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Investigation on the Current Situation of Physics Classroom Teaching in L City Middle Schools with the Concept of Core Literacy

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Abstract: This paper analyzes the actual situation of secondary schools physics classrooms in L city by means of field research interviews, classroom observation and questionnaire surveys, starting from the connotation of the core literacy concept and taking students and teachers of five representative secondary schools in L city as the research objects. The study concluded that the main problems of the current secondary school physics classroom in L city are: students' low knowledge of physics subjects, weak family education concepts and ineffective teaching. In terms of countermeasures, the article suggests that emphasis should be placed on the coherence of students' basic education, multiple channels should be used to improve students' comprehension of the national language, while education administration, schools and teachers should work together to develop students' necessary character and key abilities as the ultimate goal of education.

Core literacy is the fundamental task of implementing moral education and is the centralized embodiment of the value of educating people. In 2014, the Ministry of Education first issued the "Opinions on Comprehensively Deepening Curriculum Reform and Implementing the Fundamental Task of Establishing Moral Education", proposing "a core literacy system for student development at all school levels, specifying that students should have the necessary character and key abilities needed to adapt to lifelong development and social development" [1]. In 2021, the Western Territory of Nationality Education Examination Authority issued the "Regulations for the 2021 Western Territory of Nationality Junior High School Academic Level Examination", in which a laboratory examination was added to the physics subject for the first time, and the overall score was changed from 80 to 50 points, with the laboratory examination accounting for 30 points[2]. The "Physics Curriculum Standards for Compulsory Education (2022 Edition) " issued by the Ministry of Education in 2022 clearly states that "the philosophy of the physics curriculum standards is based on core literacy, grounded in the overall development of students, and reflects the unique nurturing value of the physics curriculum"[3]. In recent years, physics education in the Western Territory of Nationality secondary schools has achieved rapid development, but due to its location on the plateau, weak teaching resources and teaching conditions, the educational concepts of ethnic minority parents, students' lifestyles and learning habits and the inculcation of traditional culture have had an impact

on the quality of teaching in ethnic areas. Based on the perspective of core literacy concept, this paper conducted a field survey on physics classroom teaching of L city secondary schools , using interview method, questionnaire and classroom observation method to analyse the basic situation of teachers and students in the physics classroom, further understand the actual factors affecting the quality of physics classroom teaching in L city secondary schools and propose corresponding countermeasures.

1. Study Design

1.1 Research objects

This paper adopts a combination of quantitative and qualitative research methods to conduct the survey, taking two representative urban secondary schools and three rural and pastoralist secondary schools in L city as the research objects. Twenty-eight questionnaires were distributed to teachers and 28 were valid, with an efficiency rate of 100%; 371 questionnaires were distributed to students and 338 were valid, with an efficiency rate of 91.1%. The basic information about the study subjects is shown in Table 1.

Table 1: Demographic information of study subjects

Teacher sample n=28				Student sample n=338			
Group	Options	Frequency	Percentage (%)	Group	Options	Frequency	Percentage (%)
Gender	Male	16	57.1	Gender	Male	159	47.0
	Female	12	42.9		Female	179	53.0
Nationality	minority nationality	17	60.7	Nationality	minority nationality	337	99.7
	Han nationality	11	39.3		Han nationality	1	0.3
Age	20-25	2	7.2	Grade	Second grade	115	34.0
	26-30	9	32.1		Third grade	223	66.0
	31-40	7	25.0	School type	Urban school	171	50.6
	41+	10	35.7				
Education	Postgraduate degree	3	10.7		County school	167	49.4
	Bachelor degree	24	85.7				
	Associate degree	1	3.6				
Teaching age	1-2	3	10.7				
	3-5	9	32.1				
	6-10	4	14.3				
	10+	12	42.9				

1.2 Research tools

The teacher and student questionnaires used in this study were based on the knowledge classification of Yang Xiancao's scholars, with some modifications. The teacher and student questionnaires contained 36 and 34 items respectively and were divided into seven dimensions:

classroom teaching philosophy, teaching design, teaching content, teaching methods, classroom regulation and management, classroom evaluation, and classroom practice and feedback. Yang Xiancao scholars reported that the internal consistency alpha coefficient of the teacher questionnaire ranged from 0.803 to 0.845, and that of the student questionnaire ranged from 0.813 to 0.831, indicating that the reliability of the questionnaire was suitable[4]. The validity of the questionnaire was ensured by its clear themes, clear dimensions, easy-to-understand text and moderate number of questions[5].

1.3 Data processing

The data collected were statistically analysed using spss26.0 statistical software.

2. Analysis of Survey Data

2.1 The basic status of students in secondary school physics classrooms in Lhasa

2.1.1. Students' philosophy of classroom teaching

As shown in Table 2, students who "like" or "dislike" physics classes accounted for 62.8% and 1.2%, respectively, indicating that most students do not have the psychology of rejecting physics learning. In addition, students' perceptions of physics as useful and their enjoyment of physics were mainly driven by internal motivation, while their dislike of physics was due to a low sense of self-efficacy brought about by exam results. This suggests that weak subject knowledge in physics is likely to be the main negative factor influencing L city students' dislike of physics classes.

Table 2: Students' classroom teaching philosophy

Question	Options	Percent (%)
Why do you like physics class?	The teacher speaks vividly	33.3
	Interesting for learning physics	38.1
	Physics is useful	27.4
	Don't like physics	1.2
What's the reason you don't like physics class?	Bad teacher	1.8
	Not interested	6.9
	Learning physics is useless	1.8
	Bad old test	26.7
	Like physics class	62.8

2.1.2. Students' core literacy competencies

Core literacy is divided into 3 areas: cultural foundation, independent development and social participation, which are the new requirements for talent training in modern economy and society[6]. Field research found that students' core literacy competencies mainly have the following problems.

Firstly, the Chinese language level is low and the comprehension ability is poor. The author's classroom observation in a farming and pastoralist secondary school revealed that students' misspellings were common.These students are from remote counties and villages in Chamdo and have very low Chinese language skills, making it very difficult for them to understand physics classroom teaching. The students in the urban secondary schools are in the economic and cultural centre and have a slightly better understanding of Chinese than the students in the rural secondary schools.

Second, there is a gap in basic education and a low level of physics literacy development. During field interviews in one rural secondary school, the local physics teacher mentioned that in some classes about 20% of the students had not received primary education and that some had been 'transferred' across the region from C city to an orphanage in L city. These students were 'disconnected' from the school system, usually scoring between 15 and 16 in their physics exams, and usually having only 2-3 students pass the class. This means that students' early basic knowledge level is relatively low, which inevitably affects their ability to receive further systematic study of physics after P.1.

Thirdly, experimental teaching is limited and practical skills are lacking. Fieldwork found that there are the following problems mainly exist in the physics experiments teaching of L city secondary school: students' participation in physics experiment is insufficient due to factors such as a large number of students and a shortage of physics laboratories; students lack maintenance awareness of physics laboratory equipment and some equipment has traces of artificial damage, resulting in poor utilization of teaching resources;At present,due to factors such as weak experimental faculty and limited class time, physics teachers in school serve as lecturers and experiments.Some experimental courses can only be demonstrated by classroom or through multimedia.

2.1.3. The lack of family education for students is more prominent

Parents in ethnic minority areas have long been influenced by factors such as history, culture and religion, and are less aware of their children's education and less motivated to send them to school[7]. Interviews revealed that some students with special family structures (divorced or single parents) are less motivated to learn due to the lack of family discipline, and most teachers also indicated that the level of parental concern for their children's education is an important factor in their attitude to learning. Analysis of the teacher self-report question (Do you have any suggestions for the physics classroom in physics secondary schools) showed that the statistics indicated that physics teachers would like to (i) emphasize family education and match it with teacher education (ii) improve students' attitudes to learning. Clearly, there is a significant positive correlation between family parenting style and students' learning attitudes and teachers' teaching effectiveness in ethnic areas.

2.2 The basic status of secondary school physics classroom teachers in L city

2.2.1. Teachers' classroom teaching philosophy

Table 3: Teachers' classroom teaching philosophy

Question	Options	Percent (%)
Do you often learn about physics courses and pedagogy to guide your classroom teaching?	Often	32.1
	Sometimes	64.3
	Rarely	3.6
Do you often participate in teaching observation at all levels, participate in project research, etc.?	Often	17.9
	Sometimes	75.0
	Rarely	7.1
Do you often introduce some physical problems and the latest scientific and technological achievements related to people's livelihood to students?	Often	28.6
	Sometimes	57.1
	Rarely	14.3

Table 3 shows that 96.4% of the teachers would learn about the physics curriculum and pedagogy to guide their classroom teaching; 92.9% of the teachers regularly attended teaching observations and participated in research projects at all levels, and 85.7% of the teachers were introduced to their

students some physics issues concerning people's livelihood and the latest scientific and technological achievements. The interview results also showed that most physics teachers would appropriately broaden students' horizons of physics knowledge in their classroom teaching and help them to improve their level of awareness of physics concepts.

2.2.2. Teachers' instructional design

As shown in Table 4, 96.5% of the teachers were able to follow the five components of teaching; 89.3% were able to design three-dimensional objectives with the students in mind. Fieldwork revealed that the physics teachers were able to make full use of the unique multicultural environment of the Western Territory of Nationality and incorporate examples of physics knowledge points, focusing on linking textbook knowledge to students' real life. This shows that most teachers are able to prepare lessons carefully, study the teaching materials, establish a new teaching philosophy that is in line with core literacy, and implement a People-oriented teaching concept.

Table 4: Teachers' teaching design

Question	Options	Percent (%)
Are you able to teach exactly in accordance with the five components of teaching?	Often	42.9
	Sometimes	53.6
	Rarely	3.5
Do you regularly organize your teaching with a student-centered approach to the three-dimensional objectives?	Often	67.9
	Sometimes	21.4
	Rarely	10.7

2.2.3. Teachers' teaching methods

In secondary school physics teaching, most educators usually adopt the classification method proposed by Professor Li Bingde, such as the lecture method, the problem method, the demonstration method, the practice method, and the guided inquiry method[8]. The survey data showed that 82.1% of teachers preferred the lecture method and 40.8% of students preferred the guided inquiry method. Secondary school students' physical thinking is in transition from the concrete to the formal arithmetic stage, and it is difficult to flexibly classify the various representations of the existing knowledge in the process of solving physical problems[9]. Therefore, teachers should make good use of the predominance of secondary school students' thinking and use teaching methods that are consistent with students' physical and mental laws and characteristics to guide them in classifying the correspondence of physics concepts.

2.3 The basic status of secondary schools physics classroom teaching in L city

2.3.1. Teaching content of the physics classroom

The survey data showed that 26.5% of students felt that teachers were too quick in explaining exercises and 38.5% felt that their teaching was too slow. This shows that many students' current developmental levels cannot keep up with the teacher's pace of teaching. Teachers should adjust the rhythm of the classroom according to the "zone of proximal development" of the students. Only when teachers teach efficiently can students learn effectively[10]. In addition, some students and teachers agree that multimedia technology is underused in classroom teaching, suggesting that it plays an important role in improving the effectiveness of classroom teaching as a teaching aid that appropriately regulates students' motivation.

2.3.2. Regulation and management of the physics classroom

Teaching effectiveness is the purpose of classroom management, and classroom management is a prerequisite for influencing teaching effectiveness, and there is a mutual influence between the two. Table 5 shows that 54.1% of students and 67.9% of teachers perceive classroom discipline to be chaotic, which indicates that students are not very self-controlled and not very motivated to participate in the physics classroom, and also reflects the fact that the increase in the number of students has made the workload of secondary school physics teachers to maintain a stable classroom teaching order heavy.

Table 5: Regulation and management of physics classroom

Question	Options	Percentage (%) (student)	Percentage (%) (teacher)
How is the physics classroom teaching environment and classroom discipline in your class?	Always orderly, no clear rules	6.5	7.2
	Often disorderly, with no clear rules	8.0	10.7
	Sometimes orderly, with clear rules	39.6	50.0
	Always in good order with clear rules	45.9	32.1

3. Findings and suggestions for countermeasures

The data show that most physics teachers now widely recognized the concept of core literacy, generally attach importance to linking students' textbook knowledge with real life, appropriately broadening students' horizons of physics knowledge in classroom teaching, and more and more teachers focus on developing students' independent thinking and expression skills. Most students still have a positive attitude towards learning physics, can actively interact with the teacher in class and give high recognition to the teacher's teaching attitude. Their main problems are students' weak basic knowledge, low quality of physics subjects, weak family education concept, and lack of teaching effect. Therefore, in view of the current problems of physics classroom teaching in L city secondary schools , the following suggestions are made.

3.1 Pay attention to the articulation of students' basic education

In view of the lack of coherence in the basic education of students in rural and pastoral areas, the following three aspects can be addressed. Firstly, the local government should establish an education monitoring mechanism, pay timely attention to the enrolment of school-age children in remote counties and rural areas, understand the reasons for students dropping out of school and the problems that exist in schooling and provide appropriate support. The second is the rational allocation of education funding, with education funding tilted towards families in difficult and remote mountainous areas and in rural and pastoralist areas with poor transport links, to ensure that children of compulsory education age do not miss out on school due to poverty. Thirdly, we will improve the education publicity mechanism, increase publicity to parents, students, teachers and schools on the importance of the articulation of school periods, and guide people from all walks of life to work together to monitor the education of students.

3.2 Strengthening the teaching of the common national language and script

The Outline of the National Medium- and Long-term Education Reform and Development Plan (2010-2020) proposes to "strengthen the teaching of the commonly used national language and promote the teaching of Mandarin". Demographic information tells us that 99.7% of students are minority nationality, and many minority nationality students have some barriers to understanding physics subject terminology. For this reason, on the one hand, the "preparatory education" model is implemented at the pre-school level, with the aim of helping students with poor Chinese language skills to make the transition to language learning, for a period of six months or one year[11]. On the other hand, schools hold regular "oral expression" workshops, where teachers use multimedia to create Chinese situations and engage students' initiative, thus improving their logical thinking and language skills.

3.3 Active building of a network platform for home-school cooperation

Field research has revealed that secondary schools in rural areas adopt a "10 days on, 4 days off" teaching model. As students are in school for long periods of time, their sense of belonging and love at home cannot be met, which in turn affects their learning status and leads to low learning efficiency[12]. In addition, students are prone to other negative emotions such as boredom when they return to school after the holidays, and teachers do not provide students with the appropriate time to adapt to teaching in order to ensure the smooth progress of teaching so that students do not effectively integrate their new and old knowledge. To this end, the school actively builds a home school interaction network platform and establishes an effective communication polytunnel through explanations given to parents by the minority language teacher. For children from special families, a home-school cooperation guidance programme is actively negotiated to give students specific, personalized and effective support mechanisms. At the same time, the education administration offers short-term classes in adult education training for parents with limited literacy skills, so that family education and school education can form a synergy to promote the overall development of students.In the middle school physics classroom teaching of L city

3.4 Multi-measures to promote maximum teaching effectiveness

At present, the structured shortage of physics teachers and the disorderly classroom teaching in the physics classroom teaching of L city secondary school may be important reasons for the effectiveness of physics teaching. According to the basic statistics of education in the Western Territory of Nationality , the teacher-student ratio of physics in L city secondary schools is 1:184[13], which is far beyond the national requirement of 1:13.5. Therefore, universities in the Western Territory of Nationality need increase the scale of enrollment of teacher-training majors in shortage every year, increase the public funding for teacher-training students, and the government and adopt corresponding policies for introducing talents to meet the needs of physics teaching. At the same time, teachers use their teaching resourcefulness to create a democratic and equal teacher-student relationship atmosphere, implement democratic evaluation of students from multiple perspectives, and eliminate the psychological barrier between students and teachers so as to build an efficient physics classroom.

4. Discussion

It is a long and arduous task to solve the problem of physics classroom teaching in L city secondary school under the background of core literacy. Based on the real situation of education in L city, This

study proposes corresponding countermeasures and suggestions for the problems existing in the physics classroom teaching of secondary schools in L city. However, there are still many problems that have not been further discussed in the research, such as: the structural shortage of physics teachers, the language conversion of teachers and students in physics classroom teaching, etc. These problems have research value and deserve further study. In short, to effectively promote the quality of physics classroom teaching in L city secondary schools and even the whole Western Territory of Nationality secondary schools requires relevant education administrative departments and secondary schools to take the core literacy education concept as the purpose of cultivating talents, and to view the school-running goal from the perspective of development. Teachers and parents should work together, perform their own duties, give full play to their respective roles, and jointly create a good educational environment for students.

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