

Quantitative Evaluation Method of Psychological Quality of College Teachers Based on Fuzzy Logic

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ABSTRACT

Based on the fuzzy method, this paper establishes a ranking model of the psychological quality of college teachers and an interception model of assessment indicators. On this basis, a quantitative evaluation method of college teachers' psychological quality is proposed by using the principles of fuzzy psychological evaluation and fuzzy recognition. According to empirical study, this evaluation approach is capable of providing a theoretical foundation for the next teacher training as well as a thorough assessment of the psychological qualities of teachers. The research concludes by pointing out that the model and evaluation approach can also be used to introduce and train university teachers, and it makes some sound recommendations for their development. An empirical study on the quantitative evaluation method of college teachers' psychological quality based on fuzzy psychological evaluation and fuzzy recognition principle is beneficial to better build the foundation of college teachers' psychological quality under the concept of harmonious education.

KEYWORDS

Conformity Psychology, Harmonious Ecological Education, Index Interception, Model, Psychological Quality, Set Pair Analysis

INTRODUCTION

Since American clinical psychologist Freudenberger introduced the idea of “psychology under the concept of harmonious ecological education” when he researched occupational stress in the 1970s, the field of teachers has gradually benefited from the research on psychology under the concept of harmonious ecological education). Under the idea of harmonious ecological education, teachers are frequently under strain at work and are vulnerable to psychological disturbances due to the uniqueness of their teaching materials and other factors (Skidmore, 2016). The National Education Association of the United States once reported that 20% of college teachers needed extra attention from psychologists, 30% of them had social maladjustment, 37.5% of them frequently felt extremely worried about their work efficiency, and another 30% found it difficult to get along with other people.

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The School of Public Administration at Renmin University of China, the Institute of Human Resources, and the Sina Education Channel jointly conducted the “Survey on Occupational Stress and Mental Health of Chinese Teachers” in 2005, and the results revealed that 86% of the teachers had a mild sense of psychology under the concept of harmonious ecological education (Data from The National Education Association of the United States). Another 34.6% of teachers reported that the pressure was very high, 47.6% reported that the pressure was relatively high, and 38.54% felt psychologically stressed; of them, 58.5% had a moderate psychology under the concept of harmonious ecological education, and 29% had a serious psychology; and 64.4% of people with poor health reported feeling unsatisfied at work (Ma et al., 2020). Numerous subsequent investigations have demonstrated that elementary and secondary school teachers exhibit emotional weariness and noticeable psychological disturbances under the notion of harmonious ecological education (Falla-Falcón et al., 2022). The American scholar Dworkin once said, “No matter what consequences the psychology of teachers under the concept of harmonious ecological education has on teachers and school organizations, the students of these teachers are the ultimate victims” (Wang et al., 2021). The development of a whole, harmonious educational ecosystem is related to the psychological well-being of college instructors. The survival and mental health of teachers are intimately correlated with their professional development and the educational reform in the educational ecosystem. The harmony of the entire educational ecosystem is somewhat related to the adjustment of college teachers’ self-development and mental health. Establishing the “overall connection” and “dynamic balance” in a harmonious educational environment between one’s own development and other system components is the main objective of college teachers’ mental health.

The terms “ecological harmony” in education refer to the transplantation and borrowing of the terms “ecological balance” and “ecological harmony” in the field of education. Ecological harmony emphasizes the kinship, openness, interaction, and creativity of the educational mechanism. It emphasizes the harmonic matching and organic unity between the subject and object of education and the internal and exterior environment. The educational idea of “ecological harmony” complements and broadens many other existing advanced educational ideas while also being consistent with the current state of education in the country. Researchers from various nations have conducted empirical research to investigate the causes or influencing variables of teachers’ psychology under the idea of harmonious ecological education in order to alleviate teachers’ psychological quality assessment under the concept of harmonious ecological education (Deng, 2022). The early stages of linked study on psychology and other aspects under the notion of teachers’ harmonious ecological education primarily focused on external factors such as teachers’ work pressure and social support. With the re-examination of teachers’ roles in the context of the development of postmodern teachers’ harmonious ecological education, the major issue of the teachers’ job burnout study has switched from external to internal aspects of teachers. Teachers’ cognition, belief, and evaluation models will influence their classroom thinking and conduct. As a result, it is critical to investigate how teachers’ beliefs, cognition, and evaluation process affect teachers’ emotional response to stressors that induce job burnout, which is related to teachers’ resilience. Much research has verified teacher resilience as a significant internal psychological resource of teachers, and it is an important metric to intervene and alleviate teacher burnout.

At the moment, most study on the psychology and resilience of teachers under the notion of harmonious ecological education is focused on preschool teachers. Simultaneously, there are extremely few teachers with various professional credentials as research objects (Bagadaeva et al., 2021). Most of the research discusses teachers with different professional titles as demographic variables, which are juxtaposed with teaching age and gender. There are also a small number of studies on teachers with different professional and harmonious ecological education development stages as research. The object is to study the psychological resilience of teachers or the psychology under the concept of harmonious ecological education (Wang et al., 2021). The concept of resilience stems from the attention paid by psychiatry and developmental psychology to children’s personal character and

characteristics. As for teachers' resilience, there are various understandings from different perspectives, such as "ability theory", "process theory", "result theory", and "ecology theory". However, in essence, teacher resilience is a kind of internal quality of a person, which refers to the ability and actively adapt to adversity. The formation of teachers' resilience is influenced by teachers' self and many factors embedded in their work and life situations. Therefore, teacher resilience highlights a teacher's capacity to uphold their dedication to their profession and deal with a variety of uncertainties in their day-to-day instruction under the influence of their personal, interpersonal, and professional environments.

Under this background, this research starts from the new perspective of psychological resilience, takes teachers with different professional titles as the research object, and analyzes the current state of psychological and psychological resilience levels in relation to the idea of ecological harmony in teaching teachers with various titles, which further protects psychological resilience from internal and external protection. From the perspective of resilience and risk factors, this paper probes into the influence of resilience on various dimensions of psychology under the concept of harmonious ecological education and finally puts forward some suggestions to psychology quality of teachers with different professional titles under the concept of harmonious ecological education from the perspective of resilience.

In this way, it will not only improve the physical and mental health of teachers but also raise groups of energetic and upbeat children (Maloney et al., 2016). The research on teachers' resilience is also meant to promote the career of middle school teachers to get better development, improve their quality of life, and promote their resilience to resist pressure or difficulties. By leveraging the psychological resilience of middle school teachers, on the one hand, teachers can actively seek out resources to improve their capacity for stress tolerance, thereby improving the quality of their lives and work; and on the other hand, it serves as a guide for the social and educational administrative departments on how to incorporate efficient resources to train excellent teachers. The improvement of teachers' mental health is crucial for the development of students' mental health, the enhancement of teaching quality, and the assurance of the stability rate of outstanding instructors.

The quantitative evaluation method based on fuzzy logic can more accurately describe and measure the psychological quality of university teachers and has a better ability to reflect the actual situation compared with the traditional qualitative evaluation method. At the same time, the study integrates the theories and methods of psychology and fuzzy logic disciplines across disciplines and innovatively combines the two effectively. The results of the study can provide a quantitative reference basis for the evaluation of the psychological quality of university teachers and provide scientific decision-making support for university management, which has practicality and application prospects.

RELATED WORKS

The psychological quality is necessary for teachers to engage in educational work, which will promote the teaching profession (Zhang & Yang, 2022). According to Rudasill et al. (2010), teachers' psychological qualities are a complex structure made up of a variety of different elements, including both the fundamental psychological qualities and the professional psychological qualities necessary for the advancement of professional harmonious ecological education. Bardach et al. (2022) stated that rather than adding up all of a teacher's psychological traits, it should be the psychological traits that are most closely associated with the development of pupils' physical and mental harmony with the environment. Boas and Morin (2014) conducted research on the psychological quality makeup of university professors, and they made the claim that psychological quality makeup is a quality created by the combined action of innate and acquired forces that is used to manage the tension between teachers' self-realization and social expectations as well as their own personal expectations. The internal conflicts of instructors' physical health include their mental condition, emotional control, observation, judgment, and will, among other things (Boas & Morin, 2014). Teachers' psychological quality belongs to the category of professional psychological quality. It is the social and cultural quality,

academic skill, and psychological personality quality that teachers create and acquire through their work in the classroom (Bambaeero & Shokrpour, 2017). According to Egamberdiev and Saydullaeva (2022), in order to determine a teacher's psychological qualities, the following conditions must be satisfied: reflecting the uniqueness of the teaching profession, having a strong theoretical foundation, concentrating on teaching and research activities in the sciences, and researching psychological qualities in a methodical and dynamic manner.

In order to overcome the shortcomings of traditional teaching evaluation and enhance the evaluation effect (Ma et al., 2020) apply the fuzzy evaluation method to combine qualitative assessment and quantitative assessment. First of all, establish a scientific and reasonable classroom teaching quality assessment index system, determine the standard assessment criteria, and then select and use the fuzzy comprehensive evaluation model to evaluate the classroom teaching quality, thus establishing a complete and effective teaching quality evaluation system. The main approach of building fuzzy systems is fuzzy integrated assessment, and it has a broad range of applications, including expert evaluation systems, quality control, performance assessment, weather forecasting, medical diagnosis, economic management, and psychological measurement. The fuzzy integrated assessment method of college students' entrepreneurial education is a combination of quantitative and qualitative methods, which expresses and processes the subjective judgment of humans in quantitative form, minimizes the drawbacks brought by personal subjective judgment, and makes the evaluation results more credible (Luo et al., 2022). Shi (2022) conducted a preliminary study on the structure of college students' psychological quality in the context of localization and proposed a construction method for an analytic hierarchy-based evaluation model of college students' psychological quality. It is proposed to introduce the hierarchical analysis method into the behavioral assessment model of college students' psychological disorders as the entry point (Shi, 2022).

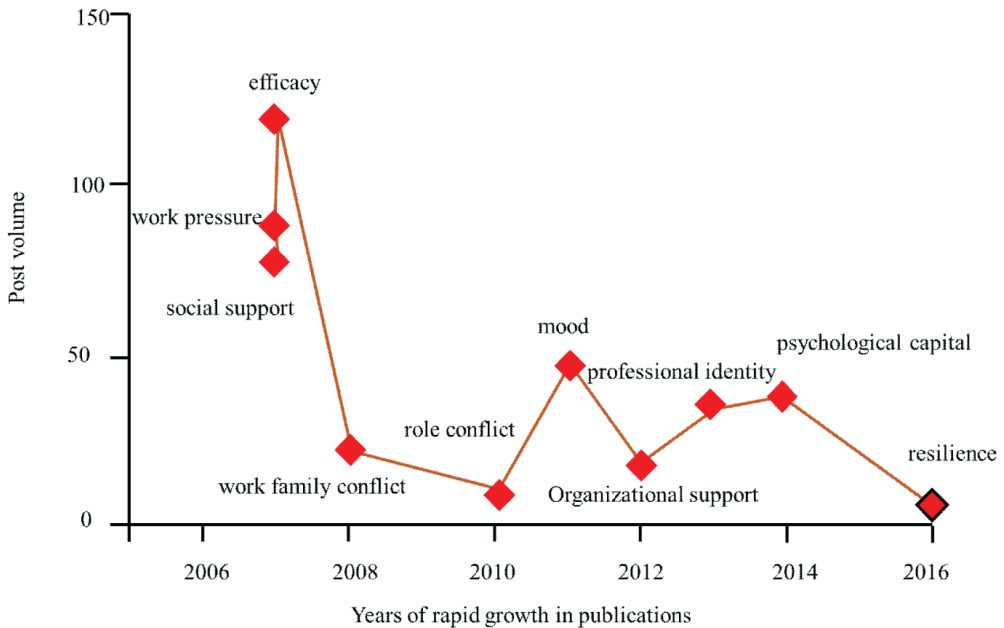
MATERIALS AND METHODS

At present, there are more theoretical studies and fewer empirical studies. The connotation of teachers' psychological quality is defined more, and the research on the structure is less frequent and scattered. Especially in recent years, teachers' psychological quality, as a component of the research on teachers' quality, has been studied theoretically from different angles. For example, the development of teachers' psychological quality is discussed from the perspective of teachers' professional development. The study of teachers' psychological qualities is still in its early stages, and there are many aspects to be improved, which promote ecological education in a harmonic manner.

Based on a review of the existing literature, it is discovered that in the related research on the psychology and other factors under the concept of teachers' harmonious ecological education, the early stage was primarily focused on the research of the psychological and external factors under the concept of teachers' harmonious ecological education, including teachers' working pressure, social support, work-family conflict, and so on (Jordan & Kristjánsson, 2017). In recent years, an increasing number of researchers have investigated the relationship between teachers' internal factors, such as emotions, professional identity, psychological capital, and psychological resilience, and teachers' psychology under the concept of harmonious ecological education, as illustrated in Figure 1.

The majority of teachers face pressure from society, parents, pupils, and school officials, which causes the teachers' ecological environment to deteriorate, relating to the management of the school. Work pressure is closely related to the psychology of teachers under the concept of harmonious ecological education. Many academics argue that the psychology of teachers under the concept of harmonious ecological education is related to long-term job pressure; that is, the concept of harmonious ecological education affects teachers' work pressure (Bahadir, 2018). Dunham (2002) defined teacher psychology in the context of harmonious ecological education as an extreme kind of occupational stress caused by irreconcilable stress responses. Spooner (1984) polled approximately 300 primary school teachers on 15 work-related symptoms and discovered that the four symptoms

Figure 1. Trends in research on psychology and other factors under the concept of teachers' harmonious ecological education



with the highest scores were weariness, stress, frustration, and worry. However, under the concept of harmonious ecological education, teachers' long-term exposure to increasing work strain can quickly lead to psychological problems. Although scholars agree that job stress is positively connected with psychology in the context of harmonious ecological education, different causes of teachers' work pressure have varying effects on the three dimensions of psychology (Iwanowicz-Palus et al., 2022).

The discovery and acceptance of the phenomenon that individual growth is not substantially harmed under high strain or high adversity is a key predicate for the establishment of resilience, according to the development genesis of the notion. Adversity or being in a difficult circumstance is one requirement for resilience, which is that people must have gone through it. It is clear that stress or adversity is frequently viewed as the condition for determining a person's resilience degree. Stress experiences are key prerequisites for the development of resilience, and they are inextricably linked. A high level of resilience is helpful in dealing with stressful events in life, and resilience can alleviate the negative impact of stress on individuals. Teachers with psychological resilience can effectively resist teacher pressure and job burnout. As a result, it has been discovered that there is a close relationship between resilience and stress and that resilience can protect individual instructors when they are under stress.

Theoretical Model of Influencing Factors of Teachers' Psychological Resilience

The psychological resilience of teachers with different professional titles has a significant predictive effect on their psychology under the concept of harmonious ecological education. And teachers' internal and external circumstances affect their psychological resilience level, which in turn affects their psychological level under the concept of harmonious ecological education. What are the specific internal and external factors that affect teachers' psychological resilience? Are these factors protective factors or risk factors for teachers with different professional titles? Next, this research will use grounded theory to divide the interview data with the help of NVivo software.

Grounded theory is a theory-building research method that advocates a harmonious ecological education development theory in data-based research, rather than deducing verifiable hypotheses from existing theories. Proposed by Glaser and Strauss (2004), the theory seeks to close the gap between theoretical and empirical research by layer-by-layer, bottom-up coding of data, which includes conceptualization, genericization, identification of core categories, and the development of a theoretical framework. Lawrence and Tar (2013) believe that grounded theory is a process of systematically collecting and analyzing phenomenon data, draw the results, developing harmonious ecological education, and testing theoretical statements. Researchers begin with actual observation, describe their findings using the original data, and then move on to developing a systematic theory. This is a bottom-up approach to establishing the substantive theory, where the fundamental ideas that capture the essence of things and phenomena are first identified on the basis of systematic data gathering and then appropriate social theories are developed through the interrelationships between these ideas. Grounded theory must be backed by empirical evidence, but its essential trait is that it abstracts new concepts and ideas from empirical facts, not its empiricism.

As shown in Figure 2, this study identified 10 internal and external factors that affect teachers' resilience. These internal and external factors may be protective factors or risk factors for teachers with different professional titles. Based on this, this study will discuss the internal and external protective and risk factors of the psychological resilience of teachers with different professional titles and make corresponding divisions.

As shown in Figure 3, taking junior teachers as an example, the level of psychological resilience of junior teachers is not as high as that of middle and senior teachers, but their strong professional identity and optimistic and positive attitude keep their emotional exhaustion at a low level. Compared with middle and senior teachers, junior teachers have a relatively high level of depersonalization. This is mainly due to the personal psychological insufficiency of primary teachers and the deviation

Figure 2. Theoretical model of the influencing factors of teachers' psychological resilience

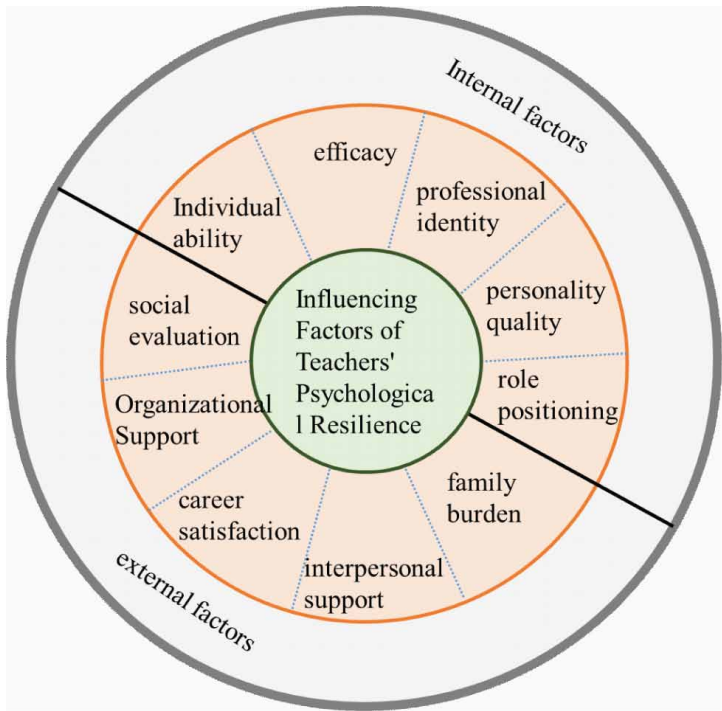
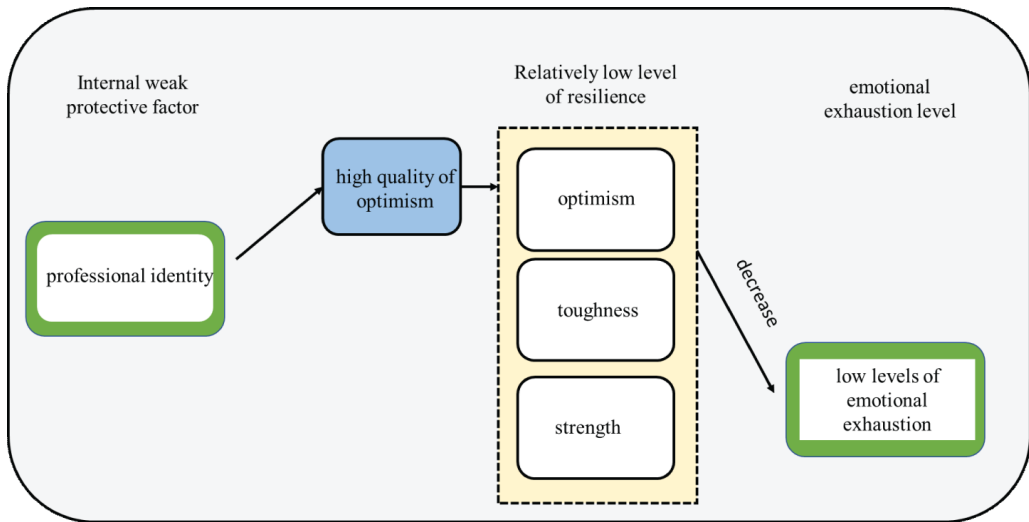


Figure 3. The process of reducing the level of emotional exhaustion by weak protective factors in primary teachers



of role orientation. Some junior teachers said that they rarely had in-depth communication with the older teachers in the school, and most of them maintained normal politeness. On the one hand, the old teachers were busy with family and work, so junior teachers are afraid of disturbing them.

The Principle of Set Pair Analysis

Set Pair Analysis (SPA) is a mathematical and analytical method used to handle uncertain or vague information in decision-making processes. Its distinguishing feature is the objective acknowledgment of all types of objectively existing uncertainties as well as the dialectical analysis and mathematical processing of uncertainty and certainty as a certain and uncertain system of similarities, differences, and opposites. Set pair analysis is the study of the characteristics, relationships, structures, states, trends, and mutual connection patterns of the two sets in a set pair. This study is usually carried out by determining the connection number of the two sets, but it can also be done without it. Set pair analysis theory and method have been applied in various domains of science, technology, and social economy.

The primary principle behind set pair analysis is to dialectically examine and mathematically deal with the system's certainty and uncertainty, reflecting the three system characteristics of dialectics and mathematics. Set pair analysis splits confidence into two aspects, "identity" and "opposition", and names uncertainty "difference", studying things from the same, different, and opposite perspectives. Similarities, differences, and opposites are interconnected, influenced, and restricted, and under specific situations, they turn into each other. Simultaneously, the connection degree and its mathematical expression are developed to unify the description of all types of uncertainties, therefore translating the dialectical understanding of uncertainty into precise mathematical procedures.

Set Pair

A set pair refers to a pair composed of two sets that have a certain relationship and whose information is not exactly equal. Commonly used uppercase letters represent a set pair, such as A, H, M, etc.

The Similarities and Differences Between the Two Sets

- **Homo-relationship:** If two sets have some of the same characteristics, researchers say these two sets have an identity relationship, which is referred to as the same relationship.

- **Anti-connection:** If two sets have some opposite characteristics, researchers say these two sets have an opposite relationship, which is called anti-connection for short.
- **Differential connection:** Two sets of certain connections; if this connection is neither an identity connection nor an opposite connection, then this connection is called a difference connection.

Contact

According to the needs of the specific problem W, the characteristics of the set pair H (A, B) formed by the set A and the set B are analyzed for the same (same), different (difference), and anti-opposition. The set pair has a total of N among them: there are S features that are shared by A and B in the set pair; P features are opposite to the two sets, and the remaining $F=N-S-P$ features are neither shared nor opposed by the two sets.

Then the similarity, difference, and inverse connection degree of sets A and B in the context of the problem is expressed as:

$$\mu = \frac{S}{N} + \frac{F}{N}i + \frac{P}{N}j \quad (1)$$

For simplicity, the usual order is:

$$\frac{S}{N} = a \quad (2)$$

$$\frac{F}{N} = b \quad (3)$$

$$\frac{P}{N} = c \quad (4)$$

Then the similarity, difference, and anti-relationship degree can be recorded as:

$$\mu = a + bi + cj \quad (5)$$

In the formula, i and j have dual meanings: the first meaning is that i and j are used as the coefficients of the degree of difference and the degree of oppositeness, respectively. It is stipulated that i is indeterminate in the interval [-1, 1] depending on the situation; j is stipulated in -1 in general. The second meaning is not to care about the value of i and j, and it only plays the role of marking. This article takes the second meaning when expressing the degree of concern and takes the first meaning when sorting the degree of concern.

THE CONNECTION DEGREE SUBTRACTION ALGORITHM

If there are two similarities, differences, and inverse connection degrees

$$\mu_1 = a_1 + b_1i + c_1j; \mu_2 = a_2 + b_2i + c_2j,$$

the difference between the two connection degrees is:

$$u_1 - u_2 = (a_1 - a_2) + (b_1 - b_2)i + (c_1 - c_2)j \quad (6)$$

Fuzzy Psychological Evaluation Model

Teachers' psychological evaluation aims to solve the problem from qualitative to quantitative evaluation, which can truly reflect teachers' overall psychological level. This process belongs to comprehensive evaluation. Comprehensive evaluation refers to the overall evaluation of things or systems affected by various factors. In practical applications, the objects to be evaluated are often affected by various uncertain factors and have fuzziness. Therefore, it is necessary to combine fuzzy theory with classical comprehensive evaluation methods. This method can make the results as objective as possible and can achieve better practical results. Generally, when using fuzzy comprehensive evaluation, the weight value is allocated through the subjective judgment of the evaluator. When there are too many factors, it is difficult to accurately allocate the weight. It is necessary to use the analytic hierarchy process to determine the weight vector in the fuzzy comprehensive evaluation method to establish an evaluation model to make the weight distribution more reasonable.

Let the factor set of the thing to be evaluated be $U = \{u_1, u_2, \dots, u_n\}$, the evaluation comment set is $V = \{v_1, v_2, \dots, v_m\}$, in the context of fuzzy relationships from set U to set V , r_{ij} ($i = 1, 2, \dots, n; j = 1, 2, \dots, m$) represents the possibility of making the j th comment on the evaluated thing starting from the i th factor. Assuming fixed i ($r_{i1}, r_{i2}, \dots, r_{im}$) is a fuzzy subset of set V , which means a single-factor evaluation of the thing to be evaluated from the perspective of the i th factor. This leads to the formation of a fuzzy evaluation matrix:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \quad (7)$$

The factor importance set of U , that is, the weight set, is $W = (w_1, w_2, \dots, w_n)$; when the fuzzy evaluation matrix R and W are known, the fuzzy psychological evaluation of the thing to be evaluated can be obtained by using the fuzzy transformation principle as:

$$B = W * R = (w_1, w_2, \dots, w_n) * \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} = (b_1, b_2, \dots, b_m) \quad (8)$$

In a complex system, it can be divided into several layers according to its characteristics. First, psychological evaluation is carried out in each layer, and then a higher-level psychological evaluation is carried out on the evaluation results, until the evaluation at the highest level. This paper adopts multi-layer fuzzy psychological evaluation (which can be regarded as three layers) when evaluating the psychological quality of teaching teachers.

The calculation process of the multi-layer fuzzy psychological evaluation is as follows.

First, make a psychological evaluation of the factors of the third-level indicators.

If to evaluate $a_1 = (a_{11}, a_{12}, a_{13}, a_{14}, a_{15})$, then $R = (r_{ij})_{5 \times 4}$; the psychological evaluation is:

$$A_1 = W_1 * R \quad (9)$$

The psychological evaluation of the second-level indicators $a = (a_1, a_2, a_3)$ is:

$$A = W * \begin{pmatrix} A_1 \\ A_2 \\ A_3 \end{pmatrix} \quad (10)$$

Make the same psychological evaluation on $b = (b_1, b_2, b_3, b_4)$ and $c = (c_1, c_2, c_3, c_4, c_5)$, respectively:

$$B = S * \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{pmatrix} \quad (11)$$

$$C = T * \begin{pmatrix} C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5 \end{pmatrix} \quad (12)$$

Finally, the psychological evaluation of the teacher's psychological quality is:

$$E = Q * \begin{pmatrix} A \\ B \\ C \end{pmatrix} \quad (13)$$

Given the score represented by each element of the evaluation set, the stratified score and psychological evaluation score of the teacher's psychological quality can be obtained.

Determination of the Weight Set of Evaluation Factors

The importance of each factor in the evaluation factor set is different. In the psychological evaluation, the key link is the determination of the importance degree a , of each factor in the factor concentration. Whether the value is properly selected or not directly affects the results of the psychological evaluation. There are many methods for determining the weights, such as: This paper adopts the first eigenvalue method in the Analytic Hierarchy Process (AHP) proposed by American operations research expert Professor Thomas L. Saaty. Take the factor set $U = (u_1, u_2, \dots, u_n)$ as an example, apply the 1-9 scaling method to any two factors u_i, u_j . The degree is judged according to the ranking result of the degree of attention to determine the importance of u_i relative to u_j ; and the judgment matrix P is obtained after pairwise comparison:

$$P = \begin{bmatrix} p_{11} & p_{12} & p_{13} \\ p_{21} & p_{22} & p_{23} \\ p_{31} & p_{32} & p_{33} \end{bmatrix} \quad (14)$$

This is an antisymmetric matrix with all 1s on the diagonal.

In this paper, the sum-product method is used to obtain the eigenvectors, and the steps are as follows:

1. Normalize each column of the judgment matrix:

$$\bar{p}_{ij} = \frac{p_{ij}}{\sum_{i=1}^3 p_{ij}} (j = 1, 2, 3) \quad (15)$$

2. The normalized judgment matrix of each column is added row by row:

$$\bar{a}_i = \sum_{j=1}^3 \bar{p}_{ij} (i = 1, 2, 3) \quad (16)$$

3. Normalize the vector $\bar{A} = (\bar{a}_1, \bar{a}_2, \bar{a}_3)^T$:

$$a_i = \frac{\bar{a}_i}{\sum_{j=1}^3 \bar{a}_j} (i = 1, 2, 3) \quad (17)$$

4. Calculate the first eigenvalue of the judgment matrix:

$$\lambda_1 = \frac{1}{3} \sum_{i=1}^3 \frac{\sum_{j=1}^3 p_{ij} a_j}{a_i} \quad (18)$$

5. Check whether the obtained eigenvectors are the required weights and whether they are reasonable.

CR refers to the consistency ratio of a judgment matrix, where CI represents the consistency index of the matrix, given by the formula: $CI = (4-n)/(n-1)$. R is the random consistency index of the matrix, and its value is determined by the corresponding RI value. For instance, when $n = 3$, $RI = 0.52$. The value of CR can then be calculated accordingly.

DISCUSSION

GBDT Measurement Results and Analysis

GBDT (Gradient Boosting Decision Tree), also known as MART (Multiple Addressing Region Tree), is an iterative decision tree algorithm, which is composed of multiple decision trees (Rong et al., 2020). The results of all trees are added together to form the final answer. When it was first proposed, it was considered as an algorithm with strong generalization ability together with SVM. In recent years, more attention has been paid to the machine learning model used for searching and sorting.

The reliability test is used to test the consistency and reliability of the pre-survey results, usually Cronbach's Alpha coefficient; that is the reliability coefficient is used to analyze the internal consistency reliability of the questionnaire. It is generally believed that a reliability coefficient above 0.8 indicates that the questionnaire has high reliability; a reliability coefficient above 0.7 indicates that the questionnaire is reliable (Connelly, 2011). In this study, SPSS22.0 was used to analyze the reliability of the MBI-ES and CD-RISC scales, respectively. It can be seen that the Cronbach's Alpha coefficient of the MBI-ES total scale was 0.873, and the reliability coefficient of each factor was 0.873. It is between 0.761 and 0.833, which indicates that the scale has a good level of reliability.

The closeness of the results to the actual situation is usually called validity, and the KMO test (Kaiser-Meyer-Olkin) and Bartlett's Test of Sphericity are mainly used to analyze it. The KMO test is used to examine the partial correlation between variables, with a value between 0 and 1, and the closer the value is to 1, the better the validity of the questionnaire. Bartlett's Test of Sphericity is used to judge whether the correlation matrix is a unit matrix. When H_0 is rejected, it means that the correlation coefficient matrix between the items is not a unit matrix and there is a correlation between the original variables. If the significance of Bartlett's Test of Sphericity is less than 0.05, it also indicates that the questionnaire has good validity. In this study, SPSS22.0 was used to analyze the validity of the MBI-ES and CD-RISC scales, respectively. It can be seen that the chi-square value of the Bartlett's Test of Sphericity for the MBI-ES scale is 3159.290, and the corresponding probability P value is 0.000, reaching a significant level, indicating that there is a strong correlation between variables; the KMO value is 0.890, which is relatively close to 1. Therefore, it can be concluded that the validity of the MBI-ES scale is good.

It can be seen that the chi-square value of the Bartlett's Test of Sphericity of the CD-RISC scale is 4493.850 and the corresponding probability P value is 0.000, reaching a significant level, indicating that there is a strong correlation between variables; the KMO value is 0.948, which is relatively close to 1. Therefore, it can also be concluded that the validity of the CD-RISC scale is better.

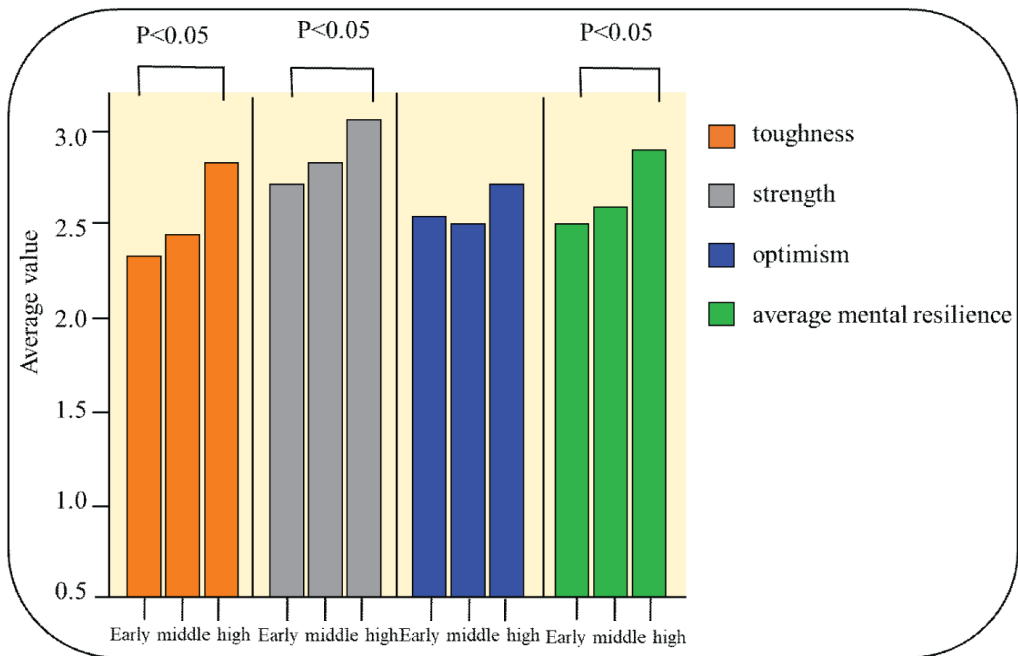
Through the above analysis, it is found that the MBI-ES and CD-RISC scales have good reliability and validity, so this study did not modify the original scale but directly used the original scale to conduct a questionnaire survey.

Stacking Measurement Results and Analysis

In this study, the average and standard deviation of the total score of psychological resilience and each dimension of the data of 310 valid subjects were counted to explore the basic situation of teachers with different professional titles in terms of resilience and various dimensions. The results are shown in Figure 4.

As can be seen from Figure 4, the level of psychological resilience of teachers with primary, intermediate, and senior professional titles is higher than the theoretical average of 2, which is at an upper-middle level. Among them, the level of psychological resilience from high to low is: senior teacher>intermediate teacher>junior teacher; that is, the higher the professional title, the higher the psychological resilience level. From the perspective of various dimensions of teachers' psychological resilience, the level of toughness from high to low is: senior teacher>intermediate teacher>junior teacher; that is, the higher the title, the higher the level of toughness; the level of strength from high to low is: senior teacher>intermediate teacher>junior teacher; that is, the higher the professional title, the higher the level of strength; the level of optimism from high to low is: senior teacher>junior teacher>intermediate teacher. Teachers with different professional titles have significant differences at the 0.05 level in the overall level of resilience, tenacity, and strength. After the post-hoc multiple comparison test, it was found that in the overall level of resilience, tenacity and strength dimensions, senior teachers were significantly higher than junior and intermediate teachers; in the dimension of optimism, intermediate and senior teachers showed significant differences; that is, senior teachers are significantly higher than intermediate teachers.

Figure 4. The overall level difference of the psychological resilience of teachers with different professional titles

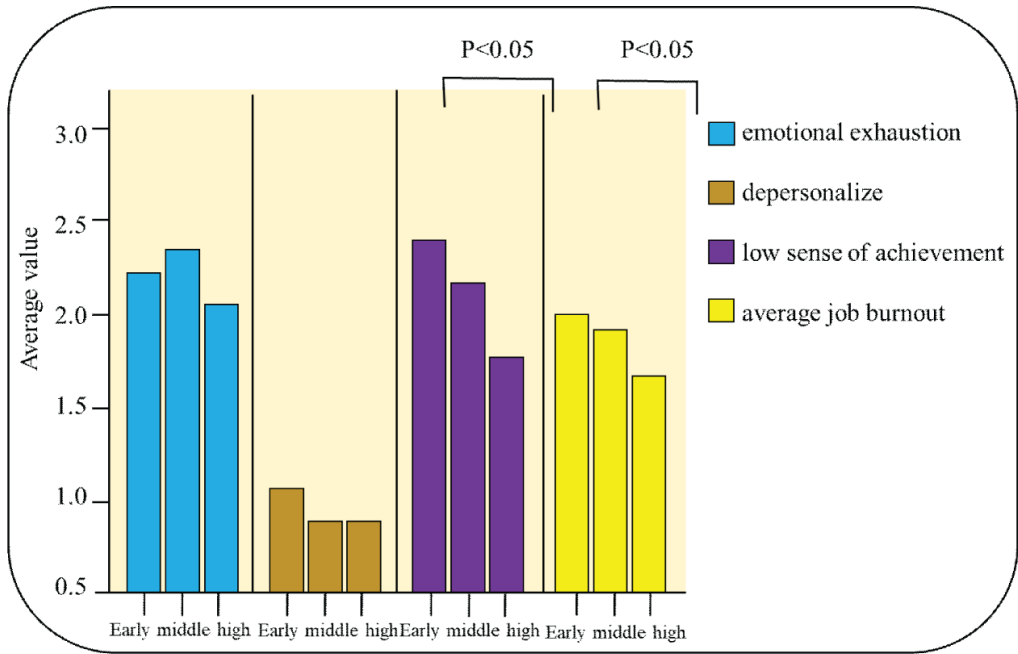


It can be seen from Figure 5 that the psychological level of teachers with primary, intermediate, and senior professional titles under the concept of harmonious ecological education is lower than the theoretical average of 3, which is in the lower middle level. Among them, the psychological level under the concept of harmonious ecological education is from high to low: primary teacher>intermediate teacher>senior teacher; that is, the higher the professional title, the lower the psychological level under the concept of harmonious ecological education. From the perspective of various psychological dimensions under the concept of harmonious ecological education for teachers, the level of emotional exhaustion from high to low is: intermediate teachers>junior teachers>senior teachers; the de-personalization level from high to low is: junior teachers>intermediate teachers>senior teachers; that is, the higher the professional title, the lower the level of de-personalization; the low sense of achievement level from high to low is: beginner teacher>intermediate teacher>senior teacher; that is, the higher the professional title, the higher the sense of personal accomplishment. Teachers with different professional titles did not show significant differences in the dimensions of emotional exhaustion and depersonalization, but there were significant differences at the 0.05 level in the dimensions of overall psychology and low sense of achievement under the concept of teachers' harmonious ecological education. Through multiple comparative tests, it has been discovered that primary and senior teachers, as well as intermediate and senior teachers, exhibit significant differences in their overall psychological level and low sense of achievement dimension under the framework of harmonious ecological education. The level of psychology and low sense of achievement of teachers with low and intermediate professional titles is significantly higher than that of senior teachers. It is worth noting that the post-hoc multiple comparison test found that on the dimension of emotional exhaustion, intermediate teachers were significantly higher than senior teachers.

Teachers' psychological resilience has a significant negative predictive effect on their psychology under the concept of harmonious ecological education.

This study conducted a regression analysis on the psychology and various dimensions of 120 effective primary school teachers under the concept of psychological resilience and harmonious

Figure 5. Differences in the overall psychological level of teachers with different professional titles under the concept of harmonious ecological education



ecological education, aiming to explore the psychological resilience of primary school teachers under the concept of harmonious ecological education and the prediction effect of various dimensions.

Taking the psychological resilience of primary teachers as the independent variable, it is found by regression analysis of the psychology and various dimensions under the concept of harmonious ecological education, as seen in Figure 6, that the model fits well ($R_2=0.406$, adjusted $R_2=0.401$); the amount of variation that can be explained by the psychological resilience of junior teachers' emotional exhaustion, depersonalization, and low achievement is 19.1%, 16.3%, and 44.9%, respectively. The probability p-values of the t-test of the significance of the regression coefficients of each dimension of the psychology of primary teachers under the concept of harmonious ecological education are all less than 0.05, indicating that the psychological resilience of primary teachers has an extremely significant negative predictive effect on the psychology and various dimensions under the concept of harmonious ecological education.

Taking the psychological resilience of intermediate teachers as the independent variable, it is found by regression analysis of their psychology and various dimensions under the concept of harmonious ecological education, as seen in Figure 7, that the model fit was average ($R_2=0.223$, adjusted $R_2=0.216$); the variation of emotional exhaustion, depersonalization, and low achievement of middle-level teachers that could be explained by their resilience were 1.9%, 1.9%, and 36.2%, respectively. Only the regression coefficients of the psychological and low achievement dimensions under the concept of harmonious ecological education have a significant t-test probability p-value less than 0.05, indicating that the psychological resilience of intermediate teachers is a negative prediction of the dimensions of psychology and low achievement under the concept of harmonious ecological education. The effect is extremely significant, and the negative predictive effect on emotional exhaustion and depersonalization is not significant.

Taking the psychological resilience of senior teachers as the independent variable, a regression analysis was carried out on their psychology and various dimensions under the concept of harmonious

Figure 6. Regression analysis diagram of primary teachers' psychological resilience and harmonious ecological education concept

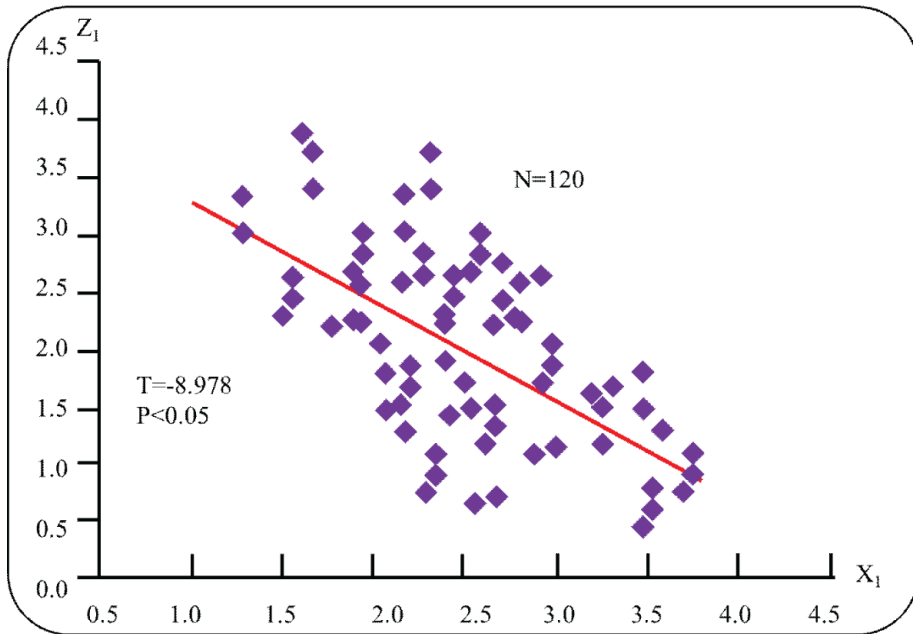
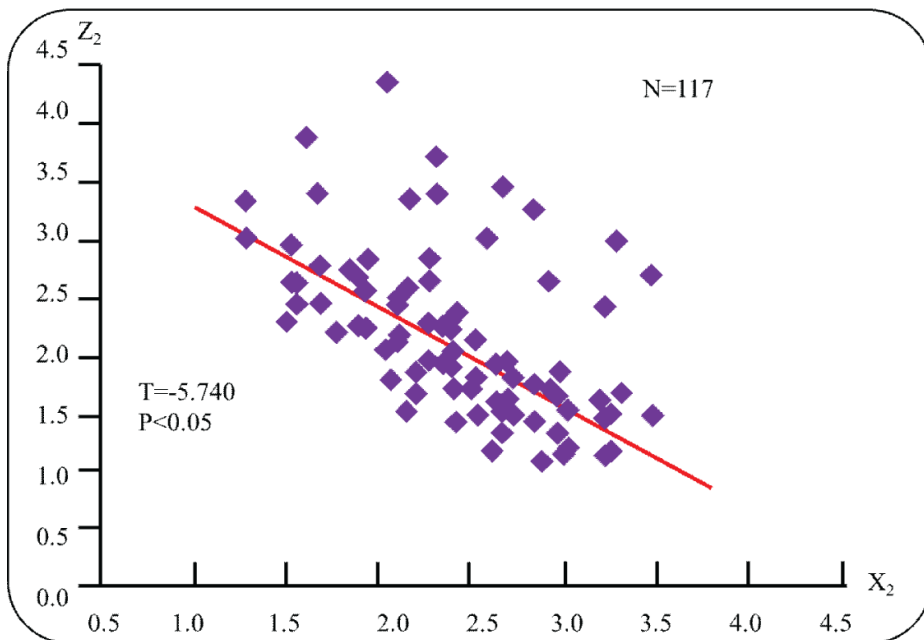
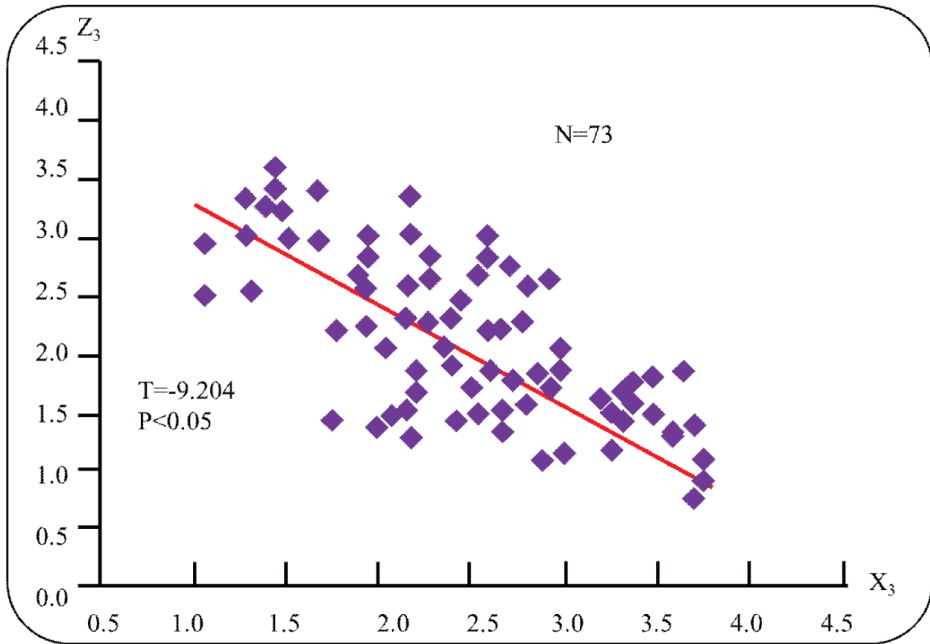


Figure 7. Regression analysis diagram of middle-level teachers' psychological resilience and harmonious ecological education concept



ecological education, as seen in Figure 8, that the model fit was better ($R_2=0.544$, adjusted $R_2=0.538$); the variance of senior teachers' emotional exhaustion, depersonalization, and low sense of achievement

Figure 8. Regression analysis diagram of psychology under the concept of psychological resilience and harmonious ecological education of senior teachers



that could be explained by their resilience were 31.9%, 33.4%, and 43.1%, respectively. The probability p-values of the significant t-test of the regression coefficients of all dimensions of psychology under the concept of harmonious ecological education of senior teachers are all less than 0.05, indicating that the psychological resilience of senior teachers has an extremely significant negative predictive effect on psychology and various dimensions under the concept of harmonious ecological education.

In a word, those teachers who have a stronger sense of mission, responsibility, and efficiency in education and teaching can cooperate with colleagues, share values and visions, and build the school into a real community of learning and development under the leadership of the principal; they will be able to overcome difficulties and obstacles in complex and changing work situations, avoid or overcome the occurrence and impact of job burnout with strong toughness, and lead the growth of students and enjoy the great job satisfaction and sense of achievement brought by giving full play to their educational and teaching abilities.

CONCLUSION

Professional psychological quality is the foundation and driving force behind teachers' careers. In order to investigate the psychological resilience of primary school teachers under the concept of harmonious ecological education and the prediction effect of each dimension, this study conducted a regression analysis from the psychological resilience and dimensions of 120 primary school teachers. The empirical research on the evaluation method of college teachers' psychological quality based on the concept of harmonious education will help to build a better platform for college teachers' psychological quality. In the future, the corresponding research and theory should further adopt the method of cross-sectional research and follow-up research, deepen the research on professional consciousness and role positioning at different psychological levels, and refine the psychological quality of different stages of professional harmonious ecological education development and the

development track of harmonious ecological education so that the research on teachers' professional psychology can be more comprehensive.

Evaluation of psychological quality is multifaceted, but current research lacks specific definitions and scope, leading to ambiguity. Evaluation based on fuzzy logic presents difficulties because psychological quality is difficult to quantify accurately. Future research needs to clarify the content and scope of evaluation, consider the practical maneuverability of fuzzy logic methods, and ensure that the evaluation is objective and scientific. In summary, future research should fully consider these issues to promote the development and application of psychological quality evaluation methods.

In order to bridge the gap in psychological quality evaluation, future research should clearly define the evaluation content, explore operable evaluation methods, establish a scientifically rigorous evaluation system that takes into account individual differences and situational factors, and strengthen the application and promotion of evaluation results. This will improve the evaluation method and promote the improvement and enhancement of psychological quality.

DATA AVAILABILITY

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

COMPETING OF INTEREST

The authors declare that there are no competing of interest.

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