and learning outcomes. The research actively integrates artificial intelligence and big data analysis tools to achieve accurate identification and response to students' individual needs, improves the accuracy of educational intervention, and provide strong support for the design and implementation of customized learning paths. Using a multi-source data fusion analysis method, we combine quantitative data (such as test scores, questionnaire results) with qualitative data (such as teacher observations, student interviews), and adopt a mixed methods research strategy to provide

a more comprehensive and in-depth research perspective, which will help to more accurately assess and understand the multifaceted impacts of personalized education. Finally, the research developed and validated new assessment tools and scales, covering multiple areas such as psychological adaptability, academic achievement, social skills, innovative thinking, and career development, providing a more comprehensive assessment framework.

4 Analysis and discussion of prospective research

4.1 Comprehensive data analysis framework

This study used a multi-level data analysis method to comprehensively evaluate the impact of personalized education strategies on students' long-term development. The data analysis plan is divided into two parts: quantitative data analysis and qualitative data analysis. In addition, to ensure the reliability and validity of the study, all data collection and analysis processes followed strict ethical standards, and data quality was ensured through appropriate data cleaning and preprocessing methods.

4.2 Quantitative data analysis

Descriptive statistical analysis: Use descriptive statistics to summarize the main characteristics of a data set, such as mean, standard deviation, frequency, and percentage.

Before and after comparison analysis: Use paired samples t test to compare the differences before and after the experiment.

Variance analysis: it was used to compare academic performance and questionnaire results before and after the experiment.

Multivariate analysis: Multiple regression analysis is used to examine the relationship between different variables to evaluate the impact of personalized education on academic achievement.

Effect size calculation: Calculate effect size indicators such as Cohen's d to evaluate the actual impact of the intervention.

4.3 Qualitative data analysis

Content analysis: Content analysis of interview transcripts and qualitative feedback was conducted to extract main themes and opinions. In addition, a cross-group subject comparison analysis was conducted to explore differences between the control and experimental groups.

Case study method: In-depth analysis of a specific student or teacher's experience to fully understand the specific impact of personalized education.

4.4 Data processing and evaluation standards

To ensure the accuracy and reliability of data analysis, the following measures will be implemented:

Quality control: Clean and preprocess data to ensure the integrity and accuracy of the data set.

Reliability and validity: Enhance the reliability and credibility of the research through cross-validation and multi-method investigation.

4.5 Theoretical analysis of expected results and research hypotheses

Compared with the control group, the experimental group will have significant improvements in mental health, academic achievement and career development. Among them, Group D is expected to have the most significant improvement effect because the intervention measures are the most comprehensive. Therefore, the proposed research hypotheses are as follows:

Hypothesis 1 Improvement of comprehensive capabilities

The intervention will significantly improve the comprehensive abilities of students in the experimental group in terms

of subject ability, social skills, cognitive development and career planning, with significant differences compared with the control group.

Hypothesis 1.1 The effect of family participation

The experimental group that includes parent participation (Group B, C, and D) will be more able to improve students' general skills than Group A that only has student intervention.

Hypothesis 1.2 The impact of teacher participation

The intervention groups (Group C and D) that include teachers will achieve more significant improvements in students' social skills and cognitive development, highlighting the importance of teachers' role.

Hypothesis 1.3 Long-term effects of environmental changes

Group D, which conducts a comprehensive intervention in the campus environment, will show more lasting and extensive positive effects in long-term follow-up evaluations.

Hypothesis 2 Differences in intervention effects and schooling stages

The intervention effects will be significantly different at different school stages, reflecting the impact of developmental stages on intervention acceptance and effectiveness.

Hypothesis 3 Long-term effects of the intervention

The effects of the intervention were not only visible immediately after the intervention ended, but still significant in long-term follow-up evaluations.

These hypotheses will be statistically tested using the data collected to determine whether the effects of the intervention are statistically significant.

5 Ethical considerations

All participants (including students, parents, and teachers) were required to provide informed consent, ensuring participant data privacy and anonymity. Meanwhile, we should assess the possible risks of intervention and develop countermeasures in advance.

6 Conclusion

This study examines the strategies, methods and impact of personalized education as it is implemented at different grade levels. Through empirical analysis, it examines the impact of personalized education on students' academic performance, career planning and personal development. Based on comprehensive data analyses and ethical standards, this study aims to fill research gaps and provide guidance for future educational policy and practice.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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