Technological Approach to the Reflection Development of Future Engineers

Gulnara F. Biktagirova
Institute of Pedagogy and Psychology
Kazan (Volga region) Federal University
Kazan, Russian Federation
BikGF@mail.ru

Roza A. Valeeva
Department of General and Social Education
Institute of Pedagogy and Psychology
Kazan (Volga region) Federal University
Kazan, Russian Federation
valeykin@yandex.ru

Abstract— **Developing in modern Russia, engineering education is aimed on mastering specific competencies and self-development of future engineers with reflection taking a special place. Technological approach to the reflection development of future engineers can motivate students for professional work in the process of education, helps students to evaluate future professional activities, leads to self-development, self-organization and criteria restructuring of the their own activities. The paper presents the technological and pedagogical bases of the reflection development process, the main structural elements and stages of the process, testing reflection development of future engineers in Kazan Federal University.**

Keywords- reflection, reflection development, technological approach, engineering education, future engineers

I. INTRODUCTION

Developing in modern Russia, engineering education is aimed on mastering specific competencies, as well as personal self-development of future engineers, able to find creative solutions in a variety of situations and implement innovative processes. This aim implies changes in training students – future engineers. Analyzing the components of the educational content of previous years, including the skills to be developed in learning process, it should be noted that in Russian pedagogical literature of the last two decades, the ability to reflect is included into general learning skills compulsory for mastering in higher education institutions [1, 5].

But very seldom the attention is paid to the technology of the process. Moreover, in the new university standards of training future engineers professional reflection development is included into the list of their required competences. The realization of this task lies in creating the conditions and the development of technologies for the acquisition of professional reflective skills, students' interested attitude to reflective activities promoting proper reflexive behavior of an engineer in general.

II. REFLECTION

Reflection is the subject of research of different sciences interpreting this definition specific to their subject of study. This fact indicates the importance of reflection in human life and his training as a specialist.

In the individual's development as a professional, reflection holds a special place. According to many researchers, reflection includes:
- The ability to control one's actions, including mental;
- Monitoring the logic of his judgment;
- The ability to see the unknown in the known, unusual in an apparent, that is, to see the contradiction that is the cause of the thought movement;
- Carrying out a dialectical approach to the analysis of situation;
- Standing on the position of different "observers";
- Converting explanation of the phenomenon observed, depending on the purpose and conditions;
- The use of theoretical methods of learning to analyze the knowledge of its structure and content;
- Determining the sequence and hierarchy of cognitive activity stages, based on the reflection of the past activities experience by means of its foundation, the causes and meaning search [1, 2, 3].

All these skills are of great importance for the future engineer.

III. TECHNOLOGICAL APPROACH TO THE REFLECTION DEVELOPMENT

The realization of the future engineers' reflection development strategy was carried out within the study, organized by the Department of General and Social Pedagogy at the Institute of Mathematics and Mechanics named after NI Lobachevski of Kazan Federal University, by implementing three interrelated research areas: in studying psychological and pedagogical disciplines, enrichment by a professional context the content of future engineers humanitarian training; phased activities on orientation students on professional competence and values, the design of professional development individual trajectories.

When designing a future professional reflection development, we used the technological approach of forming future engineers' reflexive competencies, including:

- Any pedagogical influence, aimed at developing the student's corresponding reflexive knowledge, skills and abilities suggests the actualization of his personal activities;

- The content of training activities should be subjectively meaningful to the student and line up with the ways and characteristics of his reflective activity building out;
- Determination of the student in the reflective activity and its dynamics should become the object of control to the teacher;
- The educational process as a whole should subjectively be evaluated by a student as a self-change, and not a "plantation" by teachers alien goals, objectives, etc. [4, p.87].

The implementation of these fundamental procedural and technological provisions in the proposed process of future engineers reflection development, determines availability of a reflexive "field" that map the three interrelated areas of activity.

Technological and pedagogical foundations of this process of professional engineering reflection development are:
- Diagnosis of the future engineers reflection development and its results;
- programming of educational actions (sequence, interaction, succession), activating the formation of a constructive engineer;
- Instrumental and methodological and psycho-pedagogical support of the student in his reflective skills development.

Four process steps implemented in the learning process allow achieving a result: self-determination in the learning process, educational action, reflection and reconstruction activities, the whole learning process reflection. In accordance with and within the framework of these stages the development of the structural components of reflection (operations of evaluation, signification, comprehension and system reflection) takes place.

The main structural elements of the processes responsible for the future engineers reflection development are diagnosis of the state of both the process of development, and its results, the level of students reflection; correction the process of reflection training; problem-exploratory learning.

Thus, the process of the future engineers' reflection development is a reflexive and dynamic technological mechanism of learning. It is connected by the following cycles: diagnostic, teaching, modeling and strategic, activating the self-motion reflection and development of the ability for value rethinking, self-knowledge, self-development, self-organization and the criteria restructuring of their own activities.

The first step in the learning process implies a reflective analysis of the difficulties in reflective skills formation, looking for their possible causes and self-determination in the aims and tasks of the forthcoming training activities.

In the subsequent steps (training and simulating) the future engineers professional reflection development is implied in the course of the workshops with business discussions and role-playing games related to the professional choice, teaching and performing creative tasks; trainings (diagnostic, perceptual, communicative, and organizational. etc.), round-table discussions on relevant vocational themes; organization of teaching and research activities; work on joint projects with companies that simulate future engineers cross-cutting activities, etc. [6].

The final step suggests the analysis of the carried out activities in the form of the project presentation, speaking at the final seminars and conferences on the implementation of these projects into practice. This step contributes to the development of individual self-development strategies and programs lined up "for him" and having a concrete practical character.

The data of dynamic changes in reflection indicators based on the results of the "input" and "output" diagnostics show positive signs of this process. The experience of Kazan Federal University shows the effectiveness of technological approach to the reflection development of future engineers.

IV. CONCLUSION

The described points of using technological approach to the students' reflection development in higher engineering education serve the educational ensuring of future professionals formation. Such training encourages students to self-development of necessary knowledge and skills, develops personal and significant abilities, creates conditions for the professionally significant competencies development. A study conducted in one of the oldest universities in Russia, confirms it.

REFERENCES

[1] Biktagirova, G. The need of future pedagogical psychologists' educational reflection development. Philology and Culture, Kazan, 2009, vol. 17-18, 6-10.

[2] Vazheevskaya, N. Reflection as an element of the Physical Education content. Science and school, 2000, vol. 6, 23-26.

[3] Korzhuev, A., Popkov, V., Ryazanova, E. Reflection and critical thinking in the context of higher education. Pedagogy, Moscow, 2002, vol. 1,18-22.

[4] Biktagirova, G. Didactic conditions of teachers' pedagogical reflection development in the process of training: Dissertation for the degree of candidate of pedagogical sciences. Kazan State University, 2004, 170 p.

[5] Prachev, N. Pedagogical conditions of professional reflection formation of the technical training profile students in higher education. The thesis abstract on competition of a candidate of pedagogical sciences scientific degree. Stavropol, 2012, 17 p.

[6] Valeeva, R., Usova, S. Teaching and research work of students as means of self-realization. Higher Education in Russia, Moscow, 2006, vol. 9, 91-95.