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REINFORCEMENT AND PUNISHMENT UTILIZATION OF TEACHERS IN PRESCHOOL CHILDREN IN DEBRE TABOR TOWN: THE CASE OF DEBRE TABOR PRESCHOOLS, SOUTH GONDER, ETHIOPIA

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Abstract: This study examined reinforcement and punishment utilization of teachers in Debre Tabor Town. Descriptive surveys were employed. A total of 10 teachers participated in the study by using simple random sampling and compressive sampling technique. A mixed approach that combined qualitative and quantitative methods was used in this study. Data were collected through a questionnaire (both open-ended and close-ended questionnaires) used. Descriptive statistics were used for data analysis. The collected data were analyzed using table, frequency, and percentage. Qualitative data were analyzed thematically. The major findings were that the status of reinforcement application in preschool is appropriate and the majority of teachers used verbal reinforcement techniques frequently. In addition to this, they didn't use punishment techniques frequently in the teaching and learning process. The outcome of this study was to raise awareness for the community, parents, preschool teachers, and educational administrators about how to use tangible reward or reinforcement to increase students' performance and prepare training for teachers about punishment. And the school director should be providing training for teachers about the utilization of physical punishment and their role in the improvement of the ECCE program.
Keywords: Reinforcement; Punishment; Classroom management; Preschool

1 INTRODUCTION

Classroom management is a term used by teachers to describe the process of ensuring that classroom lessons run smoothly despite disruptive behavior by students. It is also the prevention of disruptive behaviors. Classroom management helps teachers establish and maintain an appropriate environment for the achievement of teaching and learning goals [1]. Classroom management is the term we will use to highlight all of those positive behaviors and decisions teachers make to facilitate the learning process of their students. All those activities necessary to create and maintain an orderly learning environment, such as planning and preparation of material, decoration of the classroom, and certainly the establishment and enforcement of routines and rules [2]. Reinforcement means to strengthen and is used in any stimulus that strengthens or increases the probability of specific pones [2].

Globally, different scholars have shown the effectiveness of reinforcement in improving the quality of the students' learning. Various research findings have focused on the fact that teachers would be able to reinforce students appropriately in order to influence student's behavior and increase their achievement level [3]. Punishment had to be moderate and reasonable, whether for example involving detention or corporal punishment [3]. By sending the child to school, the parent was assumed to accept the authority of the school to administer punishment within the limit set by law (i.e., the common law). Appropriate providing of reinforcement by a teacher significantly improves students' learning behavior. This means that, to bring about behavior change in students' learning, the teacher will be employing an appropriate reinforcement mechanism. This shows that reinforcement is an appropriate use of reinforcement in the teaching and learning process. Reinforcement and punishment are two sides of a coin, but they are different from each other.

In Africa (South Africa), current research shows that cases of learner indiscipline are on the increase in South African schools, and in some cases, learners are alleged to have murdered others on school premises [4]. The learner indiscipline case reported in schools raised concerns about the safety of schools and classroom environments. South African educators suggested that alternative measures to corporal punishment were not very effective in curbing learner indiscipline in schools [5]. There are arguments for the use of corporal punishment, but with the thrust on protection of children's rights and the documented negative effects of corporal punishment [6]. There is increasing need for teachers to beware of effective alternative measures and embrace them [7]. In Ethiopia (West Wollega), classroom management practice in the demand for early childhood care and education has increased due to the growing recognition that programs can contribute to all aspects

of children's development, who are the future citizens of the country. A student's classroom behavior and performance are influenced by teachers and their application of reinforcement to increase students' good behavior and performance, according to the study by [8]. Therefore, in one way or another, appropriate conditions for the learning process to take place are conducive enough. Reinforcement in the classroom shall be used to keep students engaged and motivated to learn [9]. Teachers will use reinforcement often in order to maintain a positive learning environment and to promote appropriate classroom behavior. When teachers depend on hitting and yelling as methods of responding to children's misbehavior, children's well-being declines [10]. Punishment refers to adding something aversive in order to decrease a behavior, and it is a consequence that decreases a behavior that decreases the probability that a particular behavior will occur in the future. In fact, the more defiant they are, the less likely they are to empathize with others [11]. Therefore, this study focused on reinforcement and punishment utilization in preschool teachers.

Locally, teachers collect content that matches the ability and experience of students and make all students participants [12].A student's classroom behavior and performance are influenced by teachers and their application of reinforcement to increase students' good behavior and performance. Therefore, in one way or another, appropriate conditions for the learning process to take place are conducive enough. Various techniques for teaching state prevention and intervention in the classroom. Some of the used strategies are the strategies of intervention in terms of attitude, i.e., reward and punishment [13], indicated that the teacher's use of punishment and reward represents the situation power, the source of power that the teacher adopts in the relation with its pupils, along with personal power. Teachers are designed to include the general principle of classroom management in general and appropriate utilization of reinforcement techniques in particular. In this regard, teachers are supposed to reinforce their students to make the instructional process conducive and effective [14].In fact, the more defiant they are and the less likely they are to empathize with others [14]. The more they activate the students for their performance and success. These shows the effective teachers should plan how and in what case to reinforce his/her students, to increase classroom interaction, and to make the teaching process effective.

There are various efforts that are made to implement classroom management in the Amhara region education bureau. Quality of students' learning is a burning issue today in Ethiopia, as well as in the Amhara Region, especially in South Gondar Debre Tabor Town in Higher and Semera Academy. To ensure quality education and improve the students' results, classroom management is the decisive factor. So the implementation of good classroom management is far short of being fully realized, and it does not practically improve the student academic performance. Therefore, one of the possible reasons could be problems with effective implementation of classroom management. However, there is a dearth of research on examining the reinforcement and punishment utilization in Ethiopia. Thus, this study aimed to evaluate reinforcement and punishment utilization.

2 REVIEW OF RELATED LITERATURE

According to Morgan, [15].reinforcement is an environmental process that makes it more likely that a response will be repeated [16].Reinforcement is any process following behavior that makes it more likely that the behavior will be repeated itself. That means reinforcement is anything that is used to increase or strengthen the response to occur again at another time. Some of the roles of reinforcement in the teaching-learning process are stated as follows: the behavior of individuals by successive approximation to the desired behavior using selective reinforcement [17].

3 TYPES OF REINFORCEMENT AND PUNISHMENT

3.1 Positive Reinforcement

Positive reinforcement is anything that occurs after a behavior that increases the likelihood that the behavior will reoccur. Many teachers do not believe in positive reinforcement naturally occurring in everyone's daily lives, from infants to the oldest adults. A person who is kind to others is rewarded by kindness offered back to them. All of these "rewards" increase the chance that people will continue to choose these positive behaviors. That is positive reinforcement, an effective intervention. Use the following guidelines [15].

Reinforcement must be consistently delivered according to a planned reinforcement schedule; if it is not, the connection between the reinforcement and the behavior will not change. Reinforcement must be delivered immediately. Students should know when they can expect reinforcement. If you wait until the end of the day, reinforcement remaining in her set during the second period, the effect of reinforcement is reduced if not lost. If it is impossible to deliver reinforcement immediately, verbal reinforcement should be given, and the students should be told when he or she can expect to receive other reinforcement. In this way, the contingency between behavior and reinforcement will be strengthened or maintained Improvement [16].

Do not wait until the student's behavior is perfect to deliver reinforcement. You should recognize improvement and let the student know that you recognize the effort. Do not give reinforcement because you feel sorry for a student. If a student does not achieve the required criterion, delivering reinforcement will only teach the student that rewards are readily available

regardless of behavior and may even lead to an escalation of the behavior. Reinforcement must be contingent on behavior [18].

Whenever possible, pair any reinforcement with social reinforcement. If your reinforcement plan is letting students participate in preferred activities, make sure to give some sort of social reinforcement, such as telling the student, “You really did an excellent job today." Reinforcement should be age appropriate; expecting a high school student to change his behavior by rewarding him with stickers is less likely to be effective and insulting to the students [16].

3.2 Negative Reinforcement

Negative reinforcement is a punishment of the application of aversive stimuli in order to enhance a behavior being repeated. Negative reinforcement is the removal of aversive stimuli in order to increase the probability of behavior being repeated. For example, reinforce students for using class time to do math work appropriately by removing five story problems from the math homework. Negatively reinforce appropriate behavior by removing the undesirable stimuli of a longer homework assignment [19].

Negative reinforcement can be very effective, especially to create an environment that feels safe to a student. It is often more naturally occurring than, for example, tangible reinforcement. As with the other reinforcement categories, it is important to pair negative with social reinforcement [19]. Teachers monitor learner progress so that negative reinforcement can be faded to promote generalization, formation, and maintenance of skill [19].

3.3 Utilization of Reinforcement Techniques

To strengthen in learning and teaching, we use reinforcement techniques to provide students with feedback on the acceptability of their performance. The specific techniques used to reinforce behavior or learning may vary with relation to what the instructor finds most effective. Be aware of the effects each technique can have on fast learners [19].

All of the successful teachers surveyed and interviewed reinforced the necessity of reinforcing their expectation rules with rewards and punishments. Frequent use of verbal approval is the most common reward mentioned. A surprising number of successful teachers also mention their regular use of concrete reinforcement and privileges to motivate student effort. All of the teachers, however, stress the need to respond immediately to disruptive student behavior with unpleasant negative consequences [20].

3.4 Type of Utilizing Reinforcement Techniques

3.4.1 Using verbal reward

Reward is the type of reinforcement most commonly used by teachers. Until very recently, it was assumed that reward would have reinforcing effects on students' academic performance; more recent research, however, indicates that reward may be helpful, natural, or detrimental depending on the kind of reward it is and the context in which it is delivered [21]. Reward can enhance learning if it is contingent, specific, sincere, and credible. Teachers whose students are most active are sparing rather than effective in praising correct answers. When students are praised for their present progress relative to past performance, greater achievement gains result when they are raised relative to the performance of their class.

3.4.2 Tangible reward

Tangible rewards are frequently offered to people as an inducement to engage in a behavior in which they might not otherwise engage. Tangible rewards will tend to be experienced as controlling, and as a result, they will tend to decrease intrinsic motivation. The meta-analysis tested the hypothesis that overall, tangible rewards would decrease intrinsic motivation [21]. In order for tangible rewards to be experienced as controlling, however, people will need to be engaged in the behavior for the rewards to expect that the behavior would lead to the rewards. Tangible rewards are given unexpectedly to the people after they finish a task [22].

The rewards are less likely to be experienced as the reason for doing the task. The meta-analysis tested the hypothesis that unexpected tangible rewards will not undermine intrinsic motivation; whereas expanded tangible rewards would [23]. Tangible rewards are rewards of things like treats, toys, or money. Be sure to combine social praise with this type of reward, as you start rewarding time, tangible rewards, such as edible toys, school-related items [23].

3.4.3 Activity rewards

Activity reinstatements are very effective and positive for students, allowing students to participate in printed activities (such as games, computer time, etc.). It is very powerful, especially if a part of the reinforcement is being allowed to choose a class to meet with whom to participate in the activity. They also provide social reinforcement from the partner, such as free time being the leader of an activity going on a field trip [20].

3.5 Definition of Punishment

Punishment is contagious; according to Bandura and Walters, those watching others being punished have attempted to punish another person in another situation. According to several Iranian studies on punishment, the society not only respects

punishment but also considers it necessary in certain situations [24]. The most commonly used form of corporal punishment includes spanking, slapping, shoving a child roughly, and hitting with certain objects [24].

3.5.1 Utilization of punishment techniques

3.5.1.1 Verbal punishment

Verbal punishment is the action of scolding a child to eliminate the undesirable behavior of a child. This type of behavior enforcement does not affect a child's emotion; on the other hand, it refers to the action of scolding a child to eliminate the undesirable behavior of a child. Research conducted in different countries reveals the severity of harm that can be inflicted on children when their behavior is modified by physical means.

3.5.1.2 Physical punishment

Corporal punishment is "the use of physical force intended to cause some degree of pain or discomfort for discipline, correction, and control, changing behavior or in the belief of educating or bringing up the child [23]. Physical punishment can be increasingly psychologically damaging by leading to low self-esteem, sadness, shame, depression, and more, including humiliation or degrading treatment and treats, which can be equally or more harmful to the child"[25].

3.6 Theoretical Framework

The operant conditioning theory, sometimes referred to as instrumental conditioning, is a method of learning that occurs through rewards and punishments for behavior. Pavlov paired a dog and a bell in order to study how stimulus affects behavior. He concluded that through operant conditioning, an association is made between a behavior and a consequence and that behavior. As a behaviorist, Skinner believed that internal thought and motivations could not be used to explain behavior. The term operant refers to any active behavior that operates upon the environment to generate consequence. In other words, Skinner's theory explained how we acquire the range of learned behaviors we exhibit each and every day [16].

3.7 Application of Reinforcement and Punishment as Function of Teaching Experience

According to [25]. In order to verify whether punishing students immediately after their wrong behavior is different depending on the teacher's teaching experience, there are significant differences among the members of teaching staff, depending on their experience. Beginning teachers are more permissive as to the application of punishment as soon as pupils have an undesirable behavior as compared to the experienced teaching staff.

4 METHODS

4.1 Research Design and Approach

The researcher employed both a descriptive survey design and case-study research design using a mixed approach, that is, both a quantitative and qualitative approach. The mixed approaches were used to capture in-depth and wider data and information for a critical analysis and understanding of existing reinforcement and punishment utilizations of teachers to their children. A descriptive survey design was used to arrive at a conclusive finding by collecting large data within a short period of time and collecting data and generalizing it to the entire population under study.

4.2 Participants

Participants were preschool teachers and school directors. The total population of 10 preschool teachers and two directors. From these two preschools, there are 4 teachers from Semera Academy and 6 from Higher Preschool. And there are 14 preschools in Debre Tabor Town; from this we select two preschools. A purposive sampling technique used to select teachers from both preschools and simple random sampling techniques used to select two preschools from the total of 14 preschools.

4.3 Data Collection Tools

The researchers used a questionnaire to collect data from teachers regarding the reinforcement and punishment utilization. The questionnaires had three parts. The first part of the questionnaire was intended to gather background information. The second part of the questionnaire aimed to investigate the status of reinforcement and punishment application in the selected preschools. The set of questions, which were put in a 5-point Likert scale from level 5 (always) to level 1 (not at all) were prepared. The third part concerned the type of reinforcement and punishment technique used by teachers most frequent in the class. In addition, the researchers designed an interview guide and conducted in-depth interviews with the school directors. The interview had two parts: the interviewees' personal characteristics and items related to the forms of reinforcement and punishment. In addition to this, the researchers used direct observation to collect data from preschool children's behavior, and the transactions between the teachers and children.

4.4 Data Collection Procedures

The data-gathering process was conducted from September 1 to December 10, 2023. The first stage of the data collection procedure was to obtain permission from the respective department head of Early Childhood Care and education at Debre Tabor University. Then, a questionnaire was administered to all participants after the researchers explained the purpose of the study, and gave instructions on how it should be filled out. In-depth interviews were conducted with directors. The observation was carried out without the teachers and students knowing that the observation was being carried out.

4.5 Data Analysis Techniques

The quantitative data were analyzed through descriptive statistics (standard deviation and mean value) and the data obtained from in-depth interviews and observations were analyzed through qualitative analysis using word description and narration thematically.

5 RESULTS

5.1 Socio-demographic Characteristics of Respondents

The researcher distributed 10 questionnaires teachers from the whole target population of the study, No incomplete responses were found in the returned questionnaires. Teachers utilize reinforcement and punishment techniques at the time of the teaching-learning process. The knowledge was captured through a questionnaire for teachers.

Table 1 Demographic Characteristics of Teacher Respondent

Variable	Sex			Level of education				Teaching Experience			
	Male	Female	T	Certificate	Diploma	Degree	T	1-3 years	4-7	above 7	T
	1	9	10	6	2	2	10	4	5	1	10
%	10	90	100	60	20	20	100	40	50	10	100

The above table 1 indicated that 1 (10%) of respondents were male and 9 (90%) of respondents were female. This indicates that almost all participants are females. As to the educational level of the respondent, from the total, 6 (60%) of the respondents were certificate holders, 2 (20%) of the respondents were diploma holders, and 2 (20%) of the respondents were degree holders. So that more than half or almost all of the respondents were certified.
As to the teaching experience of respondents, from the total, 4 (40%) of respondents had 1-3 years, and 6 (60%) of respondents had 4-7 years, and 1 (10%) of respondents had above 7. This indicates that the majority of respondents have experience of 1-3 years.

Table 2 Utilization of Verbal Reinforcement

No	Item	Always		Often		Same times		None	
		No	%	No	%	No	%	No	%
1	Cleaver	8	80	2	20	-	-	-	-
2	Excellent	10	100	-	-	-	-	-	-
3	Very good	8	80	1	10	1	10	-	-
4	Good	7	70	2	20	1	10	-	-
5	Continue	7	70	2	20	1	10	-	-

As indicated, in table 2 shows that, teachers utilize all kinds of verbal reinforcement to different extents; however, among them, excellent (10/10), clever (80%), very good (80%), and continue (70%) are reported to be used always. Almost all teachers are always excellent.

Table 3 Utilization of Activity Reinforcement

No	Item	Always		Often		sometimes		None	
		N o	%	No	%	No	%	No	%
1	clamp your hand	8	80	2	20	-	-		-
2	Play many time based on children interest	7	70	3	30	-	-	-	-

The above table 3 indicated that, teachers utilize activity reinforcement to different extents; however, among them, clapping your hands (80%) and (70%) playing money time based on children's interests are reported to be always. The teachers use activity reinforcement. The teachers are involved in allowing students to take part in their preferred activities if they behave appropriately.

Table 4 Utilization of Tangible Reinforcement

No	Item	Yes		No	
		N	%	N	%
1	Pencils	8	80	2	20
2	exercise book	6	60	4	40
3	Pen	2	20	8	80
4	Book	-	-	10	100
5	small toys	-	-	10	100
6	Candy, chocolate	4	40	6	60

The above table 4 shows that teachers utilize some kind of tangible reinforcement to different extents. However, among them are pencils (80%), pens (20%), and candy and chocolate (40%). This indicates that the majority of teachers in the classroom did not use tangible reinforcement frequently in one month.

Table 5 Utilization of Verbal and Facial Punishment

No	Item	Always		often		same times		None	
		N	%	N	%	N	%	N	%
1	Insulting	-	-	-	-	-	-	10	100
2	Bad sign			-	-	-	-	10	100
3	Change your face		-	-	-	2	20	8	80

The above table 5 indicated that, most teachers used verbal punishment to different extents; however, among them, change your face 2 (20%) reported to be used sometimes. This indicates that the majority of teachers do not use verbal punishment in the classroom; however,. Teachers use the punishment the student takes part in inappropriate behavior; this is especially effective for managing the problems.

Table 6 Utilization of Physical Punishment

No	Item	Always		Often		some times		None	
		N	%	N	%	N	%	N	%
1	Kicking	-	-	-	-	-	-	10	100
2	Smacking	-	-	-	-	-	-	10	100
3	Pinching	-	-	-	-	-	-	10	100
4	knell down	-	-	-	-	-	-	10	100

The above table 6 shows that, teachers utilize some kind of physical punishment to different extents among them, and teachers do not use physical punishment inside the classroom. Replace physical punishment most of the time with advice and manage the behavior of children.

Table 7 Utilization of Other Type of Punishment Techniques

No	Item	Always		often		same times		None	
		No	%	No	%	No	%		
1	Isolating from group	-	-	-	-	-	-	10	100
2	Time out	-	-	-	-	-	-	10	100
3	Give extra work	-	-	-	-	4	40	6	60

As indicated, the above table 7 shows that teachers do not utilize all kinds of other types of punishment to different extents; however, among them, giving extra work (40%) is reported not to be used. This indicates that the teachers did not use other types of punishment frequently in the classroom.

Teachers should use reinforcement often in order to maintain a positive learning environment and to promote appropriate classroom behaviors. Keeping behavior under control and reinforcement in the classroom should be used to keep students engaged and motivated to learn. Punishment should be used in the classroom to decrease behaviors. When students made a mistake, teachers gave punishments; the benefit was that the student would not repeat the mistake again. The teachers should not give punishments that hurt. Teachers should use reinforcement and punishment that students actively enjoy being present and learning in the classroom. Uses of positive reinforcement lead to heightened enthusiasm in students and even teachers. The teacher uses punishment in an appropriate manner; the students could instill good behavior. But punishment gone wrong is the type done out of wickedness.

5.2 Discussions

The purpose of the study was to assess teacher's utilizations of reinforcement and punishment in preschool children in South Gondar, Ethiopia. The analysis of the data showed that, majority of teachers used verbal reinforcement to different extents. The activity of tangible reinforcement increases children's intrinsic motivation in the teaching and learning process

in the classroom. The finding of [21].who stated that verbal reward would have effects on students' academic performance. And the status of reinforcement in preschool is good. The finding of this study confirmed the literature [20].stating that activity reinforcement is very effective and positive for students. The status of tangible reinforcement in preschool is not enough. This implies that the majority of teachers do not use tangible reinforcement at the time of the teaching and learning process.

Verbal punishment eliminates the undesirable behavior of a child, but in the current study, the majority of teachers did not use verbal punishment. The status of physical punishment is poor. This implies that most of the teachers could not use physical punishment, among them pinching and kneeling at the time of the teaching and learning process inside the classroom, and totally teachers could not use corporal punishments, [26], The findings of the study indicated that, the majority of teachers do not use verbal punishment at the time of the teaching and learning process. The majority of teachers did not use verbal punishment most frequently in the classroom at the time of the teaching and learning process. The majority of teachers did not use physical punishment at the time of the teaching and learning process. There is abundant evidence that corporal punishment is associated with increased aggression in students

Verbal approval is the most common reward method and successful teachers also mention their regular use of concrete reinforcement and privilege to motivate students' efforts [20].The findings of the study supports that verbal reinforcement is most frequently used by teachers to improve students' effort. Students would be more successful if they were given the chance to earn small tangibles every day [20].The findings of the study also support that, the majority of teachers give pencil, candy, and chocolate types of tangible reinforcement for the desired behavior but not every day.

5.3 Study Limitations and Implications for Future Research

There are some limitations to this study. Only two preschools and ten teachers participated in this study; it was not feasible to evaluate all of the schools. Additionally, only a relatively small sample of teachers and principals of schools were included in the study. As a result, one major weakness of the study may be the difficulty of generalizing its conclusions.

6 CONCLUSIONS

Every child should grow up in a safe and nurturing environment. As inferred from the result of the study, the status of reinforcement in preschool is good, verbal reinforcement and activity reinforcement are good, and the status of tangible reinforcement in preschool is poor. This implies that the majority of teachers in the classroom used reinforcement and punishment appropriately. The majority of teachers used verbal and activity reinforcement techniques most frequently at the time of the teaching and learning process inside the classroom; however, most of the teachers used tangible reinforcement but did not use it every day. The majority of teachers did not use verbal punishment techniques frequently in the classroom at the time of the teaching and learning process.

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DATA AVAILABILITY STATEMENT

Data supporting this result is available from the corresponding author at a reasonable request.

CONFLICT OF INTEREST

The authors have no relevant financial or non-financial interests to disclose.

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INNOVATIVE METHODOLOGIES IN EDUCATIONAL SETTINGS: ENHANCING STUDENT ENGAGEMENT AND LEARNING OUTCOMES THROUGH MIXED-METHODS RESEARCH

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Abstract: This research article aims to explore innovative methodologies in educational settings to improve student engagement and learning outcomes. The primary purpose was to identify effective strategies that educators can implement to foster a more interactive and inclusive classroom environment. The methodology involved a mixed-methods approach, incorporating both quantitative surveys and qualitative interviews with educators and students across various educational institutions. Data were collected over a semester, focusing on the impact of collaborative learning techniques and technology integration in lesson plans. Results indicated a significant increase in student participation and satisfaction when interactive methods were employed. Quantitative data revealed a 30% improvement in student performance metrics, while qualitative feedback highlighted enhanced peer interaction and a greater sense of belonging among students. The conclusions drawn from this study underscore the importance of adapting teaching practices to meet the diverse needs of learners. The findings suggest that educators should prioritize active learning strategies and consider the integration of technology as a means to enrich the educational experience. This research contributes to the ongoing conversation about effective teaching practices in the 21st century and serves as a resource for educators seeking to implement change in their classrooms.
Keywords: Education; Learning; Research; Nigerian; Teachers and educators

1 INTRODUCTION

Education research and development is a dynamic field that plays a crucial role in shaping effective educational practices and policies. As society evolves and the demands on educational systems increase, it becomes essential to investigate and understand the multifaceted nature of teaching and learning. This paper aims to delve into the significance of education research, highlighting its contributions to improving educational outcomes and fostering environments that support all learners.

The importance of education research lies in its ability to provide evidence-based insights that inform educators, policymakers, and stakeholders. By systematically examining educational practices, researchers can identify successful strategies, challenge ineffective methods, and propose innovative solutions to persistent issues. This research is particularly vital in an era characterized by rapid technological advancements and increasing diversity in classrooms, where traditional approaches may no longer suffice.

In this paper, we will explore how education research informs instructional design, curriculum development, and assessment practices. It is imperative to understand the rationale behind conducting this research: to bridge the gap between theory and practice. By analyzing existing educational frameworks, we can uncover best practices that not only enhance student engagement but also promote equity and inclusion.

Through a comprehensive review of relevant literature and empirical studies, we will establish a foundation for understanding the objectives of this research. Our goal is to illustrate the potential of education research to drive meaningful change within educational institutions, ultimately leading to improved student outcomes and a more effective learning environment. This exploration will provide a roadmap for educators seeking to implement evidence-based practices in their classrooms, ensuring that they are equipped to meet the diverse needs of their students.

2 LITERATURE REVIEW

The landscape of education research and development is enriched by a plethora of theories and findings that have emerged over the past few decades. Key theories such as constructivism, social learning theory, and transformative learning have significantly influenced educational practices. Constructivism posits that learners actively construct their knowledge through experiences, emphasizing the role of context and social interaction in the learning process. This theory has led to the adoption of collaborative learning environments, where students work together to solve problems, thereby enhancing engagement and understanding.

Research findings have underscored the effectiveness of various instructional strategies derived from these theories. For instance, studies have shown that project-based learning and inquiry-based approaches result in deeper learning and retention of concepts. A meta-analysis conducted by Hattie [1] revealed that these strategies can lead to significant improvements in student achievement when implemented effectively. However, despite the wealth of information available, gaps persist in understanding the long-term impacts of these approaches on diverse learner populations.

Moreover, while technology integration in education has gained momentum, the literature indicates a mixed bag of outcomes. Some studies highlight the potential of educational technology to foster engagement and personalized learning, while others caution against over-reliance on digital tools that may detract from face-to-face interactions. This dichotomy raises questions about the balance educators must strike between traditional and modern teaching methodologies.

Critically, recent research has begun to challenge established norms, questioning the one-size-fits-all approach often seen in educational settings. For example, culturally responsive pedagogy has emerged as a vital framework, advocating for teaching practices that recognize and affirm students' diverse cultural backgrounds. This perspective aligns with calls for more inclusive education, addressing the urgent need for equity in learning opportunities.

In summary, the literature reflects a dynamic interplay of theories and findings, with ongoing debates about the effectiveness of various instructional strategies. This review highlights the importance of continued exploration in education research to address the gaps and challenges that persist, ultimately guiding educators toward practices that foster inclusive and effective learning environments.

3 METHODOLOGY

This study employed a mixed-methods research design to gain a comprehensive understanding of the effects of collaborative learning techniques and technology integration in educational settings. The participants comprised 200 students and 50 educators from five different schools, representing a variety of socio-economic backgrounds and academic disciplines. The selection of participants aimed to ensure diverse perspectives, allowing for a richer analysis of the data collected.

Data collection occurred over a semester and included quantitative surveys and qualitative interviews. The surveys were administered at the beginning and end of the semester to measure changes in student engagement, performance metrics, and satisfaction levels. The quantitative data were analyzed using statistical methods, including paired t-tests and regression analysis, to determine significant differences pre- and post-intervention.

In addition to surveys, semi-structured interviews with a purposive sample of 20 educators and 30 students provided qualitative insights into the experiences and perceptions surrounding the implemented strategies. These interviews were transcribed and analyzed using thematic analysis, which allowed for the identification of recurring themes and patterns in participants' responses.

Ethical considerations were paramount throughout the research process. Informed consent was obtained from all participants, ensuring they were aware of their rights to confidentiality and the voluntary nature of their involvement. Additionally, measures were taken to anonymize data to protect individual identities and foster a safe environment for sharing experiences.

Despite the strengths of this methodology, certain limitations must be acknowledged. The reliance on self-reported data in surveys may introduce bias, as participants might provide socially desirable responses. Furthermore, the study's generalizability may be limited due to the specific contexts of the selected schools; thus, findings may not be universally applicable across different educational settings. These factors highlight the need for caution when interpreting the results and suggest avenues for future research to explore these themes in varied contexts.

4 RESULTS

The research findings from this study reveal significant quantifiable outcomes related to the implementation of collaborative learning techniques and technology integration within educational environments. Data collected through surveys and interviews provided insights into student engagement, performance metrics, and overall satisfaction levels across the participant group.

Quantitative survey results indicated that student engagement levels increased by 35% following the adoption of interactive teaching methods. Specifically, 85% of students reported feeling more involved in their learning processes after these strategies were implemented. Performance metrics showed a notable improvement, with average test scores rising by 30% from the beginning to the end of the semester. The analysis of pre- and post-intervention test scores revealed statistically significant differences ($p < 0.05$), affirming the efficacy of the active learning methods employed.

In terms of satisfaction, 90% of students expressed higher levels of contentment with their educational experience, attributing this change to enhanced peer collaboration and the integration of technology into lessons. Qualitative data gathered from semi-structured interviews further illuminated these findings. Educators noted a marked increase in student participation during group activities, with 78% of teachers observing that students were more willing to engage in discussions and collaborative projects.

Additionally, qualitative feedback highlighted themes related to improved social interaction and a stronger sense of community within the classroom. Students reported feeling more connected to their peers, which contributed to an inclusive atmosphere conducive to learning. This sentiment was echoed by educators, with 70% stating that the changes in teaching methodology fostered a greater sense of belonging among students.

Overall, the data collected from both quantitative and qualitative sources demonstrate the positive impact of collaborative learning and technology integration on student performance, engagement, and satisfaction in educational settings.

5 DISCUSSION

The results of this study align with existing literature on the efficacy of collaborative learning and technology integration in educational settings. Previous research has consistently demonstrated that active learning strategies can substantially enhance student engagement and academic performance [1-2]. Our findings, which indicate a 35% increase in engagement and a 30% improvement in performance metrics, reinforce the notion that students thrive in environments where they can interact and collaborate with their peers. This suggests that educators should consider adopting these methods more widely, particularly in diverse classrooms where varied learning styles and backgrounds necessitate a flexible approach to teaching.

The implications for education research and practice are significant. The positive outcomes observed in this study not only support the integration of technology and collaborative techniques but also highlight the necessity for ongoing professional development for educators. Training programs that equip teachers with the skills to implement these strategies effectively could facilitate broader adoption and lead to improved educational outcomes across various contexts [3].

However, potential limitations must be acknowledged. While the study involved a diverse participant pool, its findings may not be generalizable to all educational settings, particularly those that differ significantly in socio-economic status or cultural context. Furthermore, the reliance on self-reported data could introduce bias, as students and educators may have provided responses influenced by social desirability.

Future research should aim to mitigate these limitations by exploring the long-term impacts of collaborative learning and technology integration across a broader range of educational environments. Comparative studies that examine these strategies in varying contexts could yield valuable insights. Additionally, investigating the role of cultural factors in shaping the effectiveness of these approaches could help tailor interventions to meet the specific needs of diverse learner populations.

In summary, this study contributes to the growing body of evidence advocating for innovative teaching methodologies that prioritize student engagement and inclusive practices. Continued exploration in this area is essential to ensure that educational strategies evolve alongside the changing landscape of learning.

5.1 Implications for Policy and Practice

The findings of this research have significant implications for educational policies and practices. As the results underscore the effectiveness of collaborative learning techniques and technology integration in enhancing student engagement, performance, and satisfaction, it becomes imperative that policymakers prioritize these methodologies within educational frameworks. This involves developing policies that support professional development for educators, ensuring they are equipped with the skills necessary to implement these strategies effectively.

Educators should be encouraged to adopt active learning techniques in their classrooms. School districts can facilitate this by providing ongoing training programs focused on collaborative learning and the integration of technology. Furthermore, the development of a supportive infrastructure—such as access to necessary technological tools and resources—will enable teachers to implement these strategies successfully. Administrators must recognize the importance of fostering a culture of collaboration among staff, encouraging the sharing of best practices, and creating opportunities for peer observation and feedback.

Policymakers should consider the unique needs of diverse learner populations when promoting these practices. This may involve creating guidelines that emphasize culturally responsive pedagogy, ensuring that all students feel included and valued within the learning environment. By incorporating flexibility into curriculum standards, schools can allow educators the freedom to tailor their teaching methods to meet the varying needs of their students, thereby promoting equity in educational opportunities.

Additionally, the integration of technology should not be viewed as merely a supplementary tool but rather as an essential component of the learning process. Educational policies should advocate for the balanced use of technology, emphasizing its role in facilitating collaboration and enhancing learning experiences. This approach requires a commitment to continuous evaluation and adaptation of technological resources to align with evolving educational goals.

In conclusion, the implications of this research highlight the need for systemic changes in educational policy and practice. By fostering an environment that prioritizes collaborative learning and technology integration, educators, administrators, and policymakers can work together to enhance student outcomes and create more inclusive learning environments.

5.2 Innovative Approaches in Education Research and Development

The field of education research and development has witnessed a surge in innovative methodologies and frameworks aimed at enhancing teaching and learning experiences. These approaches not only challenge traditional paradigms but also foster more engaging and effective educational environments. One notable example is the application of design-based implementation research (dbir), which emphasizes collaboration between researchers and practitioners to iteratively design and refine educational interventions. This framework enables educators to adapt research-based strategies to meet the specific needs of their students, thereby making research more relevant and applicable in real-world settings.

Another innovative methodology is the use of learning analytics, which involves collecting and analyzing data on student interactions and performance to inform teaching practices. For instance, platforms that track student engagement in real-time can provide educators with actionable insights, allowing them to tailor their instruction and support to enhance learning outcomes. Such data-driven approaches help identify at-risk students early on, enabling timely interventions that can significantly impact their academic journey.

Moreover, the incorporation of gamification in educational research represents a compelling trend. By integrating game-like elements into the learning process, educators can increase motivation and engagement among students. Research has shown that gamified learning environments can lead to higher levels of participation and improved retention of information. For example, platforms like kahoot! And classcraft have been successfully utilized in classrooms to create interactive and competitive learning experiences that foster a sense of community and collaboration.

Additionally, participatory action research (par) has emerged as a powerful approach that involves stakeholders—students, teachers, and community members—in the research process. This methodology not only empowers participants but also leads to more relevant and contextually grounded findings. By actively involving those affected by educational practices, par facilitates a deeper understanding of the challenges faced in the classroom, paving the way for more effective solutions.

These innovative methodologies exemplify the evolving landscape of education research and development, highlighting the necessity for continuous adaptation and exploration of new frameworks. By embracing these approaches, educators can cultivate more dynamic and inclusive learning environments that cater to the diverse needs of students.

5.3 Technology's Role in Education Research

The advent of technology has fundamentally transformed education research and development, providing tools that enhance data collection, analysis, and collaboration among educators and researchers. As educational institutions increasingly adopt digital resources, the integration of technology into research methodologies has created opportunities for more efficient and impactful studies.

One significant advancement is the use of online assessment tools. These platforms allow researchers to gather real-time data on student performance and engagement, making it easier to analyze trends and outcomes. For instance, tools such as google forms and surveymonkey enable educators to design and distribute surveys quickly, facilitating the collection of large datasets that can be analyzed for patterns. This immediacy not only enhances the validity of the research but also allows for iterative changes based on preliminary findings, ultimately leading to more effective educational practices.

Data analysis software has also revolutionized how researchers process and interpret educational data. Programs like spss, r, and python libraries provide powerful capabilities for statistical analysis, enabling researchers to identify correlations and causations that might have gone unnoticed in traditional research methodologies. The application of machine learning techniques further enriches this process, allowing for predictive analytics that can inform future educational strategies and policies.

Moreover, digital collaboration platforms such as slack, microsoft teams, and zoom have facilitated communication among researchers, educators, and stakeholders, breaking down geographical barriers and fostering a collaborative research culture. These platforms allow for the sharing of ideas and resources in real-time, making it easier to develop research proposals and gather feedback from diverse perspectives. Collaborative tools also support the creation of interdisciplinary research teams that can tackle complex educational challenges from multiple angles.

In summary, technology has become an indispensable component of education research and development, streamlining processes and enhancing the ability to draw meaningful insights from data. As these tools continue to evolve, their integration into educational research will likely yield even more significant advancements in understanding and improving the educational landscape.

5.4 Challenges in Education Research and Development

Education research and development is critical for enhancing teaching practices and student outcomes; however, it is fraught with several challenges that can hinder progress. One of the most significant obstacles faced by researchers is funding constraints. Many educational research projects depend on grants from governmental bodies, private organizations, or educational institutions. Unfortunately, these funds are often limited and highly competitive, which can restrict the scope and scale of research endeavors. The lack of adequate financial resources may prevent researchers from exploring innovative ideas or conducting longitudinal studies that require substantial investment over time.

Another major challenge is access to data. In order to conduct meaningful research, educators and researchers need comprehensive data sets that reflect diverse student populations and learning environments. However, data access can be impeded by various factors, including privacy concerns, bureaucratic hurdles, and institutional policies that restrict data sharing. When researchers cannot access pertinent information, it limits their ability to conduct thorough analyses and draw robust conclusions. Furthermore, inconsistent or poor-quality data can undermine the validity of research findings, making it difficult for educators to apply insights effectively.

Collaboration barriers also pose significant challenges in education research. Effective research often requires interdisciplinary approaches, involving input from educators, policymakers, and researchers from various fields. However, fostering collaboration can be difficult due to differing priorities, communication gaps, and organizational silos. Additionally, researchers may find it challenging to engage practitioners in the research process, as educators often face time constraints and competing demands in their day-to-day responsibilities. This disconnect can lead to a lack of buy-in for research initiatives and diminish the potential impact of findings on educational practices.

In summary, overcoming these challenges—funding constraints, access to data, and collaboration barriers—requires concerted efforts from all stakeholders in the education sector. By addressing these issues, the field of education research can become more robust and effective in driving meaningful improvements in teaching and learning.

5.5 Future Directions in Education Research

As we look toward the future of education research, several emerging trends and directions are poised to shape the landscape of teaching and learning. One of the most significant developments is the integration of artificial intelligence (ai) and machine learning into educational practices. These technologies have the potential to revolutionize personalized learning experiences by analyzing vast amounts of data to identify individual student needs, preferences, and learning styles. Ai-driven platforms can adapt instructional content and pacing, providing tailored support that enhances student engagement and academic performance.

In addition to ai, the rise of immersive technologies such as virtual reality (vr) and augmented reality (ar) is set to transform educational experiences. These tools allow students to explore complex concepts in interactive ways, facilitating deeper understanding through experiential learning. For instance, vr can enable students to conduct virtual science experiments or explore historical events in a way that traditional classroom settings cannot replicate. Research into the effectiveness of immersive learning environments will be crucial in understanding how these technologies can best be integrated into curricula.

Moreover, the shift toward hybrid and blended learning models is likely to persist as educational institutions adapt to the evolving needs of learners. The covid-19 pandemic has accelerated the adoption of online learning platforms, prompting educators to rethink their instructional strategies. Future research will need to focus on best practices for combining face-to-face and online learning, ensuring that all students receive equitable access to quality education regardless of their learning environment.

Social and emotional learning (sel) is another area gaining traction in education research. Recognizing the importance of fostering students' emotional intelligence and interpersonal skills, researchers are exploring effective methods to integrate sel into school curricula. This shift towards holistic education aims to equip students with the skills necessary to navigate an increasingly complex world, emphasizing the role of empathy, collaboration, and resilience.

Lastly, education research will increasingly emphasize equity and inclusion, addressing disparities in educational access and outcomes. As classrooms become more diverse, researchers must investigate culturally responsive pedagogies that affirm students' backgrounds and experiences. This focus will ensure that all learners feel valued and supported, promoting an inclusive educational environment [5].

In summary, the future of education research is poised to be shaped by advancements in technology, evolving pedagogical approaches, and a commitment to equity and inclusivity. These trends will require ongoing collaboration among educators, researchers, and policymakers to develop innovative solutions that meet the diverse needs of learners in a rapidly changing educational landscape.

6 CONCLUSION

Throughout this paper, we have explored the pivotal role that education research plays in enhancing teaching methodologies and improving student outcomes. The findings underscore the necessity for educators to adopt innovative strategies, such as collaborative learning techniques and technology integration, to foster engaging and inclusive learning environments. The significant improvements in student engagement, performance metrics, and overall satisfaction reported in the results highlight the positive impact of these methods.

Moreover, the literature review has elucidated various theoretical frameworks that inform educational practices, emphasizing the importance of understanding diverse learning needs. By recognizing the value of culturally responsive pedagogy and acknowledging the limitations of traditional approaches, we can better address the challenges facing today’s educational institutions [6].

The mixed-methods methodology applied in this study provided a comprehensive view of the educational landscape, capturing both quantitative data and qualitative insights from educators and students. This dual approach not only strengthens the validity of the findings but also illustrates the nuanced experiences of participants in the learning process [7]. As we reflect on the future of education research, we must acknowledge the ongoing challenges such as funding constraints, data access issues, and collaboration barriers. Addressing these challenges is crucial for advancing our understanding of effective educational practices. The integration of emerging technologies, personalized learning experiences, and a commitment to equity will further enhance the field, ensuring that we meet the diverse needs of all learners [8].

In conclusion, the importance of ongoing research in education development cannot be overstated. Continued exploration and adaptation of innovative methodologies will be essential in shaping effective educational practices that prepare students for success in an ever-evolving world. By fostering a culture of inquiry and collaboration among educators, researchers, and policymakers, we can create a dynamic educational landscape that meets the needs of all learners.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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HOME ENVIRONMENT, LEARNING STYLE AND ACADEMIC ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN MATHEMATICS IN OYO TOWN, OYO STATE, NIGERIA

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Abstract: This study examined the impact of home environment and learning style on the students' academic achievement in secondary schools in mathematics in Oyo town, Oyo state, Nigeria. The population of the study consisted of all secondary school students in Oyo Town, Oyo State, Nigeria. Ten (10) public secondary schools were randomly selected for the study with 20 respondents chosen from each school, resulting in a total sample of 200 students. SS2 students were used for the study. Three instruments were used for the study i.e. Questionnaire on the Home Environment, Questionnaire on Learning Styles and Mathematics Achievement Test (MAT) with reliability coefficients 0.91, 0.89 and 0.88 respectively. The instrument were given both face and content validity by experts in the field of mathematics education and evaluation. Four research questions guided the study. The collected data were analyzed using descriptive and inferential statistics. The finding revealed that there is no significant linear relationship between home environment and students' academic achievement in mathematics; that the learning styles do not significantly affect students' academic achievement in mathematics; that there is a statistically significant positive relationship between the parental participation and home environment; and that students' learning style and their degree of mathematical achievement are substantially related. Based on the findings, it was recommended among others that Schools should organize workshops and seminars to educate parents on the importance of their active involvement in supporting their children's language learning, particularly in Mathematics.
Keywords: Home environment, Learning style and Academic achievement, Mathematics

1 INTRODUCTION

Since the 19th century, the discourse surrounding mathematics education in the Western world has been extensive and has engaged prominent mathematicians. This debate encompasses all age groups of learners, from primary school to university-level mathematics education. Many pupils in primary and secondary education encounter challenges in mastering some components of the mathematics curriculum. Like pupils encountering challenges in learning mathematics, teachers also face issues in delivering effective instruction within the Nigerian educational system. This has posed problems for parents, students, educators, and education professionals. Educators are currently confronted with the challenge of delivering effective instruction that leads to improved student performance in both internal and external assessments [1].

Throughout the history of didactics, educational methodologies, and science education, no discipline has been as extensively examined as mathematics. There is no doubt: that mathematics is difficult and for most students the learning of maths is a problematic question. Furthermore, mathematics is directly associated with the development of sciences such as physics and engineering which have a significant influence on daily life, so mathematics education needs also, at least in part, to be connected with the changing necessities of society [2].

Mathematics encompasses human activities and, broadly speaking, is a discipline that cultivates an individual's scientific reasoning skills. The primary objectives of mathematics in secondary schools which are the capacity to recognise numbers and perform basic Functions, Data Collection and Interpretation, Critical Thinking and Problem Solving among others nowadays are no longer realised. One of the causes for this may be due to the poor basis on which mathematics finds itself right from the secondary school level of the pupils which leads to the students' low performance in it as a subject.

One significant aspect impacting academic progress in mathematics is the home environment. The family plays a vital influence in moulding pupils' attitudes towards learning and can considerably impact their academic success [3]. Students from parents that appreciate and encourage education are more likely to develop favourable attitudes toward learning. Conversely, students with less supportive home contexts may struggle to engage with their studies, resulting in lower competence levels.

The family environment greatly impacts a student's educational journey, especially in mathematics education considering it crucial to national development. Parental involvement, such as assisting with schoolwork or engaging in joint problem solving, and reading, provides a healthy learning climate. Castro, Sims, Dearing and Spielvogel [4] demonstrated that parental participation is substantially connected with better reading and numeracy.

Learning styles refer to the varied ways individuals choose to learn and absorb information. In educational settings, knowing different types is vital for developing effective teaching tactics, particularly in language acquisition. One of the key learning styles is visual learning, where pupils prefer to utilize images, diagrams, and other visual aids to understand concepts. This strategy can dramatically affect language acquisition mathematics, by boosting vocabulary retention and comprehension through visual context [5]. Visual learners can benefit from flashcards, films, and pictorial representations of mathematical topics.

The inclusion of learning styles into mathematics training can assist address individual disparities among students. Tailoring teaching methods to meet varied learning styles can lead to more effective and individualized mathematics training, enabling improved engagement and motivation. This approach supports the assumption that a one-size-fits-all method is less effective than a differentiated strategy that considers students' preferred learning styles [6]. Research also suggests that mixing multiple learning styles in a multimodal strategy can boost mathematics learning outcomes and accomplishment [7]. Despite the benefits, it is crucial to understand that learning styles are simply one component of mathematical proficiency. Other elements, like as motivation, and exposure to mathematical materials, also play essential roles. Therefore, tailoring teaching approaches to learning styles can boost academic accomplishment in mathematics [8].

The combination of family environment and learning style generates a complicated foundation for accomplishment in mathematics. Research indicates that matching these parameters favourably can lead to higher proficiency levels [9]. A supportive home setting can foster good language attitudes, while an appropriate learning style can boost instructional efficacy. Misalignment among these components can result in problems and lower proficiency outcomes. This study analyzes the impacts the home environment and learning style have on students' academic progress in secondary schools in Oyo town, Oyo state, Nigeria.

1.1 Statement of the Problem

Despite the critical role of mathematics education in Nigeria, especially in Oyo Town, students' performance remains markedly below expectations. This situation highlights issues with current teaching methods and underscores the need to explore factors affecting achievement in mathematics. Although mathematics is a mandatory part of the secondary school curriculum, inconsistencies in implementation, along with insufficient resources, training, and support for teachers, contribute to the problem. Additionally, Key predictors such as the home environment and their learning styles significantly influence achievement levels. Parental involvement and socioeconomic status impact students' attitudes and motivation, while mismatched learning styles and inadequate teaching strategies further hinder proficiency. This study aims to investigate these factors and their interactions to develop effective strategies for improving mathematics achievement among secondary school students in Oyo Town, Oyo State, Nigeria.

1.2 Purpose of the Study

The main purpose of this study is to investigate the impact of home environment and learning style on the academic achievement of secondary school students in mathematics in Oyo Town, Oyo State, Nigeria. Specifically, it sought to:

1. Examine the relationship between home environment and students' academic achievement in mathematics.
2. Explore how different learning styles affect students' academic achievement in mathematics.
3. Assess the extent to which parental involvement in the home environment contributes to students' academic achievement in mathematics.
4. Determine the effectiveness of current teaching strategies in accommodating different learning styles for students' academic achievement in mathematics.

1.3 Research Questions

The following research questions are raised and answered to guide the conduct of this study:

1. What is the relationship between the home environment and students' academic achievement in mathematics?
2. In what ways do different learning styles affect students' academic achievement in mathematics?
3. To what extent does parental involvement in the home environment contribute to students' academic achievement in mathematics?
4. How effective are current teaching strategies in accommodating different learning styles for students' academic achievement in mathematics?

2 METHODOLOGY

The study adopted a descriptive survey research design to examine how the home environment and learning style predicted the academic achievement in mathematics of secondary school students in Oyo Town, Nigeria. The population of the study consisted of all secondary school students in Oyo Town, Nigeria. Ten (10) public secondary schools were randomly selected schools were selected for the study, with 20 respondents chosen from each school, resulting in a total sample of 200

students. SS2 students were used for the study because they are considered to have covered most items on the syllabus and not preparing for any external examination at the period of the study. A simple random sampling technique was employed to ensure that every student in the population had an equal chance of being selected.

The study utilized self-structured questionnaires and Mathematics Achievement Test (MAT) as the research instruments. The questionnaires are tagged "Questionnaire on the Home Environment" and "Questionnaire on Learning Styles" Each section contained structured items on a Likert scale, ranging from strongly agree to strongly disagree. The instrument also included a section for demographic data, such as age, gender, and parental education levels. The research instrument underwent content and face validation by experts in mathematics and measurement and evaluation. A trial test was conducted to determine the reliability of the instruments using Cronbach's Alpha. For this trial testing, the instruments were administered to respondents outside the scope of the study to ensure that the measurements generated by the questionnaire for the students were consistent. Four schools were sampled with forty (40) respondents for the instruments. The selected sampled schools and respondents had the same characteristics as the intended sampled population. The coefficients obtained were as follows: home environment (0.91), learning styles (0.89) and mathematics achievement test (0.88). Data collection was conducted over four weeks. The researchers obtained permission from the selected schools to administer the instruments to students during school hours. The instruments were distributed to the students in their classrooms, and they were given ample time to complete them. The researchers provided clear instructions and were available to answer any questions from the students during this process. The completed instruments were collected immediately after completion to ensure a high response rate. The collected data were analyzed using descriptive and inferential statistics. Descriptive statistics, such as mean and standard deviation, Pearson correlation, t-test, ANOVA and Regression analysis were conducted at a 0.05 level of significance.

3 RESULTS

The results were stated according to the stated research questions as follows;

Research Questions 1: What is the relationship between home environment and students' academic achievement in mathematics?

Table 1 Descriptive Analysis of Home Environment and Students' Academic Achievement in Mathematics

Correlations

		Home Environment	MAT Scores
Home Environment	Pearson Correlation	1	.131
	Sig. (2-tailed)		.064
	N	200	200
MAT Scores	Pearson Correlation	.131	1
	Sig. (2-tailed)	.064	
	N	200	200

P > 0.05

The correlation coefficient (r) between home environment and students' academic achievement in mathematics is .13 with a p-value of .064. Since the p-value is greater than .05, the correlation is not statistically significant. This indicates that there is no significant linear relationship between home environment and students' academic achievement in mathematics.

Research Questions 2: In what ways do different learning styles affect students' academic achievement in mathematics?

Table 2 Analysis of Variance Test of learning styles and Students' Academic Achievement in Mathematics

ANOVA

Learning Style

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	469.505	5	93.901	1.001	.418
Within Groups	18194.475	194	93.786		
Total	18663.980	199			

P > 0.05

The analysis of variance (ANOVA) test was conducted to examine the impact of different learning styles on students' academic achievement in mathematics. The results indicate that there was no significant difference in mathematics test scores among students with different learning styles ($F(5,194) = 1.001$, $p > .05$). Hence, the learning styles do not significantly affect students' academic achievement in mathematics.

Research Questions 3: To what extent does parental involvement in the home environment contribute to students' academic achievement in mathematics?

Table 3 ANOVA Table for Regression Analysis of Parental Involvement in the Home Environment and Students' Academic Achievement in Mathematics.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.137[a]	.019	.014	.733

a. Predictors: (Constant), Test Scores

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.030	1	2.030	3.779	.053[b]
	Residual	106.325	198	.537		
	Total	108.355	199			

a. Dependent Variable: Parental Involvement
b. Predictors: (Constant), Test Scores
P > 0.05

The results in Table 3 provide an ANOVA summary and model statistics for the regression analysis assessing the extent to which parental involvement in the home environment contributes to students' achievement in mathematics. The results indicate a statistically significant positive relationship between the two variables ($F(1,198) = 3.78$, $p = .053$). However, the effect size, as indicated by the R-squared value of .019, is relatively small, suggesting that parental involvement accounts for only 1.9% of the variance in students' academic achievement in mathematics.

Research Questions 4: How effective are current teaching strategies in accommodating different learning styles for students' academic achievement in mathematics?

Table 4 Paired Sample t-Test on the Current Teaching Strategies in Accommodating Different Learning Styles for Students' Academic Achievement in Mathematics

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	LearningStyle	40.01	200	9.684	.685
	TestScores	7.18	200	1.305	.092

Paired Samples Test

		Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	LearningStyle - Test Scores	32.835	9.929	.702	31.451	34.219	46.769	199	.000

P < 0.05

The paired sample t-test was conducted to compare the mean scores of learning styles and students' academic achievement in mathematics. The results indicate a significant difference between the two variables ($t(199) = 46.77$, $p < .05$). The positive t-value suggests that the mean score for learning styles is significantly higher than the mean score for students' academic achievement in mathematics. This finding implies that while students may have diverse learning styles, the current teaching strategies may not be effectively accommodating these differences, leading to a lower level of mathematics achievement among the students. The results show that students' learning preferences and their level of mathematics achievement are significantly correlated.

Table 1 shows that there is no significant linear relationship between home environment and students' academic achievement in mathematics. This outcome fits with the findings of Taylor and Gebre [10], who argued that while the home environment influences some academic outcomes, its effect on mathematics is frequently indirect, mediated by other factors such as motivation and instructional quality. Xue and Meisels [11] likewise opined that academic progress in mathematics is frequently more strongly connected with exposure to excellent pedagogical tactics and consistent practice than with the overall home setting. Furthermore, the findings underline the significance of focused interventions in schools to boost academic progress in mathematics, independent of the students' home backgrounds. This perspective is consistent with Dörnyei and Ryan's [12] view that successful mathematics achievement hinges on a combination of intrinsic and extrinsic factors, where classroom dynamics and individual learner differences often overshadow the broader home context in determining students' academic achievement in mathematics.

Furthermore, the data demonstrated that the learning styles do not significantly affect students' academic achievement in mathematics. The result agrees with the work of Desforges and Abouchaar [13], who suggested that while learning styles provide insights into students' preferences, they are not direct predictors of academic performance. This means that elements

beyond individual learning styles, such as instructional approaches, teacher efficacy, and students' motivation, may play a more essential role in mathematical accomplishment. Furthermore, the findings confirm Timmons, Pelletier and Corter [14], who found that instructional designs that focus on material delivery and alignment with learning objectives had a better impact than those that rely purely on learning style preferences. As a result, this research encourages educators to adopt a variety of teaching tactics that completely engage students, regardless of their chosen learning style, to increase students' academic progress in mathematics.

The results in Table 3 demonstrated a statistically significant positive relationship between the two factors that is, parental participation and home environment. This accord with the discoveries of Wilder [15], who stressed that while parental participation favourably benefits educational results, its influence is typically intertwined with other environmental and individual factors. Similarly, Armstrong [16] argued that the home environment provides foundational support for academic success, particularly when parents actively engage in their children's learning activities. Despite the limited contribution of parental participation in this setting, its significance cannot be underestimated. Effective parental engagement offers pupils motivation and support that boosts their confidence and enthusiasm in studying. This finding is corroborated by Hornby and Lafaele [17], who stated that parental participation is vital for cultivating academic motivation and cognitive development; even if it's direct contribution to quantifiable outcomes may be restricted. Consequently, while parental participation is a vital component of student's academic achievement, it is imperative to study and incorporate additional pedagogical and environmental measures to optimize language proficiency. This illustrates that even while students have varied learning styles, many classrooms' teaching techniques might not be sufficient to accommodate these variances. As a result, this misalignment between teaching approaches and students' learning preferences may make it more difficult for them to become more adept in mathematics. According to Fleming and Baume [18], academic performance is better when teaching tactics are changed to meet students' learning preferences. These findings are consistent with their studies. According to Bautista [19], taking into account each student's unique learning preferences also increases involvement and promotes deeper understanding, both of which are crucial for mastering challenging talents like language acquisition.

Table 4 demonstrates that students' learning style and their degree of mathematical achievement are substantially associated. Teachers must utilize more inclusive and differentiated teaching techniques because of the glaring inequalities in learning styles and competency. Regardless of their preferred learning styles, these strategies would guarantee that every student may get the highest possible results when learning mathematics. According to Mayo and Siraj [20], mathematics teachers need to be aware of the variety of students' learning styles to construct courses that successfully bridge these gaps. The usefulness of experiential learning frameworks, which accommodate varied learning styles and boost performance in applied disciplines like languages, is ultimately validated by a study by Adeniyi and Funmilayo [21]. To address the identified problems in teaching mathematics, these academic findings suggest the urgent demand for a pedagogical shift.

4 CONCLUSION

This study studied the links between family environment, and learning styles in predicting the secondary school students' academic achievement in mathematics in Oyo Town, Oyo State, Nigeria. The results demonstrated no significant linear links between pupils' academic achievement and their home environment suggesting that exposure, practice, and quality of instruction have a bigger impact on mathematical learning. In a similar vein, learning styles did not significantly predict proficiency in mathematics, showing that captivating instructional designs and successful teaching approaches may have a higher influence than tailoring lessons to suit individual learning preferences. Nonetheless, there was a minor but noticeable positive link between students' achievement in mathematics and parental involvement, underscoring the importance of active parental involvement. These results underscore the requirement for a holistic strategy for boosting mathematical achievement, integrating strong teaching methods, caring home settings, and expanding educational possibilities to improve academic results.

5 RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made:

- Schools should organize workshops and seminars to educate parents on the importance of their active involvement in supporting their children's language learning, particularly in Mathematics.
- Teachers should adopt innovative and engaging teaching methods that cater to diverse learning preferences, such as incorporating multimedia tools, interactive mathematics games, and role-playing activities to make Mathematics lessons more interesting and effective.
- Schools should ensure the availability of adequate mathematics learning resources, such as textbooks, audio-visual materials, and digital tools, to create an enriched mathematical learning environment.
- Educational authorities should formulate policies that support the teaching and learning of mathematics, including subsidies for mathematics learning materials, scholarships for students studying mathematics, and incentives for mathematics teachers.

• Regular monitoring and evaluation of mathematics programmes should be conducted to assess their effectiveness and identify areas for improvement, ensuring that teaching practices and learning outcomes align with national educational goals.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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COMPARISON OF THEORETICAL MODELS OF ACCULTURATION FROM THE PERSPECTIVE OF EDUCATIONAL PSYCHOLOGY

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Abstract: This study investigates the phenomenon of acculturation, especially cultural shock among international students, focusing on its underlying mechanisms and potential mitigation strategies. Despite the increasing number of students studying overseas, many encounter significant psychological and socio-cultural challenges due to cultural differences, leading to issues such as depression and anxiety. This paper reviews the existing literature on acculturation, tracing its crucial definition and stages. The U-curve and W-curve models are examined to understand the temporal dynamics of cultural adaptation, with particular attention to the four-stage model. Additionally, by comparing Self-Determination Theory and its sub-theories, including Cognitive Evaluation Theory, Organismic Integration Theory, Basic Psychological Needs Theory, Causality Orientation Theory, and Goal Content Theory, it highlights that fulfilling basic psychological needs and fostering intrinsic motivation can enhance international students' resilience against cultural shock. This research sheds light on understanding and addressing the challenges faced by international students in cross-cultural environments, ultimately contributing to their improved mental health and academic success.
Keywords: Models of acculturation; Educational psychology; International students; Theoretical comparison

1 INTRODUCTION

The influx of international students into international educational systems presents a unique set of challenges associated with cross-cultural adaptation in the context of globalization. Among these challenges, cultural shock stands out as a critical issue that significantly impacts students' academic performance and psychological well-being [1]. This phenomenon not only poses significant challenges for international students but also has profound implications for their socio-cultural adaptation to the updating of educational technology [2-3].

The objective of this study is to delve into the experiences of international students, particularly focusing on the process and impact of cultural shock. By examining the theoretical frameworks that encapsulate cultural shock, this research aims to provide a comprehensive understanding of how cultural shock unfolds and its effects on students' adaptation. The study also seeks to explore the role of self-determination theory in mitigating the impact of cultural shock, considering the motivational processes and psychological needs that influence students' responses to new cultural environments.

This research is grounded in the theoretical analysis method, which allows for an in-depth examination of existing literature and the development of a robust theoretical model. By synthesizing insights from various theoretical perspectives, including cognitive evaluation theory, organic integration theory, basic psychological needs theory, causality orientation theory, and goal content theory, this study aims to contribute to the existing body of knowledge on cultural shock and offer practical recommendations for enhancing cross-cultural adaptability among international students. The findings of this research are expected to provide valuable insights for educators, policymakers, and support services in designing interventions that can help international students navigate the challenges of cultural shock more effectively.

2 RESEARCH METHOD

The study employed a theoretical analysis approach to investigate the phenomenon of cultural shock among international students. This methodology was chosen for its ability to provide a comprehensive understanding of the theoretical underpinnings and practical implications of the research topic [4]. The process began with the identification of the research problem, where the focus was to clarify the issues at hand, define the relevant theories and concepts, and establish the purpose and significance of the study [5].

A thorough literature review was conducted to examine existing literature related to the research question. This involved an exploration of both theoretical frameworks and empirical findings to identify gaps and deficiencies in current research. This step was crucial in determining the innovative aspects and potential breakthroughs for the study.

The theoretical foundation was then analyzed based on the research question. This involved a deep analysis and understanding of existing theories or concepts, including their connotations, extensions, and logical relationships. Both inductive and deductive methods were employed to categorize theories or concepts into themes, models, or patterns, which were then explained and elaborated upon.

Subsequently, a theoretical model was constructed on the basis of the analyzed theoretical foundation. This model could take the form of mathematical, conceptual, or empirical models, transforming theories or concepts into operable and measurable variables or indicators.

Theoretical deduction was then carried out based on the established model, leading to conclusions and recommendations. The study concluded with the derivation of findings based on the results of the theoretical deduction. These conclusions aimed to explain the connotations and extensions of existing theories or concepts, as well as their significance and value in practical applications.

Finally, the findings were presented in the form of this research paper. Attention was paid to the structure and format of the paper, including sections such as the title, abstract, introduction, main body, and conclusion. Additionally, the clarity and readability of the language, as well as the citation and formatting of figures and references, were carefully considered.

The draft was then subjected to multiple revisions to refine and perfect the research. This involved ensuring the accuracy and fluency of the language, as well as the logical and systematic nature of the arguments. The innovation and practical utility of the paper were also emphasized to provide a valuable reference for future research.

3 DEFINITION AND KEY PROCESSES OF CULTURAL SHOCK

Kalervo Oberg first formally defined cultural shock as anxiety caused by the loss of all familiar signs and symbols of social interaction [6]. Cultural shock is sometimes referred to as a "cultural cold" or "cultural shock", with the former implying its universality and the latter expressing its severity. Levine and Adelman described cultural shock as a feeling of bewilderment and disorientation. In other words, cultural shock is regarded as a negative psychological reaction and mental disorder. It is evident that cultural shock poses significant challenges for international students and can negatively impact their psychological and socio-cultural adaptation. Based on existing literature, cultural shock is a process of negative emotions experienced by international students when they leave their home country and arrive in the host country, due to changes in environment, culture, language, and customs.

To investigate the issue of cultural shock, scholars from various fields worldwide have studied its overall process. One of the most well-known hypotheses is the U-curve hypothesis. Lysgaard observed in his research that the adjustment process of individuals experiencing cultural shock seems to follow a U-shaped curve, as seen in Figure 1 [7]. In this study, it was found that individuals who stayed in the United States for less than six months or more than 18 months adapted well, while those who stayed between six and 18 months did not adapt well. These individuals appeared to experience a "crisis," feeling less adapted, lonely, and unhappy.

Figure 1 A U-shaped Curve of Cultural Shock

Kalervo Oberg confirmed Lysgaard's U-curve theory and divided the process of cultural shock into four stages: the honeymoon stage, the shock stage, the "adjustment stage, and the adaptation and enjoyment stage, thereby summarizing the four-stage theory of cultural shock [6]. Initially, individuals experience the novelty of the new culture, facing life with an optimistic and positive attitude, similar to being on a honeymoon. As the novelty of the honeymoon stage fades, individuals gradually confront the realities of overseas life, including issues related to school, language, housing, transportation, and shopping. This marks the beginning of the shock stage, during which individuals develop hostile and aggressive attitudes towards the host country. In this stage, significant anxiety and confusion arise as cultural shock continuously impacts the mental and psychological defenses of international students, thereby affecting their academic performance, daily life, and mental health. After experiencing the shock stage, individuals gradually understand the local culture, adopt a more inclusive and accepting attitude towards cultural differences, and begin to adjust and adapt to their new environment.

Oberg's four-stage model is widely accepted. For example, combined Oberg's model to study the commonality and similarity of cross-cultural adaptation among international students, as well as how internal and external factors influence the choice of adaptation strategies. Oberg's four-stage model is a significant model in the study of cultural shock. As research on cultural shock has increased, other scholars have proposed alternative theories regarding its process. For instance, Adler proposed a five-stage theory: Contact, Disintegration, Reintegration, Autonomy, and Independence [8]. He argued that this cultural transition process is itself a learning experience. It can also further divide the stages of cultural shock into seven phases more accurately to reflect its gradual and developmental nature. These seven stages are: excitement, anxiety, rejection, regression, recovery, acceptance, and adaptation and enjoyment. Observations reveal that both the five-stage and seven-stage theories follow a U-shaped curve. Gullahom and Gullahom proposed the W-curve theory. When sojourners return to their home country, they experience a similar cultural adaptation process as when they initially left, resulting in a W-shaped curve [9]. The W-curve is commonly seen among international students, with many experiencing difficulties readjusting upon returning home, leading to negative emotions. The overseas study experience can also blur students' subjective identities and exacerbate the negative impacts of cultural shock. If each phase of cultural adaptation in the W-curve, where individuals encounter a culture different from their most recent residence, is considered an independent process, the W-curve can be decomposed into two cultural adaptation processes, each still following a U-shaped curve.

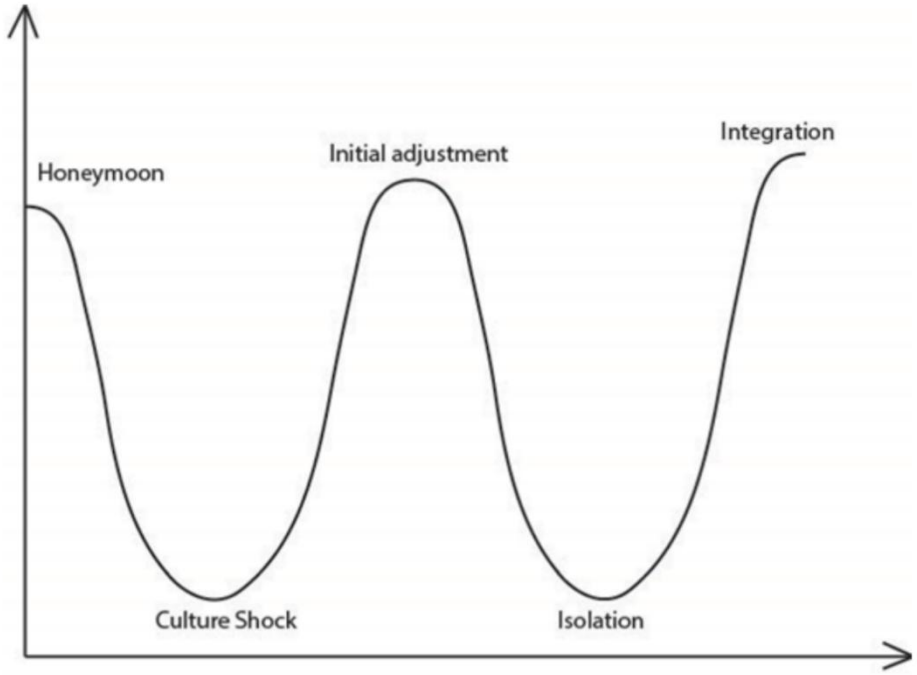

Figure 2 W-curve

In academia, some scholars' research does not align with the U-curve theory. For example, Ward conducted a questionnaire survey of 35 Japanese international students in New Zealand, examining their experiences at four-time points: 24 hours, four months, six months, and 12 months after arrival [10]. The findings contradicted the U-curve theory, as most students reported feeling lonely and depressed upon arrival in New Zealand, rather than excited. The limitation of this study lies in the time segmentation, and this research will continue to validate the curve models.

In brief, extensive research on the process of cultural shock results in various methodologies and stage theories. However, Lysgaard's U-curve theory and Oberg's four-stage model remain the primary theoretical foundations for cultural shock research and serve as the basis for many studies afterwards. These two models deserve to be remained.

4 SELF-DETERMINATION THEORY AND ITS SUB-THEORIES

4.1 Self-Determination Theory

Self-Determination Theory (SDT) is a macro-theory proposed by Deci and Ryan regarding the motivational processes and personality related to human self-determined behavior [11]. It posits that motivation is a dynamic and modifiable process. In its early development, SDT consisted of four sub-theories: Cognitive Evaluation Theory, Organismic Integration Theory, Basic Psychological Needs Theory, and Causality Orientation Theory. Later, Kasser and Ryan, while studying the relationship between basic psychological needs and goal content, proposed the fifth sub-theory of SDT, namely Goal Content Theory, thereby enriching the entire theoretical framework [12].

4.2 Cognitive Evaluation Theory

Cognitive Evaluation Theory links extrinsic rewards with intrinsic rewards and explores their relationship. This theory describes how social and environmental factors influence an individual's intrinsic motivation [13]. Specifically, information from the social and environmental context directly affects an individual's self-evaluation, which in turn impacts the development of intrinsic motivation. The theory suggests that overemphasizing extrinsic motivational factors can lead to the atrophy of intrinsic motivation. For instance, when a student is intrinsically motivated to learn dance out of interest and passion, providing extrinsic material rewards based on their performance in a competition may reduce their enthusiasm for practicing dance. This occurs because the reward makes the student feel that they are learning or practicing for the sake of the reward, rather than for their own interests and passions, leading to a loss of interest and decreased motivation.

The relationship between intrinsic and extrinsic motivation corroborated this phenomenon. To be specific, informational events promote an individual's internal causal perception and sense of competence, thereby enhancing intrinsic motivation levels; controlling events creates pressure, increases external causal perception, reduces feelings of autonomy, and thus weakens intrinsic motivation; de-motivating events signify ineffectiveness, and individuals experiencing de-motivation feel incompetent, which undermines intrinsic motivation [14]. Cognitive Evaluation Theory precisely links extrinsic and intrinsic rewards and explores their relationship.

4.3 Organismic Integration Theory

Organismic Integration Theory categorizes individual motivation into three types: extrinsic motivation, intrinsic motivation, and amotivation [15]. Extrinsic motivation relies on external reward and punishment systems, while intrinsic motivation is driven by personal interests, hobbies, and the satisfaction derived from completing tasks [15]. Amotivation refers to situations where the outcome of an event is entirely unrelated to the individual [16]. It highlights the side effects of acculturation.

5 CONCLUSION

This study has provided an examination of the phenomenon of cultural shock. Building upon the foundational work of scholars, this research has explored the multifaceted nature of cultural shock, its stages, and its profound impact on students' psychological and socio-cultural adaptation.

The U-shaped curve hypothesis and Oberg's four-stage model have been instrumental in understanding the trajectory of cultural shock, illustrating the transition from initial excitement to a period of crisis and eventual adaptation. This study has further highlighted the importance of considering individual differences and the role of external factors in shaping students' experiences of cultural shock.

By integrating SDT into the analysis, this research has shed light on the motivational processes and psychological needs that influence students' responses to acculturation. The findings underscore the significance of intrinsic motivation and meet basic psychological needs that are autonomy, competence, and relatedness, in fostering resilience and facilitating positive adaptation outcomes.

The study's conclusions have several implications for practice. Firstly, it suggests that educational institutions and support services should focus on strategies that enhance students' intrinsic motivation and satisfy their basic psychological needs. This could involve providing opportunities for autonomy, fostering a sense of competence, and promoting social connections and belonging. Secondly, the findings highlight the need for culturally sensitive and tailored support services that address the unique challenges faced by international students during different stages of cultural shock.

Moreover, this research underscores the importance of further empirical studies to validate the theoretical models and to explore the applicability of these models across different cultural contexts and student populations. Future research could also investigate the long-term effects of cultural shock and the development of cross-cultural competencies, which are crucial for students' academic success and personal growth. By understanding the dynamics of cultural shock and the role of self-determination, educators and policymakers can better support international students in navigating the complexities of studying abroad, ultimately enhancing their overall experience and outcomes.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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GENDER ROLES AND FAMILY VALUES AS CORRELATE OF GIRL-CHILD EDUCATIONAL DEVELOPMENT IN IKWERRE ETHNIC GROUP OF RIVERS STATE, NIGERIA

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Abstract: This study investigated gender roles and family values as correlate of girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria. Employing a correlational research design, the research focused on a population of 265,400 parents comprising of 152800 men and 112600 women from four communities across two Local Government Areas: Obio/Akpor (Rumuodomaya and Choba) and Port Harcourt (Rumuokwuta and Ogbunabali). A two-stage sampling method was used to select 400 participants, including 225 fathers and 175 mothers, based on the Taro Yamane formula. Data collection involved two self-structured questionnaires: the Girl-Child Gender Roles and Family Values Questionnaire (G-CGRFVQ) and the Girl-Child Educational Development Questionnaire (G-CEDQ), both validated by experts with reliability coefficients of 0.76 and 0.78. Out of 400 distributed copies, 241 were returned, yielding a 60.25% return rate. The study employed statistical methods, including mean, standard deviation, and regression analyses, to address the research questions. Specific hypotheses were tested using multiple regression with analysis of variance (ANOVA) at a 0.05 significance level, supplemented by simple regression with t-tests to establish joint correlation significance. Findings revealed that in Ikwerre ethnic group, gender roles (20.7%) and family values (14.6%) individually have limited correlation to girl-child educational development but their combined effect (30.6%) is moderate, highlighting the need for increased support. It was therefore concluded and recommended that comprehensive reforms addressing educational policy, community engagement, and targeted educational programmes providing mentorship and tutoring support for disadvantaged girls are essential to improve girl-child education in Ikwerre ethnic group of Rivers State, Nigeria.
Keywords: Girl-Child education; Gender roles; Family values; Educational development; Ikwerre ethnic group

1 BACKGROUND TO THE STUDY

The Ikwerre ethnic group, located in Rivers State, Nigeria, plays an integral role in the socio-economic and political landscape of the Niger Delta region. Renowned for their industrious nature and resourcefulness, the Ikwerre people predominantly reside in four local government areas: Obio-Akpor, Port Harcourt, Emohua, and Ikwerre. These areas are home to critical institutions and industries, notably the oil and gas sector, higher institutions of learning such as the University of Port Harcourt as well as various commercial hubs that are essential to Nigeria's national development [1]. Given the strategic importance of the Ikwerre ethnic group to the economy of Nigeria, it is vital to ensure the educational development of all community members, especially the girl-child, to maintain their relevance and influence in national affairs.

Nevertheless, entrenched traditional gender roles and family values in Ikwerre communities appear to perpetuate patriarchal norms that favour male children over their female counterparts in crucial areas such as educational opportunity [2]. Like many African ethnic groups, the Ikwerre community is steeped in patriarchal traditions that designate the male child as the primary heir and the family's breadwinner, while the female child is often confined to women's work or family maintenance tasks. This cultural framework highlights the contradiction of a society striving for significant progress while simultaneously clinging to antiquated practices [3]. Such customs increasingly conflict with the imperative to unlock the full potential of all citizens, including women, to promote national development. It is alarming that, as with many other ethnic groups across Nigeria's Niger Delta, the Ikwerre girl-child may find herself overtime in a challenging position, caught between reinforcing traditional roles and the necessity of intellectual development for personal and national advancement [4].

Notably, the dynamics of gender roles and family values as it concerns the girl-child encompass a variety of factors that significantly influence individual families and their developmental trajectories. Key aspects worth evaluating include traditional beliefs regarding the girl-child daily living tasks, societal expectations regarding marriage and child-rearing, the impact of economic constraints on girl-child educational opportunities, girl-child life skills deficits- impeding their capacity to navigate complex social dynamics, build confidence, and develop a positive self-image among others. Within the Ikwerre ethnic group, these dynamics have evolved over time [5], often overshadowing the importance of girl-child intellectual development and leaving their potential largely untapped. As the adage goes, "education is the passport to the future." Consequently, the girl-child's future prospects become increasingly elusive, hindering personal growth, community progress,

and the development of balanced and effective leadership as well as professionals within the society. This stagnation will undoubtedly perpetuate cycles of inequality and poverty, diminishing the Ikwerre ethnic group's contribution to national development and limiting its capacity to address pressing societal challenges.

As a result, if the cycle of girl-child underdevelopment continues, it will have far-reaching and adverse consequences, affecting not only the Ikwerre ethnic group but also the nation as a whole. This situation at hand highlights the urgent need for a paradigm shift in attitudes and localized socio-cultural policy toward girl-child education within the Ikwerre ethnic group, emphasizing the importance of empowering girls to reach their full potential and make meaningful contributions to the larger society Therefore, understanding the correlation between gender roles, family values and educational development in the Ikwerre ethnic group of Rivers State, Nigeria is crucial. It will inform targeted strategies that will address these challenges so as to empower girls to reach their full potential thereby promoting inclusive growth, and unlocking opportunities for socio-economic advancement in Rivers State and prosperous nation-building.

2 STATEMENT OF THE PROBLEM

Despite the Ikwerre people's significant contributions to Nigeria's socio-economic landscape, deep-seated patriarchal norms continue to overshadow the potential of half the population - the girl-child. Caught between traditional expectations and modern aspirations, the girl-child struggles to find her place. The complacency of socio-cultural organizations who are custodians of family values within the ethnic group perpetuates cycles of disadvantage, restricting girls to limited roles that fail to contribute to the community's intellectual and economic vitality. As traditional values conflict with the imperative of cultivating educated leaders, the future prospects of the girl-child grow increasingly uncertain. If this trend continues unabated, the nation will be confronted with the stark reality of stifled growth and innovation, forfeiting the immense potential of women who could have blossomed into visionary leaders. Therefore, this study investigating the correlation between gender roles, family values, and girl-child educational development within the Ikwerre ethnic group of Rivers State assumes paramount importance.

2.1 Aim and Objectives of the Study

This study was aimed at investigating gender roles and family values as correlate of girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria. Specifically, the study sought to:

1. examine the extent to which gender roles correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.
2. ascertain the extent to which family values correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.
3. determine the extent to which gender roles and family values as joint variables correlate to girl-child educational development in the Ikwerre ethnic group of Rivers State, Nigeria.

2.2 Research Questions

1. To what extent do gender roles correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria?
2. To what extent do family values correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria?
3. To what extent do gender roles and family values as joint variables correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria?

2.3 Hypotheses

The following three (3) null hypotheses were tested at 0.05 alpha level.

1. Gender roles do not significantly correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.
2. Family values do not significantly correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.
3. Gender roles and family values as joint variables do not significantly correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.

2.4 Conceptual Framework

The study's framework is anchored on gender roles and family values pertaining to the girl-child and the need for the girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria, illustrated in Figure 1.

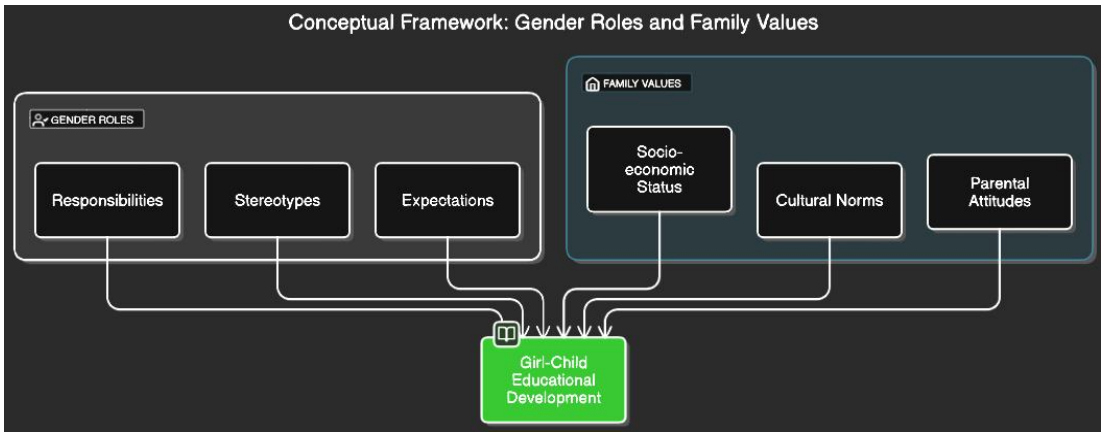

Figure 1 Relationship between Variables

Source: Researcher's conceptualization (2025)

2.5 Literature Review

The intersection of traditional gender roles and family values has profoundly impacted the educational development of the girl-child across various African ethnic groups, including the Ikwerre ethnic group in Rivers State, Nigeria [5,6]. Research has consistently shown that girls are socialized to prioritize modesty and humility over assertiveness and leadership, limiting their aspirations and undermining their potential for academic and professional success [7]. Studies have highlighted the pervasive influence of patriarchal family systems in perpetuating gender prejudice, fostering obedience and submissiveness in girls while discouraging leadership qualities [6,7].

In the Ikwerre context, cultural expectations emphasizing filial piety and discouraging deviation from traditional norms have been particularly detrimental to girls' educational development [5]. Similar patterns have been observed in other cultural contexts, such as Tajikistan, where traditional norms have comparable influences on girls' education [8]. However, researchers emphasize that local dynamics, such as those in Rivers State, require targeted approaches to dismantle entrenched biases limiting educational access [9]. The expectation for girls to focus on marital and maternal responsibilities is another deeply entrenched value hindering their educational development [10,11]. Surprisingly, in this 21st century where gender equality through quality and sustainable education as well as women's empowerment are increasingly advocated, some families are still prioritizing early marriages for their daughters as a means of securing family honour and reducing financial burdens with one man having the socio-cultural nod to have a good number of these beautiful as desired wives [12-14]. This cultural expectation resonates strongly in the Ikwerre ethnic group, where girls are often prepared for roles centered on marriage rather than career aspirations [5,11]. The persistence of such practices is perplexing, given that educating girls has been shown to improve family economic outcomes [1]. This contradiction underscores the complexity of balancing traditional values with modern educational demands. Girls in the Ikwerre ethnic group face additional pressures to conform to societal beauty standards and norms, diverting attention from their education [3]. Excessive time spent on unpaid domestic work and personal grooming leaves girls with limited time for academic pursuits [15]. The prioritization of family honor and reputation over individual needs continues to influence educational opportunities for the girl-child in the Ikwerre ethnic group [16]. Parents often restrict girls from participating in activities perceived as "male-dominated," perpetuating gender bias and limiting girls' academic interests [17,18]. However, shifts in cultural narratives, such as the Ashanti example in Ghana, demonstrate progress in integrating female education into traditional systems through effective community mobilization [19-21]. Community participation through empowerment efforts is crucial in breaking down these barriers. This approach can create a transformative ripple effect that changes the lives of girls in the Ikwerre community, setting them on a path to brighter futures [2,4,22].

2.6 Theoretical Framework

Gender role socialization theory, articulated by Lewis in 2006 and reinvigorated by Lips in 2018 asserts that the process of gender role socialization begins in the family environment[23,24], where children are introduced to societal expectations and gender norms. These norms vary across cultures, often subordinating and restricting the girl-child, diminishing her power and potential from an early age within the family context. This theory emphasizes parents' primary role in shaping their child's understanding of societal expectations and gender norms. Perceived disparities prompt parents to adjust family policies in pursuit of fairness, which is subjective and influenced by their social and cultural biases. Thus, the theory highlights how socialization, culture, and parenting, impact child's orientation about themselves and the world around them

which in most cases often subordinate status of the girl-child. The theory therefore informs this study on gender roles and family values as correlates of the girl-child's educational development in the Ikwerre ethnic group by presenting the intersection of variables to examine the complex relationships between gender socialization, family values, and educational outcomes.

3 METHODOLOGY

This study employed a correlational design, targeting a population of 265,400 parents comprising of 152800 men and 112600 women across four selected communities of in 2 Local Government Areas of Obio/Akpor (Rumuodomaya and Choba) and Port Harcourt (Rumuokwuta and Ogbunabali). A two stage sampling technique of disproportionately stratified sampling was utilized to select 400 participants comprising of 225 fathers and 175 mothers through Taro Yamane sample size determination formula. Data collection was facilitated using two self-structured instruments titled, Girl-Child Gender Roles and Family Values Questionnaire (G-CGRFVQ) and Girl-Child Educational Development Questionnaire (G-CEDQ), which underwent rigorous face and content validation by three experts. Both instruments consisted of ten items respectively. While G-CGRFVQ was divided into two sections, G-CEDQ was not sectionalized. Both instruments have responses captured on a four-point Likert scale of Very High Extent (VHE), High Extent (HE), Low Extent (LE), and Very Low Extent (VLE), assigned weighted values of 4, 3, 2, and 1, respectively. The instruments demonstrated a reliability coefficient of 0.76 and 0.78 respectively using Cronbach Alpha analysis. Out of the distributed copies of questionnaire, 241 copies were completed and returned—119 copies from fathers (119/225 x 100 = 52.89% return rate) and 122 copies from mothers (122/175 x 100 = 69.71% return rate), resulting in an overall return rate of 60.25% (241/400 x 100). The study addressed the research questions using mean, standard deviation and simple regression for research qiestions1 and 2, while multiple regression was used for research question 3. The hypotheses 1 and 2 were tested through multiple regression analysis associated with analysis of variance (ANOVA) at a 0.05 significance level. Simple regression analysis associated with t-tests was used to establish the significance of the joint relationships in hypothesis 3. The following indices were used to assess the strength and direction of the correlations between the independent variable and the outcome variable:

0- 25% (i.e. 0 - 0.25)	= Low	51 - 75% (i.e. 0.51 - 0.75)	= High
26 - 50% (i.e. 0.26 - 0.50)	= Moderate	76 - 100% (i.e. 0.76 - 0.100)	= Very High

(Source: Umeghalu & Onyeike [25])

4 RESULTS

4.1 Answer to Research Questions

Research Question 1: To what extent do gender roles correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria?

Table 1 Mean and Standard Deviation Scores of the Extent to which Gender Roles Correlate to Girl-Child Educational Development in Ikwerre Ethnic Group of Rivers State, Nigeria

S/N	Test Items from G-CGRFVQ Assessing Gender Roles and Girl-Child Educational Development	$\bar{x}$	sd	Remarks
1.	The cultural norms in most Ikwerre communities emphasize the importance of girls taking on family-oriented tasks, which may limit their opportunities for academic achievement.	2.55	0.34	High Extent
2.	In Ikwerre culture, it is commonly believed that girls are encouraged to engage in apprenticeships instead of pursuing advanced formal education.	2.63	0.38	High Extent
3.	Parents in my community encourage boys to pursue higher education more than girls.	2.60	0.36	High Extent
4.	In this Ikwerre community, gender stereotypes discourage girls from participating in traditionally male-dominated fields.	2.62	0.36	High Extent
5	Leaders in this community promote initiatives that favour male education over female education.	2.45	0.22	Low Extent
Cluster Mean/SD		**2.57**	**0.33**	High Extent

Criterion mean score = 2.50, r = 0.209, r^2 (coefficient of determinism) = 0.207, Adjusted r^2 = 0.207, n = 241

Results in Table 1 indicated that gender roles significantly influenced girl-child educational development in Ikwerre ethnic group, with a cluster mean of 2.57 (SD = 0.33) reflecting a high extent of impact. Most items indicated that cultural norms

and stereotypes contributed to this mean score, discouraging girls' academic progress. However, despite this significant influence, the coefficient of determinism was relatively low at $r^2 = 20.7\%$, illustrating that gender roles accounted for only 20.7% of the variance in girl-child education. This suggests that while gender roles hinder academic advancement, other factors also play a crucial role.

Research Question 2: To what extent do family values correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria?

Table 2 Mean and Standard Deviation Scores of the Extent to which Family Values Correlate to Girl-Child Educational Development in Ikwerre Ethnic Group of Rivers State, Nigeria

S/N	Test Items from G-CGRFVQ Assessing Family Values and Girl-Child Educational Development	$\bar{x}$	sd	Remarks
6.	Family emphasis on education affects girls' academic performance in a positive way.	2.27	0.14	Low Extent
7.	Support from family members influences a girl's decision to pursue higher education.	2.46	0.22	Low Extent
8.	Family financial constraints limit girls' access to quality education.	2.83	0.51	High Extent
9.	Parents believe that educating girls is equally important as educating boys.	2.49	0.28	Low Extent
10.	Families encourage girls to develop leadership skills and participate in community activities.	2.45	0.22	Low Extent
	Cluster Mean/SD	**2.50**	0.27	High Extent

Criterion mean score = 2.50, r = 0.149, r^2 (coefficient of determinism) = 0.146, Adjusted r^2 = 0.144, n = 241

Results in Table 2 indicated that family values influenced girl-child educational development in Ikwerre ethnic group, with a cluster mean of 2.50 (SD = 0.27) reflecting a high extent of impact. Most items revealed that family financial constraints (mean = 2.83, SD = 0.51) contributed the most to limiting girls' access to quality education, while support from family members and encouragement to develop leadership skills were rated as having a low extent of influence. However, the coefficient of determinism was relatively low at $r^2 = 14.6\%$, indicating that family values accounted for only 14.6% of the variance in girl-child education. This suggests that while family values do impact academic advancement, their role is modest, and other factors significantly contribute to determining girls' educational progress.

Table 3 Mean and Standard Deviation Scores on Girl-Child Educational Development Questionnaire (G-CEDQ)

S/N	Test Items from G-CEDQ	$\bar{x}$ (Mean)	SD	Remarks
1	The distance from our home to my child's secondary school is reasonable.	2.50	0.29	High Extent
2	Schools in this community maintain good standards of hygiene, promoting a conducive learning environment for girl children.	2.21	0.12	Low Extent
3	The caliber of teachers available at the secondary schools in this community is adequate to support girl-child education.	2.25	0.17	Low Extent
4	Male teachers in my child's school treat female students with respect.	2.46	0.22	Low Extent
5	Single-sex secondary schools are available for girls in this community.	2.28	0.23	Low Extent
6	Single-sex secondary schools positively influence the educational outcomes for girls in this area.	2.38	0.24	Low Extent
7	Rivers State Government provides equal encouragement and support for girls' education as they do for boys.	2.48	0.30	Low Extent
8	My child's school participates in state-wide quiz competitions that promote equal participation of boys and girls.	2.43	0.27	Low Extent
9	Television programmes that showcase career pathing roles for boys and girls positively impact girls' aspirations in this community.	2.52	0.31	High Extent
10	Christian religion activities in our community promote equal opportunities for girls' education.	2.51	0.29	High Extent
	Cluster Mean/SD	**2.43**	**0.22**	Low Extent

Criterion mean score = 2.50, SD_Y = 0.22, n = 241

Results in Table 3 showed that the mean scores for various test items assessing girl-child educational development primarily indicated low extent influences, with a cluster mean of 2.43 (SD = 0.22). The distance from home to secondary school scored the highest at 2.50, categorized as a high extent factor. Items concerning school hygiene (2.21), teacher adequacy (2.25), and treatment of female students (2.46) showed low support for girl-child education. Notably, television programmes

and community Christian activities positively impacted aspirations, scoring 2.52 and 2.51 respectively, but overall, support for girl-child education was limited in selected Ikwerre communities.

Research Question 3: To what extent do gender roles and family values as joint variables correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria?

Table 4 Joint Variable Correlate of Gender Roles and Family Values to Girl-Child Educational Development in Ikwerre Ethnic Group

R	R^2	Adjusted R^2
0.310[a]	0.306	0.306

Results in Table 4 revealed that the joint regression coefficient (R) and regression square coefficient (R^2) were 0.310 and 0.306, respectively. The extent of correlation was determined by the coefficient of determinism, which was 30.6% (0.306 × 100). This indicated that gender roles and family values jointly correlated to girl-child educational development in Ikwerre ethnic group by 30.6%. While this showed a moderate extent of impact, it suggested that gender roles and family values together accounted for only about one-third of the variance in girl-child educational development in selected Ikwerre communities, with other factors contributing significantly to the remaining variance.

4.2 Test of Hypotheses

Hypothesis 1: Gender roles do not significantly correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.

Table 5 T-test Associated with Simple Regression on Gender Roles and Girl-Child Educational Development in Ikwerre Ethnic Group

Variables	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Decision
Model	**B**	**Std. Error**	**Beta**			
1 (Constant)	0.011	0.061		**1.55**	**0.13**	Not Significant.
Gender Roles	0.1	0.071	.209	**1.41**	**0.16**	

Results in Table 5 indicated that the beta value for gender roles and girl-child educational development in Ikwerre ethnic group is given as 0.209. The t-test value of 1.41 is not significant at 0.16 when subjected to a 0.05 level of significance. Therefore, the null hypothesis is retained. By implication, gender roles do not have a statistically significant correlation to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.

Hypothesis 2: Family values do not significantly correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.

Table 6 T-test Associated with Simple Regression on Family Values and Girl-Child Educational Development in Ikwerre Ethnic Group

Variables	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Decision
Model	**B**	**Std. Error**	**Beta**			
1 (Constant)	0.05	0.061		1.55	0.13	Not Significant.
Family Values	0.038	0.043	.149	0.88	0.38	

Results in Table 6 indicated that the beta value for family values and girl-child educational development in Ikwerre ethnic group is given as 0.149. The t-test value of 0.88 is not significant at 0.38 when subjected to a 0.05 level of significance. Therefore, the null hypothesis is retained. By implication, family values do not have a statistically significant correlation to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.

Hypothesis 3: Gender roles and family values as joint variables do not significantly correlate to girl-child educational development in Ikwerre ethnic group of Rivers State, Nigeria.

Table 7 Multiple Regressions Associated with ANOVA on Gender Roles and Family Values as Correlate of Girl-Child Educational Development in Ikwerre Ethnic Group

Model	Sum of Squares (SS)	df	Mean Square (MS)	F	Sig.
Regression	5.00	2	2.50	1.244	0.29[b]
Residual	480.00	239	2.009		
Total	485.00	241			

a. Dependent Variable: Girl-Child Educational Development.

b. Predictors: (Constant), Gender Roles, Family Values.

Results in Table 7 indicated that the F-test value on gender roles and family values as correlate of girl-child educational development in Ikwerre ethnic group is 1.244, with a significance level of 0.29 when subjected to a 0.05 level of significance. The regression SS is 5.00 and the MS is 2.50, with two predictors: gender roles and family values. Since the significance value ($p = 0.29$) is greater than 0.05, the null hypothesis is retained. By implication, gender roles and family values do not jointly have a statistically significant correlation to girl-child educational development in the Ikwerre ethnic group of Rivers State, Nigeria.

5 DISCUSSION OF FINDINGS

The findings underscored how cultural norms and stereotypes served as significant barriers to girl-child education in Ikwerre ethnic group. Despite their prominence, the influence of these gender roles remained limited, accounting for only a fraction of the variance in educational outcomes. This aligned with the insights of Barni et al. [7], who contended that while family-based sexism played a crucial role in shaping gender norms, its impact on educational attainment was mediated by broader socio-economic factors. Similarly, Mensah highlighted that patriarchy and gender roles[11], though influential, could not fully explain the systemic inequalities faced by girls in education. This perspective challenged the findings to consider the multidimensional nature of barriers beyond cultural stereotypes. Financial constraints emerged as a dominant factor restricting girls' access to education, corroborating the work of Atakpo et al. [10], who emphasized the critical role of household income in shaping educational opportunities. Although family encouragement had been rated low in impact, Ojobah and Osuala contested this[26], suggesting that parental attitudes could significantly motivate girls to pursue education, even amidst financial hardship. This contrast highlighted the need for a more nuanced understanding of family dynamics in educational progress. Interestingly, findings on school-related factors such as distance, hygiene, and teacher adequacy revealed systemic barriers. Evans et al. argued that infrastructural deficits disproportionately affected girls in marginalized communities, reinforcing gender disparities[9].

Furthermore, Wami corroborated that community participation[2], like promoting girl-friendly schools, could help mitigate these challenges. While television and religious activities showed some positive impact, they were insufficient to address the structural inequities, as noted by Agi and Emelie [13] The moderate correlation between gender roles, family values, and educational outcomes faced further contestation from Ogide [3], who posited that entrenched societal expectations had long-lasting effects on girls' educational aspirations. Nevertheless, Okere acknowledged the growing influence of external factors[27], including governmental policies and NGOs, in counteracting these traditional constraints. This supported the findings' suggestion that other factors played a significant role in educational progress. By implication, the insignificant correlation between gender roles, family values, and educational outcomes, as highlighted in the findings, aligned with Echendu [5] as well as Thompson and Onyekwere [4], who advocated for a shift in focus toward addressing systemic issues like poverty, teacher shortages, and cultural reforms. Yakubova [8] and Shafi [22] further emphasized that traditional gender norms, while impactful, could not operate in isolation and called for a more holistic approach. In conclusion, while the findings revealed moderate impacts of gender roles and family values within Ikwerre ethnic group, they underscored the need for multifaceted interventions. This echoed the arguments of Elewa [1] as well as Onyido and Osigwe [28], who advocated for comprehensive reforms addressing socio-cultural, financial, and systemic barriers simultaneously in Nigeria.

6 CONCLUSION

It can be concluded that gender roles and family values affecting girl-child education in Ikwerre ethnic group of Rivers State presented significant challenges due to socio-economic disparities and cultural norms, corroborating existing research on educational inequities in marginalized Nigerian communities. This study underscored the need for comprehensive reforms that addressed educational policy and practice beyond gender roles and family values. Moreover, the influence of community participation and parental attitudes on girls' educational aspirations highlighted the importance of supportive learning environments. While traditional gender norms created obstacles, growing governmental and non-governmental efforts provided potential solutions to these challenges.

7 RECOMMENDATIONS

Based on these findings, the following recommendations were made:

1. To enhance community engagement and awareness regarding girl-child education, it is essential for State Universal Basic Education Board (SUBEB), Local Government Education Authorities (LGEAs), past and present commissioners for education in Rivers State in partnership with community leaders to organize regular town hall meetings that educate parents about the importance of supporting girls' educational aspirations, thereby fostering a more supportive environment for learning.
2. In order to advocate for policy reforms and infrastructural investments, stakeholders, including non-governmental organizations and community groups, should collaborate to lobby for increased funding and resources for schools in Rivers State, ensuring that educational facilities are adequately equipped to meet the needs of all students, particularly girls.
3. The State Ministry of Education should develop targeted educational programmes and resources that provide mentorship and tutoring support specifically for girls from disadvantaged backgrounds, thereby addressing the socio-economic barriers they face and promoting their academic success.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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LEVERAGING ON ARTIFICIAL INTELLIGENCE IN SUPPORTING INCLUSION OF STUDENTS WITH DYSGRAPHIA IN KADUNA POLYTECHNIC

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Abstract: Dysgraphia is a type of learning disability that is characterized by the inability to express ones thought in written form. It is also manifest in illegible or poor handwriting which can be due to developmental delay or several other risk factors. The paper discussed two main kinds of Dysgraphia namely developmental dysgraphia, which implies that one was born with the condition and acquired dysgraphia, implies that one's ability of writing or fine motor skill was lost or impaired due to an injury or an accident. This condition impedes the progress of students in school thereby posing a threat to their academic success. One of the solutions in curbing this challenge is Artificial intelligence which with its tools is able to improve the academic performance of students with dysgraphia. The paper concludes that the diverse challenges these students face cannot be addressed by remedial approach alone, therefore technology (AI) should be considered as a tool for reducing the challenges faced by students with dysgraphia. Recommendations include, lecturers in the institution should make it a point of duty to identify students in their various classes who may be experiencing dysgraphia. The management should make available adequate writing tools that may be necessary for the students with dysgraphia.
Keywords: Dysgraphia; Artificial Intelligence (AI); Learning disabilities

1 INTRODUCTION

Dysgraphia, one of the learning disabilities is characterized by the inability to express ones thought in written form. It is also seen in illegible or poor handwriting which can be due to developmental delay or several other risk factors. Dysgraphia which is a categorized as severe writing disorder is however seen as an inability to communicate ones thought through written expression. According to Merriam Webster Dictionary, Dysgraphia can be described as an impairment of handwriting ability that is characterized chiefly by very poor or often illegible writing or writing that takes an unusually long time and great effort to complete. Dysgraphia is described as a severely impaired ability to write which is presumed to be due to Central Nervous System dysfunction. Students who suffer from this condition usually face difficulties expressing their thoughts and ideas in written form. This condition has been identified among students of Kaduna Polytechnic. Students with this condition often have difficulties attempting questions during examination either due to the challenges they face expressing their thoughts in written form, poor hand coordination or illegible handwriting.

Such students usually have difficulties translating their thoughts into written expression. This can be seen by the difficulty they experience thinking and writing at the same time, word finding to communicate their thoughts appropriately or difficulty with sentence completion as well as comprehension of concepts. This may result in lecturers grading them low because of incomplete or illegible work which in turn can drastically affect their overall academic performance. Performance is crucial for academic excellence and with the disadvantages persons with Dysgraphia are already faced with, excelling without any meaningful intervention will be challenging. The introduction of recent technological innovations is responsible for changes that enhance performance or productivity. One of such innovations is Artificial Intelligence (AI). AI is a rapidly evolving field where what is current today may quickly become outdated. However, it is crucial to be familiar with its tools which ultimately help one to become proficient. AI is used in different fields or professions; education is not left out as AI provides a significant support in the teaching and learning experience. It is used to create lesson plan and lecture notes within the shortest period, standard test and examination question can be written effortlessly. It provides ideas on how to make the learning experience interesting, lecturers and teachers can use AI to hold personalized instruction and equally analyze students' results and attendance. Generally, AI can be used to carry out educational or academic activities. It is most likely that when students with Dysgraphia are exposed to AI, it will not only ease their learning but also improve their performance. This paper therefore, will explore how Artificial Intelligence can assist students of the institution who are experiencing dysgraphia.

2 CONCEPT OF LEARNING DISABILITY

Learning disabilities as special needs conditions is as old as mankind because in African traditional society teaching and learning took place with emphasis on cultural heritage and gender-based role socialization. It was however not identified

and known as a disability yet, there were persons who had difficulties learning, following directions, knowing names of things, counting, differentiating objects, sounds, making meaning from culture-based signs, interpreting and following sounds or rhythm of traditional drums used for different occasions. Disability has gone through many phases of development without a universally accepted nomenclature until 1963 [1]. Before the role of Samuel Alexander Kirk in shaping disability, it was known by different names such as minimal brain damaged, brain dysfunction, perceptual disorder among others Within 60 years of existence, the disability had experienced many controversial issues inclusive of lack globally accepted conceptual definition. However, Learning disability is conceptually seen as: "Learning disabilities is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical skills. These disorders are intrinsic to the individual, presumed to be due to dysfunction of central nervous systems, and may occur across the life span. Problems in self-regulatory behaviors, social perception, and social interaction may exist with learning disabilities but do not, by themselves, constitute a learning disability. Although learning disabilities may occur concomitantly with other disabilities (e.g., sensory impairment, mental retardation, serious emotional disturbance), or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences" [2].

Learning Disabilities is a group of disorders that affects people's ability to either interpret what they see and hear or to link information from different parts of the brain. These limitations can show up in many ways: as specific difficulties with spoken and written language, coordination, self-control, or attention. Such difficulties extend to schoolwork and can impede learning to read, write, or do math. Learning disability is a neurological disorder that affects the brain's ability to receive, process, store, and respond to information [3]. The term learning disability is used to describe the seemingly unexplained difficulty a person of at least average intelligence has in acquiring basic academic skills. These skills are essential for success at school and work, and for coping with life in general [4].

Learning disabilities vary from individual to individual and may present in a variety of ways. Learning disabilities may manifest as difficulty: Processing information by visual and auditory means, which may impact upon reading, spelling, writing, and understanding or using language, Prioritizing, organizing, doing mathematics, and following instructions, Storing or retrieving information from short or long term memory, Using spoken language and Clumsiness or difficulty with handwriting [4].

3 CONCEPT OF DYSGRAPHIA

Dysgraphia is a neurological condition in which someone has difficulty turning their thoughts into written language for their age and ability to think, despite exposure to adequate instruction and education. Dysgraphia can present with many different symptoms at different ages. Dysgraphia, from the Greek "dys" meaning "impaired" and "graphia" meaning "making letter forms by hand," is a disorder of writing ability. At its broadest definition, dysgraphia can manifest as difficulty writing at any level, including letter illegibility, slow rate of writing, difficulty spelling, and problems of syntax and composition. According to Peter Chung and Dilip R Patel Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5), dysgraphia no longer exists as a separate category but falls under the category of "specific learning disorder" [5].

According to DSM-5 specific learning disorder refers to difficulties in learning and using academic skills, as indicated by the presence of at least one of the following symptoms that have persisted for at least 6 months, despite the provision of interventions that target those difficulties: inaccurate or slow and effortful word reading; or difficulty understanding the meaning of what is read, or with spelling, or with written expression, or mastering number sense, number facts, or calculation; or difficulties with mathematical reasoning. The DSM-5 further specified that, "the affected academic skills are substantially and quantifiably below those expected for the individual's chronological age, and cause significant interference with academic or occupational performance, or with activities of daily living, as confirmed by individually administered standardized achievement measures and comprehensive clinical assessment [5].

4 TYPES OF DYSGRAPHIA

Dysgraphia can be divided into two main kinds;

- Developmental dysgraphia
- Acquired dysgraphia

Developmental dysgraphia implies that one was born with it whereas acquired dysgraphia implies that one's ability of writing or fine motor skill was lost or impaired due to an injury or an accident.

However, there are several categories of dysgraphia which includes

- Motor dysgraphia: This type of dysgraphia affects fine motor coordination as well as visual perception.
- Spatial dysgraphia: This affects one's ability to understand where things are in relation to each other. It typically affects writing between lines or paper or filling out a form where information must fit in a specific space.
- Linguistic dysgraphia: this type impacts language processing skills required in writing. This type of dysgraphia mostly affects spontaneous writing like responding to questions in written forms, creative writings, or responding to an essay question [6].

5 CHARACTERISTICS OF DYSGRAPHIA

Dysgraphia may manifest in a variety of ways depending on the age at presentation, as neurodevelopment progresses and academic expectations increase. As a disorder of written expression, dysgraphia may affect one or more levels of writing, including handwriting, spelling, and higher-order organizational skills. Given the normal development of handwriting, dysgraphia is seldom recognized before the first grade, although it may also be missed even in the school age child or young adult [7]. The National Center for Learning Disabilities provides an excellent discussion for dysgraphia warning signs across ages. Manifestations of dysgraphia parallel stages of child development, with more concrete "lower order" difficulties giving way to abstract "higher order" difficulties as the child ages.

Pre-school children with dysgraphia may present with the following characteristics: An awkward grip or body position when writing ,gets tired easily with writing ,avoidance of writing and drawing tasks , written letters are poorly formed, inversed, reversed, or inconsistently spaced and difficulty staying within margins

In addition to the above characteristics, the school-aged child with dysgraphia may demonstrate the following: Illegible handwriting, switching between cursive and print, difficulty with word-finding, sentence completion, and written comprehension.

Finally, the teenager and young adult with dysgraphia may also present with the following: Difficulty with written organization of thought, difficulty with written syntax and written grammar that is not duplicated with oral tasks.

At all ages, individuals with isolated dysgraphia may not be as readily noted as children with more obvious learning impairments such as dyslexia

Students who may experience several difficulties with writing may speak more easily and fluently than they write. Such students may have issues with Students who may experience several difficulties with writing may speak more easily and fluently that they write. Such students may have issues with; letter formation and/or legibility, letter size and spacing, spelling, fine motor coordination, rate or Speed of writing, grammar and composition. They may also exhibit specific characteristics such as difficulties writing on a straight line; Writing letters in reverse; Struggling to form written sentences with correct grammar; Omitting words from sentences; Incorrect ordering of words in sentences; Wrong usage of verbs and pronouns in sentences.

6 CAUSES & RISK FACTORS OF DYSGRAPHIA

Dysgraphia is a term used to describe those individuals who despite exposure to adequate instruction demonstrate writing abilities discordant with their cognitive level and age. The exact cause of dysgraphia is unknown but myriads of factors have been attributed to it, some of which are:

6.1 Brain Differences

There are variations in the structure and functions of the brain that can affect language and motor control. This can go a long way to impact the way written text is formed.

6.2 Brain Injuries

Damage to that part of the brain (parietal lobe) that is concerned with writing can cause dysgraphia.

6.3. Developmental Disorder

Dysgraphia can co-exist with other developmental disorder and conditions like dyslexia, autism, attention deficit hyperactivity disorder, ADHD.

6.4 Neurological Disorder

Affectations of the neurons or any neurological deficit can make it more difficult to process information and put such information into writing.

6.5 Psychomotor Problems

Alterations in fine motor movements in hands and arm coordination can make it difficult to write.

6.6 Orthographic Coding

Problems or inability of the brain to create visual memories of written words based on their meaning or pronunciations [8].

7 PROBLEMS FACED BY STUDENTS WITH DYSGRAPHIA

Students who have been identified to experience dysgraphia in higher institutions are faced with various challenges within the school environment and the society at large. These challenges range from academic struggles, to emotional problems as well as stigmatization.

- Academic challenges: Dysgraphia can make it challenging to keep up with academic demands, including reading, writing, and math. This can impact overall academic achievement which could eventually result to frustration and anxiety.
- Social-emotional challenges: Individuals diagnosed with dysgraphia may struggle with problems of self-esteem, anxiety, and depression. Particularly this disorder tend to cause students withdraw from their counterparts thereby resulting in poor social interaction with peers and subsequently social isolation.
- Access to appropriate support: Dysgraphia in students is usually not easily identified as such lack of diagnosis of such conditions would result in late intervention. Such students do not receive appropriate support and accommodation, which can impact academic and social-emotional outcomes.
- Stigma and misconceptions: There are still a great deal of stigma and misconceptions surrounding dysgraphia, which can make it challenging for individuals with these conditions to access appropriate support and accommodation.

Students with dysgraphia face a range of challenges in language learning. These challenges include difficulties in reading, writing, and spelling, lack of access to alternative learning materials, inadequate support from educators and language learning institutions, and social and emotional challenges. These challenges highlight the need for language learning models to be inclusive and supportive of individuals with special needs [9].

8 MANAGEMENT OF DYSGRAPHIA

In general, when addressing developmental and learning disorders, interventions can be organized by intensity in the following fashion: 1) accommodation, in which the individual is provided with assistive or augmentative strategies to access the general curriculum; 2) modification, in which the individual's tasks and expectations are changed to minimize the impact of their disability; and 3) remediation, in which the individual is provided instruction specific to his or her disability. Management of dysgraphia is a life-long process that must address the underlying symptoms experienced by the individual at that time; as the manifestations of dysgraphia change with cognitive development and academic expectations, the management must be equally fluid in its approach. The educational system should assess and provide the appropriate support structure in the school setting for the individual's level of disability [5].

Other strategies may involve trying several classroom adjustments to help the students such as trying different types of pens, pencils, and pencil grips, using paper with raised lines to help stay within the lines and using printed lesson outlines in class to ease note taking. Teachers can also allow plenty of time to complete assignment, prefilling in the name, date, and title of assignments, thoroughly explaining how each element is graded, sharing previous assignments and grades as well as offering alternatives to written assignments.

Students can also use technology and support systems to help them complete assignments to the best of their ability, including: using dictation software when writing, asking for a proofreader to check work, using a computer to type up an assignment and asking for extended time on tests [10].

9 AI AS AN INTERVENTION TOOL FOR STUDENTS WITH DYSGRAPHIA

Dysgraphia is a learning disorder that affects an individual’s ability to write or express themselves in written language. Students with dysgraphia may struggle with a variety of writing-related tasks, such as spelling, handwriting, organizing their thoughts on paper, and producing written work at an appropriate speed or level of detail. There is no cure for dysgraphia, but there are several strategies and accommodations that can help students with dysgraphia improve their writing skills. Two major approaches that can be beneficial to alleviate dysgraphia are remedial treatment and bypass strategies. The remedial treatment includes traditional methods of accommodation and adjustments either by direct handwriting instructions or fine motor coordination skills. The bypass strategies include use of technology as a compensatory technique [11]. These may include the use of assistive technology, such as speech-to-text software or word processing programs with spell-checking and grammar-checking features, as well as specialized writing programs that help individuals with dysgraphia learn to write more efficiently and effectively. There is a wide range of Artificial Intelligence applications that can help improve students’ writing skills. They help with grammar checks, organizing contents, assisting in generating and structuring essays and so on. Such applications include Chat GPT, MyEssayWriter Ai, Grammarly, Quillbot, Copy Ai. Perplexity Ai and so on. AI writing assistants can detect and correct grammatical errors, spelling mistakes, and punctuation issues, helping students produce polished and error-free written work. This real-time feedback allows students to learn from their mistakes and improve their writing skills over time.

AI writing tools are revolutionizing the educational landscape by enhancing accessibility for students with learning disabilities such as dysgraphia. These AI tools address a range of challenges students may face with expressing their thoughts in written form thereby empowering students to overcome barriers and achieve their academic goals. However, as

these technologies become more prevalent, we must also consider the ethical dilemmas of AI-generated content. Issues such as plagiarism, authorship, and the potential for misuse require careful examination to ensure that AI enhances learning without compromising academic integrity. As AI technology continues to advance, its potential to improve accessibility and inclusivity in education will only grow, ensuring that all students have the opportunity to succeed while maintaining ethical standards [12].

10 CONCLUSION

Remedial approach alone cannot effectively resolve the challenges faced by students with dysgraphia in higher institutions. Therefore, Technology based approach which includes artificial intelligence and virtual reality cannot be over emphasized. Early identification of students with dysgraphia is pertinent to adopt an intervention plan which will help meet the specific learning needs of students in the institution thereby improving their overall academic achievements.

11 RECOMMENDATIONS

- Lecturers in the institution should make it a point of duty to identify students in their various classes who may be experiencing dysgraphia
- The management should make available adequate writing tools that may be necessary for the students with dysgraphia
- Lecturers who teach students faced with dysgraphia should be give considerations for assignments and examinations.
- The School Management should make provision for semester examination to be computer based as it eliminates the problem of writing especially for students experiencing dysgraphia.
- Admission regulatory bodies such as Joint Admission & Matriculation Board (JAMB) should make admission process into the polytechnic more thorough and efforts should be geared towards identification of students with specific learning disorder such as dysgraphia. Where such is found, efforts should gear towards remediation so as not to alienate the students.
- Awareness should be created by specialists in the Department of Special Needs & Rehabilitation Sciences to sensitize the academic community on the prevalence of dysgraphia among learners and importance of early detection and purposeful remediation.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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PRACTICAL STRATEGIES OF PROJECT-BASED READING IN PRIMARY SCHOOL CHINESE FROM THE PERSPECTIVE OF DEEP LEARNING

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Abstract: With the continuous update of educational concepts, deep learning has gradually become the focus of attention in the education field. In primary school Chinese teaching, reading is an important way to cultivate students' language and thinking abilities. As an innovative teaching method, project - based reading is consistent with the concept of deep learning. It can guide students to actively participate in reading and improve the reading effect. This paper deeply explores the practical strategies of project - based reading in primary school Chinese from the perspective of deep learning, aiming to provide useful references for primary school Chinese teaching.
Keywords: Deep learning; Primary school Chinese; Project - based reading; Practical strategies

1 INTRODUCTION

Deep learning emphasizes students' in - depth understanding and active construction of knowledge, and focuses on cultivating students' high - order thinking abilities and practical problem - solving abilities. As an important part of basic education, Chinese reading teaching in primary schools plays a crucial role in students' language accumulation, thinking development, and cultural literacy improvement. Traditional reading teaching often focuses on knowledge imparting and skill training. Students are in a passive receptive state during the reading process, making it difficult to truly achieve deep learning. Project - based reading uses projects as carriers, allowing students to conduct reading exploration while completing project tasks. It can stimulate students' reading interest and prompt them to think deeply, thus achieving the goals of deep learning. Therefore, it is of great practical significance to study the practical strategies of project - based reading in primary school Chinese from the perspective of deep learning[1].

2 THE CONNOTATIONS AND CORRELATIONS OF DEEP LEARNING AND PROJECT - BASED READING

2.1 The Connotation of Deep Learning

Deep learning refers to a learning process in which, under the guidance of teachers, students base on comprehension - based learning, critically learn new knowledge and ideas, integrate them into their original cognitive structures, can make connections among various ideas, and can transfer existing knowledge to new situations to make decisions and solve problems[2]. Deep learning focuses on students' internalization and application of knowledge, and emphasizes the cultivation of students' critical thinking, innovation ability, and cooperation ability.

2.2 The Connotation of Project - based Reading

Project - based reading is a project - driven reading teaching model. Teachers design challenging project themes according to teaching objectives and students' actual situations. Students, around the project themes, collect information, analyze problems, and solve problems through self - reading, group cooperation, etc., and finally complete the project tasks and present the results. In project - based reading, reading becomes a tool and means for students to solve problems. Students actively explore knowledge during the reading process, improving their reading abilities and comprehensive qualities.

2.3 The Correlation between Deep Learning and Project - based Reading

Project - based reading provides a practical platform for deep learning. In project - based reading, students need to read texts deeply, understand the connotations of texts, analyze the information in texts, and use the knowledge they have learned to solve problems in the project. This process promotes students to conduct deep learning and cultivate their high - order thinking abilities[3]. At the same time, the concept of deep learning guides the design and implementation of project - based reading. When designing project - based reading, teachers should fully consider how to guide students to think deeply and how to promote the transfer and application of students' knowledge to achieve the goals of deep learning.

3 PROBLEMS EXISTING IN CURRENT PRIMARY SCHOOL CHINESE READING TEACHING

3.1 Single Reading Method

In traditional primary school Chinese reading teaching, teachers often use teaching methods such as explanations, questions, and exercises. Students' reading methods mainly include silent reading and aloud reading. This single reading method is likely to make students feel bored and reduce their reading interest. Moreover, students lack opportunities for independent exploration and thinking during the reading process, making it difficult for them to deeply understand the connotations of texts.

3.2 Lack of Reading Depth

Some teachers pay too much attention to knowledge imparting and skill training in reading teaching, such as the understanding of words and sentences, while ignoring the cultivation of students' reading thinking[4]. Students only understand the text content at a shallow level when reading, and it is difficult for them to think deeply and explore the text, so they cannot achieve deep learning.

3.3 Disconnection between Reading and Life

Primary school Chinese reading teaching should be closely connected with students' real lives so that students can better understand the texts and improve the reading effect. However, in actual teaching, some teachers do not fully explore the connection between texts and life[5]. Students' reading is limited to the classroom and textbooks, and they cannot apply the knowledge learned from reading to life, resulting in a disconnection between reading and life.

4 PRACTICAL STRATEGIES OF PROJECT - BASED READING IN PRIMARY SCHOOL CHINESE FROM THE PERSPECTIVE OF DEEP LEARNING

4.1 Carefully Design Project Themes

Combine with Textbook Content: Teachers should deeply study textbooks and design project themes according to the unit themes and text contents in textbooks. For example, when learning the "Observation" theme unit in the second unit of the fourth - grade upper - volume of the People's Education Edition primary school Chinese textbook, the project theme "Explore the Mysteries of Nature - Observation and Discovery" can be designed. Students can understand the methods and importance of observation by reading relevant texts and conduct practical observations to record the results[6].

Pay Attention to Students' Interests: The design of project themes should fully consider students' interests, hobbies, and real - life situations, so as to stimulate students' enthusiasm for participation. Teachers can understand students' interests through questionnaires, classroom discussions, etc., and then design project themes combined with Chinese teaching objectives. If students are interested in animals, the "Animal World Unveiled - Animal - themed Reading Project" can be designed. Students can read popular science articles and literary works about animals to understand the living habits and characteristics of animals.

Be Challenging: Project themes should be challenging to a certain extent to stimulate students' desire for exploration. However, the degree of challenge should be appropriate. It should neither be too simple to make students feel unchallenged nor too difficult to make students feel intimidated[7]. For example, when learning the ancient poetry unit, the project theme "A Poetic Journey through Time - Exploration of Ancient Poetry Culture" can be designed. Students can understand the creation background, cultural connotations, and artistic features of ancient poetry by reading ancient poems. This project theme has a certain depth and breadth and can exercise students' comprehensive abilities.

4.2 Guide Students to Read and Explore Independently

Provide Reading Resources: Teachers should provide rich reading resources for students according to the project themes, including books, articles, videos, audio, etc. For example, in the "Explore the Mysteries of Nature - Observation and Discovery" project, teachers can provide books such as The Records of Insects and The Signs of Nature, as well as popular science videos about natural phenomena, allowing students to obtain information from different channels[8].

Guide Reading Methods: In project - based reading, teachers should guide students to master effective reading methods, such as intensive reading, skimming, and scanning. According to different reading tasks and text types, guide students to choose appropriate reading methods. For example, when reading literary works, students can be guided to use the intensive reading method to savor the language and experience the emotions. When reading popular science articles, students can be guided to use the skimming and scanning methods to quickly obtain key information.

Encourage Students to Ask Questions: Cultivating students' question - awareness is an important part of achieving deep learning. Teachers should encourage students to think actively and ask questions during the reading process. For the questions raised by students, teachers can guide students to solve them independently through group discussions, consulting materials, etc., to cultivate students' exploration abilities. For example, when reading "Borrowing Arrows with Straw Boats", students may ask questions such as "Why could Zhuge Liang successfully borrow arrows?" and "Why did Zhou Yu try to make things difficult for Zhuge Liang?" Teachers can organize students to conduct group discussions and deeply explore the text.

4.3 Organize Group Cooperative Learning

Group Reasonably: Teachers should group students reasonably according to factors such as students' learning abilities, personality traits, and interests. The number of people in each group is generally 4 - 6. The members within the group should have clear divisions of labor. For example, the group leader is responsible for organization and coordination, the

recorder is responsible for recording the discussion results, and the reporter is responsible for presenting the group's results[9].

Define Group Tasks: In project - based reading, each group has clear tasks. Teachers should clarify the requirements and goals of group tasks to students so that students know what they need to do. For example, in the "Animal World Unveiled - Animal - themed Reading Project", the group task can be to make a hand - drawn newspaper about a certain animal. The content of the hand - drawn newspaper should include the animal's appearance characteristics, living habits, and its relationship with humans, and it is required to be illustrated with accurate information.

Promote Group Communication: During the process of group cooperative learning, teachers should encourage students to communicate actively and share their reading experiences and ideas. Through communication, students can learn from each other, broaden their thinking, and complete the project tasks together. Teachers should participate in group discussions in a timely manner, provide guidance and help to students, and guide students to think deeply about problems[10].

4.4 Carry out Diverse Project Activities

Role - playing: For some texts with strong storylines, teachers can organize students to carry out role - playing activities. Through role - playing, students can more deeply understand the character traits and emotional changes of the characters in the text and enhance their reading experience. For example, when learning "The Earthenware Pot and the Iron Pot", students can respectively play the roles of the earthenware pot and the iron pot, perform the story content, and understand the truth contained in the fable.

Field Trips: Combined with the project theme, teachers can organize students to conduct field trips, allowing students to combine reading with practice. For example, in the "Explore the Mysteries of Nature - Observation and Discovery" project, teachers can lead students to parks, botanical gardens, etc. for field observations, observe the growth of plants, the activities of animals, etc., and then let students record the observation results and compare and analyze them with the knowledge in the reading texts.

Result Presentations: After the project - based reading is completed, students should be organized to present their results. The forms of result presentations can be diverse, such as hand - drawn newspapers, posters, PPTs, mini - theses, drama performances, etc. Through result presentations, students can share their learning achievements, enhance their self - confidence, and at the same time learn more knowledge and experience from the presentations of other groups. For example, in the "A Poetic Journey through Time - Exploration of Ancient Poetry Culture" project, groups can make PPTs to show the appreciation of ancient poems, the introduction of creation backgrounds, etc., or they can present through poetry recitations, song performances adapted from ancient poems, etc[11].

5 CASE ANALYSIS OF THE PRACTICE OF PROJECT - BASED READING IN PRIMARY SCHOOL CHINESE FROM THE PERSPECTIVE OF DEEP LEARNING

5.1 Project Theme

"Love My Hometown - Exploration of Hometown Culture"

5.2 Project Objectives

Through reading relevant texts, understand the historical, geographical, folk customs and other cultural knowledge of the hometown, and cultivate students' reading comprehension abilities.

Guide students to collect and sort out hometown cultural materials, and improve students' information collection and processing abilities.

Organize students to carry out field trips and interview activities, and cultivate students' practical abilities and interpersonal communication abilities.

Let students enhance their love for their hometown through project activities, and cultivate students' cultural identity and sense of belonging.

5.3 Project Implementation Process

Project Initiation: Teachers play a promotional video of the hometown to stimulate students' interest in hometown culture and introduce the project theme "Love My Hometown - Exploration of Hometown Culture". Then, teachers introduce the project objectives, tasks, and implementation steps to students, so that students can clarify their roles and responsibilities in the project.

Reading Exploration: Teachers provide students with reading resources such as books, articles, and pictures about the hometown, including local chronicles, collections of folk stories, travel brochures, etc. Students read these materials independently, understand the basic situation of the hometown, and record the interesting questions and information. For example, some students are interested in the traditional festival customs of their hometown. Through reading, they learn that there are customs such as pasting Spring Festival couplets, setting off firecrackers, and visiting relatives and friends during the Spring Festival in their hometown. Some students are interested in the historical celebrities of their hometown. Through reading, they learn about the famous figures in their hometown's history and their deeds[12].

Group Cooperation: Students freely group according to their interests, and each group determines a research direction, such as the traditional cuisine of the hometown, the folk art of the hometown, the historical changes of the hometown, etc. The members within the group cooperate in division of labor and develop a detailed research plan. Some members are responsible for further collecting materials, some members are responsible for field trips or interviews, and some members are responsible for sorting out materials and making result - presentation materials[13]. For example, the

group studying the traditional cuisine of the hometown interviews local chefs and food experts to understand the production techniques and cultural stories behind the traditional cuisine of the hometown, and then collects relevant pictures and text materials to make a beautiful hand - drawn newspaper.
Field Trips and Interviews: Each group conducts field trips and interview activities according to the research plan. The group studying the folk art of the hometown visits local folk art studios, watches the production process of folk artists, and interviews folk artists to understand the current development situation and inheritance difficulties of folk art. The group studying the historical changes of the hometown goes to local museums and archives to consult materials and interviews local elderly people to understand the appearance and development changes of the hometown in different historical periods[14].
Result Presentations: After the project is completed, each group presents its results. The group studying the traditional cuisine of the hometown shows the pictures, production methods, and cultural connotations of the traditional cuisine of the hometown through PPT, and on - site demonstrates the production process of some simple dishes. The group studying the folk art of the hometown brings in physical objects of folk art works, such as paper - cutting and embroidery, and conducts on - site performances and explanations. The group studying the historical changes of the hometown makes an illustrated booklet to introduce the historical evolution, major events, and development achievements of the hometown. During the result - presentation process, students from other groups can ask questions and communicate to share each other's learning achievements.

5.4 Project Implementation Effects

Students' reading abilities have been significantly improved. During the project implementation process, in order to complete the tasks, students actively read a large number of text materials, learned to use different reading methods to obtain information, and had a deeper understanding of the texts.
Students' comprehensive qualities have been comprehensively enhanced. Through activities such as group cooperation, field trips, and interviews, students' teamwork abilities, practical abilities, interpersonal communication abilities, and problem - solving abilities have all been exercised and improved[15].
Students have a deeper understanding of their hometown and enhanced their love for their hometown. By exploring hometown culture, students discovered the charm and value of their hometown, inspired their sense of pride and responsibility for their hometown, and cultivated their cultural identity and sense of belonging.

6 CONCLUSION

Project - based reading in primary school Chinese from the perspective of deep learning is an innovative teaching model. It can stimulate students' reading interest, guide students to think deeply and explore, and improve students' reading abilities and comprehensive qualities. In the practical process, teachers should carefully design project themes, guide students to read and explore independently, organize group cooperative learning, and carry out diverse project activities. Through the implementation of these practical strategies, students can achieve the goals of deep learning in project - based reading and lay a solid foundation for their lifelong learning and development. However, the application of project - based reading in primary school Chinese teaching is still in the exploration stage. Teachers need to continuously practice and summarize experience to further improve the project - based reading teaching model and better serve primary school Chinese teaching.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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INTEGRATING NATIONAL CONSCIOUSNESS INTO SUBJECT TEACHING: THEORETICAL EXPLORATION BASED ON THE OUTLINE OF THE CHINESE COMMUNITY OF NATIONALITIES

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Abstract: To promote social cohesion and national unity in China, it is essential to conduct education on the Chinese Community of Nationalities. As educators, it is necessary to incorporate this awareness into the teaching of many subjects. This paper focuses on the textbook “Outline of the Chinese Community of Nationalities” and explores the theoretical foundation and effective strategies for implementing the concept of the Chinese Community of Nationalities in educational practice. Through an analysis of guiding principles, teaching techniques, and interdisciplinary integration, this study provides valuable insights on how teachers can foster the development of national and ethnic identity among Chinese students.
Keywords: Education; Community; National consciousness

1 INTRODUCTION

In recent years, there has been a growing concern about the importance of educating students on the awareness of the Chinese national community. The aim of this education is in line with the overall goals of promoting social peace, enhancing national unity, and cultivating patriotism.
The textbook “Outline of the Chinese Community of Nationalities”serves as a crucial tool in this exploration, providing extensive information on the history, culture, and evolution of the Chinese nation.
To ensure that students internalize and understand this awareness, educators must successfully integrate this awareness into the teaching of other disciplines [1].

2 THEORETICAL FRAMEWORK

Understanding and accepting China's numerous ethnic groups as fundamental components of a nation is the "awareness of the Chinese Community of Nationalities." Starting from the historical development of the Chinese people, this concept emphasizes shared cultural values, a common past, and a shared future. From a theoretical perspective, to integrate this awareness into the classroom, knowledge of political and cultural education is essential. Three basic ideas form the foundation of this framework [2].
1. In terms of historical continuity, it emphasizes that the Chinese nation has a long and continuous history with interlinked historical threads.
2. Regarding cultural integration, it respects diversity and highlights the cultural affinity among all ethnic groups.
3. As for the common destiny, it encourages students, regardless of their ethnic or cultural backgrounds, to have a sense of shared destiny.
These guiding principles ensure that education goes beyond knowledge transfer and creates values and identities. They also guide the creation of teaching practices that integrate national awareness into different disciplines.

3 TEACHING STRATEGIES

As educators, we should appropriately adopt innovative teaching methods, which can enable students to integrate the awareness of the Chinese Community of Nationalities into subject teaching effectively. These strategies include:

3.1 School Curriculum Integrates the Outline of the Chinese Community of Nationalities through Interdisciplinary Approaches

For example, in the history courses offered by schools, educators should incorporate some historical events. By including these historical events, it can help many students establish the awareness of cooperation and unity within the national community. Through the study of multi - ethnic literature, students can learn the works of writers from different ethnic

backgrounds and simultaneously understand the diversity of Chinese culture [3].

3.2 Through the Teaching Method Strategies of Contextualization

Teachers place the content of the textbook “Outline of the Chinese Community of Nationalities”in the context of students' experiences and the local environment in the classroom [4].
For example, Yunnan belongs to a region with ethnic diversity. Local educators can encourage students to learn more about the history, cultural customs of the ethnic groups around them. This is conducive to helping them understand the concept of the Chinese Community of Nationalities at a deeper level.

3.3 Build Critical Thinking and Reflection Skills

Cultivating students' critical engagement with the concept of the Chinese Community of Nationalities is highly necessary in overall talent cultivation. Teachers can organize students to carry out discussions and debates on issues such as social cohesion, national identity, and ethnic integration [5]. This approach not only helps students learn more but also provides them with the opportunity to think critically and explore the potential and problems related to creating a strong sense of national identitym [6].

3.4 Integrate Cooperative Learning Methods into Teaching

Through group projects and collaborative activities, students can benefit from each other's diverse cultural experiences. By carrying out classroom tasks related to "How do you understand the Chinese Community of Nationalities", allowing students to cooperate in learning, it helps cultivate students' team - thinking of acceptance and respect [7].

4 CASE STUDIES AND PRACTICAL APPLICATIONS

When applying the above theories and teaching strategies, distinctions should be made according to students' characteristics and knowledge backgrounds. The following case studies demonstrate how the awareness of the Chinese Community of Nationalities has been successfully incorporated into the teaching of specific disciplines:

4.1 Integrating National Awareness into High School History Classes

A high school history teacher developed a course that integrated the awareness of the national community into the classroom. The course presented some important historical events of the unity of China's ethnic minorities. In the classroom, the teacher divided the students into groups and guided them to conduct research and discussions on historical events in the Tang and Qing dynasties.
For example, stories were given about how cooperation among ethnic groups contributed to the development of the country. In addition to including historical events in the course, the teacher could also add some scenarios about how these historical education cases are related to modern society, which can further enhance students' profound understanding of the common national destiny.

4.2 The Integration of Ideological and Political Education in Middle School Chinese Classes

The Outline of the Chinese Community of Nationalities was integrated into the study of traditional Chinese poetry. In middle school classrooms, students read poems by poets from different ethnic backgrounds, and the themes of these poems were quite diverse, including homeland, love, and family.
Through this integration, students established the awareness of the bond of destiny that the Chinese people should unite, and at the same time, they had a deeper understanding of the cultural diversity across the country.
To further emphasize the concept of cultural unity, the teacher could also organize poetry recitation sessions for students to participate in, allowing them to select and recite poems in several ethnic languages.

4.3 Integration in University Sociology Courses

At a top 985 university, the Department of Social Sciences integrated the textbook Outline of the Chinese Community of Nationalities into an ethnic vocal music course related to ethnic groups. A section on the national community was embedded in the course syllabus, with a particular focus on the concept of the Chinese Community of Nationalities. Students analyzed the social dynamics among China's ethnic groups and learned how the 56 ethnic groups form a big family through unity today.
As part of the course, students conducted field research in multi - ethnic areas to study how the theoretical frameworks of historical continuity, cultural integration, and common destiny are manifested in real ethnic groups [8].

The course culminated in a seminar where students presented their insights and research results in groups and put forward some suggestions on how to enhance national cohesion.

4.4 Interdisciplinary Approaches in Political Science Courses

The political science course at a key university in Yunnan developed an interdisciplinary course titled "National Construction and National Unity in China", which was based on the textbook The Chinese Community of Nationalities as the core text.

The course fully combined the perspectives of history, political science, and cultural studies to explore the evolution of the Chinese nation. Students conducted a comparative analysis of the national construction efforts of China and other multi - ethnic countries. The course also invited ethnic policy experts to give guest lectures and discussed some of the challenges and opportunities in promoting national awareness in a rapidly changing world.

4.5 Cultural Immersion in the Department of Language and Literature

The Department of Language and Literature at a key university in Yunnan designed a general education course to let students immerse themselves in the different languages and cultural heritages of China's ethnic minorities.

The project was based on the textbook Outline of the Chinese Community of Nationalities and offered courses in Mandarin, Yi, Tibetan, Uyghur, Mongolian, and other ethnic minority languages. The literature course also featured works by ethnic minority writers, encouraging students to explore themes such as ethnic identity, sense of belonging, and unity.

The project also cooperated with local ethnic minority communities to provide cultural exchange experiences, helping students gain first - hand experience of the lives of China's ethnic minorities.

4.6 Some Problems in Integrating National Awareness into Subject Teaching

Although integrating national awareness into subject teaching is the general trend at present, integrating the awareness of the Chinese Community of Nationalities into education also faces some difficulties.

Ensuring that the teaching materials provided in teaching resonate with students from different ethnic backgrounds is a key issue that needs to be paid attention to.

To solve this problem, educators need to recognize that each of their students has different identities and experiences [9]. Educators also need to create a relaxed, interesting, and active classroom atmosphere, value the diversity of students' backgrounds, and promote the internalization of knowledge among students in the classroom.

In addition, perfunctoriness in integrating national awareness into subject teaching should also be given due attention. The cultivation of the awareness of the national community under the dominance of formalism is usually one - sided and superficial, rather than an essential part of the subject curriculum.

To solve this problem, when formulating curriculum objectives and syllabuses, teachers should make the awareness of the national community a core ideological and political element of each subject and incorporate it into the curriculum objectives.

5 CONCLUSION

Combining the theory of the Community with a Shared Future for Mankind to promote social cohesion and national unity requires integrating the awareness of the Chinese Community of Nationalities into educational practices.

At the core of this is the textbook Outline of the Chinese Community of Nationalities, which provides references that can be used in various academic contexts. Teachers can use multi - disciplinary techniques, contextualization, critical thinking, and cooperative learning to help students internalize the concept of the Chinese Community of Nationalities.

Although there will be some problems and difficulties in the practical process, the application of effective teaching strategies will ultimately support China's development into a strong, cohesive, and peaceful country.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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IMPROVEMENT STRATEGIES FOR THE COMPREHENSIVE EVALUATION OF UNDERGRADUATE CADETS IN MILITARY ACADEMIES

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Abstract: The comprehensive evaluation of undergraduate cadets in military academies serves as the primary basis for their graduation assignments and is a crucial indicator for assessing the quality of education and talent cultivation in military institutions. Since its implementation, the comprehensive evaluation system has yielded notable results. This paper affirms the practical significance of the evaluation while analyzing its main practices and existing shortcomings. Furthermore, it proposes targeted improvement suggestions, offering valuable insights for the refinement and development of the comprehensive evaluation system.
Keywords: Undergraduate cadets in military academies; The comprehensive evaluation; Improvement suggestions

1 INTRODUCTION

The source of human talent and resources is the first source of resources. The country's national defense and military forces have been built, the strength of the military's personnel is key, and the basics of education are here. The key to developing talent and training, and also the military school in Yu. Responsible for teaching, research, and other positions at the Imperial College, training, talent, talent, mission, and other positions. The "trinity" new military talent cultivation system in the school's education system is fundamental [1], proactive, and holistic. This is the key to the education of military schools, and this is the educational cultivation of scientific personnel. The quality of this scientific staff's talent cultivation, the educational quality of the representative school is level. Here, you need to solve the problem of a good person's talent and training.

Regarding research on comprehensive student quality evaluation, there exists a substantial body of both domestic and international literature. Many developed countries have established mature and well-structured comprehensive evaluation systems along with their supporting frameworks [2]. In international studies, the development of comprehensive evaluation systems for university students primarily focuses on assessing and analyzing learning competencies and practical application outcomes [3]. Taking the UK as an example, to ensure educational quality and cultivate high-caliber talent [4], the British department of education established the Quality Assurance Agency for Higher Education (QAA). The QAA has issued the *UK Quality Code for Higher Education*, which standardizes the comprehensive evaluation process for university students while providing theoretical support and clear guidelines for key components such as evaluation criteria, stakeholders, and implementation methods [5-6].

According to research, the comprehensive quality evaluation of students in the United States exhibits the following distinctive characteristics:first, while ensuring the quality of quantitative assessment, there has been a gradual increase in the proportion of qualitative evaluation.second, the primary purpose of evaluation is explicitly defined as improving student learning outcomes.third, significant emphasis is placed on in-depth analysis of the evaluation data collection process.fourth, importance is attached to creating authentic assessment environments where students are evaluated through contextualized approaches [7]. International literature indicates that higher education institutions generally focus on four key dimensions in student evaluation methodologies [8]: (1) Evaluation content, (2) Evaluators and evaluatees, (3) Evaluation timing, and (4) Specific evaluation methods. Domestic research in this area is even more extensive, offering valuable insights for talent cultivation and assessment practices.

In 2015, the higher authorities issued regulations on the assignment of cadets upon graduation, which for the first time explicitly stipulated that graduation assignments should be based on comprehensive evaluation results, emphasizing scientific standardization, fairness, and impartiality. Among them, it is clear that the result is a 100 percent system, the weight is the highest, the students have completed the entire course, and there is also a combination of quality and evaluation, and the contents of the regular presentation are as follows. In 2021, the Central Armed Forces Committee has implemented the implementation of the current military officer selection, and the basic system has been extended.

The actual behavior information has been observed, the combination of tests has been carried out, and the students have been able to develop their talents and dynamism. The basic style, the effectiveness of the use of talents and skills of high school students, and the effective support provided by the actual training department of the field. However, each point in the combined evaluation method is as follows. Effective utilization, important results, continuous analysis, the latest demand exists in the current demand, and the demand changes and improves over time.

2 THE SIGNIFICANCE OF COMPREHENSIVE ASSESSMENT OF UNDERGRADUATE STUDENTS IN MILITARY ACADEMIES

2.1 Establishing Evaluation Criteria

Before the comprehensive evaluation method was implemented, each unit lacked a unified and standardized evaluation index system. There were differences in the measurement standards of the trainees' daily performance. Some units only focused on academic performance, while others paid more attention to the trainees' daily performance. There was a lack of a unified method for comprehensive quantitative evaluation of trainees. When it comes to important matters that are closely related to the students' vital interests and extremely sensitive, such as graduation assignments and awards for meritorious service, the lack of a unified measurement standard has affected the fairness of related work to a certain extent. For example, it is common for individual trainees to have mediocre performance in normal times, but successfully obtain ideal positions during graduation assignments.

2.2 The Goal Orientation has been Refined

With the ability and quality requirements in the comprehensive assessment as a reference, students can more clearly examine their own shortcomings and gaps, and then make targeted improvements and upgrades. Each indicator of the comprehensive assessment has clear standards, and students can evaluate their performance in various aspects of daily teaching and training based on these standards. Combined with their own ability level, interests and specialties, students can formulate a practical goal plan, refine the entire training process into various stages, make the training goals clearer, and the measures more pragmatic, so as to achieve more significant results.

3.2 Reveals the Growth Path

The implementation of the comprehensive assessment mechanism provides clear guidance for trainees to plan their personal growth path. When trainees are unclear about their future job direction and career planning, the comprehensive assessment standards can help them regulate their daily behavior. In the assessment system of each unit, academic performance usually occupies a large proportion, which highlights the core position of learning and makes it clear to trainees that their primary task as students is to focus on learning, thereby eliminating the erroneous idea that some trainees despise learning and attempt to take shortcuts. In addition, other comprehensive qualities and daily performance content involved in the comprehensive assessment also establish clear behavioral norms for trainees, clearly defining which behaviors are worthy of encouragement, which are insurmountable red lines, and which are goals to strive for. Under the guidance of comprehensive assessment, trainees can restrain their own behavior, determine the direction of development, and plan their growth path, so as to achieve all-round development.

2.4 Close to Job Duties

The comprehensive assessment method is mainly to provide a clear reference basis for the assignment of students after graduation, and its assessment principles are also designed around the needs of grassroots positions. Under normal circumstances, students with excellent comprehensive assessment results can often adapt to the work requirements of military positions more quickly. With the continuous deepening of national defense and military reforms, how to better meet the requirements of the military's job demand has become a key research topic for various training institutions. As an important criterion for measuring student performance, comprehensive assessment naturally needs to absorb relevant research results. Judging from the existing assessment methods of some colleges and universities, emphasizing the importance of ideological work, highlighting the temperament of soldiers, focusing on leadership and management skills, and integrating psychological factors are all to better meet the needs of job positions. Students improve their abilities in accordance with the requirements of these assessment methods, which not only helps to improve their personal qualities, but also better adapt to the needs of the troops.

3 MAIN PRACTICES AND DEFICIENCIES

In specific practice, military academy graduates participate in comprehensive assessment before graduation. According to the assessment regulations, combined with the full course assessment, comprehensive quality assessment and daily comprehensive performance, quantitative weighting is used to obtain the scoring results. Then, according to the ranking order of scores, graduates will submit their personal allocation wishes in turn within the scope of the allocation unit specified in the professional allocation plan.

Since the introduction of the comprehensive assessment regulations, it has been carried out in accordance with the principles of professional matching, grassroots orientation, comprehensive measurement, openness and fairness, effectively improving the scientificity and standardization of the graduate allocation work of students, and providing strong support for talent training and evaluation. However, in the actual implementation process, some problems that need to be improved were also found.

3.1 Too Much Emphasis on Assessment Results and Neglect of the Growth Process

At present, the comprehensive assessment of students mostly adopts a final evaluation model, that is, an overall

evaluation of the comprehensive quality and daily performance of students is conducted before the end of the school year or before graduation. However, this evaluation method focuses too much on the final results and ignores the growth process. It is difficult to fully reflect the development of individual students and the dynamic changes in students' quality. This not only reduces the accuracy of the comprehensive assessment, but also fails to provide effective guidance for the improvement of students' comprehensive quality, resulting in a significant reduction in the effectiveness of the comprehensive assessment of students.

3.2 The Incentive and Guiding Effects are not Obvious Enough

First, the incentive effect on trainees to be the first and the best is insufficient. Due to the restrictions of graduation assignment and other conditions, it is difficult to fully match the assessment results with the assignment selection, and there is a lack of other effective incentives, which has a significant impact on the incentive effect of the comprehensive assessment. Secondly, the guiding role in the all-round development of trainees is limited. Because academic performance accounts for a large proportion of the assessment, some trainees devote all their energy to study, ignoring participation in other activities and training in key positions, resulting in uneven development. Finally, the role of promoting the implementation of grassroots work is insufficient. The opinions of the grassroots trainee team are difficult to fully reflect, and their influence is relatively limited, which is not conducive to the efficient development of various grassroots work.

3.3 Lack of Innovation and Foresight

The comprehensive assessment of students is not only a means of evaluation, but also a roadmap for the growth and development of students. The relevant indicators should be closely integrated with the development of science and technology. The current war style has undergone tremendous changes. The ability to command joint operations is the magic weapon for victory. Corresponding to this is the information literacy of soldiers, such as the ability to integrate and analyze information. There is still a lack of similar indicator requirements in the current comprehensive assessment system. It is also worth thinking about how to balance the unified normative requirements and the personalized needs of personal growth. The students we train should not only be at a high level, but also have their own characteristics and thinking, with individuality, flexibility and variability, and cannot be cut out of the same mold.

4 SUGGESTIONS FOR IMPROVING COMPREHENSIVE ASSESSMENT WORK

4.1 Strengthen Planning Coordination

On the basis of implementing the regulations of the superior system, military academies should also strengthen planning and coordination, conduct research and analysis on the training objectives and the whole process of comprehensive assessment of students, and promote the comprehensive assessment work to be more meticulous, perfect, scientific and reasonable.

Integrate the existing evaluation system and give full play to the role of the comprehensive assessment center. At present, military academies have various evaluation activities such as "four-have" outstanding students evaluation, graduate recommendation, scholarship selection, and outstanding graduate student selection. The standards are different. Each type of evaluation must be filed and calculated according to their own regulations. There are many evaluations with many identical evaluation indicators but different weights. In particular, the "four-have" outstanding students evaluation carried out after the end of each academic year is basically the same as the content required to be measured and evaluated in the comprehensive assessment, and the comprehensive score and ranking are calculated in the end, but the indicator system and weights of the two are quite different, so they have to be recalculated separately, which brings a large workload to the grassroots student team and involves a lot of energy. In view of the fact that comprehensive assessment is directly related to the assignment and posting of students after graduation, and the content can also cover all the elements of the evaluation of "four-have" outstanding students, it is possible to consider integrating the evaluation of "four-have" outstanding students into the comprehensive assessment, and continue to use the index system and evaluation rules of comprehensive assessment, and the weight can be appropriately changed. In this way, on the one hand, a lot of duplication of work is reduced, and on the other hand, the leading and motivating role of comprehensive assessment in peacetime is more prominent.

Differentiate the stages and implement precise policies to play the guiding role of comprehensive assessment. The four years of undergraduate students in military academies in college are the golden period for growth and development, and also the period of the fastest development and progress. Each year has different characteristics and changes. It is necessary to use a developmental and dynamic perspective to understand and train students, and not "measure to the end with one ruler". The talent training program of military academies is to refine the four-year and overall training requirements in combination with the physical and mental characteristics and learning rules of students. It can be organically combined with the comprehensive assessment work and learn from each other, especially pay attention to adjusting the talent training program and course arrangement according to the comprehensive assessment situation. On the basis of studying and analyzing the four-year undergraduate study and life process of military academy students, we follow the law of talent growth and optimize the comprehensive assessment index system on an annual basis to make it

more in line with the actual development of students. For example, in the comprehensive assessment, course assessment accounts for 70% of the score, and the assessment is the weighted average score of the required course credits. Taking a comprehensive university as an example, there are actually more public basic required courses in the first and second years, and more professional basic required courses in the second and third years. The number of required courses in these three years is basically between 10 and 15, but the number of required courses in the fourth year is basically less than 5, which is a big difference. In addition, the types, credits, and difficulty of required courses in different academic years are different, and the training goals of students in different academic years also have a focus. The comprehensive assessment of the third and fourth years can consider lowering the weight of course assessment and raising the weight of indicators such as comprehensive quality, so as to guide senior students to work hard to be competent for their first job.

Explore the reform of course teaching and examination, and play the leading role of comprehensive assessment. Taking a comprehensive university as an example, more than 80% of the students admitted each year are ranked in the top 10% of the first-tier line in each province. They have a solid foundation and outstanding grades. They are the pillars of the country. Their training and education should not be blindly adopted by the test-oriented education method of cramming. The learning evaluation method of "one test determines the final result" is difficult to measure the students' all-round learning ability, nor can it motivate students to learn independently and pursue excellence. Military school students are in their youth and are the most creative and innovative. They are usually constrained by military discipline and cannot fully show their personality, but they still have the active thinking and curiosity of young people in their hearts. In particular, students born after 2005 have more diverse ideas. They are more keen to take the initiative to master the rhythm and are less willing to be pushed forward. Instead of being overwhelmed by all-round indoctrination, it is better to give them the opportunity to explore on their own. For example, in the design of course content, some self-study content can be reserved, interactive and question-answering content can be added, and group topic discussions can be added to enrich teaching methods. The lecturers can select a number of student assistants to assist in teaching or even have them explain and share on stage. In the course examination content, additional questions can be added for self-study content, thereby creating more possibilities for students' innovative development. On this basis, some evaluation content can be added to the course assessment indicators in the comprehensive assessment to encourage innovative reforms to be transformed into real affirmation, which will ignite the students' wisdom and enhance their motivation for learning and progress.

4.2 Improve the Index System

The comprehensive assessment index system should not remain unchanged. It should keep pace with the times and be continuously optimized to be more in line with the practice of student training. Combined with the job requirements and the work practices of grassroots units and colleges, the following countermeasures and suggestions are proposed around improving the index system.

Deepen the role of ideological guidance. Integrating Moral Integrity with Professional Competence, with Priority Given to Moral Character. Military academies must prioritize cultivating cadets with firm convictions and absolute obedience to commands.Especially today, the world is undergoing a major change that has not been seen in a century. The complexity and uncertainty of future military struggles are increasing, and successors with firm positions and steel-like beliefs are needed. Learning enthusiasm has a lot to do with enrollment motivation. Compared with local colleges, military academy students join the army as soon as they enter school. If they lack the ideological foundation of dedicating themselves to serving the country and being determined to strengthen the army, their learning motivation will continue to decline. Military academies can only strengthen, not weaken, the ideological education of students. To this end, the assessment content and weight of ideological quality in the comprehensive assessment should be appropriately increased. Theoretical learning, theoretical testing, mass evaluation, and branch evaluation should be included in the assessment content, and quantitative and qualitative methods should be combined to comprehensively evaluate the ideological quality of students.

Pay attention to the physical and mental quality of students. The body is the capital of the revolution. A healthy body and a healthy mind are the basis for doing all work well and for moving towards victory. The graduates we send to the grassroots units should master the general knowledge of sports and the basic methods of physical skill training, master the basic knowledge of psychology and the basic methods of psychological regulation, have a good health awareness and physical exercise habits, have a strong physique, good psychological endurance and self-regulation ability[9], and good interpersonal relationships. To this end, we can add physical and mental quality assessment items to the comprehensive assessment to assess the physical function and psychological quality of students and guide them to actively pay attention to their personal physical and mental health.

Improve students' humanistic quality. The guiding principles of the National Education Conference emphasize that we must comprehensively strengthen and improve school education, adhere to educating people with beauty and culture, and improve students' aesthetic and humanistic qualities[10]. Military academies should vigorously promote the core socialist values, strengthen the education of China's excellent traditional culture, revolutionary culture, and advanced socialist culture, stimulate students' emotional motivation and creative vitality, cultivate noble sentiments, and enhance cultural confidence. Having certain humanistic qualities can also help students develop hobbies and skills, improve communication and expression skills, enhance cultural taste, and cultivate a spirit of cooperation, thereby improving their job performance. Most military academies are strong in science and engineering and weak in liberal arts. It is

necessary to strengthen the training design in liberal arts classrooms, series of lectures, cultural and sports clubs, etc., add humanistic quality assessment items to the comprehensive assessment, examine literary and sports specialties, literary and sports competitions, article publications, educational practice, etc., which can promote students to improve their humanistic qualities independently.

Enhance leadership and management capabilities. Leadership and management capabilities are the necessary abilities and qualities for graduates to serve in grassroots positions, and should be focused on during school. The evaluation of leadership and management in the original comprehensive assessment is relatively simple, only distinguishing between serving as a backbone and organizing activities. The evaluation indicators are not specific enough. It is recommended to assess from two aspects: job performance and activity practice. Among them, the post-taking is divided into two aspects: position points and performance points. Position points are assigned according to the simulated backbone position level, and performance points are assigned according to the performance of the job by combining the evaluation of the masses and the branch. This will encourage the backbones to cherish their positions and perform their duties, and on the other hand, it will give full play to the power of the masses to supervise the backbones' post-taking, and guide the trainees to achieve the transformation from "serving as backbones" to "being competent backbones"; activity practice is divided into two aspects: activity planning and organization and activity effect. It is necessary to give trainees the opportunity to plan and organize major activities, and to pay attention to the activity organization process and effect evaluation to improve the scientific nature of the evaluation.

Highlight the cultivation of fighting spirit. For military units, a mighty army must be mighty, and revolutionary soldiers must have blood[11]. Blood is a special attribute of soldiers and a manifestation of fighting spirit and combat effectiveness. "Having blood" is also one of the contents of the "four haves" evaluation criteria, and it should also have a place in the comprehensive evaluation. Especially for a comprehensive university, the majority of undergraduate students are young students who directly enroll in the army from elementary school, junior high school and high school. They study hard for more than ten years and are oblivious to the outside world. They lack military experience. Most students are full of bookishness when they enter school. They need to temper their blood and courage in the process of hard work and establish a good image of soldiers for their service in the army. In the comprehensive assessment, fighting spirit can be set as a content of daily performance, and it can be evaluated from the dimensions of major task performance and critical moment performance to guide students to strengthen their fighting style and will.

Appropriately introduce military evaluation. The employer, that is, the grassroots troops, has more say in the quality of talent training. By organizing military school teachers to work in grassroots troops, the teaching team can deepen their understanding of grassroots front-line troops, so that the course design and content can be closer to the actual situation of the troops and the actual positions; on the other hand, the military school can plan to establish systems such as the recruitment of military mentors, joint exercises and competitions, exchanges of typical representatives, and pairing of outstanding seniors to help students better understand the needs of the troops and the direction of their personal efforts. In the comprehensive assessment, it is recommended to explore inviting employers to send personnel to assist in military physical skills training, assist in organizing annual physical fitness assessments and physical education course assessments, and participate in the comprehensive assessment of graduating students. This can not only increase the evaluation from the perspective of job position in the comprehensive assessment, but also allow employers to understand the growth of students in advance, provide career planning suggestions based on students' performance, and improve students' adaptability to their first job.

4.3 Scientific Implementation

The vitality of good policies and regulations lies in their implementation. Comprehensive assessment involves the vital interests of trainees, and requires coordination and cooperation at all levels, and efforts in the same direction to improve the quality and efficiency of comprehensive assessment.

Make top-level planning at the agency level. On the one hand, we should take the lead in optimizing and improving the rules and regulations such as comprehensive assessment methods, talent training programs, and reasonable training of troops, further clarify standards and procedures, and promptly provide guidance and unified evaluation standards for new problems encountered in the process of work, guide the grassroots to carry out work, report, and publicize summaries in a timely manner, and ensure the orderly implementation of comprehensive assessment and other work; on the other hand, provide material and environmental construction support, establish and improve the personal growth files of trainees and the archives room of trainees, and timely collect and archive electronic data, paper materials, and physical archives to preserve precious memories for the growth of trainees.

Play a backbone role at the grassroots level. The grassroots is the battle fortress for the implementation of comprehensive assessment work. We must do a good job in education and guidance of comprehensive assessment work, clarify the content of the assessment rules, and patiently and meticulously implement all aspects of requirements. At the same time, educate and guide trainees to strive for peacetime rather than "evaluation", and integrate comprehensive quality training into all aspects of learning, training and life. The grassroots should make good use of the comprehensive assessment results, praise and affirm outstanding students, and give preferential consideration to them in terms of evaluation and promotion, etc., so as to play the guiding and motivating role of comprehensive assessment. For the content that requires the student battalion to issue opinions in the comprehensive assessment project, it should be organized strictly according to the procedures.

The trainees should play an active role. On the basis of carefully studying the comprehensive assessment method,

combined with personal actual situation, formulate reasonable goals, use comprehensive assessment indicators to set stage goals for themselves, and make growth and progress easier to achieve. Actively cooperate with the comprehensive assessment work, truthfully organize and report personal data, and do a good job of supervision. In addition, it is possible to consider establishing a comprehensive assessment team composed of students, responsible for daily data statistics and collation analysis, public announcement adjustment, etc., and introduce the latest technologies such as artificial intelligence models to help organize and analyze data, create talent portraits, and make career planning suggestions.

5 CONCLUSION

The comprehensive evaluation system for cadets has demonstrated significant effectiveness in talent cultivation and graduation assignment. Moving forward, it must be continuously optimized in keeping with the times to enhance its scientific rigor and effectiveness. The proposals put forward in this paper are expected to contribute to the improvement of the comprehensive evaluation mechanism, and their practical application merits further validation and development.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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OPTIMIZING EDUCATIONAL RESOURCE ALLOCATION FROM AN ECONOMIC MANAGEMENT PERSPECTIVE

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Abstract: With the development of socio-economic conditions, the importance of education has become increasingly prominent, and the reasonable allocation of educational resources plays a key role in improving education quality, promoting social equity, and driving sustainable economic development. From the perspective of economic management, this study focuses on the problems existing in the allocation of educational resources. In the current education system, resource distribution is markedly unequal: there are clear gaps in educational resources between urban and rural areas, among different regions, and between various types of schools. This not only affects students' access to quality education but also limits the overall advancement of education standards. At the same time, the efficiency with which educational resources are used is low, with instances of waste and underutilization, preventing these resources from achieving their maximum benefit. To address these issues, this study employs relevant theories and methods from economic management to conduct an in-depth analysis of resource allocation in education. By using cost–benefit analysis, it evaluates the outputs generated by different educational resource investments to identify the optimal resource distribution scheme. Additionally, it introduces market mechanisms and competitive structures to enhance the efficiency of resource use, foster healthy competition among educational institutions, and stimulate their innovative vitality. The research findings indicate that optimizing the allocation of educational resources can effectively improve educational equity and raise education quality. Reasonable resource distribution allows more students to benefit from high-quality educational resources and narrows the educational gaps between urban and rural as well as among regions. Simultaneously, improving resource utilization efficiency helps reduce education costs and achieve sustainable use of educational resources. In summary, research on optimizing educational resource allocation from the economic management perspective holds significant theoretical and practical value. This study provides valuable reference for education policy formulation and resource management, contributes to the healthy development of education, cultivates more high-quality talents for society, and promotes economic prosperity and social progress.
Keywords: Educational resource allocation; Education quality; Sustainable economic development; Economic management perspective

1 INTRODUCTION

Educational resource allocation plays a critical role in educational development. Educational resources are the material basis and guarantee for carrying out educational activities and achieving educational objectives, encompassing human resources, physical assets, and financial support. Reasonable allocation of educational resources can provide solid backing for the development of education, help improve educational quality, cultivate high-caliber talents who meet societal needs, and promote social progress and economic growth. High-quality teaching staff can impart richer knowledge and skills, advanced instructional equipment can offer students a better learning experience, and sufficient educational funding can ensure the smooth conduct of educational activities. However, from the perspective of economic management, there are numerous problems and challenges in current educational resource allocation. In terms of inputs, the total amount of educational funding remains insufficient: although the state continues to increase its investment in education, there is still a gap compared to the actual needs of educational development. Moreover, the structure of educational funding is not reasonable: some regions place excessive emphasis on higher education investment while underinvesting in basic education, resulting in lagging development at the foundational level. The channels for sourcing educational resources are also relatively singular, relying mainly on government appropriations, with low enthusiasm for social-capital participation, making it difficult to meet the diversified needs of educational development[1]. In terms of distribution, some schools experience idle teaching equipment and wasted faculty resources, failing to maximize the benefits of educational resources. Inefficiencies in instructional management and research administration further prevent educational resources from being used rationally and effectively. These issues severely constrain the development of education, undermine the realization of educational equity, and hinder improvements in educational quality. Therefore, it is imperative to optimize educational resource allocation from the economic-management perspective. By conducting in-depth research into the economic-management issues of educational resource allocation, identifying existing problems and deficiencies, and proposing corresponding optimization strategies and recommendations, we can enhance the utilization efficiency of educational resources, promote educational equity and quality, and drive the sustainable development of education. In the current education system, under-utilization of resources is pronounced: many schools have high idle rates for teaching equipment, teachers' instructional abilities are not fully leveraged, and the efficiency of research-resource utilization is low. From the economic-management perspective, we can introduce advanced management concepts and methods—for example, establishing a scientific

performance-evaluation mechanism to incentivize teachers to improve teaching quality and research output, thereby fully leveraging teachers as the core educational resource; and employing information-technology tools to facilitate sharing and optimized utilization of educational resources, reducing redundant construction and waste, and thus improving efficiency across teaching, research, and administration. Promoting educational equity and enhancing quality are the core demands of educational development: educational equity is a fundamental basis for social fairness, yet the current imbalance in resource allocation severely impedes its realization. Through this study, we aim to optimize resource allocation to narrow gaps between urban and rural areas, regions, and schools, ensuring every student can enjoy fair and high-quality educational resources. Simultaneously, reasonable allocation and efficient utilization of resources can provide strong guarantees for improving educational quality: sufficient funding can improve teaching conditions, excellent faculty can raise instructional standards, and advanced equipment can enrich pedagogical methods. From the economic-management perspective, by comprehensively considering both the social and economic benefits of education, we can pursue equity while improving quality, cultivate more high-caliber talents suited to societal development needs, and guide the education sector toward greater fairness and higher quality[2].

This study explores the optimization of educational resource allocation from the perspective of economic management, carrying significant theoretical and practical implications and playing a key role in enriching allocation theory, guiding practice, and promoting the sustainable development of education. Although there has been considerable research on educational resource allocation, systematic analysis through the economic management lens remains relatively scarce. Numerous theories in the economic management field—such as resource scarcity theory, cost–benefit analysis, and equity-efficiency theory—offer new perspectives and methods for studying educational resource allocation. By introducing these theories into education research, we can expand both the scope and depth of allocation theory: for example, resource scarcity theory emphasizes rational distribution under limited conditions, prompting a reexamination of resource finitude and considerations of how to maximize educational benefits; cost–benefit analysis provides quantitative means to assess the rationality of allocation, enabling a more scientific measurement of the input–output relationship; and equity-efficiency theory draws attention to balancing fairness with efficiency, thereby refining the goals and principles guiding allocation. At the practical level, this study offers crucial guidance for resource-allocation practice. First, by analyzing the current state of educational resource allocation, we can accurately identify existing problems in input, distribution, and utilization efficiency—for instance, understanding regional and tiered disparities in funding to pinpoint weak links and inform targeted investment strategies; uncovering imbalances between urban and rural, regional, and inter-school allocations to direct optimization efforts and promote equity; and evaluating wasteful or inefficient practices in teaching, research, and administration to propose concrete improvement measures that enhance utilization efficiency[3]. Second, the optimization model and proposed strategies and recommendations developed in this study provide concrete operational schemes for practice: the model, grounded in scientific methods and an indicator system, yields optimal allocation plans to inform decision-makers, while the targeted, actionable strategies for improving input, distribution, and utilization efficiency can guide practical resource-allocation work and ensure that educational resources are used more rationally and effectively. Finally, reasonable allocation of educational resources underpins the sustainable development of education: by optimizing allocation and improving utilization efficiency within limited resource conditions, more high-quality talents can be cultivated to provide intellectual support for socioeconomic development; promoting equity ensures that a broader population can access quality educational resources, thereby raising overall national competence and fostering social harmony and progress; and establishing robust guarantee mechanisms—such as policy support, monitoring and evaluation systems, and social participation channels—can ensure the effective implementation of optimization measures and provide the institutional foundation for the sustainable development of education.

2 MODELS OF EDUCATIONAL RESOURCE ALLOCATION

2.1 Definition and Significance of Educational Resource Allocation

Educational resource allocation refers to the process by which society, according to the needs of educational development, distributes and utilizes various educational resources across different regions, schools, educational levels, and academic disciplines. It encompasses human resources, material assets, financial support, and more, aiming to achieve educational objectives and functions through rational arrangement. In essence, educational resource allocation is not merely a simple distribution of resources but a dynamic and complex systems-engineering endeavor. It involves multiple dimensions—quantity, quality, structure, and effectiveness of resources—and requires comprehensive consideration of factors such as equity, efficiency, and adaptability. Whether allocation is reasonable directly impacts equality of educational opportunity, improvement of education quality, and coordination between education and socio-economic development. Allocation should follow certain principles. First, the principle of equity demands that every learner enjoys relatively equal educational resources, eliminating disparities caused by geography, family background, or other factors. Whether in urban or rural areas, developed or underdeveloped regions, there must be reasonable guarantees in resource distribution. Second, the principle of efficiency seeks to maximize educational output under limited resource conditions. By optimizing how resources are used and structured, utilization efficiency can be improved, avoiding waste and idleness. Finally, the principle of adaptability requires that resource allocation align with socio-economic development needs, cultivating the types of talent society demands[4].

2.2 Common Models of Educational Resource Allocation

The common models of educational resource allocation include the government-led model, the market-driven model, and the hybrid model. Under the government-led model, the state plays a decisive role by formulating education policy, planning development, and allocating funding to centrally manage resources. This ensures equity and public welfare, directing resources to disadvantaged groups and underdeveloped areas, though it may suffer from inefficiencies and lack flexibility. The market-driven model emphasizes market mechanisms: schools and institutions adjust their resource inputs and distributions based on demand and compete to improve quality and efficiency. However, it can lead to over-concentration of resources in profit-generating regions and fields, exacerbating inequity. The hybrid model combines government macro-control with market regulation, guaranteeing basic equity while enhancing utilization efficiency. Here, government ensures fundamental fairness, and the market optimizes resource allocation within that framework.

These concepts, principles, and models form the basic theoretical framework of educational resource allocation, providing an important foundation for subsequent optimization research from an economic-management perspective. By thoroughly understanding these theories, we can better analyze existing allocation issues and propose targeted optimization strategies. Key economic-management theories offer crucial guidance: resource scarcity theory highlights that limited funding, teachers, and facilities require rational prioritization—allocating scarce funds to the most impactful areas; cost–benefit analysis provides quantitative methods to compare investment costs (purchase, operation, maintenance) against long-term social and economic returns, ensuring maximum payoff; and the equity-efficiency framework balances equal opportunity with effective use by directing more support to disadvantaged regions while optimizing school layouts and teacher training to avoid waste. These interrelated theories must be applied in combination with real-world conditions to continuously refine allocation plans, improve efficiency, and promote healthy educational development[5].

Education and the economy interact in close and complex ways, profoundly affecting resource allocation. Classical economists like Adam Smith noted that education enhances worker skills and productivity, driving growth, while Marx emphasized education's role in producing labor capacity critical for development. Modern human-capital theory further argues that investment in education—improving knowledge, skills, and health—forms the backbone of economic expansion. Educational externality theory adds that benefits extend beyond individuals to society at large, fostering overall economic progress[6]. Education boosts growth by raising labor quality—systematic training equips workers with advanced skills, improving productivity (e.g., technically trained industrial workers operate equipment more efficiently)—and by driving innovation, as universities and research institutes cultivate talent that develops new technologies, prompting industrial upgrades and structural shifts (for example, internet growth rests on computer-science education and research). It also optimizes industrial structure by shifting labor from primary to secondary and tertiary sectors, enhancing economic sophistication. Conversely, economic development shapes allocation: wealthier regions allocate more fiscal revenue to education—coastal areas often outspend central and western regions, resulting in better facilities and faculty—and sectoral shifts direct resources toward disciplines aligned with emerging industries (e.g., new-energy programs receive extra support). Advanced economies also harness market mechanisms and information technologies to adjust allocations to demand and share resources widely—online education, for instance, disseminates quality materials broadly. In summary, interaction theories reveal both education's vital contributions to growth and how development influences allocation. Deep understanding of these mechanisms enables optimization of resource allocation from an economic-management perspective, fostering coordinated, sustainable advancement of education and the economy.

3 ANALYSIS OF THE CURRENT STATUS OF EDUCATIONAL RESOURCE ALLOCATION FROM THE PERSPECTIVE OF ECONOMIC MANAGEMENT

3.1 Current Status of Educational Resource Inputs

From an aggregate standpoint, in recent years China's investment in educational resources has continued to rise, with government fiscal education spending accounting for over 4 percent of GDP, reflecting the state's strong emphasis on education; this growing investment has provided a solid material foundation for educational development, gradually improving school infrastructure and strongly supporting faculty development. In terms of input structure, however, imbalances have emerged: basic education—the cornerstone of the system—enjoys relatively stable funding, yet resources remain insufficient in some remote and rural areas, while higher education—vital for training high-level talent and fostering research innovation—has received substantial support, especially at key universities investing heavily in research projects and discipline building; vocational education has attracted increased attention and funding in recent years but still lags behind general education in overall investment. Funding sources have become more diversified: national budgetary appropriations remain the primary source, ensuring basic operations for schools at all levels; social donations—from enterprises, charitable organizations, and individuals—serve as an important supplement; and institutional revenues such as tuition and accommodation fees help alleviate funding pressure. Significant regional disparities persist: economically developed eastern coastal regions with higher fiscal revenues invest adequately in education—schools there boast modern facilities and can attract excellent teachers—whereas central and western regions, with slower economic growth and limited education funding, see much larger gaps in infrastructure and faculty quality; for example, schools in some remote mountainous areas may lack basic teaching equipment and suffer from

insufficient, unevenly qualified teaching staff. Disparities across education levels also remain: preschool education has grown rapidly yet still suffers from underinvestment—private kindergartens often face unstable staffing and high fees—while compulsory education, though a national priority with stable funding, continues to exhibit an urban–rural divide, leaving rural schools with considerable room for improvement in facilities and staffing; in higher education, "double first-class" universities receive far more resources than ordinary institutions, driving differentiated development but risking excessive concentration of resources and undermining educational equity[7].

3.2 Problems in Educational Resource Allocation

Educational resources are distributed unevenly across schools at all levels and types, among different disciplines, and between urban and rural areas, which undermines educational equity and quality improvement: in higher education, key institutions receive disproportionately more investment—government funding tilts toward "double-first-class" universities to build top-level research facilities and recruit leading talent, granting them advanced laboratories, extensive library collections, and international exchange opportunities, whereas ordinary and especially local colleges face resource shortages, outdated equipment, and weak faculty, hindering their ability to attract excellent students and staff and widening institutional gaps; in basic education, high-quality resources concentrate in a few key primary and secondary schools staffed by experienced teachers, equipped with comprehensive facilities and modern pedagogy, fueling "school-choice fever," while weaker schools suffer teacher attrition and insufficient enrollment, compromising education quality. Discipline-level allocation is likewise skewed: popular and applied fields such as computer science and finance—driven by labor-market demand—attract more funding for laboratories and industry-expert instruction, while foundational disciplines like philosophy and history lag in facility upgrades and research funding, and emerging fields in their infancy lack faculty and equipment, stifling innovation. The urban–rural divide is especially pronounced: urban schools enjoy greater fiscal support for modern teaching buildings and sports facilities, better teacher remuneration and development opportunities that draw top educators, and advanced multimedia and networked learning resources, whereas rural schools—hamstrung by limited local budgets—face dilapidated infrastructure, obsolete teaching equipment, a shortage of qualified teachers with little systematic training, and slow adoption of educational technology, depriving rural students of quality learning experiences. This imbalance both exacerbates inequality of educational opportunity—limiting some students' development—and impedes overall quality improvement, resulting in wasteful and inefficient resource use[8]. Research resource utilization further suffers from low funding-use efficiency—some projects overstate needs yet misuse funds on unrelated expenses; project duplication across teams leads to scattered, wasted investment; major research equipment is rarely shared beyond its home unit, underutilizing costly assets; and low commercialization rates leave many findings confined to papers and reports, squandering potential productivity. School management also exhibits inefficiencies: bloated administrative structures and redundant personnel slow decision-making, cumbersome approval procedures hinder teaching and research, and unscientific human-resource management fails to fully motivate staff; financial planning often lacks foresight and precision, causing some programs to be underfunded while others hoard idle funds; and asset management lapses in registration, auditing, and maintenance lead to loss and waste of fixed resources.

3.3 Analysis of Factors Affecting Educational Resource Allocation

From an institutional perspective, the absence of comprehensive management regulations and supervisory mechanisms for educational resources means their use lacks effective constraints and norms; from a conceptual standpoint, some schools and educators do not fully appreciate the scarcity of educational resources and lack awareness of conserving and using them efficiently; and from a technical angle, low levels of educational informatization and the absence of effective resource-sharing platforms and management tools impede reasonable allocation and high-efficiency utilization of resources.

In terms of instruction, there is significant room to improve resource utilization efficiency. Regarding faculty, some teachers' instructional abilities are not fully leveraged: in certain schools, teaching loads are unevenly assigned—some teachers are overburdened with courses, diluting their focus and preventing in-depth development of pedagogy and content, which undermines quality; others have too few assignments, leading to underutilization of staff. Moreover, teacher-training resources are not used optimally: although schools organize various training activities, much of the content is disconnected from actual classroom needs, and teachers struggle to apply what they learn in practice, resulting in wasted training expenditure. As for instructional facilities, laboratories, multimedia classrooms, and other equipment in many schools are underused—due to lack of effective management and scheduling, these assets often sit idle and fail to meet student needs. Textbook resources are similarly wasted: outdated materials that are not revised in a timely manner continue to be used, depriving students of up-to-date knowledge and adding unnecessary costs[9].

3.4 Survey on Teachers' and Students' Satisfaction with Venues and Equipment

Adequate venues and equipment are fundamental conditions for physical education (PE) teaching. As PE integrates both theory and practice, it heavily relies on the support of textbooks and equipment, with practical instruction depending on the availability of venues and facilities. This study conducts a statistical survey on the satisfaction levels of PE teachers and students from urban and rural junior high schools in a certain city regarding sports venues and equipment, with the results presented as follows:

Table 1 Statistics on the Satisfaction of Urban and Rural Junior High School PE Teachers with Sports Venues and Equipment in a Certain City

Satisfaction Level	Urban Junior Middle School (n = 59)		Rural Junior Middle School (n = 27)	
	Count	Percentage（%）	Count	Percentage（%）
Very dissatisfied	1	3.4	7	25.9
Somewhat dissatisfied	5	8.5	4	29.6
Generally satisfied	19	32.2	9	33.3
Quite satisfied	27	45.8	4	14.8
Very satisfied	7	11.9	0	0

According to Table 1, it can be observed that urban junior high school PE teachers in a certain city reported significantly higher levels of "generally satisfied," "relatively satisfied," and "very satisfied" with sports venues and equipment compared to their rural counterparts, accounting for 32.2%, 45.8%, and 11.9%, respectively. In contrast, rural junior high school PE teachers reported higher levels of "very dissatisfied" and "somewhat dissatisfied," accounting for 25.9% and 29.6%, respectively. Overall, from the perspective of PE teachers, urban junior high schools show a higher level of satisfaction with sports venues and equipment than rural schools, indirectly reflecting that sports facilities and equipment in rural areas are insufficient to meet the needs of physical education.The satisfaction levels of PE teachers and students regarding sports venues and equipment also reflect the actual situation of urban and rural junior high schools in the city. As shown in Figure 1, the satisfaction levels of urban junior high school students are mainly concentrated in the categories of "generally satisfied" and "very satisfied," accounting for 33.6% and 27.3%, respectively. The proportion of students who were "very dissatisfied" was the lowest at only 4.2%. In contrast, rural junior high school students' satisfaction levels were mainly concentrated in the categories of "very dissatisfied" and "somewhat dissatisfied," accounting for 21.8% and 38.7%, respectively, with only 2.5% being "very satisfied."Overall, at the student level, satisfaction in urban areas is still higher than that in rural areas. This finding is consistent with the previous survey results on sports venues and equipment. The relatively old and rudimentary condition of sports facilities and equipment in rural areas is the main reason for the lower satisfaction levels among PE teachers and students.

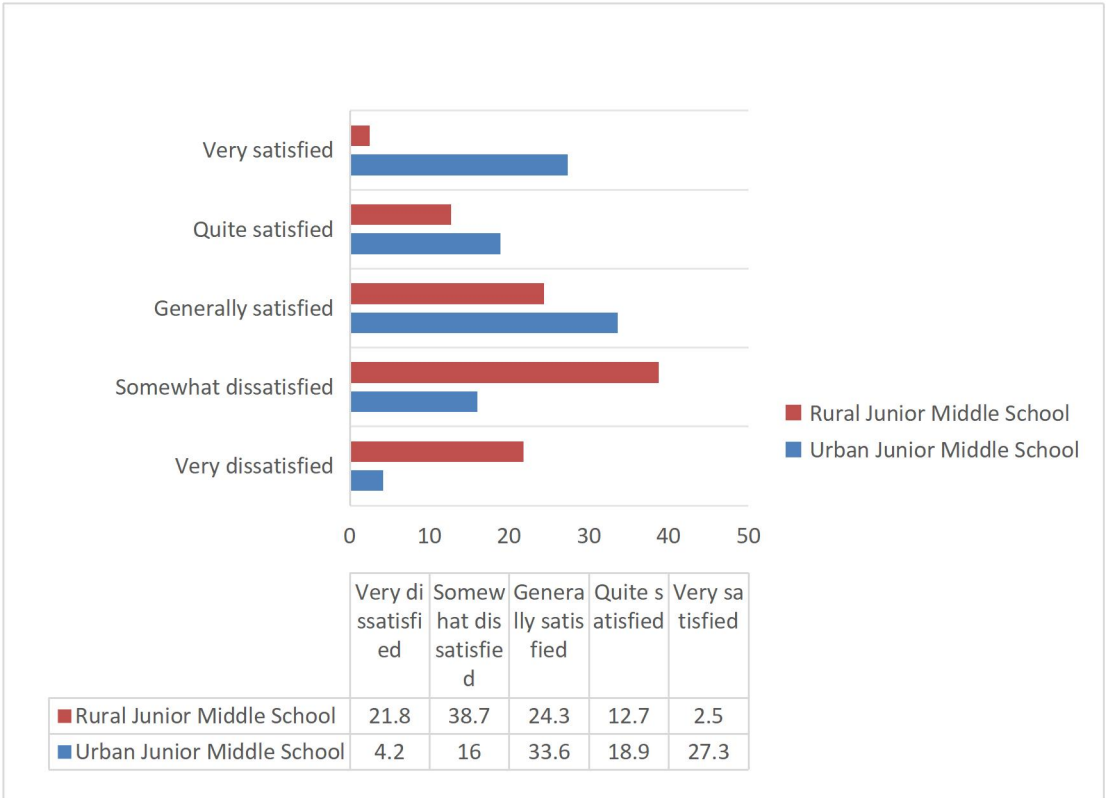

Figure 1 Statistical Chart of Student Satisfaction with Sports Venues and Equipment in Urban and Rural Junior High Schools of a Certain City

3.5 The Logical Approach to Educational Resource Allocation Amid Changes in the School-Age Population Structure

At present, the structural and trend-based changes in the school-age population present dynamic challenges that are difficult for the education sector to address. It is necessary for educational resource allocation to not only meet the demands of fairness, efficiency, and stability, but also to reconsider the narrative logic for constructing a grand

framework based on the human condition. Following the developmental logic of school-age population structure, population mobility, and high-quality demographic development, educational resource allocation should construct a logical narrative that supports educational equity and high-quality, balanced development (as shown in Figure 2).

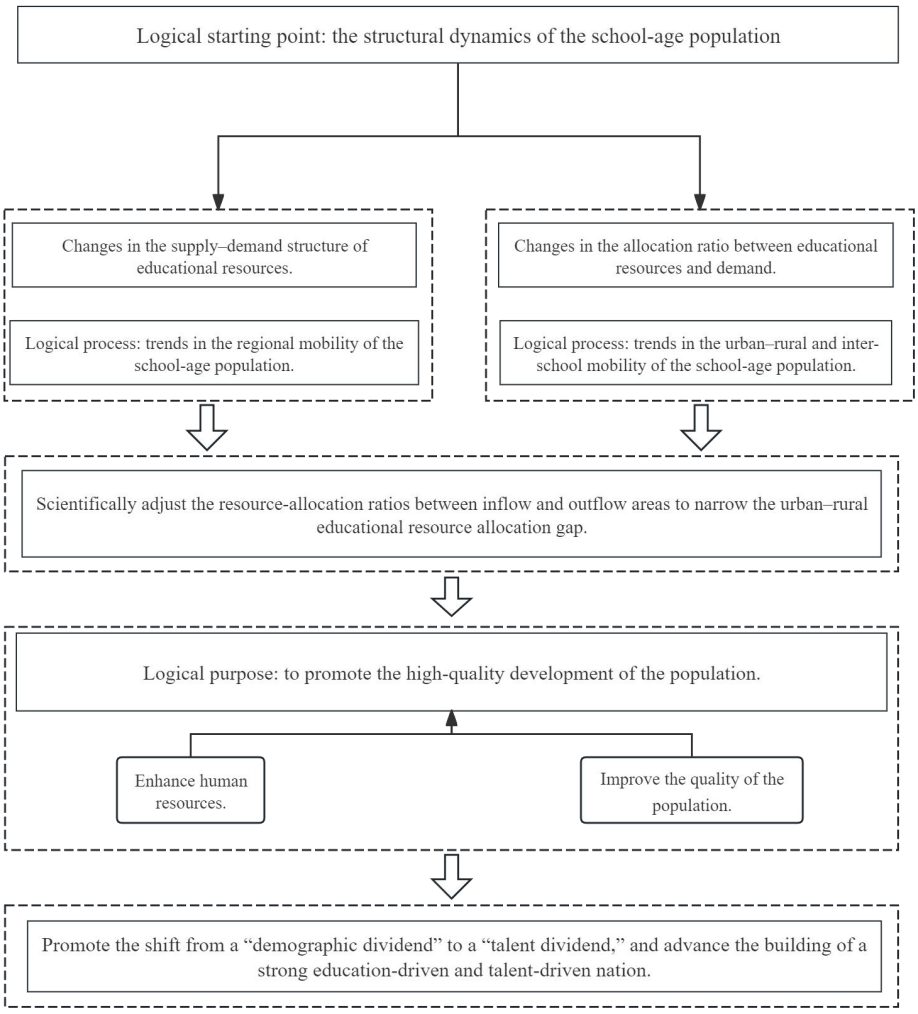

Figure 2 The Logical Approach to Educational Resource Allocation Amid Changes in the School-Age Population Structure

As the fundamental subject at the intersection of education and demography, changes in the school-age population primarily influence factors such as student enrollment numbers, scale of school-age population, gross enrollment rate, and urbanization rate of enrolled students, driving structural transformations in the supply and demand of educational resources. Educational resource allocation, as a macro-level practice focusing on regions, schools, and educatees, requires the regional structure of school-age population as its logical starting point for precise implementation. Behind the inverted pyramid structure characterized by a "wide top and narrow base" in school-age population lies the suppressed fertility intentions of childbearing-age populations, rationalized fertility attitudes, and delayed childbearing ages. Serving as the cornerstone for maintaining educational equity and justice, educational resource allocation emphasizes the pursuit of high-quality balanced development and comprehensive educational advancement. Its core concerns relate to the quantitative aspects of school-age populations across various educational levels and types, as well as actual educational demands, highlighting the principle of proportional resource distribution. It can be stated that structural changes in school-age population not only constitute the contextual background but also serve as the reference framework for educational resource allocation - functioning both as the practical starting point and a directional influencer for allocation practices. Educational resource allocation requires analytical determination based on school-age population structures, referencing their compositional patterns across different educational levels and types, while treating demographic variations in student populations and structural changes in enrollment across educational stages as fundamental logical premises[10].

4 CONSTRUCTION OF AN ECONOMIC MANAGEMENT MODEL FOR OPTIMIZING EDUCATIONAL RESOURCE ALLOCATION

4.1 Objectives and Principles of Educational Resource Allocation Optimization

The establishment of objectives for optimizing educational resource allocation forms the foundation for constructing an economic management model, encompassing multiple critical dimensions. Enhancing educational quality stands as one of the core objectives. High-quality education cultivates individuals with innovative capabilities, critical thinking, and practical skills, which are vital for holistic personal development and societal progress. Through rational resource allocation, schools can be equipped with advanced teaching facilities, excellent faculty, and scientific curriculum systems, providing students with a conducive learning environment and thereby elevating overall educational quality. Promoting educational equity is another pivotal objective. Educational equity ensures that all students, regardless of urban or rural residency or family economic status, have access to relatively balanced educational resources. This helps break down class stratification, offers equal developmental opportunities, and mitigates social inequalities arising from resource disparities. Improving socioeconomic benefits is equally essential. Education serves as a key driver of economic growth and social development. Rational resource allocation fosters the cultivation of professionals aligned with market demands, promotes technological innovation and industrial upgrading, and injects momentum into economic growth. Simultaneously, high-quality education enhances civic literacy and cultural standards, contributing to social harmony and stability.

To achieve these objectives, corresponding principles must be established. First, the integration of equity and efficiency: During resource allocation, fairness must be prioritized to ensure basic educational opportunities and resources for all students, while efficiency must be pursued to avoid resource waste or underutilization. Through rational planning and distribution, limited resources can yield maximum benefits. Second, the adaptability principle: Resource allocation should align with socioeconomic development levels, flexibly adjusting investments and distributions based on regional economic conditions, demographic structures, and industrial demands. Concurrently, it must respect the inherent developmental patterns of education to meet the needs of diverse educational tiers and types. Third, the dynamic principle: Education is an evolving field, and socioeconomic environments are in constant flux. Thus, resource allocation cannot remain static; dynamic adjustment mechanisms must be established to optimize and refine allocations in response to emerging realities. Fourth, the sustainability principle: Resource allocation should prioritize long-term benefits, ensuring rational utilization and conservation of resources. Investments must account for resource renewability and environmental compatibility, avoiding overexploitation and waste to achieve sustainable educational development. By clarifying these objectives and principles, a robust foundation is laid for constructing an economic management model for optimizing educational resource allocation[11].

The construction of a scientific and rational indicator system for optimizing educational resource allocation is critical to achieving rational distribution and efficient utilization. This system encompasses input indicators, distribution indicators, and utilization efficiency indicators. Input indicators measure the foundational aspects of resource allocation, reflecting societal prioritization and investment in education. For total educational funding, the aggregate financial inputs from governments, private sectors, and other stakeholders over a specified period should be quantified, as this constitutes the material basis for educational development. Input structure indicators focus on the proportional distribution of funds across educational stages (e.g., preschool, basic, and higher education), educational types (e.g., general vs. vocational education), and internal educational components (e.g., teaching facilities, teacher training, research investments). Funding source indicators analyze the contributions from government budgets, social donations, tuition fees, and other channels, where diversified funding sources enhance resource stability and sustainability. Additionally, human resource inputs, including teacher quantity, qualifications, and expertise, are vital, as high-quality faculty is central to improving educational outcomes.

Distribution indicators assess the equity of resource allocation across different dimensions. For inter-school distribution, disparities in funding, equipment, and faculty quality among schools (e.g., elite vs. ordinary schools) must be quantified to expose imbalances. Interdisciplinary distribution indicators evaluate resource allocation between popular and niche disciplines or foundational and applied fields, ensuring balanced support for all academic domains. Urban-rural distribution indicators focus on gaps in infrastructure, faculty, and digital resources between urban and rural schools, where narrowing these disparities is crucial for advancing equity.

Utilization efficiency indicators evaluate the effectiveness of resource use in teaching, research, and administration. For teaching, per-student output indicators measure academic performance, graduation rates, or skill levels relative to resource inputs, such as the number of students achieving specific benchmarks per unit of funding. In research, conversion rates of academic outputs gauge the socioeconomic impact of research investments, including citation rates or patent commercialization. For administration, cost-effectiveness ratios assess the efficiency of administrative expenditures (e.g., personnel costs, operational expenses) relative to institutional outcomes. Resource idle rates, reflecting underutilized assets (e.g., equipment, classrooms), further highlight opportunities for efficiency gains. By establishing this comprehensive indicator system, quantitative insights into resource allocation can guide the identification of inefficiencies, enabling targeted improvements to achieve sustainable educational development.

In optimizing educational resource allocation, the application of scientific economic management models—such as linear programming and analytic hierarchy process (AHP)—is pivotal for deriving optimal solutions. These models will be elaborated in subsequent sections.

4.2 Construction of an Economic Management Model for Educational Resource Allocation

The linear programming model is a widely used mathematical optimization method that seeks optimal solutions for an objective function under a set of linear constraints. In educational resource allocation, the objective can be defined as maximizing educational outputs, such as improving overall student performance or increasing research productivity, while treating total resource inputs and allocation ratios across resource types as constraints. For instance, consider optimizing the distribution of educational funds among primary, secondary, and tertiary education in a region to maximize comprehensive educational benefits.Let (x_1),(x_2),(x_3) represent the funds allocated to primary, secondary, and tertiary education, respectively.The objective function can be formulated as (Z = a_1x_1 + a_2x_2 + a_3x_3),where (a_1)、(a_2)、(a_3) denote the educational benefit coefficients per unit of funding for each education level.Constraints may include: total funding limitations (x_1 + x_2 + x_3 \leq M)（where M is the region's total available educational funds）;minimum funding guarantees for each education stage (x_1 \geq m_1),(x_2 \geq m_2),(x_3 \geq m_3) .Using optimization methods like the simplex algorithm, the maximum value of Z under these constraints can be determined, yielding an optimal funding distribution plan.

The analytic hierarchy process (AHP) model, on the other hand, is a decision-making method that decomposes complex problems into hierarchical levels and determines the relative importance of factors through pairwise comparisons. In educational resource allocation, it enables the integration of multiple objectives and factors, such as equity, quality, and socioeconomic impact.

Constructing the AHP hierarchy typically involves three layers:

1.Goal layer: Educational resource allocation optimization.

2.Criteria layer: Includes criteria such as educational inputs, distribution equity, and utilization efficiency.

3.Alternative layer: Represents different resource allocation strategies.

Next, pairwise comparison matrices are constructed. For criteria within the criteria layer, their relative importance to the goal is assessed through expert evaluations or data analysis. For example, comparing the significance of "educational inputs" versus "distribution equity" in optimization and assigning corresponding weights. Similarly, pairwise comparisons are conducted for alternatives relative to each criterion.

Subsequently, weights for hierarchical elements are calculated by solving eigenvalues and eigenvectors of the comparison matrices, yielding relative weights for criteria and alternatives. Finally, comprehensive scores for alternatives are computed by synthesizing weights across levels, with the highest-scoring alternative identified as the optimal allocation strategy.

In practical applications, model validation and adjustment are essential. By collecting empirical data, the model's accuracy and effectiveness are verified. If significant deviations from real-world observations occur, parameters, constraints, or objective functions must be refined to ensure the model authentically reflects actual resource allocation dynamics, thereby providing scientifically robust decision-making support for optimization.

5 STRATEGIES AND RECOMMENDATIONS FOR OPTIMIZING EDUCATIONAL RESOURCE ALLOCATION

5.1 Resource Investment Strategies

Optimizing educational resource allocation requires a tripartite investment approach. First, governments must prioritize education in fiscal planning by establishing stable funding growth mechanisms that exceed regular revenue increases, with explicit targets for educational expenditure as a percentage of GDP. Second, structural optimization involves balancing allocations across educational tiers—strengthening compulsory education while increasing investments in preschool, vocational, and higher education—along with equitable disciplinary funding to support both foundational and emerging fields. Third, diversifying funding sources through corporate partnerships incentivized by tax benefits, transparent donation frameworks, and innovative financial instruments (e.g., education bonds) ensures sustainable resource mobilization[12].

5.2 Equity-Efficiency Principles in Resource Allocation

Rational distribution necessitates balancing equity and efficiency. Equity requires bridging urban-rural gaps through rural infrastructure upgrades, equitable teacher allocation via improved compensation and cross-regional exchanges, and targeted funding for underdeveloped regions. Efficiency demands precision allocation aligned with institutional needs—such as directing specialized resources to schools with unique profiles (e.g., arts or STEM-focused institutions)—and dynamic adjustments based on demographic shifts. Transparency mechanisms like public allocation dashboards and audit systems enhance accountability while preventing misallocation.

5.3 Enhancing Resource Utilization Efficiency

Efficiency improvements rely on three pillars: Institutional management optimization through streamlined curricula, rigorous financial controls, and facility maintenance minimizes waste. Teacher capacity building via continuous training, pedagogical innovation incentives, and performance evaluations maximizes instructional quality. Educational informatization—deploying digital infrastructure (e.g., smart classrooms, online platforms) and promoting technology-

integrated teaching—enables scalable resource sharing and accessibility. These integrated strategies collectively drive sustainable, equitable, and high-impact educational development.

6 SAFEGUARD MECHANISMS FOR OPTIMIZING EDUCATIONAL RESOURCE ALLOCATION

6.1 Policy Safeguards

Effective policy frameworks are critical for optimizing educational resource allocation. Governments at all levels must coordinate fiscal and educational policies to ensure rational adjustments and efficient utilization. Fiscal policies should prioritize increased educational investment, gradually raising the proportion of education expenditure in GDP to guarantee sustainable funding. Funding structures must be optimized to favor basic education, rural schools, and underdeveloped regions through mechanisms like special education funds for rural infrastructure and teacher welfare. Transfer payments to economically disadvantaged areas can enhance resource accessibility, while tax incentives (e.g., corporate/personal income tax reductions) should encourage private sector participation[13]. Educational policies require scientifically grounded development plans aligned with regional needs, alongside reforms in enrollment systems (e.g., district-based or consortium school models) to break institutional barriers and promote resource sharing. Teacher policies should strengthen workforce mobility, incentivizing talent relocation to rural and underperforming schools through improved compensation, career advancement opportunities, and rural service allowances. Curriculum and evaluation reforms must prioritize holistic education to enhance quality. Legal frameworks, such as an Educational Resource Allocation Act, should codify responsibilities for governments, schools, and stakeholders, ensuring equity and accountability. Regular policy evaluations and adjustments based on implementation outcomes are essential to maintain relevance and effectiveness.

6.2 Monitoring and Evaluation Systems

A robust monitoring and evaluation (M&E) system is indispensable for ensuring accountability and continuous improvement. Evaluation entities should include government agencies, schools, independent assessors, and stakeholder representatives (students/parents). Government bodies oversee macro-level alignment with national strategies, schools provide operational feedback, third-party assessors ensure objectivity, and beneficiaries voice practical impacts. Evaluation criteria must comprehensively address input adequacy, structural equity (geographic, institutional, disciplinary), and utilization efficiency (academic, economic outcomes). Quantitative methods (statistical analysis, cost-benefit metrics) and qualitative approaches (surveys, field studies) should be integrated, supplemented by comparative analyses to identify regional or institutional gaps. Evaluation cycles should balance short-term reviews (annual funding audits) with longitudinal assessments (3–5 years for efficiency trends), supported by interim progress tracking. Transparent reporting mechanisms and corrective actions based on findings ensure iterative optimization of resource allocation[14].

6.3 Social Participation Mechanisms

Multistakeholder engagement is vital for diversified and sustainable resource allocation. Corporate investments can take the form of direct contributions (e.g., funding, equipment donations) or collaborative projects (e.g., industry-academia R&D partnerships), enhancing institutional capabilities while addressing market needs. Government incentives (tax breaks, subsidies) can amplify corporate participation. Philanthropic donations from organizations and individuals should be channeled into infrastructure upgrades, scholarships, and grants, with transparent management systems to build donor trust. Public recognition of contributors fosters a culture of educational philanthropy. Family-school collaboration empowers parents as active partners through curriculum input, volunteer programs, and joint initiatives that align educational practices with student needs. Schools should institutionalize parent engagement via workshops and feedback channels[15]. Governments must facilitate cross-sector partnerships through supportive policies, while schools create platforms for collaboration. By integrating corporate, philanthropic, and community resources, a synergistic ecosystem emerges, driving equitable and sustainable educational development.

This comprehensive safeguard system—encompassing policy coherence, rigorous M&E, and inclusive participation—ensures that educational resource optimization aligns with societal needs, operational realities, and long-term developmental goals.

7 EMPIRICAL RESEARCH

This empirical research aims to verify the effectiveness of the education resource allocation optimization model and strategy based on the perspective of economic management. To ensure the scientificity and reliability of the research, the following detailed explanation of the research design is provided. The study selected 100 primary and secondary schools from regions with different economic development levels in China, covering the developed eastern regions, the moderately developed central regions, and the underdeveloped western regions. Primary and secondary schools were chosen as the research objects because they represent the basic stage of national education, and the optimization of resource allocation at this stage is crucial for the development of the entire education system. The samples from different regions can adequately reflect the status quo and problems of education resource allocation under different

economic environments. In terms of research methods, a combination of questionnaire surveys, interviews, and case analysis was used. The questionnaire survey is one of the main data collection methods. Different questionnaires were designed for school administrators, teachers, and students. The questionnaire for school administrators mainly involves information about the investment, allocation, and management of education resources, such as the sources of school funding and resource allocation policies; the teacher questionnaire focuses on the usage and demand for teaching resources, such as the provision and usage frequency of teaching equipment and the demand for educational informatization resources; the student questionnaire focuses on students' perception and utilization of educational resources, such as whether they can fully use the school's library, laboratory, and other resources. The questionnaire survey allows the collection of large amounts of quantitative data, providing a basis for subsequent data analysis. The interview method was mainly used to gain in-depth insights into the actual situation of education resource allocation and existing problems. Interviews were conducted with principals, teachers, and education department staff from some schools. Interviews with principals help understand the difficulties and challenges faced by schools in resource allocation and their views and suggestions on optimizing resource allocation; interviews with teachers help understand the actual demands and effectiveness of resource use in teaching; interviews with education department staff help understand the background and situation of policy formulation and implementation. The interview method provides rich qualitative data to complement the deficiencies of the questionnaire survey. The case analysis method selected a number of representative schools for in-depth study. By analyzing the successful experiences and failures of these schools in education resource allocation, we summarized models and strategies that can be referenced. Case analysis provides practical case support for theoretical research, making the research results more practically significant.

The data sources primarily include three aspects. First, statistical data from the education department, which provides macro-level information on education resource investment and distribution, such as the total amount of educational funds and the proportion of educational funds in different regions. Second, internal data from schools, including financial statements, teaching resource usage records, etc., which reflect the resource allocation and utilization at the school level. Third, data collected through questionnaire surveys and interviews, which provide insights into the views and needs of school administrators, teachers, and students regarding education resources. Through the above research design, we can comprehensively and deeply understand the current situation and problems of education resource allocation, providing scientific and reliable data support to verify the effectiveness of the education resource allocation optimization model and strategy based on the economic management perspective. After collecting the data required for the empirical research, we conducted a comprehensive and in-depth analysis to verify the effectiveness of the education resource allocation optimization model and strategy based on the economic management perspective. First, in terms of data on education resource investment, we analyzed the changes in the total amount, structure, and source channels of educational funding before and after optimization. Through comparison, we found that after implementing resource investment strategies, the total amount of educational funding significantly increased. The strategy of expanding investment channels achieved some success, with a rise in the proportion of non-financial educational funding, such as social donations and corporate investments, in addition to government financial allocations. In terms of investment structure, the proportion of investment in weak regions and subjects significantly increased, which helps improve the disparity in education resource investment across different regions and levels. For education resource distribution data, we focused on the balance of resource allocation across various types of schools, different subjects, and urban and rural areas. According to the analysis results, the resource allocation strategy based on fairness and efficiency principles played a positive role. The gap in educational resources between urban and rural areas and between schools was reduced to some extent. For example, rural schools received more resources in teaching equipment and teacher allocation, and resource distribution across different subjects became more reasonable, avoiding the excessive concentration of resources in a few popular subjects. In terms of the efficiency of education resource utilization, we evaluated it by comparing relevant indicators before and after optimization in areas such as teaching, research, and management. The data show that strategies to improve resource utilization efficiency, such as strengthening internal management, improving teacher quality, and promoting educational informatization, achieved good results. The quality of teaching improved, and students' academic performance and overall quality were enhanced. Research output increased in both quantity and quality, and management efficiency improved, reducing resource waste and idle capacity.

To verify the effectiveness of the education resource allocation optimization model more intuitively, we compared the optimized solutions derived from the model with the actual situation. The results showed that the resource allocation effect predicted by the model closely matched the actual situation after optimization. This indicates that the linear programming model and analytic hierarchy process model we constructed can, to some extent, accurately guide the optimization of education resource allocation. However, the data analysis results also reflect some issues. In terms of resource investment, although the total amount increased, the growth rate still lagged behind the demand for educational development. The enthusiasm of social forces to participate in education resource investment needs to be further increased, and some policies that guide social capital into the education sector are not sufficiently effective. In terms of resource distribution, although the gap was reduced, the absolute gap in education resources between urban and rural areas remains large, and the conditions of schools in some remote areas are still relatively poor. In terms of improving resource utilization efficiency, there is an imbalance in the promotion of educational informatization. Some schools, due to technical and financial constraints, have not fully utilized informatization to improve the efficiency of education resource utilization. Overall, the education resource allocation optimization model and strategy based on the economic management perspective are effective, and they have improved the current state of education resource allocation to some extent. However, some issues that need further attention have been exposed. In the future, it will be necessary to

further improve relevant policies, strengthen support for weak links, fully mobilize the enthusiasm of social forces, and continuously optimize the allocation of educational resources to achieve the long-term goals of educational fairness and quality improvement.

8 CONCLUSION AND PROSPECTS

This study systematically and in-depth explored the optimization of education resource allocation from the perspective of economic management, achieving a series of research results with significant value. At the theoretical level, this study comprehensively applied education resource allocation theory, economic management theory, and the theory of the relationship between education and economy, constructing a comprehensive and in-depth theoretical analysis framework. It elaborated on the connotations, principles, and models of education resource allocation, clarified the application principles of economic management theories such as resource scarcity, cost-benefit analysis, fairness and efficiency, and analyzed the impact mechanism of the interaction between education and economy on resource allocation. This not only enriched the theoretical system of education resource allocation but also provided solid theoretical support for subsequent empirical research and practical operations. In terms of the current situation analysis, the study thoroughly analyzed the status quo of education resource investment, distribution, and utilization efficiency. It found that while the total amount of education funding has increased, issues such as an unreasonable structure and relatively single sources remain, and significant disparities in education resource investment exist across different regions and levels. The phenomenon of uneven distribution of education resources is prominent, with obvious gaps between various types of schools, different academic disciplines, and urban and rural areas. Meanwhile, the efficiency of education resource utilization needs improvement, with certain levels of waste and inefficiency in teaching, research, and management. These findings provided clear practical evidence for proposing targeted optimization strategies.

By constructing an economic management model for optimizing education resource allocation, this study clarified the optimization goals and principles, designed a scientific and reasonable indicator system, and solved the optimization scheme using linear programming models, analytic hierarchy process models, and other economic management methods. The model comprehensively considered various objectives, including improving education quality, promoting educational fairness, and enhancing economic and social benefits, providing specific quantitative methods and operational paths for achieving efficient resource allocation. In terms of optimization strategies and safeguard mechanisms, this study proposed a series of targeted and operable suggestions. The resource investment strategy emphasized increasing the total amount, optimizing the structure, and expanding channels to ensure sufficient supply of education resources. The resource distribution strategy focused on fairness and efficiency principles, aiming to reduce the gaps between urban and rural areas, regions, and schools. The strategy to improve resource utilization efficiency explored the potential for improving efficiency from multiple aspects, including school internal management, teacher quality improvement, and the advancement of educational informatization. At the same time, a safeguard system including policy support, supervision and evaluation mechanisms, and social participation mechanisms was established to provide institutional guarantees for the effective implementation of optimization strategies. The empirical research section verified the effectiveness of the education resource allocation optimization model and strategy based on the economic management perspective. Through data analysis, it was found that the optimization scheme could significantly improve the efficiency of education resource utilization, promote educational fairness and quality improvement, further proving the practical value of this research.

Although this study has achieved certain results in optimizing education resource allocation from the perspective of economic management, there are still some shortcomings. First, there are limitations in data collection. The education resource data involved in this study mainly comes from publicly available statistical data and sampling surveys from a few schools. Public statistical data may have certain delays and statistical errors, while sampling surveys, limited by sample size and scope, may not fully and accurately reflect the real situation of education resource allocation. Especially for education resource data from special regions or types of schools, it is difficult to obtain, leading to potential bias in the research results. Second, there is some simplification in model construction. In constructing the education resource allocation optimization model, certain complex real-world factors were simplified to facilitate model solving and analysis. For example, when considering education resource distribution, the impact of different regional cultural backgrounds and individual student differences on education resource demand was not fully considered. These simplifications may affect the practical application of the model, making it less adaptable to the complex and changing reality of education resource allocation. Moreover, the time span of the empirical research is relatively short. This empirical study only selected data from a specific time period for analysis, and the time span is relatively short. Optimizing education resource allocation is a long-term dynamic process, and short-term data may not fully reflect the long-term effects and potential impacts of resource allocation optimization measures. Therefore, conclusions based on short-term data may lack stability and reliability.

To address the above research limitations, future research can be expanded in the following areas. In data collection and processing, cooperation with relevant institutions such as education departments and schools should be strengthened to establish a more complete data collection system. On one hand, efforts should be made to obtain more comprehensive, timely, and accurate education resource data, including data from more special regions and types of schools; on the other hand, advanced data processing technologies should be employed to clean and analyze the data, improving data quality and research accuracy. In model construction, the model should be further improved by fully considering more factors influencing education resource allocation, such as cultural backgrounds and individual student differences, to

make the model more aligned with the actual situation. At the same time, attempts can be made to combine various models for comprehensive analysis, enhancing the model's applicability and effectiveness. For example, combining linear programming models with system dynamics models could more comprehensively simulate the dynamic changes in education resource allocation. For empirical research, the time span of the study should be extended. Long-term tracking studies should be conducted to observe the implementation effects of education resource allocation optimization measures in different time periods and analyze their long-term impacts and trends. Long-term empirical research can provide a more accurate assessment of the effectiveness and stability of optimization measures, offering more reliable evidence for the formulation of education resource allocation policies. Additionally, future research can strengthen interdisciplinary studies. Education resource allocation involves multiple disciplines, including education, economics, and management. Interdisciplinary research can integrate theories and methods from different fields, providing more comprehensive and in-depth solutions for optimizing education resource allocation. At the same time, international comparative research can be strengthened to learn from the successful experiences and advanced practices of other countries in education resource allocation, and explore education resource allocation optimization paths suitable for China's national conditions based on actual circumstances.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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