Border of Security Responsibility of Primary and Secondary Schools Based on Fuzzy Comprehensive Evaluation

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Abstract: In order to objectively evaluate the condition of carry out safety duty in primary and secondary schools, five factors are taken as influencing factors: staffing, budget, equipment, Administrative power, Professional skills. Based on the systematic classification of campus safety responsibility, a fuzzy comprehensive evaluation model is established. Taking 131 primary and secondary schools (including secondary vocational schools) as samples, the subjective and objective methods were used to determine the weights of the indexes and the initial values of the influencing factors. The results show that: traffic safety, school building safety, internship (secondary vocational school) safety, teachers and students’ mental health, public safety evaluation level is below “general”, that is, primary and secondary schools can not or can not fully protect the relevant safety matters. According to the evaluation results, it is proposed to redefine the boundary of campus security responsibility by adjusting the main body of responsibility, purchasing service, entrusting management and so on, which is conducive to further construction and improvement of campus security guarantee system. Improve the responsibility of the main responsibility of the ability and campus security level.

1. Introduction

The campus security of the primary and secondary school is a responsibility content, which involves many links, and requires the systematic work of a plurality of responsibility subjects and a plurality of guarantee elements. The study of the related theories is not sufficient, and the legal policy and the standard of the specification are still not perfect [1, 2]. At present, the boundary of the responsibility for the safety of the campus is not clear, and the terminal that the primary and secondary schools are in the administrative supervision system for a long time, can easily and passively accumulate the over-responsibility, resulting in part of the responsibility matters because of the human, the financial, the object, the power of affairs, The professional technical ability matching degree and other basic responsibility conditions are not sufficient, resulting in inadequate guarantee capacity. A total of 600 questionnaires were issued to 131 primary and secondary schools in Ningxiang City of Hunan Province, and 579 of the questionnaires were collected.561 of them (accounting for 96.9%) found that there was a certain degree of responsibility subject misplacement or non-matching in the current campus safety work.

According to the literature retrieval statistics, in the last 10 years (2008/2017), there were 11684 articles on the subject of “campus security”, which mainly focused on the campus safety management and campus safety evaluation from an external perspective. The theoretical research on campus safety culture and the construction of mechanism and system; However, there are only 2 subject retrieval documents with the key words of “campus safety guarantee ability”, and 0 subject retrieval documents with the key words of “campus security performance conditions”. It shows that there are some deficiencies in the research and understanding of the basic guarantee ability of
campus safety and the conditions of performing responsibility from the angle of view of primary and secondary schools (Table 1).

Table 1 Comparison of research trends in the field of campus safety.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus security</td>
<td>330</td>
<td>453</td>
<td>2290</td>
<td>862</td>
<td>766</td>
<td>853</td>
<td>1065</td>
<td>1208</td>
<td>1056</td>
<td>1218</td>
</tr>
<tr>
<td>Campus security ability</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Conditions for carrying out the responsibility of campus security</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

From the point of view of performing responsibility conditions, this paper comprehensively analyzes and evaluates the basic guarantee ability of primary and secondary schools for the current content of campus safety responsibility, scientifically divides the boundaries of campus safety responsibility, strengthens the implementation of responsibility, and further improves the scientific nature of accountability for campus safety accidents. Increasing the identity of campus security workers has a significant role in promoting.

2. The Basic Factors That Affect the Safety Performance Conditions of Primary and Secondary Schools and the Classification of Campus Safety Responsibilities

2.1. The Basic Elements Affecting the Safety Performance Conditions of Primary and Secondary Schools

In the practical work, the conditions that affect the primary and middle schools to fulfill the responsibility of campus safety are mainly affected by some basic elements, such as staff, budget, equipment, and matching degree of professional and technical ability.

People, wealth, and material are the basic conditions for performing responsibilities. From the point of view of carrying out the responsibility of campus safety in primary and middle schools, the influence of these three factors is expressed in the relationship between the quantity of actual resources and the quantity of resources that are necessary for theoretical protection. This relationship can be described as: the actual disposable three elements of resources in primary and secondary schools are all greater than or equal to the theoretical necessary number, then the primary and secondary schools from the element point of view have full performance conditions; If the number of more than one item (including one item) of the actual disposable factor is less than the theoretical necessary number, then the subject of responsibility in terms of elements does not fully possess the conditions for performing the responsibility item, if the actual number of disposable elements has more than one item (including one item) is 0, and if the actual number of disposable elements is more than one item (including one item), Then from the point of view of elements, the subject of responsibility does not have the conditions for performing the responsibility.

The corresponding authority is the constraint of performance. Here, the power refers to the primary and secondary schools through statutory authorization or legal obligations, clearly assume the management of a certain responsibility. According to the unified theory of power and responsibility, the matter of power and responsibility should be consistent. Without power, responsibility can not be performed, that is, there are no conditions for performance. In theory, primary and secondary schools should have the power and responsibility for all matters of campus security work, but in practice, even a single security work item is still a systematic work with multiple links, objectively there are many subjects of power, which can not be unified to primary and secondary schools for full protection. For example, primary and secondary schools generally need to undertake the work of traffic safety and safety of teaching facilities and equipment. They are engaged in the analysis of power links. They can not grasp or eliminate the hidden dangers of traffic outside the school gates, nor can they eliminate the shortcomings of teaching facilities and equipment in the design and production links, that is, they do not fully have the conditions for fulfilling their responsibilities for traffic safety, teaching facilities and equipment safety.

The matching degree of professional and technical ability is another constraint of performance.
The guarantee of some campus safety responsibilities requires special professional technical ability or professional equipment and instruments. For example, teachers and students mental health safety and campus special equipment safety need professional personnel or professional equipment to guarantee. Some primary and secondary schools, especially those in remote areas, are not fully capable of performing their duties.

2.2. Classification of Campus Security Responsibilities

Table 2 Index system of school safety responsibility in primary and secondary schools.

<table>
<thead>
<tr>
<th>No.</th>
<th>Level I Indicators (Ui)</th>
<th>Secondary indicators (Uij)</th>
<th>No.</th>
<th>Level I Indicators (Ui)</th>
<th>Secondary indicators (Uij)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Classroom safety</td>
<td>Theoretical Culture Course</td>
<td>8</td>
<td>Night Accommodation Safety</td>
<td>Routine work U81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimental Training Course</td>
<td></td>
<td></td>
<td>Emergency disposal U82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PEClass</td>
<td>9</td>
<td>Mental Health of Teachers and Students security</td>
<td>Routine work U91</td>
</tr>
<tr>
<td>2</td>
<td>Activity safety</td>
<td>Unorganized extracurricular activities</td>
<td>10</td>
<td>Safety of Instruments and Equipment</td>
<td>Design and production U101</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organized extracurricular activities</td>
<td></td>
<td></td>
<td>Use and management U102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Planned procurement</td>
<td></td>
<td></td>
<td>Inspection and maintenance U103</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Production and processing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Food Safety</td>
<td>Storage sales</td>
<td>11</td>
<td>Safety of Special Equipment</td>
<td>Design and production U111</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drinking water</td>
<td></td>
<td></td>
<td>Use and management U112</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kitchen facilities and equipment</td>
<td></td>
<td></td>
<td>Inspection and maintenance U113</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Annual inspection and verification U114</td>
</tr>
<tr>
<td>4</td>
<td>internship safety</td>
<td>Inside the enterprise</td>
<td>12</td>
<td>Water and electricity safety</td>
<td>Design and construction U121</td>
</tr>
<tr>
<td></td>
<td>(Secondary vocational schools)</td>
<td></td>
<td></td>
<td></td>
<td>Use and management U122</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outside the enterprise</td>
<td></td>
<td></td>
<td>Inspection and maintenance U123</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>traffic safety</td>
<td>Inside the enterprise</td>
<td>13</td>
<td>Prevention of accidental injury</td>
<td>Routine work U131</td>
</tr>
<tr>
<td></td>
<td></td>
<td>School bus safety</td>
<td></td>
<td></td>
<td>Emergency disposal U132</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outside campus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>fire safety</td>
<td>Budget and Procurement</td>
<td>14</td>
<td>Preventing Bullying on Campus</td>
<td>Routine work U141</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design and construction</td>
<td></td>
<td></td>
<td>Emergency disposal U142</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The use and management of equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire Control Supervision and Inspection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emergency disposal</td>
<td>15</td>
<td>Campus Peripheral Safety</td>
<td>Comprehensive Public Security Work U151</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Prevention and Control of Infectious Diseases U152</td>
</tr>
<tr>
<td>7</td>
<td>Schoolhouse safety</td>
<td>Planning and design</td>
<td>16</td>
<td>Emergency Avoidance Ability and Self-help Training for Teachers and Students</td>
<td>Routine work U161</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Building construction</td>
<td></td>
<td></td>
<td>Emergency disposal U162</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use and management</td>
<td></td>
<td></td>
<td>Safety propaganda and education U171</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspection and maintenance</td>
<td></td>
<td></td>
<td>Network Information and Public opinion security U172</td>
</tr>
</tbody>
</table>

School security responsibility is a complex responsibility system with overlapping responsibility.
boundaries. It is easy to integrate administrative supervision system and internal management for the purpose of multiple comprehensive cross-classification, and there are many classification results [3]. On the basis of systematically analyzing the contents of safety responsibility in primary and secondary schools, such as laws and regulations, departmental rules, administrative documents, campus safety work materials, investigation reports on campus safety accidents and court precedents [4-6], etc., according to the principles of weak coupling among strong clusters within categories, avoiding overlap of space-time and responsibilities between categories, facilitating the division of boundaries. In fact, primary schools take responsibility for campus safety, which can be divided into 17 first-level categories such as classroom safety and activity safety, and 48 second-level categories (Table 2).

3. Fuzzy Comprehensive Evaluation of the Conditions of Safety Performance in Primary and Secondary Schools

It is impossible to objectively measure the matching degree of human, financial and material resources and professional competence in the performance conditions. There is obvious coupling phenomenon between the powers [7,8]. The evaluation of the safety performance conditions in primary and secondary schools can not be expressed as the quantitative relationship of the determinate state. We choose to regard the safety performance conditions in primary and secondary schools as a fuzzy system and adopt the method of multi-level fuzzy comprehensive evaluation. Quantitative analysis is made on the status of safety performance conditions in regional primary and secondary schools.

3.1. Fuzzy Comprehensive Evaluation Index System and Evaluation Grade

The primary and secondary school campus security responsibility system \( U \) is decomposed into target level \( U_1 \) (first level index) and target level \( U_{1K} \) (second level index), which are expressed by set \( U = \{ U_1 | i = \{1,2,3...17\} \} \) and set \( U_1 = \{ U_{1K} | k = \{1:max(k)\}\} \), and \( \text{Max} (k) = \) the number of secondary indicators in \( U_1 \); the basic elements and constraints affecting the safety performance conditions of primary and secondary schools are taken as factor levels and expressed as set \( U_0 = \{ \text{people, finance, respectively. Matching Degree of Material, Material Right and Professional and Technical Ability.} \}

Establish a five-level evaluation level set \( V = \{ \text{good, good, general, poor, very poor} \} \) for primary and secondary school performance conditions, and make the corresponding threshold of each comment in the set \( V \{0.9, 0.7, 0.5, 0.3, 0.1\}; \) the objective description of each evaluation level is \{fully qualified for performance, basically qualified for performance, not fully qualified for performance, basically not qualified for performance, not qualified for performance\}. 

3.2. Determining Index Weight of Factor Layer

The santy 1-9 scale method was used to establish the two-way comparison judgment matrix \( R_0 \) of \( U_0 = \{ \text{human, financial, material, power, professional and technical ability} \} \) (see Tables 3 and 4). The consistency of the judgment matrix established in Table 4 was tested.

\[
\text{Consistency Indicators } CR = \frac{CI}{RI}, \quad CI = \frac{\lambda_{\text{max}} n}{n-1} \quad (1)
\]

In formula 1, \( n \) is the dimension of the judgment matrix, \( n = 5 \), and \( \lambda_{\text{max}} \) and \( RI \) are respectively the maximum eigenvalues and random consistency indices of the corresponding judgment matrix. By using MATLAB, \( \lambda_{\text{max}} = 5.4329 \), \( RI = 1.12 \) and \( CR = 0.0964 < 0.1 \) are calculated to meet the consistency requirements.

The relative weights of each evaluation factor \( U_i \) are obtained by summing the rows of the matrix, and the weight vector \( C0 = \{0.1613, 0.1055, 0.0294, 0.5903, 0.1135\} \) of \( U_0 \) is obtained by normalization operation.
Table 3 Santy 1-9 scaling analytical table.

<table>
<thead>
<tr>
<th>Scale value</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance degree</td>
<td>Equally important</td>
<td>Slightly important</td>
<td>Obviously important</td>
<td>Strongly important</td>
<td>Absolutely important</td>
</tr>
</tbody>
</table>

2, 4, 6 and 8 are the median values of the adjacent judgments mentioned above. If factor I is compared with J to get \(aij\), then factor j is compared with I to get \(1/aij\).

Table 4 Two-to-two comparison matrix of evaluation factors.

<table>
<thead>
<tr>
<th></th>
<th>staffing</th>
<th>budget</th>
<th>equipment</th>
<th>Administrative power</th>
<th>Professional skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>staffing</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>1/9</td>
<td>2</td>
</tr>
<tr>
<td>budget</td>
<td>1/2</td>
<td>1</td>
<td>3</td>
<td>1/9</td>
<td>2</td>
</tr>
<tr>
<td>equipment</td>
<td>1/5</td>
<td>1/3</td>
<td>1</td>
<td>1/9</td>
<td>1/5</td>
</tr>
<tr>
<td>Administrative power</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Professional skills</td>
<td>1/2</td>
<td>1/2</td>
<td>5</td>
<td>1/9</td>
<td>1</td>
</tr>
</tbody>
</table>

3.3. **Constructing Membership Function**

Based on the distribution characteristics of evaluation factors, a membership function \(R_i\) is constructed, in which \(r_1, r_2, r_3, r_4\) and \(r_5\) correspond to the membership degree of evaluation indexes to comment set \(V=\{\text{very poor, poor, general, good and good}\}\) respectively, and \(u\) is the initial value of each evaluation index. The function image of membership function \(r_i\) see Figure 1.

\[
\begin{align*}
    r_1 & = \begin{cases} 
    1 & u \leq 0.2 \\
    u - 0.1 & 0.2 < u \leq 0.25 \\
    0.2 & u > 0.25 
    \end{cases} \\
    r_2 & = \begin{cases} 
    0 & u < 0.15 \text{ or } u > 0.45 \\
    \frac{0.3 - u}{0.2} & 0.15 \leq u < 0.25 \\
    \frac{0.25 - u}{0.2} & 0.25 \leq u < 0.35 \\
    \frac{u - 0.3}{0.2} & 0.35 \leq u \leq 0.45 
    \end{cases} \\
    r_3 & = \begin{cases} 
    0 & u < 0.35 \text{ or } u > 0.65 \\
    \frac{0.5 - u}{0.2} & 0.35 \leq u < 0.45 \\
    \frac{0.45 - u}{1} & 0.45 \leq u < 0.55 \\
    \frac{u - 0.5}{0.2} & 0.55 \leq u \leq 0.65 
    \end{cases} \\
    r_4 & = \begin{cases} 
    0 & u < 0.75 \\
    \frac{0.7 - u}{0.2} & 0.55 \leq u < 0.65 \\
    \frac{0.65 - u}{1} & 0.65 \leq u < 0.75 \\
    \frac{u - 0.7}{0.2} & 0.75 \leq u \leq 0.85 
    \end{cases} \\
    r_5 & = \begin{cases} 
    0 & u < 0.75 \\
    \frac{0.9 - u}{0.2} & 0.75 \leq u < 0.85 \\
    1 & u \geq 0.85 
    \end{cases}
\end{align*}
\]

Figure 1 Function image of membership function \(r_i\).

3.4. **Fuzzy Comprehensive Evaluation (Taking School Building Safety as an Example)**

According to the above evaluation model, the first-level indicators of the target layer are used as evaluation objects to carry out multi-level fuzzy comprehensive evaluation. The evaluation methods and processes are similar. Taking the safety of school buildings as an example, the evaluation process is described in detail.

(1) Determining the weight of evaluation index (taking school building safety as an example)

Using Santy 1-9 scale method, two comparison judgment matrices \(R_7\) of \(U_7=\{\text{planning and design (U}_{71}\), construction (U}_{72}\), usage management (U}_{73}\), inspection and maintenance (U}_{74}\) are
established (see Table 5).

Table 5 Evaluation index matrix and weight calculating table (school safety).

<table>
<thead>
<tr>
<th></th>
<th>U_71</th>
<th>U_72</th>
<th>U_73</th>
<th>U_74</th>
</tr>
</thead>
<tbody>
<tr>
<td>U_71</td>
<td>1</td>
<td>5</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>U_72</td>
<td>1/5</td>
<td>1</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>U_73</td>
<td>1/9</td>
<td>1/7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>U_74</td>
<td>1/9</td>
<td>1/7</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Consistency check of judgment matrix is carried out. By using MATLAB, lambda max = 4.2247, 
R_1 = 0.89, C_R = 0.0842 < 0.1, C_R < 0.1, which satisfies the consistency requirement. The relative weights of each evaluation factor U_i are obtained by summing the rows of the matrix, and the weight vectors C_7 = {0.5491, 0.3478, 0.0516, 0.0516} of the four secondary indicators of campus safety U_7 are obtained by normalization operation.

(2) Initial Value Assignment in Group Decision Making

Nine expert groups were organized to score the evaluation factors of four secondary indicators (human, financial, material, authority, professional and technical ability matching degree) of school building safety in the survey area (Table 6, Table 7).

Table 6 Reference criteria for evaluation factor assignment.

<table>
<thead>
<tr>
<th></th>
<th>Very bad (0.0-0.2)</th>
<th>Poor (0.2-0.4)</th>
<th>Commonly (0.4-0.6)</th>
<th>Good (0.6-0.8)</th>
<th>Very good (0.8-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>staffing</td>
<td>No full-time part-time worker and organizational leadership</td>
<td>Part-time staff without organizational leadership</td>
<td>Part-time staff and organizational leadership</td>
<td>Full-time staff and organized leadership</td>
<td>Full-time staff and organized leadership</td>
</tr>
<tr>
<td>budget</td>
<td>No budget and Relevant expenditure</td>
<td>No budget but sporadic related expenditure</td>
<td>No budget but regular related expenditure</td>
<td>With the budget but not the full budget expenditure</td>
<td>A full budget and budget expenditure</td>
</tr>
<tr>
<td>equipment</td>
<td>Not equipped with necessary safety Facilities and equipment</td>
<td>Equipped with a small amount of necessary facilities and equipment</td>
<td>Equipped with a certain number of facilities and equipment, but still cannot meet the needs of adequate security</td>
<td>Can meet most of the security needs</td>
<td>Equipped with relevant facilities and equipment on demand</td>
</tr>
<tr>
<td>Administrative power</td>
<td>There is no right to intervene.</td>
<td>No relevant authority but access to intervention</td>
<td>No relevant powers but can fully participate in</td>
<td>Having partial relevant powers</td>
<td>Have relevant powers</td>
</tr>
<tr>
<td>Professional skills</td>
<td>Do not have the relevant professional and technical ability</td>
<td>Have a certain professional and technical ability, but cannot guarantee safety needs</td>
<td>Have some professional and technical service ability, can partially guarantee the safety needs</td>
<td>Have a certain professional and technical ability, basically able to ensure safety needs</td>
<td>Have sufficient professional and technical ability, and be able to fully safeguard safety needs</td>
</tr>
</tbody>
</table>
Table 7 Campus safety: expert scoring table for evaluation factors of planning and design evaluation indicators.

<table>
<thead>
<tr>
<th>Expert</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>(Σ i )/9</th>
</tr>
</thead>
<tbody>
<tr>
<td>staffing</td>
<td>0.2</td>
<td>0.1</td>
<td>0.2</td>
<td>0.4</td>
<td>0.1</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.18</td>
</tr>
<tr>
<td>budget</td>
<td>0.7</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
<td>0.4</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.26</td>
</tr>
<tr>
<td>equipment</td>
<td>0.1</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.11</td>
</tr>
<tr>
<td>Administrative power</td>
<td>0.4</td>
<td>0.6</td>
<td>0.4</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>0.4</td>
<td>0.6</td>
<td>0.6</td>
<td>0.51</td>
</tr>
<tr>
<td>Professional skills</td>
<td>0.3</td>
<td>0.5</td>
<td>0.6</td>
<td>0.4</td>
<td>0.3</td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
<td>0.43</td>
</tr>
</tbody>
</table>

According to the scoring results and membership functions, four secondary indicators {planning and design, construction, use and management, inspection and maintenance} of campus safety are established, respectively. The fuzzy evaluation matrices \( R_{71}, R_{72}, R_{73}, R_{74} \) are established.

\[
R_{71} = \begin{bmatrix}
1 & 0.61 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 \\
0 & 0.67 & 0.33 & 0 & 0 \\
0 & 0 & 0.72 & 0.28 & 0 \\
0 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 0.56 & 0.44 \\
0 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0.56 & 0.44 \\
\end{bmatrix}
\]

\[
R_{72} = \begin{bmatrix}
1 & 0.67 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 \\
0 & 0.61 & 0.39 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0.28 & 0.72 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0.67 & 0.33 \\
0 & 0 & 0 & 0.56 & 0.44 \\
\end{bmatrix}
\]

\[
R_{73} = \begin{bmatrix}
0.44 & 0.56 & 0 & 0 & 0 \\
1 & 0.44 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 \\
0 & 0 & 0.28 & 0.72 & 0 \\
0 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0.67 & 0.33 \\
0 & 0 & 0 & 0.56 & 0.44 \\
0 & 0 & 0 & 0 & 0.56 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0.56 & 0.44 \\
\end{bmatrix}
\]

\[
R_{74} = \begin{bmatrix}
0 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
\end{bmatrix}
\]

Let \( S_{7i} \) and \( S_{7j} \) be the result vectors of fuzzy evaluation for school building safety and its subordinate secondary indicators respectively:

\[
S_{7i} = C_7 \circ R_{7i} \\
S_{7j} = C_0 \circ R_{7j}
\]

By matlab calculation, \( S_{71}=\{0.1907, 0.2799, 0.6278, 0, 0\} \); \( S_{72}=\{0.1907, 0.2828, 0.6346, 0, 0\} \); \( S_{73}=\{0, 0, 0.2216, 0.1252, 0.6532\} \); \( S_{74}=\{0, 0, 0.1898, 0.0586, 0.7516\} \). According to the principle of maximum membership degree, the four secondary indicators \( U_7 (1-4) \) of school building safety are: general, general, good and good. According to the evaluation results, the fuzzy evaluation set \( R_7 \) is constructed, and \( S_7=\{0,0,0.8969,0,0.1032\} \) is calculated. According to the principle of maximum membership degree, the corresponding evaluation grade of the fuzzy comprehensive evaluation result of school safety is general.

4. Evaluation Results and Analysis

4.1. Multilevel Fuzzy Comprehensive Evaluation Results

According to the evaluation model and evaluation method established above, the fuzzy comprehensive evaluation of the safety performance conditions of primary and secondary schools is completed. Result The number and proportion of poor, poor, general, good and good indicators were 0% (0%), 1% (5.9%), 4% (23.5%), 10% (58.8%) and 2% (11.8%) respectively. The polar coordinate system is established, and the coordinates of the point \( U_i \) in the coordinate system are \( (R_i, \theta) \). \( R_i \) is the fuzzy evaluation value of the corresponding index \( U_i \), \( \theta = \frac{2 \pi i}{17} \). The evaluation results are drawn intuitively as Figure 2. At the same time, with reference to the method of Figure 2, the evaluation results of five indicators below the “general” level and their subordinate secondary indicators are displayed intuitively as Figure 2.

According to the definition, the indicators with “very poor”, “poor” or “general” evaluation level belong to the responsibility content that primary and secondary schools basically do not have or do
not fully meet the conditions for performing their duties. That is to say, the data points distributed in circles with radius less than 0.6 in Figure 2 should be further analyzed to improve the ability of primary and secondary schools to guarantee the corresponding responsibilities.

Figure 2 Fuzzy evaluation results of the first-level indicators of campus safety performance conditions Distribution map.

4.2. Security Responsibility Boundary of Primary and Secondary Schools Based on Fuzzy Comprehensive Evaluation

Table 8 Boundary analysis of safety responsibility in primary and secondary schools based on fuzzy comprehensive evaluation of performance conditions.

<table>
<thead>
<tr>
<th>Indicators of inadequate performance conditions in evaluation results</th>
<th>Corresponding Secondary Index and Its Application Factor Analysis of Influencing Factors</th>
<th>Proposed borders for safety responsibilities in primary and secondary schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic safety</td>
<td>Secondary indicators of traffic safety have higher weights on school bus safety and off-campus traffic, while primary and secondary schools lack the related rights and resource allocation of related elements, and basically do not have the conditions for performance.</td>
<td>The adjustment of the main responsibility, improve the responsibility mechanism. Transportation law enforcement departments with competence shall undertake corresponding safety responsibilities and provide security guarantees.</td>
</tr>
<tr>
<td>Internship Safety (Secondary Vocational)</td>
<td>Secondary vocational schools have the problems of insufficient allocation of human resources, property and other factors and lack of power in part of the two secondary indicators, both inside and outside the internship enterprises. They basically do not have or do not have sufficient conditions for fulfilling their responsibilities.</td>
<td>Specially increase staffing, budget and material supply, fill the shortage of human, financial and material resources in the corresponding indicators of secondary vocational schools; improve supporting policies, establish safety matters and responsibility sharing mechanism for secondary vocational schools, internship enterprises, students’ parents and students themselves; introduce safety liability insurance, accident injury insurance to reduce the risk of safety losses of enterprises and schools.</td>
</tr>
<tr>
<td>School safety</td>
<td>Secondary indicators of design planning and construction are of high weight in school building safety. Primary and secondary schools lack the relevant rights, and there are obvious problems of insufficient matching of professional and technical competence.</td>
<td>Primary and secondary schools directly or under the leadership of the government use the form of purchasing services, trusteeship and management to introduce professional and technical forces to provide the corresponding campus security services.</td>
</tr>
<tr>
<td>Mental Health of Teachers and Students</td>
<td>Most primary and secondary schools are not fully equipped with the professional and technical service capabilities to protect the mental health of teachers and students, and are not fully equipped with the conditions for fulfilling their responsibilities.</td>
<td>For primary and secondary schools that really need it, professional and technical forces can be introduced in the form of purchasing services and trusteeship management to provide psychological health and safety guarantee for teachers and students.</td>
</tr>
<tr>
<td>Public safety</td>
<td>Lack of authority or professional and technical service capability</td>
<td>The adjustment of the main responsibility, improve the responsibility mechanism. Local governments are responsible for providing comprehensive treatment security, and purchasing services or trusteeship for the prevention and control of infectious diseases.</td>
</tr>
</tbody>
</table>

From the perspective of impact factors, there are three main problems in the index of low evaluation grade: obvious shortage of resources of human, financial and other factors; lack or
incompleteness of relevant powers; and significant inadequacy of matching degree of professional and technical ability. Aiming at improving the evaluation level of the indicators and effectively improving the safety and security capability of the campus, this paper puts forward some measures, such as adjusting the main body of responsibility, increasing the supply of factor resources and purchasing services, and puts forward the suggested boundary of the safety responsibility of the primary and secondary schools in combination with the indicators to be adjusted (see Table 8).

5. Conclusions and Suggestions

1) Questionnaire survey of the administrators of safety education in primary and secondary schools shows that there is a widespread phenomenon of over-accumulation or mismatch of responsibilities and powers in the current primary and secondary schools in the region.

2) Fuzzy comprehensive evaluation of the safety performance conditions of primary and secondary schools in the region is made from five dimensions: matching of human, financial, material, authority and professional and technical competence. The results show that the evaluation level of traffic safety is poor, while that of post practice safety (secondary vocational), school building safety, mental health safety of teachers and students, and public safety is general, that is, primary and secondary schools are basically not equipped or insufficient. The performance conditions of these five indicators are basically unable or unable to provide adequate security.

3) The main problems of the indicators with low evaluation level (very poor, poor, general) are: there is a gap between the corresponding allocation of human and financial resources and the amount of resources needed to fully guarantee them; primary and secondary schools lack relevant powers or some related links; primary and secondary schools basically do not have or do not fully have relevant professional and technical abilities.

4) It is pointed out that the indicators of lack of power or part of power in primary and secondary schools should be adjusted and made clear that the administrative departments with power should be the main body of responsibility and provide security guarantee; the indicators of shortage of human, financial and material resources should be increased by the government to make special staffing, budget and material supply, so as to fully guarantee the matching degree of professional and technical ability. The indicators should be purchased services, entrusted management and other forms to improve the level of professional security;

5) Suggestions are made to further improve the standardization of campus safety, gradually implement the responsibility list type of campus safety management, further formulate and popularize campus safety standards, and clarify the third party responsibility of the pre-link of campus safety, such as design planning, production and processing.

References


