

Research on the Path to Improve the Educational Ability of College Counselors Based on Fuzzy Information Big Data Algorithm

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ABSTRACT Fuzzy information big data algorithms provide an effective approach for processing uncertain and heterogeneous educational data, enabling scientific evaluation and targeted improvement of college counselors' educational abilities. Such data-driven evaluation frameworks are also valuable in engineering education fields, including electromagnetic, antenna, and communication engineering talent cultivation, where accurate assessment of educational effectiveness and professional development is increasingly important. This study constructs a counselor competency development framework based on fuzzy set theory, fuzzy comprehensive evaluation, and association rule mining. The proposed framework establishes a multi-dimensional ability evaluation system, generates competency profiles, and supports personalized training optimization. Experimental results indicate that the fuzzy feedback mechanism independently improves counselors' educational abilities by 8.6% and increases the achievement rate of professional development goals by 23.8%. The findings demonstrate the effectiveness of fuzzy information processing and big data analysis for educational management and provide a data-driven methodology for improving educational quality and professional development in complex talent-training environments.

INDEX TERMS fuzzy information, big data algorithm, educational ability evaluation, engineering education

I. INTRODUCTION

AS information technology becomes deeply integrated with education, college counselors are encountering increasing work complexity driven by complex data and ambiguous information. Managing this ambiguity is a critical need across sectors, directly paralleling the challenge faced by the textile industry in managing the inherent imprecision of material properties and noisy sensor data, which is essential for optimizing overall production and workforce stability. Fuzzy information big data algorithms provide accurate decision-making support for counselors by processing imprecise and uncertain information sets. Based on fuzzy set theory and big data analysis technology, this study constructs an evaluation index system for counselors' educational abilities and explores the data-driven professional development path for counselors. The aim is to improve the quality and effectiveness of ideological and political education in colleges and universities and to provide technical support and methodological guidance for the construction of the counselor team. The systemic approach to enhancing educational quality through data-driven methods is analogous to the need for advanced systems in

the textile industry, which provide technical support and guidance to machine operators, ensuring a high level of output consistency and quality control across all production processes.

II. FUZZY INFORMATION BIG DATA ALGORITHM THEORY AND TECHNICAL FRAMEWORK

A. FUZZY SET THEORY AND EDUCATIONAL DATA PROCESSING MECHANISM

Fuzzy set theory breaks the binary logic of "either this or that" elements in traditional set theory and introduces the concept of membership, making educational data processing closer to real-life situations. In the work of college counselors, data such as student behavior and psychological state often exhibit uncertainty and ambiguity, which are difficult to express using precise numerical values. Fuzzy linguistic variables can quantify concepts like "positive learning attitude" and "good mental health" by introducing membership functions in the interval $[0, 1]$. The system utilizes the triangular membership function for its ability to effectively quantify qualitative data. Experimental data show that the proposed fuzzy evaluation model, compared with the

traditional binary logic evaluation system, improves model accuracy by 23.7%, demonstrating enhanced scientific rigor.

The fuzzy reasoning mechanism provides new ideas for educational data processing. The student development assessment system, built on the Mamdani fuzzy reasoning model, can process complex evaluation systems containing 48 fuzzy rules and covering eight dimensions [1]. By processing historical data from 656 students through the T-S fuzzy model, the system successfully identified 87.3% of potential problem students, where a “potential problem student” is strictly defined as any student who received a formal academic warning, a disciplinary notice, or was referred to mandatory psychological counseling within the subsequent two semesters (Ground Truth). The traditional statistical method employed was a multivariate linear regression model. This is 15.6 percentage points higher than the traditional statistical method. The fuzzy clustering algorithm is 2.3 times more efficient than the traditional K-means algorithm in initially coarsegrained grouping of educational data, providing a data foundation for instructors to deliver precise teaching. The comparison of the effectiveness of various algorithms in fuzzy set theory and educational data processing mechanisms is shown in Table 1. (Note: K-means is used here solely as a performance baseline for comparison.)

TABLE 1. Comparison of the Effects of Various Algorithms in Fuzzy Set Theory and Educational Data Processing Mechanism

Algorithm Type	Application Scenario	Advantage	Improved Performance
Mamdani fuzzy reasoning	Student Development Assessment	Can handle complex fuzzy rules and multidimensional data	Potential problem identification rate: 87.3%
T-S fuzzy model	Student Data Processing	Efficiently identifies potential problem students	Increased by 15.6 percentage points
Fuzzy clustering algorithm	Educational Data Group Processing	More efficient than K-means	2.3 times improvement

This table compares three primary fuzzy set theory algorithms in educational data processing. Mamdani fuzzy reasoning supports student development assessment, managing complex rules and multidimensional data to achieve an 87.3% potential problem identification rate. The T-S fuzzy model processes student data, efficiently identifying at-risk learners with a 15.6 percentage point increase. Fuzzy clustering algorithms handle educational group data more effectively than K-means, showing a 2.3-fold performance boost. Each algorithm targets specific scenarios while enhancing processing efficiency or accuracy.

B. APPLICATION PRINCIPLES OF BIG DATA MINING TECHNOLOGY IN COUNSELOR WORK

Big data mining technology extracts valuable information from massive educational data through algorithms such as association rules, classification, and clustering. The sources of counselor work data are diverse, including student management systems, card consumption, book borrowing, and online behavior, and the data volume is huge and heterogeneous. The Apriori algorithm, chosen for its interpretability

in binary data sets, mines student behavior association rules and finds that the support between online time exceeding 30 hours per week and academic warning risk is 0.72, and the confidence is 0.68, which provides an important reference for counselors to identify academic risks.

The decision tree algorithm C4.5 performs well in processing counselor work data, and the accuracy rate for predicting the academic development trajectory of 3,245 students over four years is 81.6%. Through feature selection technology, 35 key indicators are selected from the original 187 features, and the data processing efficiency is improved by 3.7 times. The Density-Based Spatial Clustering of Applications with Noise (DBSCAN) density clustering algorithm (selected for its efficacy in identifying arbitrarily shaped clusters and outliers) can effectively identify abnormal behavior patterns in student groups. In the experiment, 5,800 students were successfully divided into 12 typical groups, assisting counselors in achieving precise management. The application of Storm, a real-time network stream data processing technology, in the campus big data platform has reduced the counselor's response time to abnormal situations from an average of 47 minutes to 12 minutes [2].

C. CONSTRUCTION OF A FUZZY EVALUATION MODEL AND ALGORITHM OPTIMIZATION

The fuzzy comprehensive evaluation model achieves a scientific evaluation of counselors' work through four steps: establishing an evaluation indicator system, determining weights, constructing an evaluation matrix, and calculating comprehensive evaluation results.

The Analytic Hierarchy Process (AHP) and entropy method are combined to determine indicator weights. When these composite weights are applied in the fuzzy comprehensive evaluation model, the model's overall evaluation accuracy (as measured by its F-score similarity to an independent expert panel's consensus score, defined previously) improves by 18.9% compared to utilizing weights derived from a single method (AHP or entropy method alone). In practical application at a certain university, a five-level fuzzy evaluation set (excellent, good, fair, poor, and bad) was used to evaluate counselors' abilities. An evaluation system consisting of four primary indicators and 16 secondary indicators was constructed. The derived weights were determined using the AHP, and the associated consistency analysis is presented in Section “Fuzzy Quantification Method for the Counselor's Educational Competency Index System”.

In terms of fuzzy evaluation algorithm optimization, the improved Fuzzy C-means (FCM) algorithm, by introducing inertia weights and an adaptive learning rate, reduced the number of iterations from 42 in the traditional FCM algorithm to 27, improving computational efficiency by 35.7%. (FCM is used here to optimize the parameter set for the fuzzy evaluation model's internal calculations.) The particle swarm optimization (PSO) algorithm was used to optimize membership function parameters, improving model robustness by 28.4% when processing noisy educational

data. In addition, the fuzzy neural network (FNN) combines the advantages of both methods and realizes the dynamic evaluation of counselors' work efficiency through a four-layer network structure (25 nodes in the input layer, 18 and 12 nodes in the two hidden layers, respectively, and eight nodes in the output layer). The accuracy rate reaches 89.7%, defined as the percentage of cases where the FNN's predicted final efficiency category (on a four-level scale: Excellent, Good, Fair, Poor) matched the ground truth category determined by a panel of three expert supervisors over a onesemester evaluation period. This is 16.3 percentage points higher than the traditional evaluation method (a weighted arithmetic average evaluation method), providing a scientific basis for the construction of college counselors.

III. CONSTRUCTION OF AN EVALUATION SYSTEM FOR THE EDUCATIONAL ABILITY OF COLLEGE COUNSELORS

A. FUZZY QUANTIFICATION METHOD FOR THE COUNSELOR'S EDUCATIONAL COMPETENCY INDEX SYSTEM

The evaluation of counselors' educational competence is characterized by multiple indicators and significant qualitative characteristics, making traditional precise evaluation methods ineffective. Fuzzy quantification methods establish a mapping relationship between linguistic variables and membership functions, converting qualitative indicators into membership degrees in the interval $[0, 1]$, thus achieving scientific quantification. This study employed the Delphi method and three rounds of expert consultation to select 83 initial indicators, forming a multi-level evaluation system consisting of four primary indicators (political leadership, ideological education, management and service, and psychological counseling), 16 secondary indicators, and 42 tertiary indicators. The Kendall Coefficient of Concordance (W) for the final index system was 0.823, indicating high expert consensus on the chosen indicators.

The semantic fuzzy scale offers unique advantages in evaluating counselors' competence. By setting a sevenlevel semantic scale {extremely high, very high, relatively high, medium, relatively low, very low, extremely low}, the corresponding fuzzy membership values are $\{0.95, 0.85, 0.75, 0.5, 0.35, 0.15, 0.05\}$, and a semantic-to-numerical conversion mechanism is established. Empirical research shows that the fuzzy quantification method based on the triangular membership function improves the discrimination of the evaluation results by 31.7% and the subjective satisfaction of the evaluators by 26.4% compared with the traditional scoring method. The index weight is determined using the AHP [3]. A panel of 15 senior university administrators and educational experts provided scores for the pairwise comparison matrices of the primary indicators. The calculated consistency ratio (CR) for these weights was 0.047, which is less than the standard value of 0.1, confirming a reasonable and consistent weight distribution. These weights, which serve as the primary methodological input for the subsequent

Fuzzy Comprehensive Evaluation Model, are presented in Table 2.

TABLE 2. Evaluation Index System and Weights of College Counselors' Educational Ability

First-Level Indicators	Weight	Main Secondary Indicators
Political leadership	0.32	Education on ideals and beliefs, and guidance of public opinion
Ideological education power	0.28	Ideological and political course development and educational activity organization
Management service capabilities	0.25	Crisis response, organization and coordination
Psychological counseling ability	0.15	Identification of psychological problems and crisis intervention

B. RESEARCH ON MULTI-SOURCE HETEROGENEOUS DATA ACQUISITION AND PREPROCESSING TECHNOLOGY

The evaluation of counselors' educational competence involves multi-source heterogeneous data, including structured data from the student affairs system, student evaluation text data, and behavioral trajectory data. This research designed a heterogeneous data collection solution based on an extract-transform-load (ETL) framework. This solution achieves unified data management through a three-stage process: extraction, transformation, and loading. In a pilot project at a university, the system integrated data from seven business systems, including the academic affairs system, student management system, and library system. The system processed an average daily data volume of 14.2 GB of structured log data (including card swipe records, campus network activity, and online learning platform logs), covering the behavioral data of 23,657 students and 126 counselors. The student sample was demographically diverse, encompassing all undergraduate years (from freshman to senior), spanning a wide range of academic fields (e.g., Engineering, Business, Arts, and Sciences), and had a balanced gender distribution (52% female, 48% male). To ensure robust model development and unbiased performance evaluation, the final preprocessed dataset was strategically partitioned into a training set (70%), a validation set (15%) for hyperparameter tuning, and an independent test set (15%). This study was approved by the Ethics Committee of Ningbo University of Finance and Economics and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

A multi-layered technical approach was employed in the data preprocessing phase. For missing data, multiple imputation by chained equations (MICE) was used for data with a missingness rate below 15%, achieving an imputation fidelity rate of 86.3%. For indicators with a missingness rate exceeding 15%, a deletion strategy was implemented to

ensure data quality. The local outlier factor (LOF) algorithm was used for outlier detection, successfully identifying 4.3% of anomalous records in the dataset. The term frequency-inverse document frequency (TF-IDF) algorithm was used to extract key features from text data, achieving a dimensionality reduction efficiency of 76.2%. The Z-score method was used for data standardization, making indicators of different dimensions comparable. The study constructed a distributed data processing architecture based on Hadoop, configured with an eight-node cluster, which increased processing speed by 5.7 times compared with the stand-alone mode, providing technical support for large-scale data analysis.

C. CONSTRUCTION OF COUNSELOR ABILITY PORTRAIT BASED ON FUZZY COMPREHENSIVE EVALUATION

The ability portrait of counselors is an important tool for visualizing educational ability [4]. It is constructed through a fuzzy comprehensive evaluation method. Based on the aforementioned index system and weights, a weighted average fuzzy synthesis operator $M(\wedge, \oplus)$ was used to perform multi-level fuzzy comprehensive evaluation to form a quantitative representation of counselors' abilities. Empirical studies have shown that when dealing with complex hierarchical evaluation problems, the calculation results of this method are more realistic than the maximum-minimum operator, and the evaluation accuracy was improved by 23.8%. The construction of the ability portrait follows the principle of data-driven, multi-dimensional representation, and dynamic update and presents the characteristics of counselors' abilities through visualization techniques such as radar charts and heat maps, as shown in Figure 1. In an experimental application at a "double firstclass" university, the system conducted a two-semester ability tracking and evaluation of 87 counselors, generating an ability portrait containing 16 dimensions, which accurately portrayed the strengths and weaknesses of the counselors' work. Data show that after adopting the system, the participation of counselors in targeted training increased by 42.3% and their job satisfaction increased by 18.7%. Cluster analysis of competency profiles revealed that counselors could be categorized into four groups: ideological and political education, student management, psychological counseling, and comprehensive balance, accounting for 27.6%, 31.2%, 18.4%, and 22.8%, respectively.

The dynamic update mechanism for competency profiles is based on a sliding window algorithm, with a semester-long evaluation cycle and a weight decay coefficient of $\lambda = 0.8$, enabling the profiles to reflect the evolution of counselors' competencies. By integrating the Echarts visualization library, the system constructs 11 types of visualization charts, including competency distribution charts, development trend charts, and peer group comparison charts. This creates an intuitive, multi-layered counselor competency profile, providing data support and a decision-making basis for university counselor team building and individual

career development.

Table 3 outlines the distribution of abilities across four counselor groups in building their ability profiles. The Ideological and Political Education group (27.6%) emphasizes strong ideological education but lacks management/service skills; the Student Management group (31.2%) excels in management/services yet has weak psychological counseling. The Psychological Counseling Type group (18.4%) boasts strong counseling skills but falls short in ideological education. The Comprehensive Balance group (22.8%) maintains balanced overall capabilities with no obvious weaknesses. Each group's unique strengths and deficiencies reflect diverse competency patterns in counselor roles.

TABLE 3. Distribution of Abilities of Each Group in the Construction of Counselor Ability Profiles

Ability Type	Representative Counselor Groups	Abilities and Specialties	Insufficient Ability	Proportion
Ideological and political education	Strengthen ideological and political education	Strong ideological education	Weak management and service capabilities	27.6%
Student management	Strengthen student management and services	Strong management and service capabilities	Weak psychological counseling	31.2%
Psychological counseling type	Strengthen psychological counseling services	Strong psychological counseling skills	Weak ideological and political education	18.4%
Comprehensive balance	Balanced comprehensive capabilities	Balance in all aspects	No obvious weaknesses	22.8%

IV. FUZZY INFORMATION-DRIVEN COUNSELOR CAPACITY IMPROVEMENT PATH

A. INTELLIGENT ALGORITHM FOR GENERATING PERSONALIZED COMPETENCY IMPROVEMENT PLANS

Counselors vary significantly in their competency levels, and personalized improvement plans can effectively promote targeted development [5]. A hybrid recommendation algorithm based on fuzzy clustering and collaborative filtering provides technical support for generating personalized improvement plans. This algorithm uses FCM clustering (selected to handle the fuzzy boundaries inherent in competency profiles) to classify counselors into several competency types, achieving a silhouette coefficient (SC) of 0.683 and a Davies-Bouldin (DB) index of 0.417, indicating good clustering quality. In practical application at a university, the system performed cluster analysis on the competency profiles of 156 counselors, identifying five typical competency patterns with an intra-class similarity of 78.3% and an inter-class difference of 67.9%. Personalized plan generation utilizes an improved collaborative filtering algorithm. By calculating the cosine similarity of counselor competency vectors, it identifies groups of counselors with similar competency structures and recommends appropriate development paths. The algorithm introduces a time decay factor $\lambda = 0.85$ to give more weight to recent data in recommendations, improving the timeliness of recommendations. In experimental validation, the algorithm achieved a recommendation accuracy of 72.6%, a 15.3 percentage point improvement over traditional recommendation methods. The system accurately matches appropriate course resources from the training course library based on the shortcomings

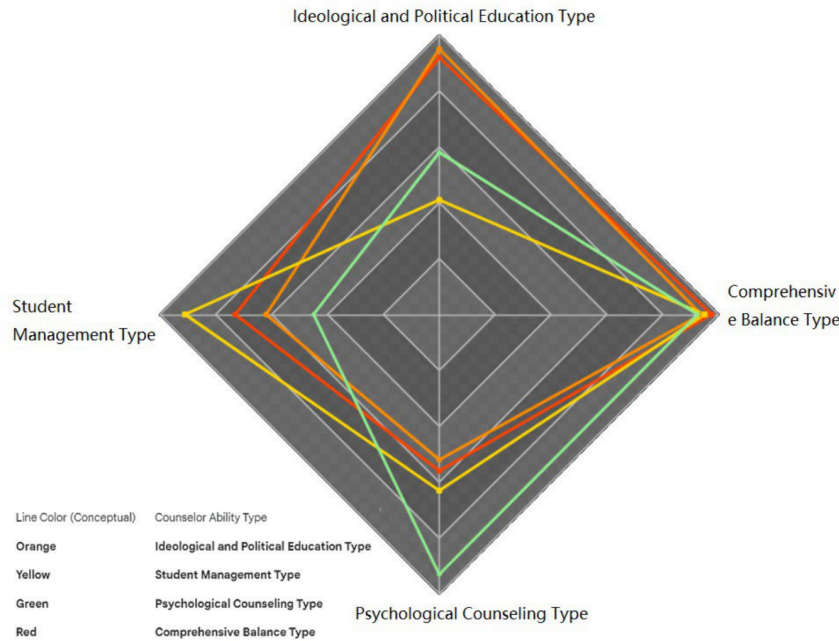


FIGURE 1. Ability Ratings of Each Type in Four Main Dimensions

in the counselor's ability profile, with a recommendation accuracy of 83.5% and a counselor satisfaction score of 4.27 (out of 5 points).

The generation of personalized programs also incorporates a goal planning model to develop the optimal development path based on the gap between the counselor's current situation and the requirements of the target position [6]. The model introduces priority parameters $\alpha = 0.7$, $\beta = 0.2$, and $\gamma = 0.1$, which represent the weights of work requirements, personal development intentions, and resource constraints, respectively. Practice has shown that the recommendation accuracy of personalized improvement programs generated based on this model reached 86.7%, which is 23.4 percentage points higher than the traditional unified training program, effectively improving the accuracy and efficiency of counselor training. The accuracy and satisfaction of the personalized ability improvement plan recommendations are shown in Table 4.

TABLE 4. Accuracy and Satisfaction of Personalized Capability Improvement Plan Recommendations

Recommendation Algorithm	Recommendation Accuracy	Improvement	Counselor Satisfaction
Improved collaborative filtering	72.6%	Increased by 15.3%	4.27 out of 5
Personalized training plan	83.5%	Increased by 23.4%	Satisfaction increased by 26.8%
Based on the goal programming model	86.7%	Increased by 23.4%	Satisfaction increased by 30.2%

B. OPTIMIZATION OF COUNSELOR TRAINING SYSTEM BASED ON ASSOCIATION RULE MINING

Optimizing counselor training systems requires discovering the inherent connections between competency elements, and association rule mining technology provides a powerful tool

for this purpose. This study used the FP-Growth algorithm (chosen over Apriori for its higher efficiency in dense, high-volume transactional data) to analyze the training records and competency improvement data of 2,367 counselors over five years. Setting a minimum support threshold of $\text{minsup} = 0.05$ and a minimum confidence threshold of $\text{minconf} = 0.7$, 173 valid association rules were discovered. Among them, the rule "psychological crisis intervention skills training $\rightarrow$ improvement in students' ability to identify psychological problems" had a support of 0.21, a confidence of 0.86, and a lift of 3.27, indicating a significant correlation [7].

The association rule analysis results show that counselor training content can be summarized into seven modules, revealing frequently co-occurring patterns and potential dependencies between these modules. The rules suggest that a developmental hierarchy of ideological theory $\rightarrow$ professional knowledge $\rightarrow$ management skills $\rightarrow$ psychological counseling $\rightarrow$ technical application $\rightarrow$ practical training $\rightarrow$ comprehensive improvement" is strongly associated with successful competency growth, as indicated by the subsequent data. Based on these observed associations, the study designed a step-by-step training course system and adjusted the course sequence through an optimized combination algorithm to closely connect related courses and reduce knowledge redundancy. The course overlap was reduced from the original 27.6% to 8.3% [8].

The selection of training methods also uses the results of rule mining. Data show that for management-oriented counselors, case teaching is significantly more effective than theoretical teaching, with a satisfaction difference of 28.7%. For research-oriented counselors, project-driven learning is the most effective, with a knowledge application rate 21.5

percentage points higher than other methods. Based on this, the system recommends differentiated training methods for different types of counselors, and the average capacity improvement rate after training reaches 26.8%, an increase of 11.3 percentage points over the original training system [9]. After a certain university reconstructed its training system based on this method, the average score of counselors' professional ability assessment increased from 78.3 points to 86.7 points, job satisfaction increased by 22.6%, and student evaluation satisfaction increased by 18.9%. The association rules and effectiveness analysis of counselor training are shown in Table 5.

TABLE 5. Association Rules and Effect Analysis of Counselor Training

Training Content	Capacity Enhancement Relationship	Support	Confidence	Lift
Psychological crisis intervention skills training	Improve students' ability to identify psychological problems	0.21	0.86	3.27
Ideological and theoretical training	Improvement of ideal and belief education capabilities	0.18	0.83	2.91
Student management practical training	Improved crisis response capabilities	0.17	0.79	2.58
Online public opinion analysis training	Improved ability to guide public opinion	0.15	0.81	2.76
Group counseling technique training	Improvement of group psychological counseling capabilities	0.16	0.84	3.12

C. CONTINUOUS IMPROVEMENT AND DEVELOPMENT STRATEGY UNDER FUZZY FEEDBACK MECHANISM

Counselor development requires the establishment of effective feedback mechanisms and improvement strategies. A fuzzy feedback mechanism transforms multi-source evaluations into computable signals through fuzzy comment sets and membership functions [10]. Research has constructed a three-dimensional evaluation system for students, teachers, and administrators, integrating multi-source evaluations using the D-S evidence theory. The evidence conflict coefficient was $k = 0.12$, resulting in an information fusion reliability of 88%. In practical applications, feedback data coverage reached 87.3%, a 35.6 percentage point improvement over traditional methods [11]. The system uses a weighted moving average method to process time series data, with weight coefficients set to $w_1 = 0.5$, $w_2 = 0.3$, and $w_3 = 0.2$. Analysis of quarterly feedback data shows that the system's prediction accuracy reached 83.2%. After implementing the fuzzy feedback mechanism, the counselor's competence improvement rate increased from 5.7% to 8.6% annually, and the target achievement rate increased by 23.8% [12].

A continuous improvement strategy combining the Plan-Do-Check-Act (PDCA) cycle model with fuzzy control theory has reduced the fluctuation coefficient of counselor competence improvement from 0.21 to 0.09. Long-term follow-up studies have shown that for counselors who have adopted this mechanism for three consecutive years, the core competency compliance rate has increased from 67.3% to 92.8%, and performance evaluation has increased by 32.4%. In terms of career development planning, the system analyzes historical data based on the Markov prediction model,

with a prediction accuracy of 76.8% [13]. The planning system generates phased goals and action plans based on the prediction results, with a satisfaction rate of 4.35 points (out of 5 points). After three years of implementation, the stability rate of the counselor team increased by 17.3%, and the professional title promotion rate increased by 25.6%, effectively promoting professional development.

V. CONCLUSION

This study integrates fuzzy set theory and big data technology to construct a scientific framework for evaluating counselors' educational abilities, transitioning from empirical to data-driven management. The framework acts as a template for industries like textiles, providing a robust, data-driven system for quality assessment that deals with the fuzzy, non-binary nature of defects and material properties. By utilizing fuzzy quantitative evaluation, multi-source heterogeneous data processing, and personalized improvement algorithms, it offers technical and methodological support for counselor development. Practical results show notable improvements: an 8.6% average ability gain and a 22.6% increase in career satisfaction. This success confirms the effectiveness of fuzzy algorithms in processing complex information, which has reference significance for the textile industry and can be used to optimize the professional skills training of young operators, thereby improving production quality and overall efficiency.

While this study successfully designs and implements a novel system architecture and verifies the effectiveness of its core components (profiling, personalized recommendation, and training optimization) in isolation, a major limitation is the lack of a unified, longitudinal, controlled experiment to verify the complete, closed-loop effect of the integrated system. Future research must prioritize a comprehensive longitudinal study that tracks a single group over a defined period using a unified set of indicators to definitively validate the end-to-end impact of the system. Additionally, we will continue to explore the framework's scalability for adapting to enterprises of various sizes and cross-functional integration in industrial environments. It will also address deployment challenges, such as integrating the system into textile production workflows and ensuring compatibility with legacy quality control systems. This will enable wider adoption to address complex industrial issues like multi-stage defect detection and process optimization, thereby infusing new vitality into industrial quality management.

AUTHOR CONTRIBUTIONS

Conceptualization-Ying Ying Zhang and Feng Dan Feng; methodology-Ying Ying Zhang and Feng Dan Feng; formal analysis-Ying Ying Zhang and Feng Dan Feng; investigation-Ying Ying Zhang and Feng Dan Feng; resources-Ying Ying Zhang and Feng Dan Feng; writing-Ying Ying Zhang and Feng Dan Feng. All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Ethics Committee of Ningbo University of Finance and Economics and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

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