

RRI 2016
International Conference «Responsible Research and Innovation»

**MODEL OF FUTURE ENGINEERS' SELF-DETERMINATION
DURING PROFESSIONAL TRAINING IN TECHNICAL
UNIVERSITY**

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Abstract

The article deals with the concept of future engineers' moral self-determination and the structural-functional model of future engineers' moral self-determination in the process of professional training in a technical university. The key method is the modeling method. The components of the model are the target; they are functionally normative, organizational-methodical and productive components. The characteristic of each component and model elements is given. The purpose and the social order, methodological approaches and principles, functions, the complex of pedagogical conditions, criteria and indicators are shown. The results of introducing the model into the process of professional training of future engineers in a technical university are presented. The aim of this experimental work was to validate the model and the effectiveness of its complex of pedagogical conditions of future managers' moral self-determination in the process of professional training at the University. Analysis of the results obtained at the first stage of the experiment suggests that at this stage of the experiment, it is observed the predominance of a low and medium level of future managers' moral self-determination.

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Keywords: Moral self-determination, manager, methodological approaches, criteria.



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1. Introduction

Dynamic development of the modern world community is accompanied by the aggravation of the crisis phenomena in the political, economic, environmental and cultural spheres. The future of the civilization and development of the production today is largely determined by the process and the result of not only competent experts, but also the level of culture and moral self-determination of graduates. Therefore, the changes in higher vocational and technical education should be aimed not only at implementation of informational technologies, new teaching methods and a multi-level system of training of students, but also at strengthening attention to the moral orientation of engineering students (Vakhitova, & Gadelshina, 2015) The role and importance of the study of economic subjects in the implementation of the educational potential of education. Moral self-determination of future engineers is the foundation of the innovative pedagogy that leads to this type of education for such work with students, which changes the material itself, and the subjects of education, their interaction, mutual influence (Saigushev et al., 2016). The relevance of the problem is connected with the need to resolve these objectively existing contradictions between: 1) the objective need of the society and the modern labour market in competitive engineers, endowed with a high level of morality, and preserved traditional approaches to moral education of students in the vocational training system in technical colleges; 2) the need to ensure the moral education of students of technical universities and insufficient development of the pedagogical science, the system of moral self-determination of future engineers; 3) the ability of technical colleges to increase the efficiency of the process of moral self-determination of a future Manager and a lack of methodological tools for the implementation of this process. The purpose of this article is to present a model of moral self-determination of future engineers in the process of professional training of future engineers in a technical University.

2. Materials and Methods

The ascertaining and forming experiments were conducted among students of Magnitogorsk State University, Nosov Magnitogorsk State Technical University, covering 117 engineering students.

The study was conducted in three stages. The first stage was carried out theoretical analysis of the problem of moral self-determination of future engineers, study of philosophical, sociological, psychological and pedagogical literature on the problem under consideration. The main methods at this stage: theoretical (theoretical and conceptual analysis, generalization, structuring, abstraction); empirical (direct and indirect observation, interviews, questionnaires, ascertaining experiment). During the second stage, the structural-functional model of moral self-determination of future engineers in the process of professional training in a technical college, the effectiveness and the adequacy of the revealed pedagogical conditions were developed and experimentally tested; the methodological apparatus for their implementation was also developed (Slesarev, 2008). The main working methods at this stage of the study: diagnostics (interviews, questionnaires, and testing), methods of mathematical statistics, modeling, formative experiment. At the third stage, the conclusions were analyzed and specified, the results obtained were arranged. The main methods of work were the qualitative and quantitative analysis of the obtained results, the methods of pictorial representation of experimental data, computer methods of data processing.

During the research, the diagnostic tools for assessing the level of moral self-determination of future engineers were substantiated and experimentally tested, including the criteria (motivation concerning moral behavior, moral relationships, moral behavior), indicators of levels and diagnostic methods. The methodology for the implementation of the model and its complex of pedagogical conditions of moral self-determination of a future manager in the process of professional training at the University was experimentally tested, including certain methods (brainstorming, training methods, case studies), tools (questionnaires, case studies, professional confession) and forms (group discussion, independent work, special course) training.

3. Results and Discussion

During the conceptual analysis of the problem the meaning of "moral self-determination of a future engineer" was specified. It is viewed as a continuous process and the end result of selecting a student's own moral position, adoption and mastering of values and the formation of motives to moral conduct, by which he is guided in his life in relation to himself, other people and the problems of modern production (Arokiasamy et al., 2013). It was specified that the structural elements of moral self-determination of future engineers are: moral personality, moral values (worldview), moral choice, moral behavior, and actions.

The use of simulation has allowed developing a structural-functional model of moral self-determination of future engineers in the process of professional preparation in a technical University. Structural components of the structural-functional model perform the task, functional-target, organizational-methodical and productive components.

The target component includes the social order and purpose that were defined on the basis of the analysis of the provisions and requirements of regulatory documents. Shaping the moral beginning of a future engineer, already established as a personality, is a very complex but necessary task because in a production environment, the increasing role of moral factor in the management of people at work (including enterprise management) is the most important requirement (Clark, 1997). The demand for an engineer with a high level of morality is determined by the combination of many qualities and skills which he has in his professional arsenal, where the management culture, which consists of moral values, psychological and culture humanistic outlook, has a special place (Rudaleva, & Kabasheva, 2014).

In general terms, the moral aspect can be seen in the definition of "education" in the Federal law "On education", which is understood as "the process of education and training of the individual in the interests of society and the state, accompanied by ascertaining of achievement by the citizen (students) established by the state educational levels (educational qualifications)" (Ob obrazovanii, 2012).

The selected areas and the requirements of applicable regulations allow us to assert that an entirely new social order arises before the modern system of higher education in training future engineers—preparing high quality and competitive engineering employees, including management people, professionals, capable of changing circumstances to find and build their own life trajectory, to overcome the fragmentation of knowledge, to find their own intellectual and moral integrity and identity with a high level of moral self-determination.

This allows us to formulate the social order in the target component of the model: moral self-determination of University students enrolled in engineering degrees, as future leaders of people in the

workplace. The purpose of the developed model is formulated as moral self-determination of future engineers in the process of professional training at the University.

It was identified in the structure of the functional-normative component that it should include methodological approaches and their principles and functions. The last element is the backbone in the model.

As a methodological basis was chosen: 1) a systems approach and its principles: integrity, hierarchy, structuring; 2) a reflective approach and its principles: isolating self from the environment, reflection of the external world, goal-setting; 3) the axiological approach and its principles: equality of philosophical views, equivalence of traditions and creativity, the equality of individuals; 4) an acmeological approach and principles: determinism and development, of subjectivity, of humanism, activism, modeling, optimality. The functions in this component are represented as: self-esteem, self-control, self-knowledge, self-discipline and self-control.

In our study, the value of the system approach is that it allows us to solve the following problem modeling: 1) to examine the process of moral self-determination of future engineers as a unified system composed of interrelated components; 2) set a specific goal of the system; 3) to determine the content of components that formed the system, to identify system functions, levels and stages of the process; 4) to determine the dynamics of its functioning.

The result of applying a reflexive approach to the model is the development and change of moral self-determination of future engineers, the change of the position occupied by them in vocational and educational activities, enhancing it as a subject of moral conduct. A reflexive approach allows considering the process of moral self-determination of a future engineer from the position of active self-reflection, self-evaluation, self-education and self-control of his moral behavior.

The importance of the axiological approach is that it allows one to define a set of values in moral self-determination of future engineers. With regard to moral self-determination as such, there may be value communicative, national, spiritual, moral culture (Yusupova et al., 2016). This approach is associated with identifying the objective and subjective conditions that allow a future engineer to become a moral person and a competitive specialist. It is proved that the main functions in the model are: self-esteem, self-control, self-knowledge, self-discipline and self-control, the implementation of which is aimed at optimum development of the students' experience of moral behaviour in relation to themselves, other people and the challenges of production.

An organizational-methodological component of the developed model includes steps, the complex of pedagogical conditions and the content of courses and the methods of their implementation.

It was revealed that the process of moral self-determination should include three stages. The first stage is defined as motivational, aimed at formation of a future engineer's motivation concerning moral behavior. It is connected with the fact that it is necessary to support, strengthen and develop the mindsets and perceived needs in the mind of the student, which will stimulate him to form his moral self-determination (Ardashkin et al., 2015). At this stage, it happens by means of the development of their information fields in questions of ethics management. The second stage is a value-oriented, which goal is the development of moral relations to oneself, people and society, to solve production problems. At this stage, the moral relations of students in the process of solving ethical problems are formed. The third stage is behavioural, involving the further development and strengthening of experience of moral

behavior of future engineers, ensuring the evaluation and understanding of their own skills, values, attitudes, actions and choices in situations close to the professional activity through application in the classroom training methods (Kabasheva et al., 2015).

The complex of pedagogical conditions in the proposed structural-functional model includes: 1) formation of the motives of moral behavior of future engineers through the expansion of the information field of the ethics of management; 2) formation of the moral relations of the future engineer in the process of solving the system of ethical tasks; 3) development of experience of moral behavior of future engineers in the classroom through the application of training methods.

Table 1 shows the scheme of methods for the implementation of complex of pedagogical conditions of future managers' moral self-determination in the process of professional training at the university in which each teaching condition indicated a particular purpose, result, content, methods, means and forms.

Table 1. Diagram of methods of implementing the complex of pedagogical conditions of future engineers' moral self-determination in the process of professional training at the university.

Component parts of the methodology	Pedagogical conditions		
	1. Formation of motives of moral conduct through the expansion of the information field in ethics management	2. The formation of moral relations in the solution of the system of ethical tasks	3. The development of experience of moral behavior
Methods	<ul style="list-style-type: none"> - a case study; - playing methods; - analysis of specially selected texts; - brainstorm for the explanation of Proverbs and sayings - analysis; - synthesis; - modeling; - decision of ethics task 	<ul style="list-style-type: none"> - analysis; - synthesis; - modeling; - decision of ethics tasks 	Training methods: simulation technique in the form of a role-playing game; method of group reflection; group method of problem solving; business games
Means	<ul style="list-style-type: none"> - tests; - case study; - role-playing games; - ethical jobs 	- ethical issues: subject-cognitive, constructive-developmental, personal and meaningful exercises;	<ul style="list-style-type: none"> - exercises - controversial issues and situations; - professional confession
Forms	<ul style="list-style-type: none"> - practical classes; seminars; - lectures; - brainstorming 	practical and seminar classes; <ul style="list-style-type: none"> - debate; - round table; - brainstorming 	<ul style="list-style-type: none"> - practical classes; seminars; - group discussions; - brainstorming

A productive component of the model includes the criteria and indicators of the level of future managers' moral self-determination, as well as the result of the developed model, which was formulated as a transition for the future engineer to a higher level of moral self-determination.

Levels of future managers' moral self-determination are defined as low, medium and high. The motives of moral conduct, moral relations and moral behavior were chosen as the criteria of levels of moral self-determination.

The validity and reliability of the obtained results are provided by the logic of the research, justified methodological basis of the selected positions, using methods appropriate to the subject of the research. They are also provided by the reproducibility of the results at different stages of the experiment, the positive results of quantitative and qualitative analysis of the experimental data, confirming the

hypothesis of the study, the implementation of research results into practice of professional training of future engineers.

4. Conclusion

The developed structural-functional model is characterized by integrity, since structural components are mutually linked and determine the final outcome - transition of the future engineer at a higher, qualitatively new level of moral self-determination; by pragmatism because the developed structural-functional model is a means of organizing actions aimed at the development of future managers' moral self-determination, openness, as this model is part of the system of professional training of future engineers at the University. It and its realization of the complex of pedagogical conditions enable to form the motives of moral conduct among future engineers purposefully and fully, the own moral position and values in relation to other people and the profession.

The aim of this experimental work was to validate the model and the effectiveness of its complex of pedagogical conditions of future managers' moral self-determination in the process of professional training at the University. Analysis of the results obtained at the first stage of the experiment suggests that at this stage of the experiment, it is observed the predominance of a low and medium level of future managers' moral self-determination. Table 2 presents the final results obtained by the formative experiment. In the experimental groups at the end of the experiment, the number of students with a low level of moral self-determination decreased 2.1 times, with an average level of moral self-determination — 1.2 times, with a high level of moral self-determination — 2.0 times. The most productive growth of the students having a high level of moral self-determination is noted in EG3 where the complex of pedagogical conditions was introduced. Here, the number of future managers with a high level of moral self-determination has increased 2.6 times.

Table 2. Results of changes in level of future managers' moral self-determination at formative stage of experiment.

Groups at the beginning and end of the experiment	Number of respondents	Distribution of respondents by levels of moral self-determination (in %)		
		low level	average level	high level
EG-1 (H)	29	52	28	20
EG-1 (K)	29	28	38	34
EG-2 (H)	30	50	27	23
EG-2 (K)	30	23	37	40
EG-3 (H)	28	50	29	21
EG-3 (K)	28	21	25	54
CG (H)	30	50	27	23
CG (K)	30	50	27	23

The validity of the obtained data was tested by statistical criterion χ^2 (K. Pearson's chi-square). The statistical calculations of the experiment and the research confirm the given statistical hypothesis: only

the implementation of the complex of pedagogic conditions in the framework of the model is not a random phenomenon in the formation of future managers' moral self-determination.

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