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A system to diagnose the level of future mining engineer communicative competence development

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Abstract
On the basis of the proposed diagnosing techniques the authors studied the state and determined the levels of future mining engineer communicative competence development at the initial stage of scientific prospecting.
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Under the conditions of integration of Ukraine into European space, training highly qualified competent and competitive specialists, whose professional level meets international standards, becomes vital. Therefore, higher technical and vocational education, exhorted to favour upgrading future mining engineer training, should play crucial role to form mining and engineering corps.

As the Concept for developing technical and vocational education in Ukraine notes, 'the success of versatile adaptation of each specialist for the requirements of present-day production depends on the quality of his\her basic training' [3, p. 3]. Hence, specialized efficiency depends on professional competence and its integral component – communicative competence, which represents a level of practical speech proficiency providing the efficiency of communicative activity in professional environment at the stage of future mining engineer training.

It should be noted that scientists always prioritize the problem of proficiency training. Recently a number of studies on the problem of vocational training have been carried out at higher educational institutions (N. Balovsiak, L. Dybkova, T. Biriukova, N. Kurmysheva, A. Orlov and others). The analysis of the problem of communicative competence in the vocational education formation affords ground to conclude that vocational training has to provide the organic integration of vocational and communicative training and therefore, to contribute to a comprehensive professional development of the individual. The theoretical analysis explains that the efficiency of a communicative competence formation depends on the integrity of communicative training [4, p 6–7].

The proposed system, developed to diagnose the level of future mining engineer communicative competence, contributes to the study of empirical facts showing the level of future specialist communicative competence development while studying Humanities. Therefore, the determination of the initial level was carried out in the complex of diagnosing techniques covering the following:

Identifying the importance of communicative competence characteristics as to the level of their development in future mining engineers;

Studying communicative and organizational capabilities;

Determining the level of students sociability;

Assessing the level of self-control while communicating;

Measuring and comparing the factors of the initial level of developing a communicative competence.

To diagnose the communicative competence of future mining engineers, we worked out a complex questionnaire of communicative competence components. The initial level of development was investigated by using the communicative tolerance diagnosis (V. Boiko) and the determination of a psychological type of attitude to others (Y. Zharykov, Y. Krushelnytsky), adapted to our study. Having received the results lower than expected, we drew up the charts of assessing the elements and offered a diagnosing questionnaire for finding out the level of determining each element. As a result, we calculated the average value ($К_i$) for each student; that made it possible to determine level differentiation of the structure components (high, sufficient, average, and low levels) in the result of dividing marks by using the maps of developing a communicative competence.

The expediency of diagnosing techniques application can be explained by specific character of step-by-step identifying the level of communicative competence development. Having studied the qualification of future mining engineers according to the results of the diagnosing test aimed at finding out the level of developing the components of communicative competence, it became expedient to explain the motivation of choosing a profession on the basis of the general level of sociability (V. Riakhovsky). Self-control assessing while communicating is a reasoned continuation of the proposed work (M. Snyder`s method) as the level described shows the effect of others opinion on a personality demonstrating the influence of emotional self-discovery and self-realization level while communicating. It became important to determine a level of communicative and organizational capabilities applying psychodiagnostic technique (B. Fedoryshyn and V. Syniavsky).

Therefore, we worked out a testing system for future mining engineer communicative competence development (which favoured determining the structure components) involving the following:

1. Psychological test to determine the general level of sociability (V. Riakhovsky), which was a basis to determine belonging of communicative process subjects to the described seven groups of sociability.

2. Test of assessing self-control in the process of communication (M. Snyder) included

determination of low, average and high communicative control in the emotional expression.

3. 'Communicative and organizational capabilities' psychodiagnostic test (B. Fedoryshyn and V. Syniavsky) made it possible to recognize four levels of communicative and organizational capabilities.

4. A complex questionnaire to identify the levels of communicative competence components development favoured ranging elements of conative and target component; describing features of the communicative competence as technique of their effect on the process of personal-communicative component communicative interaction; elements of behavioral and activity-based component; level of speech-practical component.

5. Communicative tolerance diagnosing (V. Boiko) made it possible to identify only the main trends of interaction with the others.

6. Psychological test to determine the psychological type of attitude to others –introvert, ambivert, extrovert (Y. Zharykov, Y. Krushelnytsky).

7. A chart to assess development level of conative and communicative component communicative competence ('Internal resources → orienting in the situation of communication').

8. A chart to assess development level of personal-communicative component communicative competence ('Interaction with the others → adequate orienting').

9. A chart to assess development level of behavioural and activity-based component communicative competence 'Regulation of communicative actions → social environment'.

10. A chart to assess development level of speech-practical component communicative competence 'Constructive communication → contact'.

Table 1 demonstrates test results for ten students.

Table 1. Test results of future mining engineers

№ з/п	Test 1	Test 2	Test 3 (the number of coincidences)		Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10
			com.	org.							
1	8	7	14	9	2	58	21	3	3	3	3
2	16	2	6	8	4	8	0	2	3	2	3
3	24	6	9	8	4	78	24	3	2	3	2
4	6	6	18	16	3	18	28	3	4	3	4
5	7	7	14	13	4	46	8	3	3	2	3
6	12	7	10	12	3	49	23	4	3	3	2
7	3	6	18	13	3	44	27	3	4	3	3
8	2	7	10	6	3	97	24	3	2	4	3
9	22	3	10	12	3	42	31	2	3	4	3
10	15	7	8	12	3	53	23	3	1	3	3

Subsequent stage comprises the test results according to which communicative competence development levels were determined (Table 2).

Table 2. Combined results of testing the levels of communicative competence development for future mining engineers

No.	Test 1	Test 2	Test 3 (the number of coincidences)		Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10
			com.	org.							
1	2	3	4	5	6	7	8	9	10	11	12
1	4	3	3	1	2	3	3	3	3	3	3
2	3	1	1	1	4	4	1	2	3	2	3
3	2	3	1	1	4	2	3	3	2	3	2
4	4	3	4	4	3	4	3	3	4	3	4
5	4	3	3	2	4	3	1	3	3	2	3
6	4	3	2	2	3	3	3	4	3	3	2
7	4	3	4	2	3	3	3	3	4	3	3
8	4	3	2	1	3	2	3	3	2	4	3
9	2	2	2	2	3	3	4	2	3	4	3
10	3	3	1	2	3	3	3	3	1	3	3

We explain the test results in terms of one student (Table 3).

Table 3. Results of data reduction to four levels (in terms of student 1)

Test No	Points	Points (according to 4-point scale)
1	8	4
2	7	3
3 (com)	14	3
3 (org)	9	1
4	2	2
5	58	3
6	21	3
7	3	3
8	3	3
9	3	3
10	3	3

According to the first test of determining the general level of sociability (V. Riakhovsky) the results from 4 to 8 and from 9 to 13 points testify the high level of sociability corresponding to coefficient 4. In the test of assessing self-control during a communication (M. Snyder) three chosen groups are divided into four levels according to the following scale: 0–2 points – low communicative control, 3–5 points – average, 6–7 points – sufficient, 8–10 points – high. So, 7 points correspond to coefficient 3 – a sufficient level. As for psychodiagnostic technique 'Communicative and organizational capabilities' (B. Fedoryshyn and V. Syniavsky), we multiply the number of coincidences by 0,05 according to the proposed scale of assessing communicative and organizational capabilities obtaining coefficient 3 (which is an evidence of the sufficient level of communicative capabilities) and Coefficient 1 (that corresponds to the low level of organizational capabilities). Since diagnosing technique 4 consists of such four components as personal – communicative, conative and communicative, behavioural and activity-based, and speech-practical one, an average value of the described components corresponding to the average level of communicative competence (coefficient 2) was chosen. While considering the diagnostics of communicative tolerance (V. Boiko), it was stated that the maximum of the points corresponds to the lowest level of communicative tolerance; in this case the maximum quantity is 135 points. So, it is

expedient to divide the points evenly in such a way: 1–33 points – high level of communicative tolerance; 34–66 points – sufficient, 67–99 – average, 100–135 – low. As we can see, 58 points correspond to a sufficient level of communicative tolerance (coefficient 3). While working with tests 6 of determining the psychological type of attitude to the others (Y. Zharykov, Y. Krushelnytsky), the results of fluctuation within 1 to 36 points (introvert – extrovert psychological type) were traced. The test proposes to separate three levels, each corresponding to 12 points. For our scale it is expedient to use four levels dividing them as follows: 1–9 points – correspondence to low level of communicative competence; 10–18 points – to average level; 19–27 points – to sufficient; and 28–36 points – to high level. Under such conditions, 21 points correspond to a sufficient level of communicative competence (coefficient 3).

While processing data from the diagnostic charts of communicative competence development on the elements of each of four components (tests 7–10), average coefficients are left; they are calculated for each student by combination of the determined elements. So, the test results of future mining engineers are brought to a four-point scale. Next stage calculates the coefficients of the communicative competence development level for each student. As we have normalized coefficients of each test influence on the general result, the coefficients are calculated by the formula established by us:

$$Kz = \sum_{j=1}^{n} R_j \cdot K_j ,$$

where Rj are points on a four-point scale for j-test;

Kj is normalized coefficient of each test influence on the result;

n is test quantity.

As the coefficient of communicative competence development level can only be an integer in the range from 1 to 4, then the calculated coefficient Kz for each student is rounded off. Table 4 demonstrates the results of calculating the Kz level of communicative competence development for each student.

Table 4. Results of calculating the Kz coefficient of future mining engineer communicative competence development level

№	Test 1	Test 2	Test 3 (the number of coincidences)		Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10	Kz Coefficient
			com.	org.								
1	4	3	3	1	2	3	3	3	3	3	3	3
2	3	1	1	1	4	4	1	2	3	2	3	2
3	2	3	1	1	4	2	3	3	2	3	2	2
4	4	3	4	4	3	4	3	3	4	3	4	4
5	4	3	3	2	4	3	1	3	3	2	3	3
6	4	3	2	2	3	3	3	4	3	3	2	3
7	4	3	4	2	3	3	3	3	4	3	3	3
8	4	3	2	1	3	2	3	3	2	4	3	3
9	2	2	2	2	3	3	4	2	3	4	3	3
10	3	3	1	2	3	3	3	3	1	3	3	3

Having determined the coefficients of communicative competence development for each student, we formulate a generalized table of future mining engineers communicative competence development levels (Table 5).

Table 5. Levels of future mining engineer communicative competence development while studying Humanities (a diagnostic stage)

Level	Number of students	%
Low	80	25,24
Average	117	36,91
Sufficient	92	29,02
High	28	8,83

Fig. 1 demonstrates a histogram clearly demonstratingthe levels of future mining engineer communicative competence development.

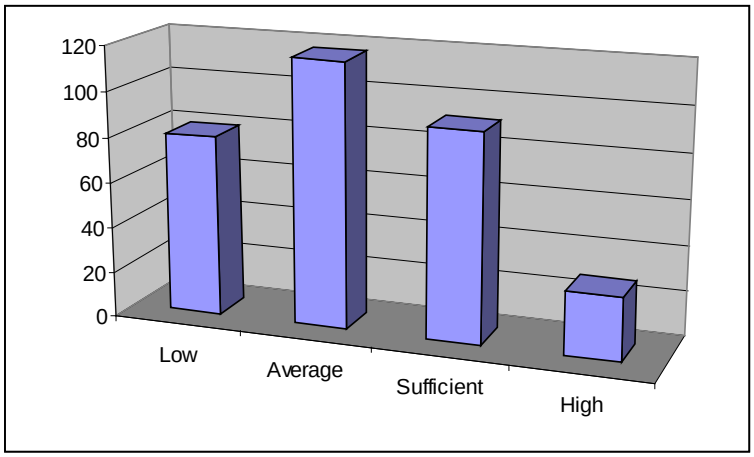

Figure 1. The results of ranging the levels of future mining engineer communicative competence development.

So, 86 respondents have low level of communicative competence development; 111 have average level; 95 have sufficient level; and 25 future mining engineers have high level.

As the results can`t meet the needs of the age, successive experiments should be aimed at providing increase in high and sufficient levels, and corresponding decrease in average and low levels of future mining engineer communicative competence development. This requires the improvement of student communicative training by means of Humanities methods development.

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