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Taxonometric Analysis of the State of Orientation of Listeners to Innovative Activity in the Process of Qualification Improvement

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ANNOTATION: In this article, based on the methods of taxonometric analysis, the issue of class allocation of listeners in the process of professional development is considered in the case of orientation to innovative activity. The main idea of this issue is to divide it into isomorphic groups, the structural values of which are close. An algorithm has been proposed to address this issue, and its usefulness has been tested in experimental studies.

KEYWORD: taxonometric analysis, algorithm, matrix, isomorphic, stimulator, destimulator.

Introduction. It is known that, in the process of professional development, listeners are characterized by multidimensional information, depending on their social status.This, in turn, makes it more difficult to analyze the cases in which the audience is focused on innovative activities. Therefore, the problem of analyzing the audience into independent groups arises. However, such issues are not given enough attention in scientific sources.

The purpose of this report is to develop an algorithm for grouping trainees according to the degree of orientation to innovative activities in the system of advanced training based on taxonomic analysis.

Problem statement. Suppose a set of $\Re$ objects is given.Each object in this set is given its own characteristic features in the X character space.It is $\Re$ necessary to divide the elements of the set into the following groups K_1 and K_2 .

The volume of data obtained for the study is m (m = 200).These data are given in the form of a matrix: $A=\left\| a_{ij} \right\|_{mxn}$.Where n is the number of characters that characterize each listener; m is the number of listeners who participated in the experiment.

The main task is to develop an algorithm that divides the elements of the given matrix A into k groups based on the analysis.

Problem solving. The main idea of solving this problem is to divide the data into isotropic, isotronic and isomorphic groups using taxonomic methods of analysis [1,2].

We use the method of grouping listeners into isomorphic groups whose structural values are close, ie slightly different from each other and their proportionality is preserved..

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Let the trainees in the training process in a given t period be given according to their characteristic features.We define their state of innovation activity as S(t).In the character space $\bar{x} = (x_1,\ldots,x_n)$ we denote the elements $a_i=(a_{i1},\ldots,a_{ij},\ldots a_{in})$by S (t) respectively:$S(t)=(a_i(t),\ldots,a_n(t))$.We express this set of values in the form of the following $A = \|a_{ij}\|_{mxn}$. It is known that such objects are represented by multidimensional symbols. Therefore, the matrix $A = \|a_{ij}\|_{mxn}$ is normalized as follows:

$$Z_{i,j} = (a_{ij} - \overline{a}_j)/S_j$$

$$\overline{a}_j = \frac{1}{m}\sum_{i=1}^{m} a_{ij}, \quad s_j=(\frac{1}{m}\sum_{i=1}^{m} (a_{ij}-a_j)^2)^{1/2}$$

in this era:a_j-j the average value of the character;

s_j-j the normal deviation value of the sign;

z_{ij}-ithe normalized value of the sign j for the object.

We divide the symbols of the matrix $\|a_{ij}\|_{mxn}$ into stimulator and destimulator as follows.Such a distinction represents the nature of the characters in the case of the learner's focus on innovative activity.If the signs have a positive effect on the state of the audience's focus on innovative activity, it will be a stimulant, and vice versa, if it shows a negative effect, it will be a destimulator.Based on this division of characters, we can construct objects that represent the following points Z_1andZ_2:

$Z_1=(z'_{01},\ldots,z'_{0j},\ldots z'_{0n})Z_2=(z''_{01},\ldots,z''_{0j},\ldots z''_{0n})$

$$z'_{0j} = \begin{cases} \max\limits_t z'_{tj}, a_j \in I \\ \min\limits_t z''_{tj}, a_j \in I, (j=1,n) \end{cases} \quad z''_{0j} = \begin{cases} \max\limits_t z'_{tj}, a_j \in I \\ \min\limits_t z''_{tj}, a_j \in I, (j=1,n) \end{cases}$$

Here: I - a set of stimulants;

z - the normalized value of the characters for a_{ij} in period t.

The taxonomic distance to points K_1 and K_2 is calculated as follows:

$c'_{0j} =(\sum_{i=1}^{m} (z_{ij}-z_{0j})^2)^{1/2}$, i-1,2,…,m

Based on the values of the obtained taxonomic distance, we determine the taxonomic indicator of the state of orientation of students to innovative activities in the process of professional development as follows:

$$d_i = 1 - c_{i0}/c_0, i = 1,2,..., m$$

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Here: $c_0 = \bar{c}_0 + 2s_0$; $\bar{c}_0 = \frac{1}{m}\sum_{i=1}^{m} c_{i0}$; $\bar{s}_0 = [\ \frac{1}{m}\sum_{i=1}^{m}(c_{i0} - \bar{c}_0)^2\ ]^{1/2}$;

After reviewing the proposed algorithm, it is necessary to research whether it is usable.

Experimental research. In order to assess the suitability of the proposed algorithm, the following information about each trainee was selected during the training process:

x_1 - the average score of the diploma of the higher education institution;

x_2 - family environment (1 educated, 0 other situation);

x_3 -gender (0-husband, 1-wife);

x_4 - address (1- own house, 0- tenant);

x_5 -number of children in the family;

x_6 -pedagogical experience;

x_7 -qualification category;

x_8 -the number of sickness(days)during the year;

x_9 -internet usage time during the day;

x_{10} -marital status (1-married, 0-single);

x_{11} -scientific-methodical publications;

x_{12} -the number of fiction books read in the last month;

x_{13} -the number of movies you have seen in the last month;

x_{14} -educational degree (1-master's, 0-bachelor's);

Points K_1 and K_2 were taken as reference objects to solve this problem.Based on the proposed algorithm, a set of programs was created, based on the results of experiments conducted on the basis of this algorithm, we can interpret the taxonomic indicator d_i of the state of orientation of listeners to innovative activities as follows.

The higher the level of the listener's state of focus on innovative activity, the closer the taxonomic indicator of innovative activity in professional activity is to 1.

Conclusion. Based on the proposed algorithm, in the process of professional development it is possible to analyze students in groups using taxonomic methods, to study their social and spiritual status, as well as to study the factors that lead to a decrease in innovation in their professional activities [3]. It also allows you to form groups of low-performing listeners on the basis of this algorithm, as well as to solve the problem of which aspects of them will have a more positive impact in the future.

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