Universities of nationalities network self-determined learning effects monitoring and evaluation research

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ABSTRACT

Popularization of universities of nationalities network self-determined learning has greatly improved teaching speed, and with the rapidly development of universities learning digitalization and informatization, network campus implementation lets campus learning cultures to have new platforms and environment. In universities of nationalities, apply network to carry out self-determined knowledge learning, its attributes have high capacity, fast timeliness, rapidly updating as well as other features. The paper utilizes comprehensive evaluation model to make fuzzy comprehensive evaluation on universities of nationalities network self-determined learning effects, carries out evaluation and analysis from network learning tools, sites, network learning time distribution, universities network learning attention, universities network self-determined learning contents. It gets good evaluation results.

KEYWORDS

Universities of nationalities; Network self-determined learning; Fuzzy comprehensive evaluation; Mathematical model.
INTRODUCTION

Usage of network cannot do without contemporary university students, in university students daily learning life, chat, communication, e-mail, news, videos and other various aspects, all reflect network importance, the paper gets year 2010-2011 each kind of network application usage rate (partial), by data indication, it gets status analysis, as TABLE 1 shows.

<table>
<thead>
<tr>
<th>Application</th>
<th>Year 2011</th>
<th>Year 2010</th>
<th>Year 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>User scale (ten thousand)</td>
<td>Usage rate</td>
<td>User scale (ten thousand)</td>
<td>Usage rate</td>
</tr>
<tr>
<td>Instant messaging</td>
<td>41510</td>
<td>80.9%</td>
<td>35258</td>
</tr>
<tr>
<td>Search engine</td>
<td>40740</td>
<td>79.4%</td>
<td>37453</td>
</tr>
<tr>
<td>Network music</td>
<td>38585</td>
<td>75.2%</td>
<td>36218</td>
</tr>
<tr>
<td>Network news</td>
<td>36687</td>
<td>71.5%</td>
<td>35304</td>
</tr>
<tr>
<td>Network videos</td>
<td>32531</td>
<td>63.4%</td>
<td>28398</td>
</tr>
<tr>
<td>Network games</td>
<td>32428</td>
<td>63.2%</td>
<td>30410</td>
</tr>
<tr>
<td>Blogs/ personal space</td>
<td>31864</td>
<td>62.1%</td>
<td>29450</td>
</tr>
<tr>
<td>Micro-blog</td>
<td>24988</td>
<td>48.7%</td>
<td>6311</td>
</tr>
<tr>
<td>E-mail</td>
<td>24577</td>
<td>47.9%</td>
<td>24969</td>
</tr>
<tr>
<td>Social network site</td>
<td>24424</td>
<td>47.6%</td>
<td>23505</td>
</tr>
<tr>
<td>Forum/BBS</td>
<td>14469</td>
<td>28.2%</td>
<td>14817</td>
</tr>
<tr>
<td>Traveling reservation</td>
<td>4207</td>
<td>8.2%</td>
<td>3613</td>
</tr>
</tbody>
</table>

By TABLE 1 expressed results indicating, the paper carries out evaluation and analysis from network learning tools, sites, network learning time distribution, universities network learning attention, universities network self-determined learning contents

MODEL ESTABLISHMENTS

Generalization of fuzzy comprehensive evaluation model

Utilize fuzzy comprehensive evaluation, steps are as following:
1) Establish factor set $U = \{U_1, U_2, \ldots, U_n\}$
2) Establish evaluation set $V$ (assessment set), $V = \{V_1, V_2, \ldots, V_n\}$

According to general evaluation system, define evaluation grade domain:

$$V = \{\text{very good}, \text{good}, \text{normal}, \text{bad}\}$$

(3) Establish evaluation matrix fuzzy mapping from $U$ to $V$, it gets fuzzy relation as following matrix shows:

$$R = \begin{bmatrix}
    r_{11} & r_{12} & \cdots & r_{1n} \\
    r_{21} & r_{22} & \cdots & r_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    r_{m1} & r_{m2} & \cdots & r_{mn}
\end{bmatrix}$$

(4) Establish weight set, $A = (a_1, a_2, \cdots, a_n)$, it meets conditions:

$$\sum_{i=1}^{n} a_i = 1 \quad a_i \geq 0$$
(5) Fuzzy relation \( R \) every line will reflect the line influence factors to object judgment degree, meanwhile, \( R \) every column will reflect the column influence factors to object judgment degree.

\[
\sum_{i=1}^{n} r_{ij} \quad j = 1, 2, 3, \cdots, m
\]

\[
B = A \cdot R
= (a_1, a_2, a_3, \cdots, a_n) \cdot \begin{bmatrix}
    r_{11} & r_{12} & \cdots & r_{1n} \\
    r_{21} & r_{22} & \cdots & r_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    r_{m1} & r_{m2} & \cdots & r_{mn}
\end{bmatrix}
= (b_1, b_2, b_3, \cdots, b_n)
\]

In \( V \), fuzzy combination is evaluation set \( B \). Based on above described facts, actual change model is:

![Figure 1: Change model](image)

As Figure 1 show, it gets fuzzy comprehensive evaluation change model, and can establish corresponding every factor grade evaluation transformation function, evaluation factors \( u_1, u_2, u_3, u_4, u_5 \) membership functions can be expressed as following:

\[
u_{11}(u_1) = \begin{cases} 
0.5(1 + \frac{u_1 - k_i}{k_i - k_1}), & u_i \geq k_i \\
0.5(1 - \frac{k_1 - u_1}{k_1 - k_2}), & k_2 \leq u_i < k_1 \\
0, & u_i < k_2
\end{cases}
\]

\[
u_{12}(u_1) = \begin{cases} 
0.5(1 - \frac{u_1 - k_i}{u_1 - k_2}), & u_i \geq k_i \\
0.5(1 + \frac{k_i - u_1}{k_i - k_2}), & k_2 \leq u_i < k_1 \\
0.5(1 - \frac{k_1 - u_1}{k_1 - k_2}), & k_1 \leq u_i < k_2 \\
0.5(1 - \frac{k_2 - u_1}{k_2 - u_i}), & u_i < k_1
\end{cases}
\]

\[
u_{13}(u_1) = \begin{cases} 
0, & u_i \geq k_2 \\
0.5(1 - \frac{k_1 - u_i}{k_1 - u_2}), & k_2 \leq u_i < k_2 \\
0.5(1 + \frac{k_2 - u_i}{k_2 - u_3}), & k_3 \leq u_i < k_2
\end{cases}
\]

Combine with fuzzy evaluation model to evaluate universities of nationalities network self-determined learning effects

Establish factor set \( U, U=(U_1, U_2, U_3, U_4) \). Among them, network learning tools, sites \( U_1 \), network learning time distribution \( U_2 \), universities network learning attention \( U_3 \), universities network self-determined learning contents \( U_4 \). It gets TABLE 2.

**TABLE 2: Universities of nationalities network self-determined learning effects evaluation indicator system**
By TABLE 2 listed factors, it gets evaluation set.

\[
U_1 = \{u_{11}, u_{12}, u_{13}, u_{14}\}
\]

\[
U_2 = \{u_{21}, u_{22}, u_{23}, u_{24}, u_{25}\}
\]

\[
U_3 = \{u_{31}, u_{32}, u_{33}\}
\]

\[
U_4 = \{u_{41}, u_{42}, u_{43}, u_{44}\}
\]

By collecting data and analyzing, it gets four kinds of factors importance ranking statistics, as TABLE 3 show.

**TABLE 3 : Four kinds of factors importance degree ranking statistics**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Rank1</th>
<th>Rank 2</th>
<th>Rank 3</th>
<th>Rank 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network learning tools, sites $U_1$</td>
<td>23</td>
<td>7</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Network learning time distribution $U_2$</td>
<td>7</td>
<td>18</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Universities network learning attention $U_3$</td>
<td>0</td>
<td>9</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Universities network self-determined learning contents $U_4$</td>
<td>3</td>
<td>0</td>
<td>9</td>
<td>21</td>
</tr>
</tbody>
</table>

By TABLE 3 sorting, it gets network learning tools, sites, network learning time distribution, universities network learning attention, universities network self-determined learning contents four aspects’ rank matrix:

\[
U_2 = \{23, 7, 4, 0\}
\]

\[
U_2 = \{7, 18, 8, 0\}
\]

\[
U_3 = \{0, 9, 13, 12\}
\]

\[
U_4 = \{3, 0, 9, 21\}
\]

Obtained weighted vector from rank 1 to rank 2:

\[
\beta = \{\beta_1, \beta_2, \beta_3, \beta_4\} = \{0.4, 0.3, 0.2, 0.1\}
\]
$U_i^* = U_i \cdot \beta^T$

$U_1^* = 12, U_2^* = 9.7, U_3^* = 6, U_4^* = 5$

The paper takes normalization processing:

$U_1^* = 0.35, U_2^* = 0.3, U_3^* = 0.2, U_4^* = 0.15$

It gets:

$\tilde{A} = (0.35 \ 0.3 \ 0.2 \ 0.15)$

By universities network psychological measurement, the paper gets remarks membership, as TABLE 4 show.

**TABLE 4**: Universities of nationalities network self-determined learning effects remarks memberships

<table>
<thead>
<tr>
<th>Evaluation way</th>
<th>Set scores interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-60</td>
</tr>
<tr>
<td>Very good</td>
<td>0</td>
</tr>
<tr>
<td>Good</td>
<td>0</td>
</tr>
<tr>
<td>Normal</td>
<td>0.05</td>
</tr>
<tr>
<td>Bad</td>
<td>0.95</td>
</tr>
</tbody>
</table>

By universities network psychological measurement each indicator obtained evaluation, the paper gets TABLE 5.

**TABLE 5**: One university of nationalities network self-determined learning effects evaluation each indicator obtained evaluation value

<table>
<thead>
<tr>
<th>Each layer indicator</th>
<th>Evaluation value</th>
<th>Each layer indicator</th>
<th>Evaluation value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instant messaging, campus information issuing $u_{11}$</td>
<td>Very good</td>
<td>Network real-time learning news $u_{31}$</td>
<td>Very good</td>
</tr>
<tr>
<td>Inside and outside school network learning timeliness $u_{12}$</td>
<td>Very good</td>
<td>Network course distribution $u_{32}$</td>
<td>Good</td>
</tr>
<tr>
<td>Network video learning $u_{13}$</td>
<td>Normal</td>
<td>Teachers’ focus $u_{33}$</td>
<td>Good</td>
</tr>
<tr>
<td>Network learning phase self testing $u_{14}$</td>
<td>Normal</td>
<td>Universities policies $u_{34}$</td>
<td>Normal</td>
</tr>
<tr>
<td>Experience sharing $u_{15}$</td>
<td>Normal</td>
<td>University network learning course $u_{41}$</td>
<td>Good</td>
</tr>
<tr>
<td>Network learning time $u_{21}$</td>
<td>Very good</td>
<td>University network learning homework $u_{42}$</td>
<td>Very good</td>
</tr>
<tr>
<td>Computer literacy learning $u_{22}$</td>
<td>Very good</td>
<td>Universities network learning examination $u_{43}$</td>
<td>Normal</td>
</tr>
<tr>
<td>Network course education time $u_{23}$</td>
<td>Very good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other network used time $u_{24}$</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By above model, it gets single layer indicator weight factor fuzzy set is:

$U_1 = \{U_{11}, U_{12}, U_{13}, U_{14}, U_{15}\} = \{0.25 \ 0.25 \ 0.2 \ 0.15 \ 0.15\}$

$U_2 = \{U_{21}, U_{22}, U_{23}, U_{24}\} = \{0.54 \ 0.1 \ 0.24 \ 0.14\}$
By TABLE 5, and combine with TABLE 3 remarks membership, the paper gets network learning tools, sites, network learning time distribution, universities network learning attention, universities network self-determined learning contents each aspect evaluation set:

Network learning tools, sites—

\[
U_1 = \begin{pmatrix}
0 & 0 & 0.05 & 0.95 \\
0 & 0 & 0.05 & 0.95 \\
0 & 0.05 & 0.95 & 0.05 \\
0 & 0.05 & 0.95 & 0.05 \\
0 & 0.05 & 0.95 & 0.05 \\
\end{pmatrix}
\]

Network learning time distribution—

\[
U_2 = \begin{pmatrix}
0 & 0 & 0.05 & 0.95 \\
0 & 0 & 0.05 & 0.95 \\
0 & 0.05 & 0.95 & 0.05 \\
0 & 0.05 & 0.9 & 0.05 \\
0 & 0.05 & 0.9 & 0.05 \\
\end{pmatrix}
\]

Universities network learning attention—

\[
U_3 = \begin{pmatrix}
0 & 0 & 0.05 & 0.95 \\
0 & 0.05 & 0.9 & 0.05 \\
0 & 0.05 & 0.9 & 0.05 \\
0 & 0.05 & 0.9 & 0.05 \\
0 & 0.05 & 0.9 & 0.05 \\
\end{pmatrix}
\]

Universities network self-determined learning contents—

\[
U_4 = \begin{pmatrix}
0 & 0 & 0.05 & 0.95 \\
0 & 0.05 & 0.9 & 0.05 \\
0 & 0.05 & 0.9 & 0.05 \\
0 & 0.05 & 0.9 & 0.05 \\
\end{pmatrix}
\]

By formula calculating:

\[
B_i = A_i \cdot R_i
\]

Make normalization processing with obtained \(B_i\), it gets fuzzy evaluation matrix:

\[
\tilde{B} = \begin{pmatrix}
B_1 \\
B_2 \\
B_3 \\
B_4
\end{pmatrix} = \begin{pmatrix}
0.07 & 0.27 & 0.12 & 0.54 \\
0 & 0.1 & 0.42 & 0.48 \\
0.08 & 0.45 & 0.29 & 0.18 \\
0.15 & 0.21 & 0.3 & 0.34
\end{pmatrix}
\]

It gets comprehensive evaluation value:

\[
Z = U' \cdot \tilde{B} = (0.32 \ 0.28 \ 0.22 \ 0.18)
\]

By comprehensive evaluation value \(0.32 > 0.28 > 0.22 > 0.18\), it shows universities network self-determined effects evaluation indicators located indicator range is in the interval of 80-90 scores.

**CONCLUSION**

Fuzzy mathematics is from people recognition on external world, due to suffer numerous factors influences, human recognized things are fuzzy. Fuzzy mathematics is a theoretical system that is formed by fuzzy set and fuzzy logic, fuzzy mathematics is applied in pattern recognition and artificial intelligence, as a relative brand new discipline, fuzzy mathematics collect some uncertain factors and then reflect into people consciousness. By establishing attributes scale on one object, carry out fuzzy mathematical analysis of one object.
The paper gets comprehensive evaluation value by fuzzy comprehensive evaluation model analysis, carries out evaluation and analysis from network learning tools, sites, network learning time distribution, universities network learning attention, universities network self-determined learning contents; by comprehensive evaluation value $0.32 > 0.28 > 0.22 > 0.18$, it shows located indicator range is in the interval of 80-90 scores, therefore it indicates contemporary universities of nationalities network self-determined learning effects evaluation index is lower that should attract higher attentions.

REFERENCES

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