

The Impact of the Double Reduction Policy on the Educational Anxiety of Parents Under Big Data

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ABSTRACT

In the context of the “double reduction” policy, using big data to carry out precision teaching is an effective way to improve the quality of teaching in schools and reduce the burden on teachers and students and increase efficiency. The formal implementation of the “double reduction” policy has not only reduced students’ academic burden, but also increased students’ spare time. However, according to relevant data, the current level of anxiety among parents about their children’s education is still high, and different parents have different levels of education anxiety. In order to study the impact of the “double reduction” policy on the educational anxiety of parents of primary and secondary school students in the context of big data, this article puts forward some suggestions related to eliminating the educational anxiety of primary school parents based on the existing problems and their causes, so as to create a good educational atmosphere.

KEYWORDS

Double Reduction Policy, Educational Anxiety, Primary and Secondary School Students

In recent years, many primary and secondary schools have paid more and more attention to the design and evaluation of students’ homework, in order to reduce students’ learning burden and improve learning efficiency (Arokiasamy et al., 2024). However, through classroom observation, it can be found that the current homework is biased toward universality and the evaluation method is relatively simple, which cannot fundamentally cultivate students’ problem-solving abilities and ultimately only increases the burden on teachers and students (Liu, 2023). The scale of China’s quality education market from 2016 to 2023 is shown in the figure below (Casado et al., 2022).

In July 2021, relevant education departments in China introduced the Double Reduction Policy, with the core concept of reducing burden and increasing efficiency (Alotaibi & Alharbi, 2022). Therefore, in this context, schools must adjust their ineffective homework implementation strategies so that they can truly serve teachers’ teaching and students’ learning.

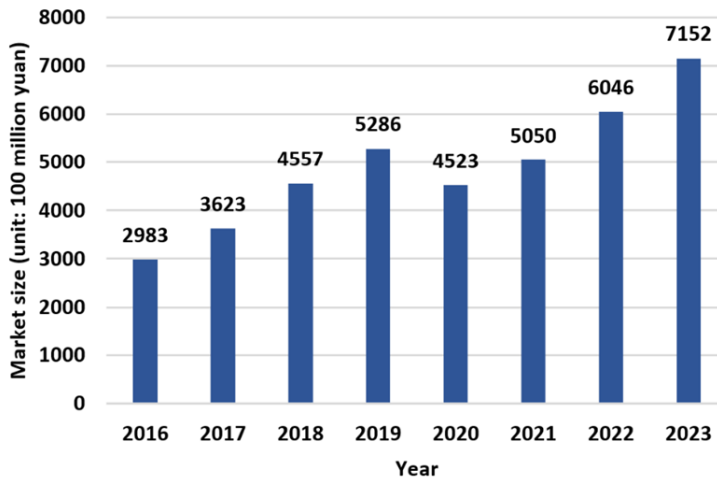
Traditional assignments often use a “universal” copy-and-paste method, resulting in duplication, redundancy, and confusion in students’ work machines (Xue & Li, 2023). In the context of double reduction and in the wave of “Internet +,” teachers must make full use of “big data” to design research

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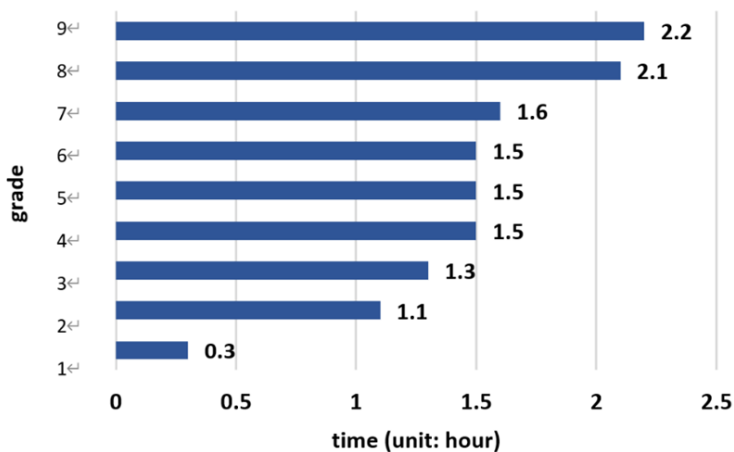
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Figure 1. China's Quality Education Market Size From 2016 to 2023



and development assignments to make assignments more targeted and efficient for students (Xue & Li, 2023). In the context of double reduction, work must not only control quantity and reduce burdens, but also innovate and improve efficiency (Aulawi, 2021). In the spring semester of 2021 before the double reduction work was fully implemented, the average time it took students to complete written homework after class (Xue & Li, 2023). This is obviously different from the burden reduction goals of not assigning homework for the first and second grade students in primary school, the average completion time of written homework for grades three to six of primary school not exceeding 60 minutes, and the average time for completing written homework of junior high school not exceeding 90 minutes (Zhou, 2023). The details are as shown in the figure below (Zhou, 2023).

Figure 2. The Average Time it Takes for Primary and Secondary School Students to Complete Homework After Class in the First Half of the 2021 Semester



LITERATURE REVIEW

The Concept of Double Reduction Policy

In July 2021, the government issued the “Opinions on Further Reducing the Work Burden and Extracurricular Study Burden of Students in Compulsory Education” (hereinafter referred to as the Double Reduction Policy), which has been implemented and has gradually begun to bear fruit (Wang et al., 2023).

Since 2021, the Double Reduction Policy has received a lot of attention as a hot item. It is a correction to the chaos and involution of traditional education (Lu et al., 2023). The Double Reduction Policy mainly includes the following aspects: First, double reduction refers to reducing the burden on primary and secondary school students in terms of homework time. Second, it is necessary to strengthen the management of school after-school services, improve school teaching quality and expand access to educational resources (Xiang et al., 2023). Third, it reduces students’ participation in shadow education. Fourth, it improves the supporting measures of the Double Reduction Policy to ensure the quality of school teaching, achieve home-school cooperation, and establish a correct outlook on education (Gupta & Aluvalu, 2021).

In the Double Reduction Policy, double reduction mainly refers to the need to reduce the burden of homework and off-campus training, which is called double reduction (Liu et al., 2023). In this study, double reduction is used as the independent variable, and the independent variable is divided into two dimensions: reducing homework burden and reducing off-campus training to explore the impact on parents’ educational anxiety of primary and secondary school students. The proportion of students receiving off-campus training in each province in 2018 before the double reduction policy is shown in the figure below (Xue et al., 2022).

Parent Education Anxiety Concept

Some foreign scholars have suggested that parents who are at social risk are out of control because they are afraid that educational inequality will result in their students being unable to win in educational competition, which will lead to lower social status and make them feel anxious (Li et al., 2023). The specific manifestation is that when parents invest time and energy in students, but do not get the expected results, parents will have educational anxiety (Naz, 2021). Foreign scholar Spielber defines educational anxiety as a kind of state anxiety (Yadav & Sagar, 2023). Wang Hongcai was the first

Figure 3. Proportion of Students with Heavy Academic Burden in Some Provinces in 2018

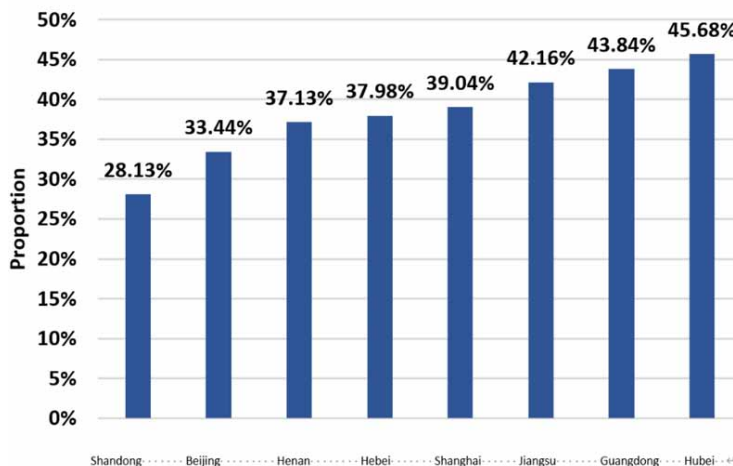
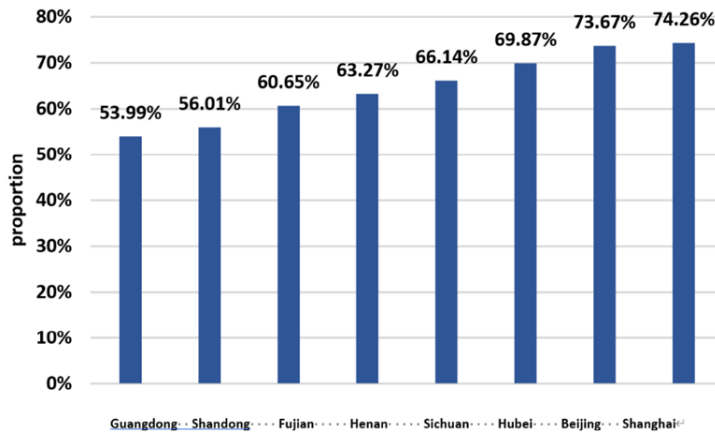


Figure 4. Proportion of Students Receiving Off-Campus Training in Each Province in 2018



person in China to propose the concept of parental educational anxiety(Wang, 2023). He defined parental educational anxiety as: excessive emotional anxiety caused by people's excessive anxiety about students' educational results, fearing that they would not be able to study well or find a good job (Shaw, 2023). To sum up, parents' educational anxiety refers to the educational anxiety caused by parents' teaching process of their children and the anxiety caused by parents' dissatisfaction with the educational results (Wen et al., 2023). In the vast literature, there are many meaningful studies on parents' educational anxiety. Countless scholars have participated in related topics and deeply explored the causes, current situation, and status of educational anxiety from different perspectives, dimensions, and theories (Alam & Mohanty, 2023). There are also fruitful results regarding the dimensions of parents' anxiety, such as parents' anxiety about students' love outlook, health anxiety, peer group anxiety, future development anxiety, learning attitude anxiety, etc. (Horton, 2023).

The Application of Big Data

The application of big data in the double reduction policy and the educational anxiety of parents of primary and secondary school students is mainly based on the homework improvement path of big data: in the context of emphasizing the double reduction, the implementation method of the operation can be reconsidered. Based on the above analysis, we can develop a new method based on big data from three main aspects: operation design, operation deployment, and operation evaluation (Li & Wei, 2023). Briefly, it starts with designing diagnostic tasks in a learning context, taking into account group differences, assigning classification tasks, and then providing assessment and feedback on the tasks in various forms.

- (1) Practical operation design plan: Diagnose the starting point of learning and training based on the accuracy of data aggregation. The starting point for assignments is an accurate understanding of the student's curriculum. In all teaching, teachers must first apply information technology education, integrate teaching interactive feedback, class observation and discussion, etc., collect data related to students' academic performance in real time, and analyze and judge the learning atmosphere. Design solutions can effectively correct erroneous tasks (Huang et al., 2023).
- (2) Tasks: Classify and solve common and partial problems. Of all the queries that students encounter when answering questions, some are general, and some are individual (Ye et al., 2023).
- (3) Performance evaluation: Carry out performance evaluation based on the demand scale. The effectiveness of actions can be effectively and easily assessed by evaluating the effectiveness of

the process and conducting periodic quantitative analyses. The description of this whole process is mainly carried out through the “Student Correction Evaluation Form” (such as Table 1) and the “Teacher Guidance Evaluation Form” (such as Table 2). In the error correction scoring system, students will evaluate the effectiveness of their own correction plans and the teacher’s guidance plan from multiple aspects; in the guidance evaluation form, teachers mainly comment on the students’ attitude and effectiveness in correcting mistakes, as well as the students’ enthusiasm and enthusiasm for correcting mistakes (Zhang, 2023).

Regular quantitative assessment mainly uses the method of regular situational test learning over a period of time, mainly referring to students’ answers. Specific cycles can be divided by training units or chapters, or by number of weeks. Of course, the test results can only be used as a reference to evaluate the effectiveness of the next phase of bidirectional user work solutions and learning practices (Kobakhidze & Hui, 2023).

RESEARCH METHODS

Data Collection Methods

The first method is qualitative interviews: to assess the understanding of parents of primary school students on the Double Reduction Policy.

The second method is questionnaire survey: based on the dimensional structure compiled from qualitative interviews. The “Educational Anxiety Scale of Parents of Primary School Students After the Double Reduction Policy” was compiled (Toseeb & Asbury, 2023). Development of the predictive questionnaire is underway; preliminary questionnaires are distributed, projects are analyzed, study factors are analyzed, and a formal second questionnaire is being developed (Toseeb & Asbury, 2023). The collected questionnaires were analyzed in relation to items and analyzed for reliability and validity.

The third method is to study the current situation of parents’ educational anxiety in primary and secondary schools after the Double Reduction Policy: using the completed Double Reduction Policy (Jian & Tengyao, 2023). It also analyzes the differences in demographic variables between primary school parents’ educational anxiety after the double reduction policy and explores the relationship between primary school students’ parental educational stressors and psychological resilience and parental education anxiety after the double reduction policy (Chu et al., 2023).

Relevant Information of Multiple Regression Models

Multiple regression model is a statistical analysis method used to study the relationship between a dependent variable and two or more independent variables. Multiple regression allows for modeling complex nonlinear and interactive relationships, improving a deeper understanding of phenomena. Multiple regression models can study the independent effects of variables of interest by controlling for the influence of other variables, reducing confounding factors. In research and practice, multiple regression models are a powerful tool widely used in various disciplinary fields, providing researchers with in-depth insights and data-driven decision support.

Multiple regression models can be used to predict the numerical values of the dependent variable and explain the impact of the independent variable on the dependent variable. This is crucial for understanding and predicting complex relationships. In causal relationship research, multiple regression can be used to control the influence of other variables and better study the causal relationship between independent and dependent variables. In the variable screening process, multiple regression allows researchers to introduce or exclude independent variables in the model, in order to conduct variable screening and find the independent variable that has the most significant impact on the dependent variable. Multiple regression can also be used to control for other factors that may interfere with the results and improve the internal validity of the study.

Table 1. Student Error Correction Evaluation Form

| | | | | |
|-----------------|----------------------------------|--|--|---------|
| | | Class: | | Name: |
| | | | | |
| Date: | | Subject: | | points: |
| Student reviews | Student error correction methods | Does it really solve the problem? | | |
| | | Does it help master core knowledge? | | |
| | | Whether to improve thinking ability | | |
| | | Whether to broaden the way of thinking | | |
| | | Is the burden reduced? | | |
| | Teacher Mentoring Program | Whether it is based on cognitive basis | | |
| | | Is it based on thinking ability? | | |
| | | Does it solve practical problems? | | |
| | | Whether the transfer of knowledge and abilities has been completed | | |
| | | Whether it feels comfortable and appropriate | | |

Table 2. Teacher Coaching Evaluation Form

| | | | | |
|-----------------|-------------------------------|--|--|---------|
| | | Class: | | Name: |
| | | | | |
| Date: | | Subject: | | points: |
| Student reviews | Correction of wrong questions | Do you have core knowledge? | | |
| | | Does it improve thinking clarity? | | |
| | | Whether it improves thinking ability | | |
| | | Is it possible to draw inferences from one instance? | | |
| | Classroom performance | Is your attention more focused? | | |
| | | Has engagement increased? | | |
| | | Has your interest in learning improved? | | |
| | | Whether the expected goal is achieved | | |

The multiple regression model is based on the following assumptions: there is a linear relationship between the independent variable and the dependent variable; The residual term (error term ε) follows a normal distribution of independent identically distributed (IID); There is no multicollinearity between independent variables. The basic form of a multiple regression model can be expressed as Equation 1:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon \quad (1)$$

Among them: Y is the dependent variable, which can be a certain dimension of parental academic anxiety or parent-child interaction anxiety; X_1, X_2, \dots, X_n is an independent variable, which may

include two factors: reducing homework burden and reducing extracurricular training; β_0 is the intercept, representing the baseline level of the dependent variable when all independent variables are zero; $\beta_1, \beta_2, \dots, \beta_n$ is the regression coefficient, indicating the degree of influence of the independent variable on the dependent variable. A positive value represents a positive correlation, a negative value represents a negative correlation, and the magnitude of the numerical value represents the relative strength of the influence; ε is the error term, representing the parts that the model cannot explain. In research, researchers need to explain the symbols and sizes of regression coefficients, evaluate the degree of fit of the model, and conduct statistical tests to verify the significance and reliability of the model. Stepwise regression, residual analysis, and other related statistical methods can be used to validate the model.

The Relationship Between Double Reduction and Parents' Anxiety in the Context of Big Data

- (1) Reduce the relationship between homework burden and parent anxiety (Wu & Zhang, 2023). In order to explore the relationship between the Double Reduction Policy and parents' educational anxiety, analyze the impact of reducing homework burden on parents' educational anxiety in the double reduction policy, and establish a multiple regression model of reducing homework burden on parents' educational anxiety, as shown in Equation 2.

$$EduAn = \alpha_0 + \alpha_1 HWork + \sum \alpha_i Ctrl_i + \varepsilon_i \quad (2)$$

In the above formula, the dependent variable is the degree of educational anxiety of parents of primary and secondary school students, represented by *EduAn*, and is measured by principal component analysis. The independent variable is one of the dimensions of the double reduction policy, the degree of homework burden reduction, *HWork* pointed out that we can get it by adding up the time spent doing after-school homework on weekdays and doing after-school homework on weekends in the questionnaire. *Ctrl_i* indicates control variables, namely parents' willingness for students to participate in cram schools, student performance, parents' expectations for children's performance, parents' education level, parents' occupation, educational equity and other variables. α_0 , α_1 and α_i is the estimated coefficient; ε_i is the random disturbance term.

- (2) Reduce the relationship between extracurricular training and parent anxiety. In the relationship between the double reduction policy and parents' educational anxiety, in addition to the impact of reducing homework burden on parents' educational anxiety, there is also the impact of reducing extracurricular training on parents' educational anxiety. To determine the impact of educational anxiety, a multiple regression model to reduce the impact of extracurricular training on parents' educational anxiety is established, as shown in Equation 3.

$$EduAn = \delta_0 + \delta_1 ExTu + \sum \delta_i Ctrl_i + \varepsilon_i \quad (3)$$

In the above formula, the dependent variable is the degree of educational anxiety of parents of primary and secondary school students, represented by *EduAn*, which is measured by principal component analysis. The independent variable is the degree of reduction of extracurricular burdens, one of the dimensions of the double reduction policy, represented by *EduAn*, and the questionnaire measured by the reduction in the number of extracurricular training courses that middle school students participate in. *Ctrl_i* represents control variables, namely parents' willingness for students to participate in cram schools, student performance, parents' expectations for students' performance,

parents' education level, parents' occupation, educational equity and other variables. δ_0 , δ_1 and δ_i is the estimated coefficient, ε_i is the random disturbance term.

How the Two Affect Each Other

(1) In terms of academic performance: The first is the impact of reducing homework burden on parent-child interaction anxiety. In order to analyze the impact of reducing homework burden on various dimensions of parents' educational anxiety in the Double Reduction Policy, first, in order to analyze the impact of reducing homework burden on parents' anxiety dimensions of academic performance, we established the multiple regression model of reducing homework burden on parents' academic performance anxiety dimensions is shown in Equation 4.

$$SduAn = \beta_0 + \beta_1 HWork + \sum \beta_i Ctrl_i + \varepsilon_i \quad (4)$$

In the above formula, the dependent variable is the degree of parents' anxiety about students' academic performance, which is represented by *SduAn* and is calculated using principal component analysis. The independent variable is one of the dimensions of the Double Reduction Policy. The degree of homework burden reduction, represented by *HWork*, which is obtained by adding the reduced time for doing after-school homework on weekdays and weekend homework in the questionnaire. *Ctrl_i* represents control variables, namely parents' willingness for students to participate in cram schools, student performance, parents' expectations for students' performance, parents' education level, parents' occupation, educational equity and other variables. β_0 , β_1 and β_i is the estimated coefficient; ε_i is the random disturbance term.

The second is to reduce the impact of extracurricular training on academic performance anxiety. In order to analyze the impact of reducing extracurricular training on parents' academic performance anxiety dimensions, a multiple regression model of reducing extracurricular training on parents' academic performance anxiety dimensions is established, as shown in Equation 5.

$$StuAn = \mu_0 + \mu_1 ExTu + \sum \mu_i Ctrl_i + \varepsilon_i \quad (5)$$

In the above formula, the dependent variable is the degree of parents' anxiety about students' academic performance, which is represented by *StuAn* and is measured by principal component analysis. The independent variable is the degree to which extracurricular burdens are reduced, one of the dimensions of the Double Reduction Policy. It is represented by *ExTu* and is measured by the number of extracurricular training courses that students in the questionnaire have participated in. *Ctrl_i* represents control variables, that is, parents' willingness for students to participate in cram schools, student performance, parents' expectations for students' performance, parents' education level, parents' occupation, educational equity and other variables. μ_0 , μ_1 and μ_i is the estimated coefficient; ε_i is the random disturbance term.

(2) Parent-child interaction. The first is the impact of reducing homework burden on parent-child interaction anxiety. In order to analyze the impact of reducing homework burden on parent-child interaction anxiety dimensions, a multiple regression model of reducing homework burden on parent-child interaction anxiety dimensions is established, as shown in Equation 6.

$$InterAn = \gamma_0 + \gamma_1 HWork + \sum \gamma_i Ctrl_i + \varepsilon_i \quad (6)$$

In the above formula, the dependent variable is the degree of parents' anxiety about parent-child interaction, represented by *InterAn*, which is measured using principal component analysis. The independent variable is one of the dimensions of the Double Reduction Policy. The degree of homework burden reduction, represented by *HWork*, is obtained by adding the time reduced in the questionnaire for doing after-school homework on weekdays and doing after-school homework on weekends. *Ctrl_i* represents control variables, that is, parents' willingness for students to participate in cram schools, student performance, parents' expectations for students' performance, parents' education level, parents' occupation, educational equity and other variables. γ_0 , γ_1 and γ_i is the estimated coefficient, ε_i is the random disturbance term.

The second is the impact of reducing extracurricular training on parent-child interaction anxiety. In order to explore the impact of the Double Reduction Policy on various dimensions of parents' educational anxiety, including the impact of reducing extracurricular training on various dimensions of parents' educational anxiety in the Double Reduction Policy, the impact of reducing extracurricular training on various dimensions of parents' educational anxiety, and the impact of extracurricular training on the anxiety dimension of parent-child interaction, a multiple regression model is established to reduce the anxiety dimension of extracurricular training on parent-child interaction, as shown in Equation 7:

$$InterAn = \sigma_0 + \sigma_1 ExTu + \sum \sigma_i Ctrl_i + \varepsilon_i \quad (7)$$

In the above formula, the dependent variable is the degree of parents' anxiety about parent-child interaction, represented by *InterAn*, which is measured using principal component analysis. The independent variable is the degree to which extracurricular burdens are reduced, one of the dimensions of the double reduction policy. It is represented by *ExTu* and is measured by the number of extracurricular training courses that students in the questionnaire have participated in. *Ctrl_i* represents control variables, that is, parents' willingness for students to participate in cram schools, student performance, parents' expectations for students' performance, parents' education level, parents' occupation, educational equity and other variables. σ_0 , σ_1 and σ_i is the estimated coefficient; ε_i is the random disturbance term.

- (3) School selection for further education. In order to analyze the impact of reducing homework burden on the anxiety dimension of parents' school choice, a multiple regression model of reducing homework burden on the anxiety dimension of parents' school choice is established, as shown in Equation 8.

$$CohAn = \theta_0 + \theta_1 HWork + \sum \theta_i Ctrl_i + \varepsilon_i \quad (8)$$

In the above formula, the dependent variable is the degree of parents' anxiety about students' school choice, represented by *CohAn*, and is measured using principal component analysis. The independent variable is one of the dimensions of the double reduction policy, represented by *ExTu*. The degree of homework burden reduction is obtained by adding the time reduced in the questionnaire for doing after-school homework on weekdays and doing after-school homework on weekends. *Ctrl_i* represents control variables, that is, parents' willingness for students to participate in cram schools,

student performance, parents' expectations for students' performance, parents' education level, parents' occupation, educational equity and other variables. θ_0 , θ_1 and θ_i is the estimated coefficient; ε_i is the random disturbance term.

How Big Data Can Improve the Relationship Between the Two

Clear obstacles to home-school cooperation and achieve effective communication. The basis and key to alleviating parents' anxiety is effective communication between parents and schools. The main reasons for communication barriers between the two are as follows:

First, at the level of knowledge and systematization, teachers have far more diverse educational knowledge and skills than parents. They focus on controlling the process of cooperation with parents and feel that parent participation increases unnecessary problems and violates the professional authority of teachers.

Second, at the level of psychological identity, some teachers have no children and cannot understand parents' educational fears and experiences. They underestimate the role of parents in the early childhood education process. Parents cannot understand teachers' educational work and overestimate teachers' importance to students.

Third, from an ideological perspective, the educational core concepts of participatory parents are relatively backward, and they have prejudices about the functions of schools and parents, the characteristics of education, and the characteristics of home-school cooperation. This idea cannot adapt well to the current "home-school cooperation" environment. At this time, parents' effective participation is needed to make decisions together. There seems to be a natural disagreement between parents and teachers because they are in independent environments and must receive different information.

Home-school cooperation should first clear the barriers to cooperation between parents and schools, create an information interactive platform, allow parents to grasp excellent information on the sustainable development of education, formulate generally accepted goals, solve specific goals, and enable people to take responsibility and gradually advance. It is necessary to ensure that parents reasonably participate in joint communication. In this process, parents will slowly correct their wrong views on education, reduce their uneasiness about education, and prevent uneasiness caused by tension in school relations. School education not only impacts students, but also impacts parents. It's equally important to fully understand the "consumer experience" of the parent team. Parental feedback is generally based on practical experience in educational settings. At this stage, more and more reliable school education does not pay enough attention and does not consider the specific situation. Various factors together reflect parents' high concern for education. The development of school education requires understanding and alleviating parents' educational problems.

DISCUSSION AND ANALYSIS

Using Big Data to Improve Double Reduction Effects

In the context of the double reduction policy, using big data for precise learning is an effective way to improve the quality of campus learning, reduce the burden on teachers and students, and improve efficiency. This article introduces in detail the implementation and application methods of the big data regional precision learning system. Combined with teaching practice, the application of precision teaching is discussed from the aspects of reducing burden and improving efficiency and scientific management. Starting from the "eight regulations" to improve work efficiency, the region's precision teaching application model is summarized, and teacher management, such as carefully designed work content, clear-cut and targeted layout, intelligent and timely inspections, and accurate data evaluation are proposed. Mechanisms, personalized practices, and limited independent learning time accurately solve the weak links of knowledge and consolidate and correct them in a timely manner.

The “Educational Information Action Plan 2.0” proposes to explore common ways of diversified learning, humanized learning, professional managers, and intelligent services through the deep integration of big data information technology and education. It emphasizes the integration of artificial intelligence into real-life learning environments by collecting and analyzing big data and completing learning based on one’s own abilities. In order to adapt to the needs of the new era, we use intelligence to conduct personalized learning for students, use big data to improve classroom teaching and learning, further improve the cultural and educational ecosystem, and build an intelligent education management system. In order to realize the deep integration of technology and education, learning, and training, Lishui City, Nanjing, Jiangsu Province has further promoted the application of accurate learning methods in the big data area and standardized college education and training management. This has actively promoted ways to further improve the quality of cultural education and teaching.

Big Data Applications

The following are application examples. In 2017, Nanjing Lishui No. 1 Primary School began to pilot the use of big data precision teaching system software. In 2019, Jinling Middle School Lishui Campus joined the user team. Since then, three ordinary high schools in the area have slowly begun to adopt this system. In June 2020, Lishui City launched the regional big data accurate learning system, completing the coverage of 45 primary and secondary schools in the district.

Since its launch, the system has served a total of 2,146 teachers, conducting 513 online surveys and 4,160 hand-read surveys. In June 2020, the district teaching and research office organized a final academic survey on 29 primary schools in Lishui District, involving more than 10,000 students, and a total of 25,000 question cards were scanned. In November 2020, a mid-semester sentiment survey of 15 junior high schools in the district was completed, involving 15,000 students, and a total of 60,000 question cards were scanned. Table 1 is a statistical table of online reading and manual reading in 15 junior high schools from August 2020 to January 2021. The statistical table of online reading and manual reading in 15 junior high schools in Lishui is shown in Table 3.

Table 3. Statistical Table of Online Reading and Manual Reading in 15 Junior High Schools in Lishui

| School Name | Number of online views | Number of hand reads | Number of teachers using |
|-------------|------------------------|----------------------|--------------------------|
| school 1 | 17 | 0 | 48 |
| school 2 | 7 | 133 | 33 |
| school 3 | 11 | 411 | 37 |
| school 4 | 11 | 39 | 30 |
| school 5 | 10 | 98 | 45 |
| school 6 | 48 | 153 | 43 |
| school 7 | 8 | 73 | 34 |
| school 8 | 132 | 0 | 37 |
| school 9 | 15 | 169 | 38 |
| school 10 | 16 | 221 | 58 |
| school 11 | 8 | 124 | 23 |
| school 12 | 112 | 0 | 92 |
| school 13 | 10 | 692 | 50 |
| school 14 | 9 | 306 | 86 |
| school 15 | 45 | 1201 | 157 |
| total | 459 | 3620 | 811 |

The following are application effects. The most significant effect is to improve work efficiency, helping teachers reduce the workload of scores and statistical analysis. Interactive question and answer cards for students and extracurricular homework automatically assess subjective questions and generate scores with one click after correcting subjective questions. That is, teachers do not need to start from scratch to evaluate or calculate the overall score for each question. The perceptual free reading method allows teachers to evaluate at any time using mobile phones, tablets, and desktop computers. The manual eye protection mode does not change the teacher's calibration method, which can be marked with paper and pen and retains calibration marks. In the field of data analysis, the system generates evaluation and data analysis reports for each role. Principals, classroom teachers, classroom managers, subject managers, and subject teachers can view necessary academic research and homework reports anytime and anywhere without the need to manually register or create statistical analysis forms. Regional education directors, department heads, teachers, and researchers can view aggregated data on school usage through the Learning Monitoring System. The knowledge point tracking table helps teachers conduct precise teaching and improve teaching efficiency. It mainly tracks the knowledge points mastered by each student through learning situation research, homework data collection, and system mining. It helps teachers, students, and parents obtain information about learning and conduct targeted review and reinforcement.

Learning environment research and analysis can help teachers track the overall dynamics of classroom learning levels in a timely manner, understand student performance and attrition, provide in-depth guidance and tracking, and achieve accurate training for teachers through comprehensive analysis of the learning environment. This study analyzes the current challenges students face in acquiring knowledge from a developmental perspective through a multifaceted study of students' learning environments, including progress and decline in academic performance, students' own biases, and analysis of problematic grades.

Case Analysis

Taking Tianning Branch of No. 24 Middle School in Changzhou City, Jiangsu Province as an example, since the implementation of double reduction, the school has combined the characteristics of the school and used big data to build a "harmonious" communication bridge between families and schools, further optimizing the "big data+" double reduction education structure.

It is well known that a lack of education at home or in school is detrimental to a child's development. Likewise, the gap between home education and school education also hinders the goal of effective education. Therefore, school networking and coeducation are crucial.

Therefore, schools use daily real-time updates such as smart campus service platforms, student class times, time away from school, medical records, campus notifications, etc., to encourage parents to establish electronic growth records for students to let parents understand the status of the school. At the same time, parents can also upload students' information to the smart campus platform to create data archives. Homeschooling based on big data helps teachers and parents gain in-depth understanding of students' daily and school behaviors; thereby, creating synergy and guiding students through critical developmental stages.

In addition to point-to-point communication, the school also integrates high-quality resources from parents and sets up parent lecture halls on time to allow parents to participate in classroom teaching, integrate into campus life, and participate in the growth process of students. Parents use their own growth process, daily life cognition, professional skills, etc., to enrich teaching and activity themes, so that students can acquire more knowledge and skills, help students broaden their horizons, improve their abilities, improve their accomplishments, and develop in an all-round way.

Application Restrictions

When exploring the optimization direction of "big data+" double reduction education, we must recognize that this education model has some issues that need attention and potential drawbacks.

- (1) Personalized attention: Big data technology can provide a more accurate understanding of students' learning situations, but it also requires more attention to their personalized needs. Optimization includes establishing more refined student profiles, taking into account student interests, subject strengths, learning styles, and other aspects, in order to better adjust teaching strategies.
- (2) Prevent data abuse: Ensure that the use of big data in education is legal, reasonable, and transparent. Strengthen data privacy protection, clearly define the boundaries of data collection and use, and prevent potential problems caused by excessive collection and misuse of data.
- (3) Educational equity: The results of big data analysis may be affected by imbalanced data collection, leading to unfair distribution of educational resources. Optimization methods include ensuring the comprehensiveness and impartiality of data collection, as well as adopting more accurate data correction algorithms to compensate for potential data biases.
- (4) Cultivating creativity and critical thinking: Big data analysis emphasizes the learning and application of existing data, but education should also focus on cultivating students' creativity and critical thinking. Optimization methods include designing more challenging and inspiring teaching content, guiding students to actively think and solve problems.
- (5) Improving teacher training level: Teachers may have shortcomings in using big data technology, and it is necessary to strengthen relevant training to improve their understanding and application level of data, so that they can better utilize big data to provide more effective educational services for students.
- (6) Guide parents to view data correctly: Parents tend to rely too much on data and overlook individual differences among students. Optimization includes strengthening communication with parents, guiding them to view data correctly, and understanding that data is only a part of education, not the whole.
- (7) Promoting interdisciplinary education: Big data analysis is often limited to specific disciplinary areas, while comprehensive abilities are equally important in education. Optimization methods include promoting interdisciplinary education, cultivating students' comprehensive literacy, and enabling them to perform well in various fields.

Through these optimizations, the role of big data in education can be better utilized, teaching quality can be improved, and potential problems and negative impacts can be avoided.

CONCLUSION

At this stage, the anxiety of parents of primary and secondary school students in the country of study is a tense situation caused by the lack of high-quality educational network resources. Although the current development of domestic big data is mature enough, due to the limited allocation of domestic high-quality educational resources, it is difficult to achieve all-round, balanced, and effective policies, and it is impossible to ensure that high-quality educational network resources are provided to every primary and secondary school student. Therefore, the country should also increase its attention to basic education and create a long-term and effective system to ensure investment in education. At the same time, it is necessary for parents to understand the characteristics of primary and secondary education. Education is a social practice activity that cultivates people and can provide students with immeasurable value in knowledge and skills.

Therefore, parents should follow the corresponding rules of educational development trends and reduce students' learning anxiety as much as possible by establishing reasonable expectations for students. Of course, it is understandable for parents to have expectations for students, but if such expectations ignore the actual situation of the students and exceed the students' abilities, then such expectations will become irrational expectations for the students. Therefore, parents should follow the general laws of educational development trends, formulate corresponding expectations based on

the specific circumstances of students, and avoid excessive expectations for their children, which may cause them invisible anxiety.

All in all, with the advancement of double reduction work in the context of big data, colleges and universities should also completely change their education methods and the current education environment. Colleges and universities should strengthen teachers' teaching design plans and ability to evaluate homework, get rid of the limitations of the original homework, and reposition the form of homework completion. Parents also need to actively learn cutting-edge educational core concepts, eliminate their own educational anxiety, create a suitable learning environment for students, so as to promote students' learning enthusiasm, truly implement the double reduction policy, improve student performance, and promote family harmony.

DATA AVAILABILITY

The figures and tables used to support the findings of this study are included in the article.

CONFLICTS OF INTEREST

The author declares that there no conflicts of interest.

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