Managerial Tools of Academic Knowledge Formation Process

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ABSTRACT

The relevance of the study is conditioned by the requirement of modern society to improve the quality of education. Knowledge is a core component in the educational content, along with the skills and competencies. The purpose of the paper is to determine the managerial tools of formation process of academic knowledge. The leading approach to the study is the process approach, allowing to characterize the quality of the academic knowledge (consistency, continuity, generality, efficiency, integrity) and to consider the management of academic knowledge's formation as a set of interrelated and interactive educational activities, ensuring the efficiency of their assimilation, understanding and application. The paper reveals the functions of academic knowledge (ontological, indicative, motivational); clarifies and scientifically proves managerial tools of the formation process of academic knowledge (case study, informational and event-based learning environment, research method, cognitive tools, unifying language and symbolic systems, visual AIDS, technical training). The paper submissions can be useful for managers and teachers of educational institutions; employees of the centers for advanced training and retraining of personnel in the selection and structuring of the content for the training of scientific and pedagogical staff.

Keywords: Managerial Tools, Educational Actions, Functions of Knowledge, Quality of Education
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1. INTRODUCTION

The relevance of the study is reasoned by the requirement of modern society to improve the quality of education. In a broad sense, the quality of education is the guarantor of national security, one of the most important factors of sustainable development of society, the competitiveness of the state, the revival of the sense-making role of education in the life of every person and of the whole society. In a narrow sense, the quality of education can be considered as a category describing the result of the educational process, reflecting the level of development of academic knowledge, practical skills, intellectual development and moral qualities of graduates (Pugacheva et al., 2016; Khairullina et al., 2016; Levina et al., *2015;* Kalimullin and Vinogradov, 2015; Kalimullin and Masalimova, 2016). Knowledge is a core component in the content of education, along with the abilities, skills, and competencies; objective information about various objects of reality, consciously perceived and recorded in

memory, learned to the level of awareness of external and internal connections, readiness of creative use (Lednev, 1989). In academic knowledge there are the most important kinds of knowledge. However, the private nature of the theories doesn't allow us to raise the question of the enlargement of the main didactic units and try to improve the consistency of students' knowledge on the basis of studying of its structure and other instructional techniques. Therefore, from the point of view of managing of academic knowledge's formation process, it is advisable to take into account their different types (concepts, facts, laws, theories, findings), which are mental mappings of the objects' class in the form of analytically separated set of core, common and essential features (Talyzina, 1975).

The content of academic knowledge in the process of vocational training includes the following main components: (a) The core as an invariant part, representing new and perspective facilities of the following classes of knowledge for modern

production-technologies, technical or social facilities, the materials at the level of general orientation; (b) professionally oriented knowledge, selected in accordance with the groups of professions; (c) a set of specialized concepts and adapted theories, providing a description of the major objects of knowledge; (d) political, technical, socio-economic, environmental, humanitarian knowledge, "introduced" in the traditional content of the basics of a specific science and providing ideological direction of educational knowledge (Krajevsky, 1977). Thus, human knowledge, considered as some integrity, is not fundamentally can be represented as a logical or hierarchical structure, because their theoretical components have been selected from a number of areas. Exactly (and only) they can be used to give a generalized theoretical description of the important objects of human knowledge. The specificity of humanitarian knowledge consists in the fact that it includes intentions, values, meanings, and inter-subjective and auto-communication relations, determined by sensor, topo-gnostic and other levels of consciousness; current present, last past, open to the flow the future, data in memory, emotions, emotional outbursts, all dispositions and predispositions, which construct and constitute the world from the "subjective spontaneity;" in a more general form it is a holistic continuum of subjective reality that constitutes the domain and the internal wealth of the individual (Matyushkin, 1987). Epistemological analysis of humanitarian knowledge shows that the knowledge in the field of humanitarian appeals not to natural essence of things but to its meaning. The latter one defines a number of features of the conceptual representation of the object of humanitarian knowledge in the form of its object. First, it makes it's a more mobile, flexible status. As opposed to the object of natural Science the object of humanitarian knowledge at much less extent is constrained by its internal essence, its very existence as an object (meaning) is the result of an priori with respect to it the principle of its understanding, of generating semantic model (Talyzina, 2006). Second, it reasons its dual nature. The fact is that the essence of the object of humanitarian knowledge consists, on the one hand, of understanding of a certain sign as a human domain, and on the other - It's decode, decrypt, i.e. from its constructive understanding-interpretation (Skatkin, 1975). The object of knowledge here, so is a semantic reality, which is deployed in contact with a fragment of reality as a constructive assessment and reassessment of matched with them personal values and meanings (Pidkasisty, 2000). Hence: Object of humanitarian knowledge doesn't form the space of non-empirical-factual realities, but the space of human significances, of values, of meanings that occur in the assimilation and development of culture. All the mentioned updates the paper's purpose - to find out the managerial tools of formation's process of academic knowledge.

2. RESEARCH METHODOLOGY

The leading approach to the study is the process approach, allowing to characterize the quality of the academic knowledge (consistency, continuity, generality, efficiency, integrity) and to consider the management of formation of academic knowledge as a set of interrelated and interactive educational activities, ensuring the efficiency of their assimilation, understanding and application.

Consistency involves the process of fundamental and special knowledge's inclusion in educational curricula as interconnected and interdependent parts of the education system. Continuity of knowledge is seen as a process of continuous education, permanent changes of goals, objectives and functions of the links of the educational system in which knowledge is transformed into skills and competencies. The generality of knowledge involves the integration of specific knowledge with the generic one. This allows consider specific knowledge, as a manifestation of a generalized one. Efficiency involves the process of applying of knowledge in different situations. Integrity of knowledge is the process of merging of heterogeneous educational data. An important feature of the integrative knowledge is their versatility, forming a perception of the world as a whole, particular, synthesizing knowledge through the creation of private-scientific pictures of the world, including it in the form of a conceptual-methodological basis of fundamental scientific theories. If the system knowledge ensures mastery of methodological procedures, an integrative one is allocation of meaningful links between concepts and theories. Increasing currently the flow of information makes the integration of knowledge as objective necessity.

Training activities can be considered from different perspectives: Subject-activities, subject-target, differentiation of internal intellectual actions on mental processes, the dominance of productivity (re-productivity) etc. From the perspective of an entity in the structure of the training actions there are goal-setting, programming, planning, execution, control (self-control) and evaluation (self-assessment). From the position of the subject of activities there are transformative, action research activities. On the basis of mental processes there are cognitive, perceptual and MNEMIC actions. Each of the mental actions is decomposed into operations (comparison, analysis, synthesis, abstraction, generalization, classification, etc. Perceptual activities include recognition, identification, memory - Imprinting, filtering of information, its structuring, maintaining, updating. Re-productive activities include primarily performing and reproducing activities. If analytic, synthetic, test evaluation and other activities are carried out according to specified criteria, formulaic way, they are also reproductive one. Actions of conversion, reproduction as well as control, evaluation, analysis and synthesis, carried out under self-generated criteria, are considered as productive ones. In other words, in learning activities according to the criterion of productivity and re-productivity three groups of actions can be identified. The actions which are by functional appointment performed according to the specified parameters, the specified way, always are reproductive, for example performing; actions aimed at the creation of new, for example goal-formation are productive ones. The intermediate group consists of actions, which depending on conditions can be a combination of both of them (for example, the control action). The reproductive performance or the productivity of educational actions is determined by how they are implemented: According to prescribed curricula, criteria or self-generated ones; previously developed or stereotyped ways or new ones.

In the process of study theoretical (analysis, synthesis, generalization, classification) and sociological (observation, interviews, questionnaires, peer assessment) methods were used.

3. RESULTS

The main results of this study are: (1) The functions of academic knowledge and characteristics of managerial tools of the formation process of academic knowledge; (2) experimental verification of the effectiveness of management tools by the formation process of educational knowledge.

3.1. The Functions of Academic Knowledge and Characteristics of Managerial Tools of the Formation Process of Academic Knowledge

It is established that as a structural component of the content of education, academic knowledge performs three functions: Ontological, forming a general idea about the objects of reality; indicative in guiding activities; motivation, informing about the value and significance of objects, causing emotional attitude towards them.

It is found that the set of modern tools for managing of the process of formation of academic knowledge includes a case study method, information and event-based learning environment, research method, cognitive tools (language and sign systems, visual AIDS, technical aids of training). The case study method is based on the acquisition of teaching materials' cases and transferring them to learners for self-study. The case can be created by the teacher, student, or they can create it working together. It is found that information-event-based learning environment is a multi-dimensional and multifunctional environment of the learners. Event component determines the organization of a dynamic network of interconnected events that have a regulatory impact on the learner and affect the actualization of their learning activities. Therefore, an important place in event component takes the information as a semantic, meaningful aspect of the educational management influencing decision's making (Masalimova et al., 2014; Lunev et al., 2016). The research method is the foundation of creative self-actualization of learners and teachers in three-dimensions - Personal, activities and communicative. Personal environment is based on intellectual and logical initiative. Activities environment - reflects the process of research method's mastering with subsequent creative self-realization. Communication - the process of co-creation of teacher and learners. In a set of tools for managing by the process of academic knowledge's formation cognitive tools are included combining: Language and sign systems (word, texts); visibility; technical training support (educational films, TV shows, videos, interactive programs, information systems, technical devices for students' knowledge and skills control). It is found that the speech of the teacher helps the processes of perception, manages attention and promotes the formation of representations and concepts. The speech of the students reflects the level of their mental development, helps the teacher to control the learning process. The text material is diverse and includes: Textbooks, tutorials, workshops, tests. Thus, for the learner it is the source of information, a means of its mastering and self-control, and for the teacher - Guide in determining of the scope and complexity of educational material and the means to control knowledge. Visibility is needed in that extent in which it promotes activation of activities of students and the development of emotional-evaluative attitude to the informed knowledge. The organization of the teaching process with the use of technical visual aids provides the increase of cognitive interest in teaching; reduce fatigue of the teacher and students in the classroom; enhancement of independent work of students.

3.2. Experimental Verification of Managerial Tools Effectiveness of the Process of Academic Knowledge Formation

Experimental verification of managerial tools' effectiveness of the process of academic knowledge's formation was conducted on the basis of Kazan state University of architecture and construction from 2014 to 2016. The experiment involved 128 teachers and 410 students. Experimental testing took place in three stages: Ascertaining, forming and control.

On ascertaining stage, the attitude of teachers and students to the managerial tools of process of the academic knowledge's formation was clarified. Interviews with students show that 84% of them prefer to work with modern technical means of training, allowing to choose the level and pace of the educational material' learning, and to work with it independently, outside the classroom. 81% of students supported the idea to organize information and event-based learning environment. 78% of students stood for a wider application of the case method. 66% of students expressed a desire to participate in educational research projects. 65% of students admitted the necessity to apply visual AIDS in the learning process. Surveys of teachers show that the use of visual means in the learning process is considered necessary by 98%, work with modern technical means of education is preferred by 94%, the organization information-event-based learning environment is considered to be necessary by 88%, the introduction of the case method is supported by 81%, the desire to include students in the implementation of research projects was expressed by 74%.

At the forming stage managerial tools of the process of academic knowledge's formation were tested. The students themselves formed the cases on this subject "labor safety in construction," including posters, manuals, technological maps, training videos, sanitary-technical passport of enterprises, international, national, regional, industrial safety standards. Students exchanged developed cases to fulfill practical tasks: Situational analysis, analysis of documentation. For example, a situational analysis had stratified nature: Simple situations (work at the reproductive level), situations of higher complexity, non-standard situations (creative level). It is found that the situational analysis contributed to the interiorization of knowledge, the actualization of the meaning of material's study on occupational safety and the formation of abilities and skills to research situations; making of independent decisions; the preparation of actions' plan focused on the intended result; identifying of errors in the production process, the technical errors leading to dangers of labor and an unacceptable level of risk. The work with documentation, posters and manuals, technological maps, educational handouts, educational videos, sanitary passports of enterprises, international, national, regional, industrial safety standards are synergistic activities that involved working in small groups and, respectively, the mutual exchange of information, the multiplier effect of knowledge. The experiment

shows that the work with case studies contributed to: Enhancing of cognitive activities of students, encouraging of their success; the accumulation of knowledge about the impact of dangerous and harmful production factors, and risks to health and personal safety and others; the formation of abilities and skills of correct decisions' making under uncertainty, development of algorithm of decisions' making and understanding of the consequences of violations of occupational safety requirements; development of curiosity to sanitary working conditions, their possible causes and consequences of accidents at the workplace.

Within the information and event-based learning environment's the educational-research center "occupation security and safety" was created, as a subdivision of the Kazan state University of architecture and construction and the website of "occupation security and safety" was developed, the main content of which was three-dimensional software products: Video and audio recordings, posters, manuals, digital libraries, multimedia training complexes. For example, three-dimensional posters - Tutorial, included in the structure of the multimedia training complexes for occupational safety, provide vocational training, taking into account as Federal state educational standards, so in accordance with the conditions of production and prevention of occupational risks in dangerous situations, accidents and industrial injuries. In this study, three-dimensional posters-AIDS allow: (1) Show the industrial reality with which the students will face in their enterprises, and to organize "education through participation" that allow students: To obtain specific knowledge and to form the ability to analyze socially significant problems and processes; to create belief in the necessity of rules' keeping of occupational safety and willingness to show respect to people; to acquire abilities and skills of individual actions for the protection of production staff and population from possible consequences of accidents, catastrophes, natural disasters; to form abilities and skills of social (collective actions for ergonomic reorganization of workplaces) of actions, willingness to social interaction on the basis of socially accepted moral and legal norms, and the responsibility for maintaining of partner, trusting relationship; (2) to dialog the process of vocational training, in order to form: The ability to generalize, analysis, information perception, goal setting and choice of ways of its achievement; ability to find organizational and managerial solutions in unusual situations and willingness to take responsibility for them; specific knowledge; the belief in the necessity of rules' keeping of occupational safety; abilities and skills of individual actions for the protection of production staff and population from possible consequences of accidents, catastrophes, natural disasters; abilities and skills of social (collective actions for ergonomic reorganization of workplaces) actions; the capacity for organizational and managerial solutions' making in unusual situations.

71% of students participated in designing of multimedia training complex for the all-Russian competition of young scientists of the Russian Federation "providing of industrial and environmental safety at explosive and chemically hazardous industrial facilities." Participation in this project contributed to awareness of the need for safety in production (97%); the development of interest in occupational safety (100%); the formation of attitude on compliance with standards of occupational safety (98%); development of aspirations to master the skills of identification and assessment of hazards and risks in order to make quick and correct decisions (91%). Under the approbation of the research method, the students were asked to develop and test a methodology for assessing of occupational safety at specific company sites, brigades and workplaces. Within this assignment, they compiled monthly and semiannual security cards with the calculation of the coefficients of conformity with applicable standards. In the security cards, along with the occupational safety indicators, were reflected: The rates of injury and level of provision of sanitary-household premises; the characteristics of the workplace section, including the quality of implementation of measures and regulations on occupational safety; the presence or the absence of jobs with deviations from the sanitary norms; the presence or absence of violations of occupational safety regulations. Having a collection of information that were expressed in maps, the students were able correctly to identify measures to improve working conditions, use personal protective equipment, use material and moral incentives in the work on favorable conditions' creating for efficient work.

In the course of the experiment posters on occupational safety were widely used. It is found that the posters on occupational safety are aimed at explaining and conviction. Conclusion on how to act is derived not from the inscription on the poster, bur from the figure. On this basis, posters on occupational safety can be divided into the following types: (1) Reminding of the safety rules; (2) reminding about the prohibited work practices; (3) reminding to use protection means; (4) pointing at a safe sequence of actions or information ones; (5) calling for the safe operation or campaign ones. During the study, students were asked not only to study the posters on occupational safety made in printed form, but to develop them independently. Therefore, for students were prepared scientific and methodological recommendations on creating of an effective poster for occupational safety: (1) To establish requirements for the types of dangerous and harmful production factors, limiting values of their parameters and characteristics, methods of control of normalized parameters and characteristics of dangerous and harmful factors, methods to protect workers from dangerous and harmful production factors, based on the subject of the poster; (2) to develop the structure of the poster, to determine the proportions of the basic elements and other parameters to improve its performance. It is found that variable working methods with posters on occupational safety: (1) Provide a high degree of emotional and psychological impact on the students, through bright, keeping in mind the illustrations or catchy slogan; (2) help to develop the ability to identify and solve the problems of hazards in the workplace that reduce the level of industrial injuries; (3) promote awareness of the need of occupational safety's standardization to ensure safety, preserve the health and human working activity at job; (4) promote interest in the organization of activities aimed at ensuring of occupational safety, safety requirements to production equipment and its individual groups (species), as well as to methods of control of occupational safety's requirements; (5) strengthen the attitude to ensure compliance with standards' requirements of occupational safety, of buildings and constructions, prevention of the most hazardous situations.

In the control phase, applying the method of qualitative analysis, it is found that the case method is an effective tool for the development and consolidation of the obtained knowledge on the basis of which the trainee makes independent decisions. It is established that the case study method allows to form the following abilities: To apply the right decisions under uncertainty; to develop an algorithm of decisions' making; to develop the actions' plan focused on the intended result; to apply the acquired theoretical knowledge to solve practical problems; to take into account other experts' points of view on the matter under consideration when making the final decision; to develop ability to analyze situations, evaluate alternatives, to choose the best solution and to plan its implementation. Features of the case method are: (1) The application of operations of the research process, analytical procedures; (2) work in a group and sub-groups, the mutual exchange of information; (3) incite insight, sharing of discoveries; (4) formation of a problem and its solution on the basis of the case, projecting in the form of source information; (5) activation of cognitive activities; (6) the process of formation of information field, organization of information communications. It is found that information-event learning environment determines the organization of events which are being inside the learners' perception, are the subject of evaluation, the reason for meditation and the basis for important conclusions. The obtained information in the course of events allows a steady focus on learning for creative development. It is found that in the process of the research method's application, students learn, first, to analyze, to compare, to make inductive and deductive inferences; second, to set goals and to specify them in tasks, to plan and organize educational and research activities, to exercise self-control; third, to collaborate, to cooperate in problems' solving; fourthly, to see and formulate the problem, formulate the hypothesis, to find unconventional ways of problems' solving. Cognitive tools, unifying language and symbolic systems, visual AIDS and technical training means increase the efficiency of management process of academic knowledge's formation. Language and symbolic systems allow to collect, to classify knowledge from different disciplines, to establish links and relations between them at the conceptual level. Visibility determines the inclusion in the process of academic knowledge's formation of a variety of demonstrations and experience's obtaining of emotional and value attitude to that knowledge. Technical training means provide equal and interrelated availability of information of various kinds (vide-lectures, documentary film, special videos, audio, etc.) for specific tasks' solving to manage the process of formation of academic knowledge.

4. DISCUSSIONS

The problem of management of the process of academic knowledge's formation is considered by different authors. Analysis of scientific literature allows distinguishing of two main tendencies in this problem's solving.

The first trend is represented by the research of Babansky (1977), Bespalko (1989), Davydov (1986), who consider the process of formation of academic knowledge as a kind of cognitive process. Undoubtedly, the formation of academic knowledge is one of the components of cognitive activity. However, the knowledge-based view, which is the process of reflection of reality in consciousness, active intellectual and emotional activities, the result of which is knowledge, a synthesis in the form of theories, laws, scientific concepts (Minimansurovich, 2014; Ivanov et al., 2015; Yashkova and Kalimullin, 2015; Kalimullin and Vasyagina, 2015; Kamalova and Zakirova, 2014; Vlasova et al., 2015b). Therefore, it is believed that the formation of academic knowledge is not a kind of learning process but its component. The formation of academic knowledge takes place under the guidance of the teacher and represents the absorption of existing in science knowledge. The learner does not reveal, but only assimilates produced by human knowledge (Lisitzina et al., 2014; Sibgatova et al., 2015; Telegina et al., 2015; Vlasova et al., 2015a; 2016; Zakirova et al., 2015; Mokeyeva et al., 2015; Cheverikina et al., 2014). In the process of academic knowledge's formation there is no a focus on discovery of new scientific truths, but there is a requirement of their creative learning only. Based on these findings, the leading approach to the study is the process approach, and in the combination of the qualities of academic knowledge the consistency, generality, continuity, integrative are included, among the functions - the ontological function is chosen, as the managerial tools of the academic knowledge's formation process the research method is selected.

The second trend is represented by research of Pidkasisty (2000), Krol (2003), Skatkin (1975), Talyzina (2006), Matyushkin (1987), which propose to consider the problem of management of formation process of academic knowledge from a position of psychological processes in the human mind. Of course, the process of academic knowledge's formation is a specific form of individual activity, which is characterized by the rate of progress in knowledge's acquiring and skills' development; ease availability of development; robustness of the mastered material; the initiative in choosing of optional assignments, self-treatment for more difficult tasks. However, in the process of academic knowledge's formation the theories, laws, scientific concepts are mastered. For effective development the active students' involvement in their own activities is required. This conclusion led to the efficiency's introduction in the characteristics of the quality of the academic knowledge; allocation of the indicative and motivational functions of academic knowledge; the inclusion of the case-method, information and event-based learning environment and learning tools in the set of managerial tools of academic knowledge's formation process.

It is believed that in modern conditions, the effectiveness of management of the academic knowledge's formation process will be increased if to take into account the psychological processes occurring in human consciousness in the process of cognition.

5. CONCLUSION AND RECOMMENDATIONS

Academic knowledge is deliberately altered reorganized scientific knowledge that is simplified and abbreviated taking into account psychological characteristics and capabilities of students, in order

to form a general idea about the objects of reality (ontological function), to identify guiding educational activities (indicative function), to inform about the value and significance of cognized objects (motivational function). In a set of tools to manage the process of academic knowledge's formation are included: (1) The case study method, allowing to gain vitally significant experience in problems' solving, to relate theory with reality, to form the ability to express one's own point of view, listen to and understand others, to work in a team; (2) information and event-based learning environment, providing wide opportunities for working with the information, justification of alternative solutions in relation to one and the same event; (3) research method, ensuring the formation of scientific and research skills (intellectual, organizational, communicative, creative); (4) cognitive tools, unifying language and symbolic systems, visual AIDS, technical equipment and ensuring the formation of students' emotional-evaluative attitude to the informed knowledge and increasing of interest to them. It is established that the right choice of managerial tools of academic knowledge's formation process enables students to move from knowledge's, abilities' and skills' accumulation to the acquisition of practices of educational-cognitive activities.

Taking into account the obtained results it is possible to allocate a number of scientific problems of management of academic knowledge's formation process which require further consideration: The selection and structuring of educational content; information and cognitive methods to manage the process of knowledge's formation; the algorithm of the self-management of academic knowledge's formation.

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