

A Review on the Influence of Family Cultural Capital, School, and Peers on Primary School Students' Scientific Literacy

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Abstract – Scientific literacy plays a crucial role in fostering innovation and national development. This study examines the impact of family cultural capital, school education, and peer influence on the scientific literacy of primary school students in Chengdu, China. Utilizing theoretical frameworks such as Bourdieu's cultural capital theory and Piaget's cognitive development theory, the study aims to establish a comprehensive understanding of how these factors interact in shaping students' scientific literacy. The findings contribute to educational policies and strategies aimed at enhancing scientific literacy among young learners. Furthermore, this study builds on existing literature by incorporating a comparative analysis with international educational frameworks to highlight global best practices in scientific literacy development. Additionally, disparities in family resources and educational quality create variations in scientific literacy levels, highlighting the need for targeted interventions. Focusing on core issues such as how to improve the effectiveness of scientific literacy education, how to narrow the gap in scientific literacy among different groups, and how to innovate strategies for cultivating scientific literacy, the aim is to provide scientific basis for solving these problems through empirical research. Theoretically, this study will enrich the theoretical system of scientific literacy education; practically, it will provide educators with effective strategies for cultivating scientific literacy; policy-wise, it will provide a reference basis for the government and related departments to formulate policies on scientific literacy education.

Keywords – Scientific literacy, Family cultural capital, School education, Peer influence, Primary education

I. INTRODUCTION

Scientific literacy has gained increasing attention in both academic and policy circles due to its significant role in economic and technological development. In China, policies such as the "National Science Literacy Action Plan" emphasize the necessity of fostering scientific literacy from an early age. However, disparities exist in how students acquire and develop scientific literacy, largely influenced by their family environment, school education, and peer relationships.

This study explores these influences within the specific context of Chengdu, China, aiming to fill existing research gaps and provide actionable recommendations. Additionally, international comparisons will be drawn to examine how different countries address scientific literacy challenges. The

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introduction of STEM (Science, Technology, Engineering, and Mathematics) education in primary schools worldwide has further highlighted the need for an interdisciplinary approach to teaching scientific literacy. In many developed countries, students who receive early STEM exposure perform better in problem-solving, logical reasoning, and scientific inquiry. By analyzing the specific case of Chengdu, this study aims to contextualize these findings within China's educational landscape.

The primary school stage is a crucial period for an individual's lifelong development, which is the best period for cultivating behavioural habits and developing intellectual level. It is also an important turning point for the psychological development of primary school students. Confucius (Cheng, 2001) said, "If one becomes less, it is natural. Habits become natural." The behavioural habits developed during this period often run through a person's life, and it is difficult to make changes in other stages of life's growth. Psychologist Piaget's cognitive development theory suggests that children aged 11 and 12 are in between the stages of "concrete operations" and "formal operations", and have initially developed abstract thinking abilities (Kuhn, 1979). Connor's "critical period of development" indicates that seizing the critical period of scientific thinking in children and carrying out education will have a more prominent educational effect. Early science education plays a crucial role in the formation of a person's scientific literacy. As the foundation of the entire education system, primary education must start from primary school to cultivate scientific literacy. Through primary school science learning, experience the process of scientific exploration, gain a preliminary understanding of scientific knowledge, cultivate some scientific learning habits, master basic scientific methods such as observation, investigation, and comparison, maintain curiosity, cultivate a sense of criticism, innovation, environmental protection, cooperation, and social responsibility, and lay a good foundation for future life, learning, and lifelong development.

The family is not only the primitive environment for human life and individual growth, but also an important place for human cognition and individual development. It is a necessary place to influence children's habits and growth. The role of family cultural capital in children's growth process is recognized by scholars from various countries. Parents play an important role in helping children acquire the correct standards of scientific cognition. In order to promote the development of social culture, create a good social environment, and maintain the sustainable development of the entire social culture, it is particularly important for parents to consciously improve their own

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cultural capital. In the process of children's learning and growth, the family plays a particularly important role, whether it is the socio-economic status, cultural environment of the family, or the education level, teaching beliefs, and behaviour of parents, all of which deeply affect the learning and development of primary school students. Research found that families with different economic levels and social statuses have different worldviews, values, and educational perspectives from their parents, which can affect their behaviour in educating their children (Aschbacher et al., 2010). In addition, if the family environment is poor, the learning ability of students will be affected to a certain extent. For example, the "preemptive plan" in the United States aims to enable disadvantaged children from disadvantaged families to acquire learning abilities comparable to those of ordinary children before entering school. The influence of family on children's cognitive development, psychological development, learning and growth, academic achievement, and other aspects has been widely valued by educators and researchers from all walks of life in society. Many research topics have explored this, including research on the influence of family on children's academic achievement, thinking patterns, cognitive development, and other aspects. This article attempts to combine Bourdieu's theory of cultural capital, especially the theory of family cultural capital, to analyse the impact of family cultural capital on the scientific thinking of elementary school students, and explore existing problems from a new perspective. This not only provides a new understanding of this problem, but also provides new possibilities for parents and schools to improve the scientific thinking of elementary school students.

II. PROBLEM STATEMENT

Scholars argue that an effective science education should focus not only on knowledge transmission but also on developing students' ability to critically analyse scientific information and apply it in their daily lives (OECD, 2019). Furthermore, contemporary scientific literacy frameworks integrate aspects of sustainability education, which is crucial for addressing global environmental challenges (Sadler & Zeidler, 2019).

Chengdu is chosen for the study based on the following important reasons. Geographical representation and uniqueness. As an important city in southwest China, Chengdu is not only representative in terms of economy, science and technology, and education, but also has certain uniqueness in its cultural and social background. These characteristics make Chengdu an ideal location for studying children and youth scientific literacy, reflecting the current situation and characteristics of children and youth scientific literacy in a specific region of China. Given the gap between China's scientific and technological development and the relatively weak research on children's and youth's scientific literacy, Chengdu, as a fast-growing big city, is of great significance for the promotion of children's and youth's scientific literacy to promote the progress of science and technology in the local area and even in the country. Therefore, the study of scientific literacy of children and youth in Chengdu can reveal the current

problems and deficiencies, and provide a scientific basis for the development of targeted strategies to improve the scientific literacy of children and youth. Cultural and social background, Chengdu has a rich historical and cultural heritage and a diversified social environment, all of which may have an impact on the scientific literacy of children and adolescents. Through an in-depth study of children's and youth's scientific literacy in Chengdu, we can explore how cultural and social factors play a role in the formation and development of scientific literacy, and provide useful reference for other regions. As an important node city of the "Belt and Road" initiative and a national center city, the improvement of children's and young people's scientific literacy in Chengdu is of great significance to the promotion of regional economic development and the enhancement of international competitiveness. At the same time, the government and all sectors of society have been paying more and more attention to the scientific literacy of children and youth, and the results of this study can provide strong support for the formulation and implementation of related policies. To summarize, the study in Chengdu not only helps to reveal the current situation and characteristics of scientific literacy of children and youth in a specific region of China, but also provides a scientific basis and practical guidance for the construction of a scientific literacy evaluation system that suits China's national conditions, and the formulation of targeted strategies for improving the scientific literacy of children and youth.

Through the literature study, the gaps in China's research on science literacy among primary school students are mainly reflected in the following areas: The development and standardization of scientific literacy assessment tools (Guan & Ploner, 2020). Currently, there are relatively few scientific literacy assessment tools for elementary school students and they lack standardization. This leads to difficulties in comparing and synthesizing data between different studies. Insufficient research on regional differences, most of the existing studies have focused on economically developed regions, with less attention paid to the scientific literacy of elementary school students in rural and less developed regions, which makes us have an incomplete understanding of the overall status of scientific literacy of elementary school students across the country. (Zhou, G., & Zhou, X, 2019). There are fewer longitudinal studies, and most of the studies are cross-sectional, lacking long-term tracking and dynamic analysis of the development of elementary school students' scientific literacy, which makes it difficult to reveal the trend of development and changes in the influencing factors. Insufficient research on influencing factors. There are fewer comprehensive studies on the multidimensional factors affecting elementary school students' scientific literacy (e.g., family cultural capital, school education, peer influence, etc.), resulting in a lack of in-depth understanding of the interaction of these factors. Fewer interdisciplinary studies, with existing studies mostly confined to the fields of education or psychology and lacking interdisciplinary cooperation with sociology, anthropology and other disciplines, limiting the multidimensional understanding of scientific literacy issues. Insufficient empirical research data, many studies lack large-scale empirical data support, the sample size is

small and difficult to represent the overall situation, and the generalizability of research conclusions is limited. Lack of international comparative studies, there are fewer international comparative studies on Chinese primary school students' scientific literacy, making it difficult to understand China's level of scientific literacy and its strengths and weaknesses on a global scale.(Sun, D., & Li, Y,2019)Therefore, the author conducts a study from the perspective of influencing factors to gain an in-depth understanding of the multidimensional factors affecting elementary school students' scientific literacy. The results of this study can provide insights into how to improve the scientific literacy of primary school students in order to contribute to the reduction of the gap in scientific literacy among elementary school students in different educational contexts.

III. LITERATURE REVIEW

Bourdieu's (1986) theory of cultural capital highlights the role of family background in shaping educational outcomes. Family cultural capital, comprising embodied (e.g., parental education), objectified (e.g., books at home), and institutionalized (e.g., academic qualifications) forms, significantly impacts children's learning experiences. Research suggests that students from culturally enriched families exhibit higher levels of scientific literacy due to early exposure to scientific discourse and resources (Guan & Ploner, 2020). Additional studies have demonstrated that parental engagement in science-related activities at home correlates positively with student achievement in STEM subjects (Archer et al., 2014). A study by Jerrim and Shure (2016) found that children whose parents actively discuss science-related topics show greater curiosity and motivation toward scientific learning. Similarly, socioeconomic status plays a crucial role in determining the availability of learning materials, extracurricular scientific activities, and access to private tutoring, all of which contribute to the development of scientific literacy (Reardon, 2011).

School education plays a pivotal role in shaping students' scientific literacy. Key factors include curriculum quality, teacher pedagogy, and access to science-related extracurricular activities. The Chinese National Curriculum Standards (2017) emphasize inquiry-based learning, yet disparities in resource allocation often lead to varied learning outcomes across different regions (Yang & Yan, 2018). Comparative research indicates that countries with strong STEM-focused curricula, such as Finland and Singapore, consistently perform well in scientific literacy assessments (Schleicher, 2019). Moreover, the integration of project-based learning and hands-on experiments has proven effective in fostering critical thinking and problem-solving skills (Kolodner et al., 2003). Another essential aspect of school education is the professional development of teachers. Studies show that well-trained science teachers who continuously update their instructional strategies contribute significantly to improving students' scientific literacy levels (Darling-Hammond, 2000).

With the development of literacy (competence)-oriented education, education departments and scholars in various countries (regions) have explored its concept and

connotation to some extent. 1987, the Further Education Unit of the United Kingdom defined literacy as "the development of knowledge, skills and attitudes necessary for successful performance". 1992, the Australian Department of Education defined literacy as "the development of knowledge, skills and attitudes necessary for successful performance". In 1992, the Mayer Committee in Australia defined literacy as "a performance based on knowledge and its understanding and skills, involving performance in a given situation and the transfer of knowledge and competence to new situations". Rojiet of Belgium defines it as "the possibility for an individual to mobilize an integrated set of supports in an internalized way in order to solve a given situation" (Haworth & Browne, 1992). In 2005 OECD in its report defines literacy as the ability to use and mobilize psychosocial resources (including skills and attitudes) in specific contexts to meet complex needs (Tynjälä et al., 2016). For example, effective interaction is a form of literacy in which a person uses both linguistic knowledge, pragmatic information skills, and also their attitudes toward the people they interact with(Mathieu, 2005). Scholars in New Zealand believe that literacy can be understood as those things we already have or may want to acquire, an endpoint rather than a process, describing what a person should have (Hipkins, 2013); literacy can be revealed through behaviours, actions, or choices in specific contexts that can be observed or measured, but the literacy implied by these manifestations and the multiple factors acting on literacy can only be obtained through speculation (Hipkins et al., 2005).Taiwanese scholars such as Chen Bozhang believe that "literacy" is a construct, a theoretical concept or idea constructed based on academic theory, referring to the "knowledge," "abilities," and "attitudes" that individuals must learn and acquire through education in order to develop into a sound individual and meet the complex needs of social life situations (Qingtian, 2019). A 1996 European seminar on literacy pointed out that due to language differences among countries, the definition of literacy is not entirely the same, but it is generally recognized that literacy emphasizes "knowing how" rather than just "knowing what"; And it is pointed out that literacy is a general ability, developed from knowledge, experience, values, tendencies, etc. formed based on personal educational practice. The report also points out that literacy and performance are different. Performance refers to doing things in a given context, displaying a certain literacy or ability, as well as a tendency or potential for action. Performance is observable, while literacy cannot be observed and can only be inferred through observed behavioural performance (Hutmacher, 1997). Scholars in China have also pointed out that literacy may be unmeasurable, and what can be measured is specific learning outcomes or academic quality. Literacy can only be an inference after academic quality assessment, a theoretical concept, rather than a concrete reality (CuiYunGuo,2013). In 2002, the United States Department of Education and the National Center for Education Statistics (NCES) jointly released a research report, in which the research team ultimately adopted the definition of literacy as "the combination of skills, abilities, and knowledge that an individual needs to complete a specific

task” (Research, 2005). In the report, the research team defined and analysed the hierarchical structure of relevant concepts, attempting to provide a clear framework for research and evaluation. In this model, traits and characteristics are the foundation of learning and are internal components of the individual. Individuals learn based on these internal components, experience different learning processes, and acquire different levels and types of knowledge and skills; Skills, abilities, and knowledge are developed through learning experiences, including school, work, and social participation; Competencies are the result of the interaction between knowledge, skills, and abilities in related work and individual traits, and are the integration of individual learning experiences; Demonstrations are the results of applied literacy, at which level performance can be evaluated. The study also suggests that literacy can serve as a basis for qualification acquisition and employment, contributing to expanding the scope of learning outcomes in secondary education. A single competency can be used in multiple different ways, for example, measuring distance is important for both professional golfers and surveyors, and although different measurement skills may be involved in these two tasks, skills related to unrelated techniques and methods involved in performance measurement should produce the same results. Literacy has different functions in different contexts (Harwood, 2012).

In summary, the following understanding can be established regarding literacy: (1) Literacy is essentially a (potential) comprehensive ability closely related to knowledge and context, a synthesis of knowledge, skills, experience, attitudes, and values, and a theoretical concept; (2) Literacy is an inherent factor in the occurrence of behaviour or performance, which is inseparable from the possibility of action and has a clear direction, that is, it has a social usefulness. For example, for learners, in order to complete a certain assignment, take a certain action, or solve a certain problem in academic practice or daily life, learners mobilize all resources they have, such as knowledge, skills, experience, attitudes, etc. These assignments, actions, or unresolved problems have certain social significance for learners; (3) Literacy must be presented in a certain context; therefore, literacy may have certain domain or disciplinary characteristics. For example, the knowledge, skills, and experience mobilized by natural science researchers in solving scientific problems are inevitably different from those mobilized by social science researchers, and may also contain certain common components; (4) Literacy cannot be directly observed, but the external manifestations of behaviour or actions can be observed, so the evaluation of literacy can only be inferred based on the observed performance; (5) For the purpose of teaching or measurement, researchers often deconstruct or divide literacy into various abilities or individual levels of literacy.

The literacy used in this study is a (potential) comprehensive ability that can be demonstrated in a certain context, which is a synthesis of knowledge, skills, experience, attitudes, and values; This literacy can be understood as an abstract concept as a whole, or as having certain domain or disciplinary characteristics, which can be deconstructed into a series of general abilities, disciplinary

literacy, or abilities based on research purposes such as teaching or measurement.

scientific literacy is an important term in the field of science education, which is often mentioned in the standards or syllabi of science curricula of various countries, and is the goal of science education in various countries, for example, the standard of compulsory elementary school science curriculum promulgated in China in 2017 pointed out that “Primary school science curriculum should be cultivate the scientific literacy of primary school students in accordance with the requirement of establishing moral character and laying a good foundation for their continued learning and lifelong development”(Yao & Guo, 2018).

After the Second World War, the United States began to ostracize the socialist countries, mainly the Soviet Union. After Soviet Premier Nikita Khrushchev came to power, the Soviet Union's economic and military power increased greatly, and it wanted to dominate the world with the United States. During the critical period of the struggle for world domination, the (USSR, 1958) successfully launched an artificial satellite, which gave the USSR the upper hand in the struggle for supremacy. However, this move caused a huge sensation in the United States, so that the United States instantly realized that there is a big gap between the country's science and technology and the Soviet Union, there is an urgent need to enhance the scientific literacy of the citizens through education, and thus enhance the level of science and technology in the country (Conant, 1956). In order to level the gap with the Soviet Union and even exceeded the Soviet Union, the United States has since begun to substantially support the country's science education. American educator Conant (Conant) as president of Harvard University, for the first time the term “scientific literacy” into the public eye. He thought that the reason why we give some people the title of “expert” is because their own “scientific literacy” is very high. He believed that we should treat scientific literacy as a kind of general education, not as a kind of professional education, and this viewpoint pointed out the object of research for later generations to study scientific literacy (Roberts & Bybee, 2014). Hurd, a professor at Stanford University in the United States, first mentioned the term “scientific literacy” in science education, and in 1956, he published “Scientific Literacy: Its Significance for American Schools”, in which scientific literacy is understood as “understanding of science and its application in society”, while science and society are not the same. “And also the relationship between science and society gave his own view, which marked the real entry of scientific literacy into basic education.” (Hobbs, 2013). Since then, the related contents of scientific literacy began to gradually enter the public eye. In 1966, Pella (Pella) and others at the Center for the Study of Scientific Literacy at the University of Wisconsin, USA, gave the first comprehensive overview of scientific literacy, proposing that it should be interpreted in terms of six major parts: the relationship between science and society, science ethics, the nature of science, the concepts of science, science and technology, and the humanities (Pella et al., 1966). In 1974, Shawalter et al. of Ohio State University gave another in-depth overview of scientific literacy, and they enriched the connotation of

scientific literacy by suggesting that it should include seven aspects: (1) the core of science; (2) conceptual systems and theoretical frameworks; (3) scientific counseling on problem solving; (4) scientific attitudes in the process of inquiry; (5) the interactivity of science and society; (6) the development of science in individual growth; and (7) the development of basic competencies in scientific research (Krajcik & Sutherland, 2010). In the 1980s, people began to move from theory to practice when exploring issues related to scientific literacy and began to use scientific methods to assess scientific literacy. In 1983, the International In 1983, Miller, the director of the Center for the Promotion and Development of Scientific Literacy, defined scientific literacy in terms of three dimensions and developed a set of methods that could be used to measure it in reality. The three dimensions are as follows: (1) understanding of scientific concepts; (2) understanding of scientific methods and processes; and (3) understanding of the relationship between science, technology, and society (Miller, 1983). 1983). From the 1990s to the present, society at large has become very focused on scientific literacy. The introduction of the National Science Education Standards in the United States in the mid-1990s has made science education popular in the United States. According to this standard, scientific literacy refers to the scientific concepts and processes that individuals need to master in order to make decisions, participate in civic and cultural affairs, and engage in economic activities, and it signifies that people have the ability to ask, discover, and answer questions in their daily lives that are raised out of curiosity (Huang et al., 2017). In foreign countries, there are a lot of researches related to "scientific literacy", and among the many researches, the internationally recognized ones are the curriculum reform plan for primary and secondary schools in the United States, i.e., "Plan 2061", and the "Plan 2061" by the Organization for Economic Co-operation and Development (OECD). The Organization for Economic Cooperation and Development (Organization for Economic co-operation and Development abbreviated as CECD) to carry out the project of international student assessment (Program for International Student Assessment abbreviated as PISA) 1985, the United States of America The "2061 program" was first used in practice, the main purpose is to popularize science-related knowledge, the program is the United States of America's basic education curriculum, teaching and learning reform of the wind vane, focusing on the public in mathematics, science and technology literacy in the three areas (Yore et al., 2017). PISA is designed for students around the age of 15 to assess whether they possess the knowledge and abilities necessary for their future work and life. The assessment is divided into three main areas: reading literacy, math literacy and science literacy (Jakubowski, 2013).

Bourdieu divided cultural capital into three forms: institutionalized form, objectified form, and embodied form, which mutually influence and develop together. The embodied cultural capital is the most closely related form of capital to an individual's body, existing in the form of a long-term maintenance of "temperament" between the body and spirit. It requires a lot of time, energy, and initial investment to understand and absorb the knowledge learned, transform it into a part of its own body, and then

express it through its own physical state. Physical cultural capital cannot be transmitted through transactions, gifts, or exchanges, but can be transmitted spiritually, for example, the most common form is the transmission of family traditions and customs. Objectified cultural capital mainly refers to the transmission of cultural products, and the medium of transmission is material objects, including books, newspapers, dictionaries, calligraphy and painting, art collections, etc. Obtaining objectified cultural capital requires a certain amount of time and ability, and factors such as family economic situation can also affect objectified cultural capital. From the perspective of the attributes of objectified cultural capital, objectified cultural capital can serve as a medium for transmission rather than a carrier of material cultural capital. It objectively exists and cannot be arbitrarily changed or transformed in form (Sieben & Lechner, 2019). Institutionalized cultural capital comes with the development of society and is a legitimate objective existence, such as certificates, diplomas, etc. Bourdieu pointed out that academic certificates and cultural competence certificates play an important role, endowing their owners with cultural, traditional, long-term effective, and legally guaranteed values (Byun et al., 2012). Based on Bourdieu's theory of cultural reproduction, the Chinese academic community divides the forms of cultural capital into: (1) teaching by example, mainly manifested in the education of the next generation by elders; (2) Cultural products refer to the goods purchased by families for their children's education; (3) Institutional education, the education level and ability of the family itself (Walkerdine, 2003). Defined family cultural capital as tangible or intangible assets related to culture or cultural activities that are possessed and displayed by family members in specific fields within their respective families, in his study on the influence of family cultural capital on college entrance examination choice. The cultural forms of institutions, consumption, and experience that cover the entire family life of students are the core driving force of the fundamental values shared among family members (Guan & Ploner, 2020).

The concept of family cultural capital in this study combines Bourdieu's "Cultural Capital Theory" from France and the "Family Cultural Capital Theory" proposed by domestic scholars under Bourdieu's Cultural Capital Theory. According to the three forms of expression of family cultural capital: physicalization, objectification, and institutionalization, researchers divide it into physicalized cultural capital, objectified cultural capital, and institutionalized cultural capital. Based on the relevant research of scientific thinking, this study defines the three as: embodied cultural capital includes the frequency of reading books, the time for parents and children to communicate and learn together, parents' requirements for academic performance, and parents' emphasis on science education; Objectified cultural capital includes the total number of household books, learning tools, and art collections such as calligraphy and painting at home; Institutionalized cultural capital includes parents' education level, parents' occupation, and average monthly family income.

IV. RESEARCH METHODOLOGY

This study adopts a quantitative approach. This study aims to use the questionnaire survey method to understand the situation of family cultural capital of primary school students, the situation of science literacy of primary school students and the situation of friendships of primary school students, so as to explore their impact.

Among them, the family cultural capital questionnaire (parent's volume) is quoted from the master's thesis of Shen Xiaomei (2017) Family Cultural Capital Questionnaire designed and used.

After reviewing the literature, it was found that the more mature international survey tools for scientific literacy are PISA and TIMSS, but such an assessment program requires a lot of human, material and financial resources, and it is difficult for individuals to implement it. Domestic assessment is not perfect, the assessment of scientific literacy for students mainly has questionnaires or test questions, and did not find the test questions that are also applicable to students in grades 5 and 6, and the questionnaires are not conducive to statistics, which is why we self-administered questionnaires using Likert 5-point scoring, which is conducive to doing regression analyses.

In this study, the revised version of Zou Hong's (1998) Peer Relationship Scale was used, which mainly examines the individual's own subjective feelings about peer relationships, including two dimensions of peer acceptance and peer fear of inferiority, with a total of 30 questions, of which 1-20 is the Peer Acceptance subscale and 21-30 is the Peer Fear of Inferiority subscale. The questionnaire was scored on a 4-point scale, which was divided according to the degree of conformity into: not at all conformity, not too conformity, more conformity and fully conformity. Among them, peer acceptance subscales 1, 3, 7, 11, and 17 are positively scored, and the rest are negatively scored, with higher scores indicating that the higher the level of peer acceptance felt by the individual, the better the peer relationship, and the peer fear of inferiority subscales are all positively scored, with higher scores indicating that the higher the sense of inferiority and fear felt by the individual in peer relationships, the worse the peer relationship. The Cronbach coefficient for peer acceptance in this questionnaire is 0.94 and the Cronbach coefficient for peer fear of low self-esteem is 0.93.

The design of the primary science curriculum follows the national education policy, taking into account the age characteristics and cognitive development of elementary school students, and divides the six years of elementary school into three stages: grades 1-2, 3-4 and 5-6. 5-6 belongs to the senior stage, in which students have accumulated some knowledge in the first two stages of learning, and in the aspect of cognitive development, the students of grade 5 and 6 are at the age when the stage of concrete operations is overloaded to the stage of formal operations, with the concept of conservation of energy and the ability of simple abstract generalization and logical reasoning. In terms of cognitive development, students in grades 5 and 6 are at an age when the stage of concrete operations is in excess of the stage of formal operations, and they have the concept of conservation of energy as well as the ability to make simple abstract generalizations and

logical reasoning, and they are more mentally mature. At the compulsory education level, the National Curriculum Standard for Physical Education and Health defines students' learning abilities in four levels according to four major aspects, namely, students' sports participation, sports skills, physical health, psychological development and life adaptation, and sets specific goals for each. Levels one through four are: grades 1-2, 3-4, 5-6, and 7-9, respectively.

To summarize, the study needs to select the higher age group of elementary school students is more meaningful, and the final selection of grade 5-6 students as the research object is in line with the logical pattern, which is convenient to support the study. In this study, students in grades 5-6 from eight elementary school in five urban areas of Chengdu were selected as the sample, with two grade 5 classes and two grade 6 classes in each school, and the sample size was roughly 1,280 students. In order to comprehensively and objectively reflect the actual situation of family cultural capital and elementary school students' scientific thinking development. The researcher used a random sampling method, and the survey of this study was conducted by a combination of online release on the Questionnaire Star platform and on-site field distribution of paper questionnaires.

V. DISCUSSION

Enhancing scientific literacy requires a multi-faceted approach involving families, schools, and peer networks. Policy recommendations include targeted parental education programs, improved science curriculum implementation, and fostering collaborative learning environments within schools. Future research should explore longitudinal trends and comparative analyses across different regions. By integrating international best practices, this study aims to contribute to the broader discourse on effective strategies for improving scientific literacy worldwide.

The most important research objective of this paper is to cultivate students' scientific literacy and implement the cultivation of national core literacy through literature research. The research in this paper is all focused on this purpose, and the literature has understood how students' core literacy is cultivated both domestically and internationally. Provide inspiration and suggestions for family education, school science education, and home school co-education, in order to promote the formation of better scientific literacy among primary school students.

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