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Problems of Forming of Managerial Potential at Students of Engineering Specialties in Higher Education Institutions of Kazakhstan

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Abstract: Now with development of economy and the teqhnology, based on the world standards and innovative technologies, it is required to Kazakhstan qualified, competitive personnel in the management field and management of all specialties including engineering. An article is considered the questions of effective providing and most rational use of resources of the enterprise, including and personnel which depend on management system and professionalism of leaders and specialists. Assimilation by the future specialists of scientific management bases, mastery of content, methods and forms of effective management, development of managerial abilities at the moment are primary objective of the modern higher school of Kazakhstan.

Key words: Management, the leadership potential, managerial potential, vocational education, the vocational-oriented education, the modern specialist

INTRODUCTION

It was revealed during of the study of the State Compulsory Educational Standard of the Technical Specialties of Higher Educational Institutions of the Republic of Kazakhstan (further SCES) that in the training process in higher education institution it is necessary to train the specialist engineer as the manager.

For example, it is designated in SCES of RK of Baccalaureate on the specialty 5B070200 . "Automation and management", in particular, in the qualification characteristic of the bachelor above mentioned specialty in the section on types of professional activity that after getting of the degree - the future specialists will be carried out not only service and operational, production and technological and design types of activity but also an organizational and management activity for high-quality implementation it is necessary skills not only of the technical plan and also in psychological culture, the organization and management and also understanding of the psychological factors, marketing features [1].

Besides, it is specified in SCES of this specialty in the section on standard tasks of professional activity that in the training process it is necessary the providing of the conditions for receipt of of full value and quality education, professional competence not only in the field of automatics, informatics and management but also mastering of humanitarian culture, ethical and law norms, regulating the relations of the person to the person, society, environment, cultures of thinking and an ability on a scientific basis to organize the own work, to acquire new knowledge and to have the choice of an individual education program by students [1].

Also it was revealed by consideration of a question of requirements to core competencies of the bachelor in "Automation and management" that future specialist shall have skills of bases knowledge of production relations and the principles of management taking into account technical, financial and, of course, human factors [1].

Today, the statistical researches show that scientific and technical progress develops so quickly that knowledge of the technical college student are become outdated already in the process of their training. Vocational training of the engineer must be provided not only a certain level of knowledge, skills but also to create their readiness for correct and effective management in the future (Ananyev, 1977).

Thus, today in process of complication of a technological basis of production, the level of culture and production efficiency of Kazakhstan depends on future specialists of engineering. Change of a form of the economic relations in the country means paradigm change

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of management. The Person of new market culture of management is a manager. And the engineer, at the same time, also must change the regulations, preferences and style of the choice of decisions that must be adequate to the market laws. It is required creative use of the knowledge and enterprise from the specialist of any profile, as well as from the engineer.

In this connection there are occurred the following questions:

- Is for the leader obligatory the requirement to have the vocational higher education corresponding to that sphere in which he realizes the management activity?
- For what rank of the leader is extremely important an availability of vocational education and for what is it less important?
- What education is promoted to success of a management activity and what is broken?
- What additional knowledge does the leader need, excepting foreign language knowledge, widespread in that country where he has business?

MATERIALS AND METHODS

Now two basic concepts of the discussed phenomenon: "activities" and "management" find application in numerous scientific areas and therefore it has different interpretation.

Researchers consider these categories in a wide philosophical, sociological, politological, pedagogical, psychological and activity context. So, for example, based on different criteria there are specified and characterized such types of activity as individual and collective, labor and innovative, motivational and value-oriented and also managerial, creative, productive and unproductive, etc. Management process always takes place where it is performed general activities of people for achievement of certain results, including management takes place in activities of specialists of an engineering profile.

Scientific management is most closely connected with work of R.L.Akoff (Akoff, 1985). The author notes that founders of scientific management school believed that, using supervision, measurements, logic and the analysis it is possible to enhance many operations of a manual work, trying to obtain their more effective implementation. Scientific management was not neglected a human factor. Systematic use of stimulation with the purpose to interest workers in increasing of productivity and production volume was an important contribution of this school.

Taylor and his contemporaries actually recognized that work on management is a certain specialty and that the organization will win in general if each employee group is concentrated on the most succesful area. The concept of scientific management became a serious critical stage thanks to which, management became wide to be recognized as independent area of scientific researches.

Representatives of administrative approach in management are top management in big business: Henri Fayol, Lyndall Urwick, James D. Mooney(Shipunov, 2000). Therefore, efficiency in a broader sense of the word in relation to work of all organization was their main care. Creation of the universal management principles was the purpose of administrative school. These principles affect two main aspects. Development of a rational management system of the organization was one of them.

The main contribution of Fayol to the management theory was consisted that he considered a management as the universal process, consisting of the several interconnected functions, such as planning and the organization.

As a result of scientific search of psychologists, sociologists, specialists in the field of cultural anthropology there was developed the concept of "the human relations", based on every possible accounting of a human factor for the purpose of profound understanding of management realities in the organizations, increases of leadership efficiency, development of participation of organization members in management. The significant contribution to development of the concept of "the human relations" was made by K.Levin, V.Vrum, etc. (Smirnova, 1998).

Development of such sciences as psychology and sociology and enhancement of research methods after World War II was made studying of behavior on a workplace more strictly scientific. Among the largest figures of the behavioural direction it is possible to mention, first of all, Chris Argyris, Likert Rensisa, Douglas McGregor and Frederick Herzberg (Smirnova, 1998). These and other researchers studied various aspects of social interaction, motivation, nature of the power and the authority, organizational structure, leadership. In the most general terms, increase of organization efficiency due to increase of efficiency of its human resources was a main objective of this school. Its postulate was consisted in the following, the correct application of a behavioral science will always promote to efficiency increase, both the certain worker and the organization in general (Smirnova, 1998).

The leadership styles, oriented to the human relations are most effective in moderately favorable for the leader situations. Benefits of the style, oriented to the human relations, is an increase in a possibility of the leader to influence on the subordinates, the care of the

subordinates improves the relations between the leader and subordinates, personal interest of executors is stimulated, need for close supervision is decreased, the risk of control loss is minimized (Liginchuk, 2010).

According to management model "Path and goal" of Mitchell and House, the leader, organizing the subordinates on implementation of the effective objectives, influences on the ways of achievement of these purposes, such as explanation of what is expected from subordinate; support, mentorship and elimination of fettering interference; the direction of the efforts of the subordinates on goal achievement; forming at subordinates such requirements which can be satisfied; requirements satisfaction of the subordinates when the objective is achieved. Number of leadership styles is considered within this model:

In model of decision making by the leader, developed by W. Vroom and F.Yetton, there are five styles or management methods which the leader can use, depending on what extent of participation of the subordinates in decision making, that is: the leader makes decisions by himself, using the available information; the leader makes the decision on the basis of an information, provided by the subordinates, reporting to them or not about a problem essence; the leader states a problem to subordinates, listens to all their opinions and then makes the decision by himself; the leader represents a problem to the group of subordinates then discusses and then makes the decision by himself; the leader states a problem to the group of subordinates, looks for the decision together with them and accepts the most acceptable of all (Meskon, 1993).

At different times, since 30th years of the 20 century, psychologists researched the issues of a typology of leadership styles.

In the "managerial lattice" model or "a management lattice", developed by R. Blake and J. Mouton, leadership styles are differed in two parameters: extents of the leader orientation to achievement of the production purposes and extent of orientation to the human relations, on people, on creation of favorable social and psychological climate in collective. From the point of view of this theory, success of activities of any leader (including principals) is determined by the measure and how the leader is oriented to interests of educational process and interests of members of pedagogical collective. Each parameter of model has twenty gradations and to each cell of the received lattice there are corresponded a certain leadership style. Thus, in this classification there are allocated 5 leadership styles: the maximum orientation to a task, minimum on people (20.0); maximum orientation to both factors (20.20); the minimum orientation to a task and maximum on people (0.20); minimum orientation to both factors (0.0); average degree of interest in the specified factors (10.10) (Blake, 1992).

Studying of scientific-theoretical and practical literature in the field of management, pedagogics and psychology on a subject of the research was allowed to prove essence of concept the managerial potential of the student which is understood as set of the real and perspective opportunities of the personality, necessary for realization of knowledge system, experience of implementation of a management activity. Engineering activities are the difficult integrated education, including various types of activity, also a management activity which helps to open a concept of managerial potential. Efficiency of a management activity depends on the leader, his qualities, knowledge and abilities, in particular, of ability to make management decisions, from methods, style, the management principles, from psychological climate in collective, from system of motivations of worker activities, from culture of a management activity.

The analysis of scientific literature and modern practice was revealed the following contradictions: between modern requirements of society to future engineering specialists and a real condition of their vocational training; between need of forming of managerial potential and non development of this problem for the theory and practice of vocational education.

Necessity of the solution of these contradictions was caused a problem, what ways are necessary for effective forming of managerial potential of students of engineering specialties in higher education institution.

The research purpose consists in substantiation of need of managerial potential forming of students of engineering specialties and in identification of effective ways of its forming in the training process of specialists in higher education institution.

RESULT AND DISCUSSION

For the solution of objectives and check of a hypothesis we were used a complex of scientific and pedagogical methods: the theoretical analysis of scientific, psychology and pedagogical literature, pedagogical supervision, conversations, testing, pedagogical experiment, methods of mathematical and statistical handling of the received results of research.

The corresponding methodology was developed for identification of formation level of managerial potential of future engineer. For diagnostics of managerial potential of students there was used the adapted complex methodology, having two types of an assessment (a self-assessment and an expert evaluation).

For the purpose of identification and diagnostics of managerial potential, for the purpose of data acquisition about a real condition of a problem we were made the stating experiment. This experiment was performed at the Pavlodar State University named after S. Toraygyrov in 2015. Selection of the research was made 241 students of full-time courses of engineering and technical specialties (050702 Automation and management, 050709 Metallurgy, 050712 Mechanical engineering, 050713 Transport, transport equipment and technologies, 050717 Heat-and-power engineering, 050718 Electrical power engineering). There were as part of expert group the teachers of universities and specialists of the organizations where the students had practical training.

It was used the computing system of handling of high-quality social and pedagogical information ("DA-system") for data processing, received during experimental work by method of the determination analysis (Mastobayev, 2006). In case of data processing, the document is understood as the questionnaire, the variable is a question of the questionnaire and values of a variable are possible versions of answers to this question. The main feature of system is its orientation to the analysis of high-quality data, i.e. each property of object is provided on a nominal scale. In other words, the system works with properties not measurable number about which it is possible to tell only there are they or they are absent. The system offers means for the analysis of communications and the relations between objects of this type. Diagnostic results are provided in the table (Table 1).

Apparently from the table, the level of formation of managerial potential is low at students of engineering and technical specialties, as the high level of managerial potential is provided to 4,9% of students (self-assessment), 4,5% (expert evaluation); the average level of managerial potential - 51,6% (self-assessment) and 45,9% (expert evaluation); low level of managerial potential - in 43,5% (self-assessment) and 49,6% (expert evaluation). The lowest results were received on such indicators as the thinker-analyst, the manager-organizer, the leader who is able to make management decisions and the professional; better results were received on such indicators as the personality and a communicator.

Table 1: General level of managerial potential of students of engineering and technical specialties

	Number of people (%)	
Levels	Self-assessment	Expert evaluation
High	4.9	4.5
Average	51.6	45.9
Low	43.5	49.6

Table 2: The general level of formation of managerial potential of future engineers of control and experimental group (stating experiment)

	Number of people (%)		
Levels	Self-assessment	Expert evaluation	Totally
Control group			
High	5.1	4.8	4.90
Average	42.8	43.3	43.05
Low	52.1	51.9	52.05
Experimental group			
High	4.5	3.9	4.20
Average	50.4	48.7	49.50
Low	45.1	47.4	46.30

There were taken part in the stating experiment the students of specialties 050702 Automation and management, 050709 Metallurgy, 050712 Mechanical engineering, 050713 Transport, transport equipment and technologies, 050717 Heat-and-power engineering, 050718 Electrical power engineering; control group were constituted 61 persons, experimental 64. Results are provided in Tables 2 and Fig. 1 and 2.

Results of diagnostics of managerial potential of future specialists of a engineering and technical profile in

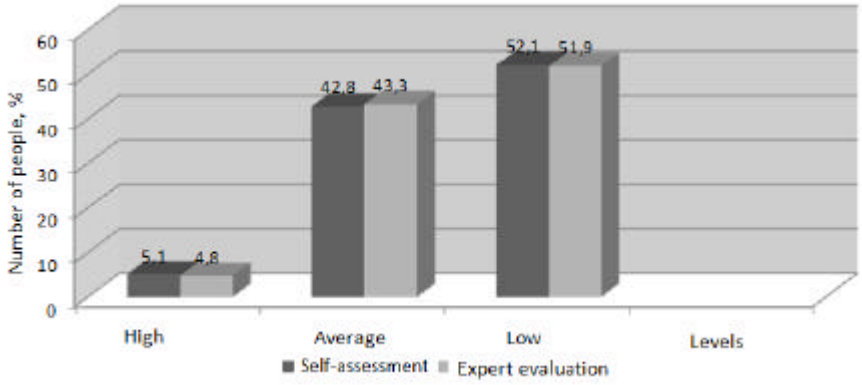

Fig. 1: The general level of formation of managerial potential of future engineers of control group (stating experiment)

control group for the beginning of experiment clearly demonstrate average and low levels of its formation that reflect

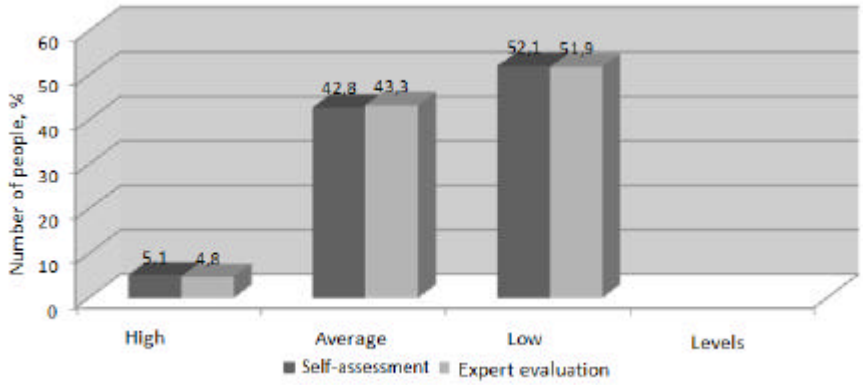

Fig. 2: The general level of formation of managerial potential of future engineers of experimental group (stating experiment)

percentage data: the average level is 51.6% (self-assessment), 45,9% (expert evaluation); low level is 43,5% (self-assessment), 49.6 (expert evaluation).

Results of diagnostics of managerial potential of future specialists of a engineering and technical profile in experimental group for the beginning of experiment (the Fig. 2) correlate with data in control group and also show average and low levels of formation of managerial potential: the average level is 50.4% (self-assessment), 48,7% (expert evaluation); low level is 45.1% (self assessment), 47.4 (expert evaluation).

Thus, the stating experiment of control and experimental groups (the Fig. 2) was revealed that the level of formation of managerial potential in both groups is almost identical and low (average or low levels, a difference between them is less then 6% in all parameters) and it is emphasized once again a need of work strengthening for this direction at training of young personnel of the country for industrial Kazakhstan.

It is considered the level of formation of managerial potential on six above designated indicators in control and experimental groups (the Fig. 3 and 4).

Apparently from the analysis, the high level of formation of managerial potential of students of control group is almost not provided – it is maximum 1,9% on an indicator "Personality", it is minimum – 0% on an indicator "The leader who is able to make management decisions". The average level of formation of managerial potential is provided it is maximum 67,3% on an indicator "Personality", it is minimum 18,35% on an indicator "The leader who is able to make management decisions". Low level of formation of managerial potential reflects high points almost on all indicators that is confirmed an importance of work in higher education institution on forming of managerial potential: it is maximum 81,65% on an indicator "The leader who is able to make management decisions", 67,15% on an indicator "Professional". Results of diagnostics of formation of managerial potential of students of experimental group both on a self-assessment and on an expert evaluation were shown low and average levels of formation on all six indicators. A difference between experimental and control group in indicators is no more than 5%.

Diagnostics of the parameter "personality" was reflected low and average grades on the following signs as: resistance to stress, an assertiveness, working capacity, obligation and fidelity to the word, humanity, love to people, adherence to principles, self-criticism, an optimistic and sense of humour. These are those parameters in which it is necessary to conduct work, to create these universal qualities, necessary for the effective leader. There were shown the high and average grathe des by students in such parameters as sense of humour, practical health.

The Thinker-analyst parameter was shown the following analysis results. Average and above an average I.Q.s (IQ) is an important criterion for the leader. As we deal with students of a higher educational institution, this indicator conforms to qualifying standards. The average level was shown on such indicators as efficiency and logicality of memory, attentiveness, ability to be concentrated and observation, a capability to acquire new knowledge for the solution of tasks. Rather low indicators were found on such indicators as a capability to formulate tasks, a capability to forecasting of various situations and results of activities, a capability to the analysis of problem tasks, situations and results of activities, ability to compare real and required results and to analyze results of the work, ability to correlate the results received in work with objectives. Students need to be taught these specific abilities, connected with such cogitative transactions of

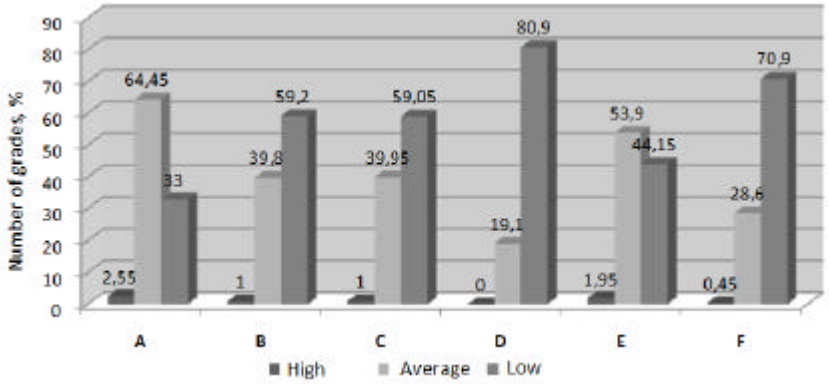

Fig. 3: Formation of managerial potential on the main indicators of future engineers of control group (the stating experiment), where: A: The personality, B:The thinker-analyst, C: The manager-organizer, D: The leader who is able to make management decisions, E: A communicator, F:The professional

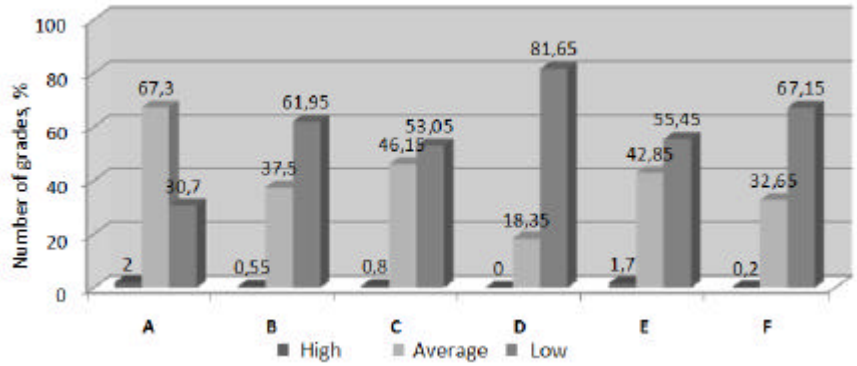

Fig. 4: Formation of managerial potential on the main indicators of future engineers of experimental group (the stating experiment), where, respectively: A: The personality, B: The thinker-analyst, C:The manager-organizer, D: The leader who is able to make management decisions, E: A communicator, F: The professional..

the analysis, allocation of the main thing, generalization and comparison that is important in a management activity of the engineering specialist.

The Manager-organizer parameter was revealed an average grade and was lower an average formation levels at future engineers. Low quantitative indices are presented on such signs as initiative, independence in the solution of questions, self-organization, discipline. Students are not always able to use rationally personal and others' time, to organize and plan the daily routine, to be more disciplined and executive. They seldom show independence and initiative in the educational activities. It is very important to raise such indicators as ability to determine the purpose and to set the task (average level), ability to quickly make decisions (average level), a capability to change style of behavior depending on conditions (low level), ability to control the their activities and subordinates (low level). Not all students have an authority in student's collective in connection with it there is necessary to work on forming of ability to support their authority and to be leader. Low indicators are reflected also in criterion "creativity and creative approach to work". It is very important at forming of the leader qualities to apply situational approach, to create conditions in which students can show and realize the organizational managerial skills.

The parameter "Leader who is able to make decisions" was shown the low level in connection with it there is necessary to work with students a concept of management decision, to fulfill technology of acceptance of management decision, in particular, such stages as: understanding of the fact of availability of a problem; formulation of a problem; goal-setting; development of versions of the decision; assessment of the options; act of decision making; organization of implementation and

motivation of the contractors; control of implementation of the process; understanding of a new situation. Besides, in case of decision making it is necessary to teach during preparation of important decisions to involve and take the responsibility for implementation of key decisions, to estimate availability (deficit) of the resources for decision making and possible consequences of decision making. We consider this indicator is very important, as forming of this component of managerial potential will help with educational process of the leaders of higher education institution who are ready to make the high-quality decisions necessary for successful functioning and organization development.

The parameter "Communicator" was shown the average level, however, in many parameters requires completions. It is very important truly and competently to establish business contacts with others as we live in the world of communications. As it was shown the analysis, students are able to build business relations with other students. It is necessary to teach them to establish partnership with administration, a management and the subordinates, to work at cooperation level. Students can speak, however, speech and listening culture is not created at all of them. They are able to listen but not to hear and it is very important quality of the leader. Speech in public, in front of an audience is necessary at carrying out of the meetings, works with collective, etc.

The parameter "Professional" was shown rather average values in such parameters as possession of professional knowledge, abilities in the field of engineering specialty, knowledge of regulating documents, connected with production. However, low indicators were shown by such criteria as knowledge of regulating documents, connected with management. Knowledge of the management theory, management bases, personnel management are not enough at students, it is necessary forming of ability to work with documentation which the specialist will be used in the professional and management activity.

In parallel with diagnostics for students of engineering specialties, in particular the specialty "Automation and management", it was offered to constitute the job description of an engineer (64 students). Job description is scientifically based regulations and profession requirements to types of professional activity and identity qualities of the specialist which allow him to fulfill effectively the profession requirements, to receive a necessary product for society and at the same time they create the conditions for development of worker identity. Job description includes a psychogram where it is the psychological portrait of a profession, provided by group of the psychological functions, actualized by this profession. Job description is the generalized reference model of the successful specialist in the given field. The person receives from job description data about an objective content of work, about the psychological qualities, needed from the person [10].

Students included in job description of the the engineer such qualities as: commitment, motivation, professional claims, emotional and mental development, satisfaction with work, professional knowledge about work, professional capabilities, vocational training ability, professional thinking, professional self-development, professional creativity (52%). Some students included in this list such signs: responsibility, the developed managerials ability, high level of development of analytical thinking, capability to long concentration of attention, high speed of reaction of the choice (23%), communicability, activity, reliability, tendency and desire to work, accuracy of operation implementation, focus, strong-willed effort (14%), punctuality, work with instructions and reference books, work with documentation, stress resistance, self-checking, ability to work in collective, mutual assistance, diligence (8%), ability to put the skills into practice, ability to plan, ability to argue the point of view, ability to manage personnel, ability to analyze a situation and to make the correct decisions (3%). Apparently from the analysis of job descriptions by the student point of view, future specialists see in the engineer first of all the professional, possessing those characteristics which are necessary for his professional engineering activity. Only the small part of the students was included in job description those lines which are necessary for management activity, that is the engineer-manager, for example, ability to manage personnel, ability to work in collective, ability to plan and analyze, ability to analyze a situation and to make decisions.

The obtained data on criteria of diagnostics method of managerial potential were allowed to reveal levels of components formation of managerial potential of students. Estimation of students and experts demonstrates that the average level of formation of managerial potential of students shows an indicator "personality" (67,3% in control group, 64,45% in experimental group), "communicator" (42,85% in control group, 53,9% in experimental group). Low level of formation of managerial potential of students is determined by other indicators (the thinker-analyst – 61,95% in control group, 59,2% in experimental group, the manager-organizer – 53,05% in control group, 59,05% in experimental group, the leader who is able to make management decisions – 81,65% in control group, 80,9%

in experimental group, the professional 67.15% in control group, 70.9% in experimental group). Thus, results of the stating experiment were shown the insufficient level of formation of managerial potential of students. These data was confirmed by analysis results of job descriptions of the engineer, constituted by students themselves.

CONCLUSION

On the basis of developed theoretical provisions and the received results of experimental work it is possible to draw the following conclusions:

Modern requirements to education of the specialists of engineering and technical profile are dictated by considerable changes in the industry, economy and society of Kazakhstan. The engineering specialist of new generation is a manager who can change his attitudes, tasks and style of decision making according to the developed economic situation, he can creatively, correctly and enterprising to make use of the knowledge base and experience and also his collective in the process of the management activity. Before higher educational institutions of the Republic of Kazakhstan on training of engineering and technical personnel there was set a task to graduate the competitive and skilled engineering specialists, potential successful and effective managers-leaders, meeting the requirements of a modern innovative industrial and economic situation of the Republic.

Besides, in the documents in the field of education of the Republic of Kazakhstan there are noted that forming of comprehensively developed and polycultural personality is necessary and requires review of the education content. It is necessary at the student to develop skills of implementation of methods of activities, including, at students of engineering and technical specialties, to develop skills of a management activity which is important component of their successful professional, engineering performance.

For the purpose of diagnostics of managerial potential of students there was used the adapted complex methodology, including self-assessment and an expert evaluation. The theoretical material, characterizing essence, content and structure of managerial potential of the student was allowed to determine criteria and indicators of diagnostic methodology of managerial potential of students. It is conditionally designated such indicators as: the personality, the thinker-analyst and manager-organizer, the leader who is able to make management decisions, the communicator and the professional. Results of application of the developed diagnostic methodology of managerial potential of students testify to an inharmonious ratio of levels of formation of its components that proves a need of purposeful forming of managerial potential of students for higher education institution.

Efficiency of the offered ways of forming of managerial potential was checked experimentally that is reflected in intermediate and control tests. The offered and developed ways were increased the level of formation of managerial potential of students to high degree, increase in experimental group was constituted 17,5% that demonstrates positive dynamics of formation of managerial potential of students.

This research is not intended to be a complete solution of the designated problem but the conclusions containing in the article and theoretical provisions are brought to the specific methodical recommendations which implementation creates real prerequisites for effective training of engineering and technical personnel potential workers of a management activity in the conditions of higher education. The developed intra high school system and a methodology of forming, training and development of managerial potential can be adapted and used in higher education institutions at training of young specialists with other directions humanitarian, law, psychology and pedagogical and other profiles that, undoubtedly, will increase the managerial potential of the Republic of Kazakhstan.

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