doi:10.5937/jaes16-19487 Paper number: 16(2018)4, 559, 503 - 514

APPROACH TO DEVELOPMENT OF MENTORING POTENTIAL IN TECHNICAL UNIVERSITIES THROUGH THE EXAMPLE OF THE URAL REGION OF THE RUSSIAN FEDERATION

Inna Guryanova*, Svetlana Burilkina, Natalya Martynova, Alexander Kaminsky, Olga Mameteva
Nosov Magnitogorsk State Technical University, Magnitogorsk, Russian Federation

New Federal State Higher Educational Standard introduces significant changes in the sense of purpose of education and overburdens professional adaptation of a starting teacher. In this regard, introduction of effective methods for developing a mentoring mechanism in the higher education system is updated. The goal of the research was to develop an approach to the definition and development of the mentoring potential in higher education institutions through the example of the Ural Region of the Russian Federation. Interviewing helped to analyze the need for mentorship and the level of its potential in universities of the Ural Region. A system of criteria for assessing the potential of a mentor in higher school was substantiated and structured. Using Harrington's scale, qualitative levels of the potential of a young professional's mentor in higher education institutions were determined based on quantitative scores. A mentor identification model was proposed, taking into account qualitative and quantitative criteria of the mentoring potential. A system of optimization measures for developing the mentoring mechanism in the higher education system of the Ural Region was substantiated. Practical implementation of the findings would facilitate effective adaptation of young professionals to teaching activities and develop their pedagogical potential.

Key words: Young professional; Mentor; Mentoring potential; Higher education system; Young teacher's adaptation; Mentoring skills.

INTRODUCTION

Modernization of higher education, specific features of teaching work, and lack of professional experience create a situation in which the adaptation process can take a young teacher a long time and be difficult. This can lead to professional frustration, lack of motivation, emotional burnout, and withdrawal from the profession. Internationally, mentorship is increasingly used to improve the professional level of young higher education workers, which accelerates the acquisition of knowledge, skills, and competences. The goal of mentorship is professional development of young specialists and a higher level of their adaptation in educational institutions, which in turn reduces staff turnover and positively affects the image of organizations and their activities [1, 2, 3]. It would significantly enhance the creative potential of both young professionals and the current employees, involving them in the corporate culture of the university [4]. In the Russian Federation, providing a mechanism for professional adaptation of newcomers in higher education institutions through the introduction of a mentoring system is defined as one of the main priorities to be addressed by the state recruitment policy of Russia, which is stipulated in the Concept of Federal Targeted Program for the Development of Education for 2016-2020 [5]. However, today's extension of the mentoring system throughout Russia is accompanied by a number of destructive factors. As the analysis has shown, the main factors that constrain mentorship in the current higher education system are imperfection of the regulatory framework in higher educational institutions [6]. The mentoring mechanism is neither codified nor detailed in the statutory instruments regulating higher education [7]. In addition, there is no stipulated financial support for mentorship. This translates to a lack of clear understanding of mentoring goals and results among university staff. As a rule, the school authorities force them to be mentors, which evokes resistance and a conventional attitude towards it in teachers. A "top-down" mentoring mechanism imposed on them leads to disregard for feedback and unwillingness to get involved in the process [6].

As a result, a threat of demoralization is formed in new employees. Along with the reluctance of teachers to assume the mentoring functions, the higher education system is characterized by a lack of special mentorship learning skills in teachers in the modern context [6]. Forced mentors do not have competencies formed well enough to train adults and improve their professionalism. In addition, they are not motivated to grow both personally and professionally [6]. To date, only a third of Russian young university teachers have mentors from among more experienced colleagues in the higher education system. At the same time, 28% of starting teachers believe that their cooperation with colleagues is supposed to be closer [8]. In this regard, the goal of this research was to develop a conceptual approach to determining the mentoring potential in the higher education system through the example of universities in the Ural Region of the Russian Federation. In the course of the research, the following tasks were accomplished: the state of mentorship in the universities of the region was analyzed;

* *Nosov Magnitogorsk State Technical University, Russian Federatin, svetlana.burilkina@yandex.ru*

criteria for the potential of young teachers' mentors were reasoned; a model for identification of mentors among the teaching staff was elaborated; a system of measures for the development of mentorship and its potential in the higher education system was substantiated.

MATERIALS AND METHODS

The methodological framework of the research was an interviewing method and a graph theory.

The sociological research method involved holding personal interviews with the teaching staff of the Ural State Pedagogical University, the Russian State Vocational Pedagogical University, and the Ural Federal University. The sociological research was carried out with the purpose of analyzing the level of adaptation and development of mentorship, as well as defining the model and the potential for mentorship in the universities.

The research sample adequacy was estimated by the following formula [9]:

$$S = \frac{D(\alpha)^2 \cdot v \cdot (1-v)}{\varepsilon^2} \quad (1)$$

where S is the minimum sampling adequacy boundary;

D(α) is a standard deviation determined by confidence level (*α*);

v is the sample variation;

ε is an acceptable error level.

Indicators of statistical data analysis (the test results) that were used in the work to analyze difficulties in new employees' adaptation, to justify criteria for assessing the professional and personal qualities of a mentor, to prove the significance of the mentoring potential level assessment results are Pearson's x^2 (Equation 2), dispersion factor (Equation 3), and variations (Equation 4):

$$\chi^2 = \sum \frac{(n_i - n_i')^2}{n_i'} \quad (2)$$

where x^2 is the calculated value of Pearson's x^2 ;

n_i is the observed frequency in each category;

n_i' is the expected frequency.

$$\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n} \quad (3)$$

where σ^2 is the dispersion factor;

x_i is the value of the i-th criterion priority score for assessing the professional and personal qualities of a mentor;

$\bar{x}$ is the average priority value upon all the criteria;

n is the number of criteria.

$$v = \frac{\sigma}{\bar{x}} * 100\% \quad (4)$$

where *v* is the coefficient of variation of assessments;

σ is the standard deviation of the mentoring potential assessments;

$\bar{x}$ is the arithmetic mean of the mentoring potential assessments.

The positions of graph theory were used in the research to construct a model for selecting a mentor by qualitative criteria of their potential. A mentor is chosen using a flow graph technique, whereby graphs represent a configuration of sets, that is, the vertices of a graph, and the connections between them, that is, arcs that have weights.

A formalized graph representation is written as [10]:

$$M_2 = \{(x_i, x_j) : x_i \in X, x_j \in X, i \neq j\} \quad (5)$$

where M_2 is a set of all unordered couples of elements with X;

$X=\{x_1,...,x_n\}$ is the vertex set.

In this study, the graph vertices stand for:

- The teachers of the department who participated in the interviewing;
- The arcs stand for preferences of the teachers when choosing a mentor, formed out of assessing the professional and personal qualities of colleagues;
- The arc weights stand for the mentoring potential indicator values of a selected teacher.

At the point of the graph there is a vertex standing for the teacher who opts for a mentor; at the bottom of the graph there is a vertex that stands for the teacher with a high level of mentoring potential selected by the teacher who is at the point of the graph.

LITERATURE REVIEW

From 1970 on, the mentoring mechanism became one of the main tools for retention of personnel and development of their quality and productivity. In 1985, G. Odiorne regarded mentorship as an innovative strategy of the management system in the United States, providing a mechanism for updating any organization within its own framework [11]. The next surge of interest in mentorship was in the 1980s and was studied in the works of such scientists as D. Megginson, D. Clutterbuck, E. Parsloe, and some others [12, 13]. It is also the time where the appearance of terminological confusion as a result of interpretation of this concept content in various fields of science belongs to. As a research in pedagogical science has shown, what most scholars mean by mentorship is a method of transferring skills and knowledge to an aspiring teacher from a more experienced employee of an educational institution. In other words, they consider mentorship as an educational process [14, 15]. In terms of the essence of the definition, this position is too narrow to comprehend mentorship as it synonymizes the essence of related and interrelated concepts such as "coaching", "mentorship" and "on-the-job training", while mentorship primarily involves assistance to a new

Journal of Applied Engineering Science Vol. 16, No. 4, 2018
ISSN 1451-4117

or young employee of an organization in their adaptation and is aimed at developing a wide range of competences [16, 17].

Another group of scientists consider mentorship as the process of adjusting a new employee and developing them as an effective performer [18, 19, 20]. Such a position reduces the insight into mentorship only to psychological factors of perception by new employees of the process of their professional becoming, whereas the learning factor of mentoring process and the teacher-student cooperation is excluded, while being the basis of the mentoring mechanism and potential [4]. A training process is based on professional implementation of real-world practical tasks a mentee performs under the guidance of a highly trained professional, having the opportunity to constantly use the experience and opinion of the professional experienced in the work as a reference.

More recent mentorship theories emphasize its functional role in an organization. After the crisis of 2008-2010, management science and pedagogy considered a mentoring system as an opportunity to retain promising young hopefuls [21, 22]. Also, mentorship was able to solve such problems as personnel turnover, establishment and development of horizontal communications in a team, and, consequently, increment of the social capital of an organization [23] was addressed. Thus, D. Clutterbuck gives an example of an organization in which the number of personnel who were inclined to quit fell from 30 to 16% in one year with the implementation of mentoring programs [24]. Modern mentorship theories consider it as a creative process and an essential characteristic of the relationship among talent development staff [25]. Many mentorship researchers often combine norms and values in a single concept of organizational culture, implying that the mentoring system in an organization is an example of internalization and socialization of knowledge [26]. However, it should be noted that modern mentorship concepts do not reflect the nature of communication in the learning process, underestimating the definition of this work objectives, which indicates a lack of a subjective stance. Mentorship makes sense and is expedient and effective if the learning process is carried out based on a mutual desire of an experienced and a novice employee [23, 26]. In other words, mentorship depends on the complexity and style of interaction and the equality of collaboration positions.

Thus, following the analysis of the existing terminological approaches, mentorship is understood within the framework of this research as a set of bilateral relationships formed in the process of an experienced professional training a young employee to ensure their effective adaptation and socialization in the workplace.

RESULTS

The following universities of the Ural Region of the Russian Federation: the Ural State Pedagogical University, the Russian State Vocational Pedagogical University, and the Ural Federal University were chosen as the study base to analyze the level of adaptation and development of mentorship. As of the academic years 2015/2016 – 2016/2017, more than 15% of the employees were newcomers with a teaching experience of less than three years (Figure 1) (Ural State Pedagogical University, 2018, Russian State Vocational Pedagogical University, 2018, Ural Federal University, 2018).

In addition, at the time of the research, out of 776 employees who entered the workplace in the academic

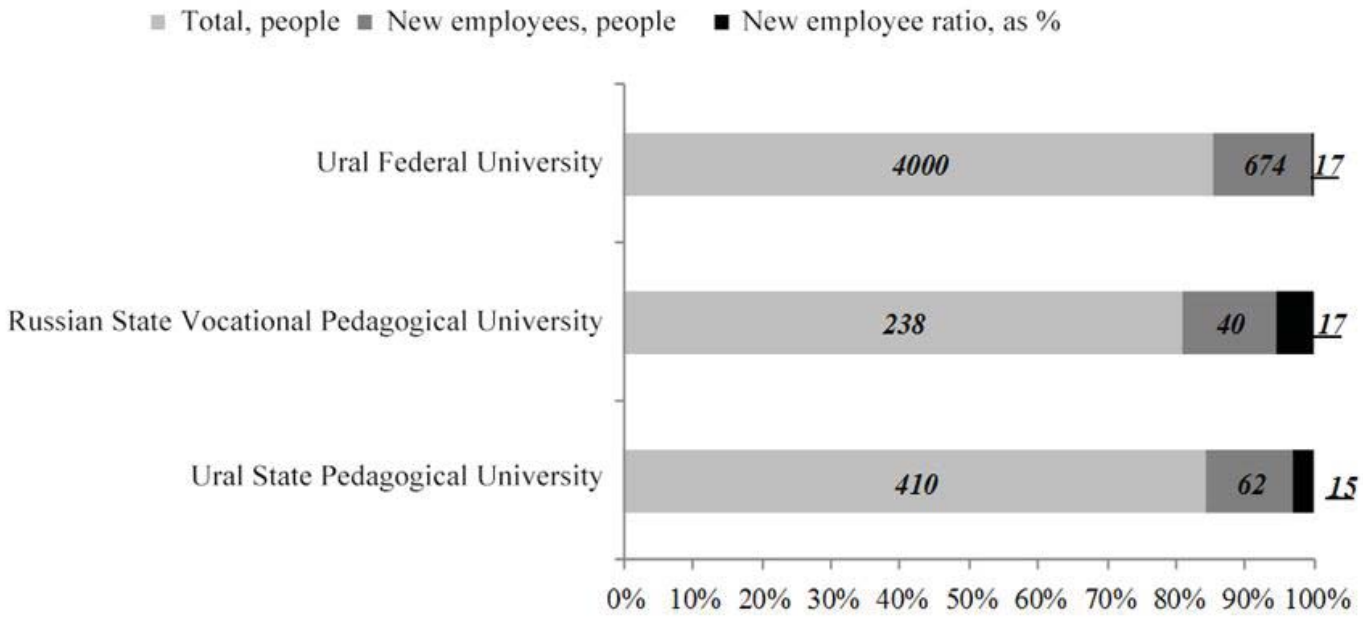

Figure 1: Number of new teachers in Russian universities of Russia in the Ural Region as of the academic years 2015/2016 - 2016/2017

years 2015/2016 – 2016/2017:

- 26 went on maternity leave (3.4% of all the newly employed);
- 214 resigned (27.6%);
- 536 presently work at the universities under study (69.1%)

Teachers who went on maternity leave were not included in the adaptation analysis; it was not possible to retrieve data.

In other words, 27.6% of the teachers failed to adapt to new working conditions in the higher education system.

To analyze the new employees' adaptation difficulties, the interviewing used a questionnaire. The questionnaire consisted of eight multiple choice questions concerning adaptation problems in a new position. Employees had to choose the most appropriate answer.

Based on the interviewing of 100 working teachers with less than three years of experience, the following results were obtained in the higher education institutions under study in the Ural Region of Russia.

I. Difficulties in the adaptation period occurred during:

1. Performance of professional duties (explanation of new material, exact calculation of a training session time, statement of questions to students, etc.) – 28% of the respondents;
2. Adaptation to working conditions (a training agenda, preparation of learning material, etc.) – 33%.
3. Perception of a large flow of new information – 29%;
4. Communication with new people – 10%;

II. The feeling of stress in the work process:

1. Not stressed (0%);
2. Experienced stress in the first days of work (9%);
3. Experienced stress in the first month of work (10%);
4. Experienced stress during the first six months of work (78%);
5. Never relieved the stress (3%).

III. The way of solving problems emerging during the performance of professional duties:

1. One-time induction by a senior official when entering the workplace – 9%;
2. Help of colleagues and a mentor – 91%.

IV. The period it took to master professional skills:

1. One month – 43%;
2. Six months – 52%;
3. One year – 5%.

V. A mentor's help is especially needed when mastering the following types of skills:

1. Practical – 47%;
2. Skills of communication with students – 43%;
3. Skills of communication with colleagues – 10%;

VI. In the adaptation period, what helped the development of professional skills was:

1. Colleagues' help – 0%;
2. A mentor's help – 88%;
3. A personal ambition and the desire to be a good specialist – 12%.

VII. Convenience of the work schedule in universities:

1. Satisfied with the work schedule – 49%;
2. Not satisfied with the work schedule – 51%.

VIII. Satisfaction with the job and the scope of obligations:

1. Completely satisfied with the job – 9%;
2. Not satisfied with the job because of a large amount of work – 22%;
3. Not satisfied with the job because of discrepancy of my own professional skills and obligations – 13%;
4. Not satisfied with the remuneration rate and the required amount of obligation – 56%.

To assess the statistical significance of the test results, Pearson's $\chi 2$ was used. Calculated from the Equation 2, the Pearson's test values were: 0.13 in answers to question I, 2.14 in answers to question II, 0.67 in answers to question III, 0.37 in answers to question IV, 0.25 in answers to question V, 1.37 in answers to question VI, 0.0004 in answers to question VII, and 0.55 in answers to question VIII.

Critical values of the Pearson's test at the error level $p = 0.05$ and with the number of degrees of freedom $df = 1–4$ are 3.8–9.5. Since the calculated test values are below critical, a hypothesis about homogeneity of the test results is accepted. This indicates the absence of random assessment results at the 95% credible level, that is, the results of analysis of young employees' adaptation problems in the new workplace are statistically significant.

Summarizing the interviewing results, the authors found out that the majority of new employees in the universities under study have faced difficulties in adapting at the new workplace because of difficult working conditions (33% of the respondents), and most of them failed to relieve stress in the first six months (78% of the respondents), since the teaching work is not only associated with the conduct of training sessions, but also with implementation of scientific activities, preparation of methodological support for academic disciplines, participation in scientific conferences, seminars, etc. Most commonly, a working day does not have fixed hours. Also, new employees refer to difficulties not only in the implementation of professional activities, but also in psychological adaptation when communicating with colleagues and students (10%). Most new teachers note the need for mentor assistance in the process of adaptation in the new job (47%) because they are not satisfied with it over a lack of relevant skills and experience in performing their duties (13%).

The mentorship purpose is a transfer of experience and a mentee's capacity building, as well as their adaptation

to the new team and motivation. Hence, the mentoring potential should be measured by the personal and professional qualities of a mentor. Therefore, within the framework of the research, the state of mentoring potential in the universities of the Ural Region of Russia was assessed.

Since mentorship is a personal-subjective entity, a subjective method of research, that is, interviewing was used to evaluate its potential. The respondents were teaching staff members of psychological and pedagogical universities of the Ural Region that train social care teachers. They are teachers at the Ural State Pedagogical University, Russian State Vocational Pedagogical University, and the Department of Psychology of the Ural Humanitarian Institute at the Ural Federal University. The number of respondents was 300 people, which exceeds the minimum sampled population necessary to ensure the representativeness of the interviewing results calculated by Equation 1.

The interviewing provided for determining the actual model of mentorship (or lack thereof) in the universities of the Ural Region and the potential for its development. To determine the actual mentoring model, young employees were asked to select one statement from the list that would best describe the team environment.

The list of questions in Questionnaire No.1:

1. There is an experienced senior professional who constantly helps me in acquiring competences.
2. A peer teacher who has a more extensive experience constantly helps me in my work.
3. A number of more experienced and qualified teachers constantly help me and my young colleagues in the work.
4. The help of my more experienced colleagues is ad hoc in nature.
5. No one helps me in my work.

The response option 1 stands for a traditional mentoring model, 2 – for a partner model, 3 – for a group model, 4 – for flash mentorship, 5 – for the lack of mentorship.

The respondents' answers were as follows (Figure 2).

According to the interviewing results, it has been identified that 58% of the young specialists in the universities of the Ural Region of the Russian Federation have to adapt to new working conditions without a mentor's help.

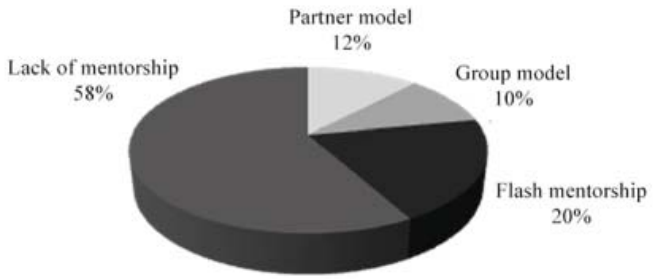

Figure 2: The structure of mentorship in the universities of the Ural Region of the Russian Federation

This situation causes anxiety and the fear of failure in the course of work. A new teacher cannot operate at full capacity without mentorship, since they do not have a sufficient level of knowledge about the job specifics and information about the norms and values of the university. Therefore, there are certain workflow productivity costs, since it takes them much more time to discharge their obligations, which can subsequently convey a sense of incommodity and the desire to quit.

42% of the respondents use different mentoring models. 10% of the young specialists at the universities under study work according to the group mentoring model. It involves the presence of a group of mentors who supervise actions of an inexperienced teacher in achieving their goals, eliminating discomfort and dealing with work issues, help to navigate the organizational policy of the university and provide recommendations for advancing innovative ideas in the educational process.

20% of the new teachers have mentors and cooperate with them from the "flash mentorship" pattern that is characterized by sporadic meetings and discussions with the mentor. This model does not require continuous supervision of the social, organizational, and professional adaptation of a young specialist, in contrast to the group mentoring model, which somewhat reduces the effectiveness of adaptation. On the other hand, however, a mentee has the opportunity to interact with many professionals and generate different perspectives to solve problems at the workplace and develop their professionalism.

About 12% of the respondents work on the partner model. This mentoring model is characterized by interaction of peer lecturers, one of them having certain experience in a specific subject area that is unfamiliar to the younger teacher. The mentor helps their partner improve the work performance, build workplace relationships and increase their personal satisfaction with the work. The advantages of this mentoring model are friendly interaction between colleagues and the mentee's ability to argue and discuss the adaptive measures offered to them.

The statistical significance of the interviewing results was estimated using Pearson's $\chi 2$ (Equation 2), its calculated value being 0.60, its the critical value being 7.81. Therefore, it can be concluded that the results of assessing the mentoring models in universities of the Ural region of the Russian Federation are statistically significant.

The next study phase was to define such qualitative characteristics of a new teacher's mentor as the mentor's potential. The key qualities a mentor should possess were determined based on a questionnaire survey for the teachers of the Ural State Pedagogical University, the Russian State Vocational Pedagogical University, and the Department of Psychology of the Ural Humanitarian Institute at the Ural Federal University (Questionnaire No.2). The respondents were asked to evaluate the importance of qualities on a scale from 0 to 10, whereby 10 stands for the absolute necessity of a quality to be found in a mentor. The list of quality criteria and the av

Table 1: Questionnaire No.2: Assessment of the priority of professional and personal qualities to be found in a mentor

Reference designation	Quality criterion	Mean priority score	Variance, as %	Cumulative variance, as %
K1	Patience	10	4.84%	4.84%
K2	Perceptiveness	10	4.84%	9.69%
K3	Willingness to help	10	4.84%	14.53%
K4	Leadership abilities	10	4.84%	19.37%
K5	Extensive experience	9.8	4.75%	24.12%
K6	High level of compe-tences	9.8	4.75%	28.86%
K7	Constant development and improvement	9.6	4.65%	33.51%
K8	Willingness to contrib-ute their personal time	9.5	4.60%	38.11%
K9	Tolerance	9.3	4.50%	42.62%
K10	Credibility	9.3	4.50%	47.12%
K11	Ability to listen	9.3	4.50%	51.62%
K12	Commitment and creativity	8.9	4.31%	55.93%
K13	Ability to articulate clear goals and find ways to achieve them	8.9	4.31%	60.24%
K14	Exactingness	8.7	4.21%	64.46%
K15	Considerateness	8.6	4.16%	68.62%
K16	Willingness to do extra work	8.6	4.16%	72.78%
K17	Diligence	8.6	4.16%	76.95%
K18	High level of loyalty to the university	7.6	3.68%	80.63%
K19	A sense of the mission, goals, tasks of the universi-ty and the department	6.3	3.05%	83.68%
K20	Promptness	6.1	2.95%	86.63%
K21	Initiative	6.1	2.95%	89.59%
K22	Reliability	5.9	2.86%	92.45%
K23	Integrity and impar-tiality	5.7	2.76%	95.21%
K24	Discipline	5.6	2.71%	97.92%
K25	Interpersonal skills	4.3	2.08%	100.00%

Journal of Applied Engineering Science Vol. 16, No. 4, 2018
ISSN 1451-4117

erage estimate of all the respondents are presented in Table. 1.

Variance percent is defined according to Equation 3. A sample of indicators, factors, and criteria is considered adequate if the cumulative variance percent exceeds 80% [27]. According to Table 1, a sufficient number of criteria (qualities) for assessing the mentoring potential are qualities K1-K18, for which the cumulative variance percent is 80.63%. Therefore, this study assessed the mentoring potential based on the criteria K1-K18. The respondents who were lecturers at the Ural State Pedagogical University, Russian State Vocational Pedagogical University, and the Department of Psychology of the Ural Humanitarian Institute at the Ural Federal University were asked to award points over the range from 0 to 10 to describe the team members. 0 score stands for the absence of the qualities in at least one team member, 10 stands for the presence of the qualities in all the team members.

The presence of K1-K18 qualities in colleagues indicates a high mentoring potential. The higher the total score is, the higher the mentoring potential is.

The adequacy and representativeness of the interviewing results is verified by the sample adequacy, the high variance percent of the proposed criteria (qualities) for assessing the mentoring potential level, and a low variation percentage in the results, calculated by Equation 4, which is 8%. This indicates a high degree of consistency of the points awarded when assessing the mentoring potential in the teaching staff.

To convert the scores into quantitative and qualitative estimates, the Harrington's scale was used [28] (Table 2).

The Harrington's scale is applicable to indicators that are measured over the range [0; 1]. The mentoring potential indicator is measured in the range from 0 (the minimum score for all the questions) to 180 (the maximum score is 10 for all the criteria K1-K18). Therefore, to apply the Harrington's scale to assessing the mentoring capacity level, the Harrington's scale was adapted to a scale from 0 to 180.

To convert the Harrington's scale, a proportion of 1:180 was used. This means that the total score on the Harrington's scale was determined by multiplying the criteria K1-K18 score by the ultimate levels of indicator values by the Harrington scale.

To distinguish the qualitative criteria of a mentor's potential, the classification of a higher school teacher professionalism by N. Kuzmin [29] was used, whereby the baseline criteria for a mentor's quality are a competence to transfer experience and knowledge.

The first level of mentoring potential: [0-36) – reproductive (inadequate), which is a teacher's ability to transfer the information they have themselves to a younger specialist;

The second level of mentoring potential: [36-66.6) – adaptive (low), which implies the ability to adapt presentation of information and experience to the psychological

Table 2: Quantitative and qualitative assessments of the mentoring potential by the Harrington's scale

Potential level	Indicator value	Total score value
Very high (system-modeling)	[0.8-1]	[144-180]
High (system-modeling)	[0.63-0.8)	[113.4-144)
Medium (locally modeling)	[0.37-0.63)	[66.6-113.4)
Low (adaptive)	[0.2-0.37)	[36-66.6)
Inadequate (reproductive)	[0-0.2)	[0-36)

Table 3: Table of arc weights-indicators of the mentoring potential in the universities of the Ural Region of the Russian Federation

Arc	Arc weight (score)	Arc	Arc weight (score)	Arc	Arc weight (score)
(1, 10)	135	(5, 11)	114	(11, 16)	114
(3, 16)	129	(6, 16)	116	(12, 13)	116
(3, 11)	114	(7, 16)	117	(14, 11)	114
(4, 16)	116	(8, 16)	115	(15, 11)	115
(4, 11)	123	(9, 15)	119	(15, 12)	114
(5, 16)	131	(9, 10)	120	(16, 11)	116

make-up of a mentee;

The third level of mentoring potential: [66.6-113.4) – locally modeling (medium), which implies a teacher's mastery of strategies for transfer of knowledge and experience on certain problems;

The fourth level of mentoring potential: [113.4-144) – system-modeling (high), which consists in the ability to form a system of knowledge, skills, and expertise to develop a young specialist's professionalism;

The fifth level of mentoring potential: [144-180] – system-modeling (top), which accounts for a mentor's ability to transform their mentoring activity into a means of shaping the mentee's personality.

As a result of the assessment, 58% of the respondents rated the mentoring potential as very low, 28% as low, and 14% as medium. The statistical significance of the assessment is confirmed by the Pearson's test (Equation 2).

To build a model for identifying a mentor by the level of their potential, the academic teaching staff of the Department of Professional Pedagogy and Psychology at the Russian State Vocational Pedagogical University was involved. The Department employs 16 professors and associate professors with 10 to 39 years of experience, who are potential mentors since they have a high level of competence and personal qualities essential in a mentor.

The mentor identification model is based on expert judgments of the team members about the choice of candidates most suitable for the role of a mentor. To construct a model based on variations in the graph method implementation algorithms, a cover forest construction algorithm was used [10]. To that end, a network was built, its vertices standing for the academic teaching staff members of the Department that were assigned reference numbers (No.1-16); the arcs between the vertices stand for the mentoring potential level of each member. The graph reflects is analytically represented in Equation 5. The arc weights are presented in Table 3, the graphical network reflecting the mentor selection mechanism by the specified criteria is presented in Figure 3.

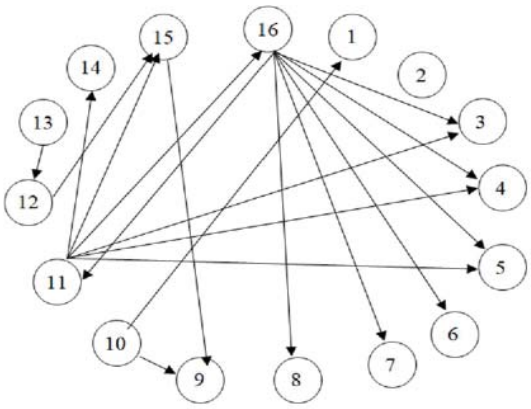

Figure 3: Network reflecting the solution to the problem of selecting a mentor in the universities under study of the Ural Region of the Russian Federation

An arc weight (a mentoring potential indicator) was determined based on the results of evaluation of the qualities that are inherent in a mentor (K1-K18 in Questionnaire No.2), regarding each member of the team separately. To build the network, only the arcs denoting a high and very high mentoring level were used, that is, only those candidates for whom the integrate mentoring potential estimate was not lower than 113.4. The mentoring capacity estimate was determined according to quantitative and qualitative assessments by the Harrington's scale (Table 1). This approach ensures a high level of a teacher's qualification and personal qualities that meet the mentorship criteria. The vertex that lies at the base of an arc is a priority relative to the vertex that lies at the apex of the arc.

Table 3 and Figure 3 show that teacher No. 1 recommends teacher No.10 as a mentor and assesses their mentoring potential as high (score 135). Teacher No.2, according to the interviewing results, cannot identify any colleagues with a high level of mentoring potential and does not evaluate their potential as high; therefore, element 2 is not included in the network diagram. Teachers No.3, No.4, and No.5 recommend teachers No.11 and No.16 as mentors; teachers No.6, No.7, No.8 recommend teacher No.16 with the mentoring potential values of 116, 117, 115 points, respectively. Teacher No.9 recommends No. 15 (119 points) and No.10 (120 points) as mentors. Teacher No.10 considers teachers No.1 and No.9 as mentors. Teacher No.11 assesses the mentoring potential to be at a high level in teacher No.16; teacher No.12 – in teacher No.13; teacher No.14 – in teacher No.11; teacher No.15 – in teachers No.11 and 12; teacher No.16 – in teacher No.11.

The teachers most frequently chosen as mentors are No.11 and 16, which reflects in Figure 4. Also, having been chosen by teachers No. 1 and No. 9 as a single option, teacher No.10 is possible as a mentor.

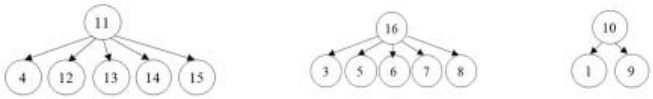

Figure 4: Results of constructing the model of choosing a mentor in the teaching team

Consequently, according to the results of expert evaluation by the teaching staff of the Department of Professional Pedagogy and Psychology at the Russian State Vocational Pedagogical University and by the graph method modeling, it was determined that teachers No.10, No.11, and No.16 could act as mentors. Teacher No.10 was indicated as a mentor for young specialists by two of the department members, No.11 – by five of the department members, No.16 – by five teachers as well.

DISCUSSION

Thus, the model developed for assessing the mentoring potential and identifying a mentor is a universal model

Journal of Applied Engineering Science Vol. 16, No. 4, 2018
ISSN 1451-4117

that can be used regardless of the region of the country and the academic profile of a university.

At the first stage of determining the mentoring potential in universities, qualitative criteria for a potential counselor's (mentor's) personality and professionalism are identified. Since the teaching profession is a type of "person to person" professions, the requirements to a mentor's personal qualities (the mentoring potential) determining the effectiveness of interaction between a teacher and a mentee (an inexperienced teacher) in the research were defined based on the principles of multidimensionality and comprehensiveness.

One of the key criteria for a mentor is the teaching activity attitude and psychological readiness for it. It manifests in the desire and wish to train young teachers, to constantly improve the methods of communication, behavior, and interaction with them.

The interaction of a mentor and an inexperienced teacher in the higher education system is one of the most important factors affecting the personality formation of a young person. In this regard, a mentor's personality should be marked by great scholarship; they have to be a polymathic person. In addition to the background knowledge in their professional activities, they must have profound knowledge in philosophy, sociology, economics, politics, art, modern science and technology. Erudition would ensure the mentor being respected by young professionals and serving as an example of a creative attitude to work, a role model.

Mentoring activities in higher education by virtue of their specific nature require special attention to broadcasting tendencies in social existence, the ability to appreciate the needs and requirements of society and to constantly make respective modification in their own operation. These qualities take on particular significance in the context of modern postindustrial information age in the education development, which requires that a mentor's personality constantly evolves and develops new skills, expertise, and appropriate thinking. Higher school as one of the most important institutions of human socialization that trains young people to be actors in future social processes should pay great attention to both new realities and trends in social development, as well as to innovations in the content, forms, and methods of education and training. Creativity and innovation should be characteristic of professional mentoring activities in universities. The core of creative and innovative processes in mentorship is a mentor's desire for a creative endeavor to introduce the latest achievements of psycho-pedagogical science into everyday practice, to study, generalize, and disseminate the best educational practices, to develop and apply new teaching technologies, active forms, and new methods of organizing educational process for a young specialist.

The mentoring activity results are evaluated by a mentor independently, which determines the importance of its objectivity. Therefore, some necessary criteria for a teaching mentor's potential should also be the need for constant self-improvement and self-reflection, self-discipline and high self-exactingness.

Special attention in mentorship is given to observation and attentiveness. Observing inexperienced specialists, a mentor generates information about their individual psychological constitutions, attitudes toward professional activities and colleagues. They form a conception of the mentee's ability, their mental state, mood and other things like that. A mentor should effectively use these skills when organizing mentoring activities, ensuring an individualized approach to training young teachers based on the mentor's own reflection, tolerance, and being non-judgmental.

The mentoring potential lays the groundwork for the ability to carry out mentoring activities based on the ability to form a system of knowledge, skills, and expertise to develop a young specialist's professionalism and personal growth. This served as the basis for development of the approach to determining the mentoring potential in this research.

The criteria developed for quantitative and qualitative assessment of a higher school mentor make it possible to assess their potential to implement mentoring activities and to select a teacher who would best conform with the mentoring potential by means of the proposed model. In addition, these criteria can be used in assessing the development of professional mentoring competences, that is, the development of their own potential. Modification of a teacher from a lower level mentoring potential to higher ones is achieved in the process of continuous professional self-improvement: through self-education (independently mastering the latest academic achievements in science and pedagogy), advanced training, generation and comprehension of best mentoring practices, and objective analysis of personal achievements by means of developing oneself as an individual, reflection of personal psychological qualities and their improvement, transformation of values, moral compass, needs, interests, motives for mentoring). It is a unity of the knowledge professionalism, the communication professionalism, and the self-improvement professionalism that ensures the development of an integral system, that is, the mentoring activity professionalism.

It should be noted that the mentoring mechanism development will also be promoted by a system of activities aimed at organizing this process within each institution and developing mentoring skills in the faculty members of universities.

At the level of legislative framework for higher education, regulations on mentorship in higher education institutions of the Ural Region should be regulated to elaborate:

- Requirements for the competences and functional responsibilities of mentors;
- Binding timeframes for the implementation of mentoring activities per young teacher;

- Academic workload for the implementation of teacher's mentoring activities allowing them to write off hours when filling individual academic curriculum performance plans, etc.

Such an approach would contribute to the mandatory nature of mentorship development in the higher education system in Russia. Also, it would serve as a motivational factor for involving young teaching job applicants with a high level of professionalism in the adaptation process.

At the university level, the following documents regulating the activity of mentors should be introduced:

- The principal's order on the organization of training;
- Participatory work plans for starting teachers and mentors;
- Methodical recommendations and best practice reviews in the mentoring activity implementation.

To develop mentorship in the higher education system of the region, it is recommended to appoint mentors for young professionals as chairpersons of cycle commissions at universities based on the teaching staff's recommendations on the approach developed in the study. Prospective mentors should be considered at the cycle commission sessions and coordinated with the chairman of the university methodological board. A mentor is appointed upon the consent of the prospective mentor and the young specialist they are going to be assigned to and on recommendation of the methodological board by order of the university.

A mentor is assigned to a young specialist for a period of at least one year. It is recommended to establish mentorship for the following categories of university staff:

- First-time teachers who do not have a seniority in teaching activity at educational institutions;
- Specialists with a teaching experience of no longer than three years;
- Teachers transferred to another job if the performance of their official duties requires expansion and deepening of professional knowledge and acquisition of new practical skills;
- Teachers who require additional training because of a significant break in pedagogical activity (more than three years).

At the end of the mentoring period, a young specialist must submit the following documents: a progress report of a young professional and a professional development plan with an assessment and feedback from the mentor with suggestions for the young teacher's further work.

The process of a young specialist's adaptation to teaching can be considered complete if: training sessions have become familiar to the young teacher, the work does not ignite fear or uncertainty in them, and the students' academic performance and the level of students' knowledge meet the evaluation criteria.

Also, to develop the mentoring potential in the higher education system, attention should be paid to the personal and professional development of teachers as mentors. This, in turn, would help to advance mentors' potential from the reproductive level to the system-modeling one. Formation and development of mentoring competence in faculty members of Russian universities can be facilitated by an effective participation of professional non-profit organizations. It is professional non-profit organizations that have generated a vast experience in the development of mentoring skills. Due to a high level of management flexibility, they are carriers of modern and effective methods and are able to solve the most challenging tasks. The development of mechanisms to attract professional non-profit organizations to the educational environment of the higher education system to provide services to support future teachers and improve the capacity of practicing ones would contribute to an inflow of knowledge and stimulate competition in this service area. In turn, to activate professional non-profit organizations, introduction of a program for public grants for research and methodological development related to the development of mentoring competences in teachers would be a motivational factor.

CONCLUSION

Based on the empirical study, the following conclusions have been drawn.

1. In the context of a low level of mentoring development in the higher education system of the Ural Region of the Russian Federation and a reproductive level of the mentoring potential in the academic teaching staff of universities, a system of qualitative criteria for the potential of a young professionals' mentor has been defined. The system of mentoring potential criteria is based on professional competences and personal qualities of a teacher that would ensure the most effective adaptation of an inexperienced teacher possible in the process of training and performing their professional duties.
2. The scale of quantitative criteria of a mentor's potential developed by the authors allowed them to substantiate qualitative levels of a teaching mentor potential in universities: reproductive (inadequate); adaptive (low); locally modeling (medium), and system-modeling (top). Based on the research findings, since the Pearson's test value is below the critical value, the results obtained appear significant. This approach laid the groundwork for developing a model for a young teacher's mentor identification in universities of the Ural Region. This model is a universal tool for determining the qualitative level of a mentor's potential by their professional and personal qualities of developing professionalism and personal becoming of young teachers. In addition, this model can be used to constantly evaluate the development of mentor's competences in university teachers.
3. A well-reasoned set of activities for the mentorship development in the system of higher education is

Journal of Applied Engineering Science Vol. 16, No. 4, 2018
ISSN 1451-4117

complex and practical in nature. It is based on improving the legislative regulation of the mentoring mechanism in higher education, raising the effectiveness of organizational measures to introduce a mentoring system in universities, and is aimed at developing mentoring skills in high school teachers. Practical implementation of the research findings would contribute to upgrading the professional and social competence in university staff and to the formation of collective knowledge that is a significant intellectual resource of the higher education system capable of ensuring its successful strategic development.

REFERENCES

1. Doyle, S., McCallister, J. (2018). Unique Obstacles for Mentorship During Training. Chest, vol. 154, no. 3, 734.
2. Esaulova, I. A. (2017). New models of mentoring in the practice of training and development of personnel of foreign companies. Business strategies, vol. 6, no. 38, from https://cyberleninka.ru/article/n/novye-modeli-nastavnichestva-v-praktike-obucheniya-i-razvitiya-personala-zarubezhnyh-kompaniy.
3. Subocheva, O. N. (2016). Mentoring as a factor in the effectiveness of the organization. Community: sociology, psychology, pedagogics, from https://cyberleninka.ru/article/v/nastavnichestvo-kak-faktor-effektivnosti-organizatsii.
4. Bressman, S., Winter, J.S., Efron, S.E. (2018). Next generation mentoring: Supporting teachers beyond induction. Teaching and Teacher Education, vol. 73, 162-170.
5. On the approval of the Concept of the Federal Targeted Program for the Development of Education for 2016-2020. (2014). The Decree of the Government of the Russian Federation as of December 29, 2014 N 2765-p, from http://docs.cntd.ru/document/420244216.
6. Klarin, M. V. (2016). Modern tutorship: the new features of traditional practice in the organizations of the XXI century, from https://cyberleninka.ru/article/n/sovremennoe-nastavnichestvo-novye-cherty-traditsionnoy-praktiki-v-organizatsiyah-xxi-veka.pdf.
7. Karacheva, E. V., Teslenko, I. V. (2015). Institute of mentoring as an actual trend in vocational education. Collection of materials of the International Youth Scientific and Practical Conference "Innovative potential of youth: patriotism, education, professionalism", from http://elar.urfu.ru/bitstream/10995/35142/1/ipoy-2015-25.pdf
8. Pinskaya, M., Ponomareva, A. (2018). National Research University "Higher School of Economics," from https://iq.hse.ru/news/188236974.html.
9. Reid, N. (2015). Statistical Sufficiency. International Encyclopedia of the Social & Behavioral Sciences (Second Edition), 418-422.
10. Kühn, D., Osthus, D., Townsend, T., Zhao, Yi. (2017). On the structure of oriented graphs and digraphs with forbidden tournaments or cycles. Journal of Combinatorial Theory, B, vol. 124, 88-127.
11. Odiorne George S., 71, developer of a management concept. (1992). The Baltimore Sun, from http://articles.baltimoresun.com/1992-01-26/news/1992026059_1_simon-war-ii-habif.
12. Irby, B., & Boswell, J. (2016). Historical Print Context of the Term, “Mentoring”. Journal Mentoring & Tutoring: Partnership in Learning, vol. 24, no. 1, 1-7.
13. Megginson, D. (2006). Mentoring in Action: A Practical Guide. Development and Learning in Organizations, vol. 20, no. 5.
14. Luebeck, J., Burroughs, E. (2017). A research journey through mathematics coaching.The Journal of Mathematical Behavior, vol. 46, 152-162.
15. Weber-Mayrer, M.M., Piasta, S.B., Ottley, J.R., Justice, L.M., O'Connell, A.A. (2018). Early childhood literacy coaching: An examination of coaching intensity and changes in educators' literacy knowledge and practice. Teaching and Teacher Education, vol. 76, 14-24.
16. Anghela, A., Voicu, C. (2013). Coaching and Mentoring in Bachelor's Degree Programs for Social Workers and Teachers. Procedia - Social and Behavioral Sciences, vol. 92, 36-40.
17. Milistetd, M., Ciampolini, V., Mendes, M.S., Cortela, C.C., Vieira do Nascimento, J. (2018). Student-coaches perceptions about their learning activities in the university context.RevistaBrasileira de Ciências do Esporte, vol. 40, no. 3, 281-287.
18. Lusena – Ezera, I., Demitere – Krumkalna, D. (2015). Adaption of New Teachers in Educational Establishments of Liepaja City (Latvia). Procedia - Social and Behavioral Sciences, vol. 197, 430-436.
19. Fisher, M., Stanyer, R. (2018). Peer mentoring: Enhancing the transition from student to professional. Midwifery, vol. 60, 56-59.
20. Soslau, E., Kotch-Jester, S., Scantlebury, K., Gleason, S. (2018). Coteachers’ huddles: Developing adaptive teaching expertise during student teaching. Teaching and Teacher Education, vol. 73, 99-108.
21. Donlan, A.E., McDermott, E.R., Zaff, J.F. (2017). Building relationships between mentors and youth: Development of the TRICS model. Children and Youth Services Review, vol. 79, 385-398.
22. Spencer, R., Drew, A.L., Gowdy, G., &Horn, J.P. (2018). “A positive guiding hand”: A qualitative examination of youth-initiated mentoring and the promotion of interdependence among foster care youth. Children and Youth Services Review, vol. 93, 41-50.
23. Kim, S.S., Im, J., & Hwang, J. (2015). The effects of mentoring on role stress, job attitude, and turnover

intention in the hotel industry. International Journal of Hospitality Management, vol. 48, 68-82.

24. Clutterbuck, D.A., Kochan, F., Lunsford, L.G., Dominguez, N., &Haddock-Millar, J. (2017). The SAGE Handbook of Mentoring 1st Edition. SAGE Publications Ltd, New York.
25. Zhang, Y.E., Nesbit, P.L. (2018). Talent Development in China: Human resource managers' perception of the Value of the MBA. The International Journal of Management Education, vol. 16, no. 3, 380-393.
26. Mena, J., Hennissen, P., Loughran, J. (2017). Developing pre-service teachers' professional knowledge of teaching: The influence of mentoring.Teaching and Teacher Education, vol. 66, 47-59.
27. Menke, W. (2018). Factor Analysis. Geophysical Data Analysis (Fourth Edition), 207–222.
28. Potapova, V. A., Mezenova, O. Ya. (2015). Evaluation of the balancedness of the recipe for snacks using the Harrington desirability function. Text of the scientific article on the specialty "Food Industry," from https://cyberleninka.ru/article/n/otsenka-sbalansirovannosti-retseptury-ryborastitelnyh-snekov-s-pomoschyu-funktsii-zhelatelnosti-harringtona.
29. Sabirova, E.G., Vasyagina, N.N., Imanov, A.K. (2016). The Model of the Professional and Personal Orientation of the Teacher. Mathematics Education, vol. 11, no. 1, 291-301.

Paper submitted: 10.10.2018.
Paper accepted: 20.11.2018.