Innovation Engineering Education

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Abstract

The author analyzes the issues of training engineers capable of innovation in the modern world. Some contradictions in the educational process and their consequences are indicated. Ideas for developing students' innovative approach are suggested. The role of production methodological developments is touched upon. It points to the task of training specialists with a high level of skill, creative potential, ready and capable of creative activity, with the fact that teachers can not divide students into capable of creative work and are not capable of separating them. The question is raised about a professional mobile specialist and an innovative specialist, a creative specialist with the skills and skills to make innovative decisions in his and related fields of science, technology and technology. It points out the importance of competencies related to production and technological and organizational management activities, planning and conducting experiments and design developments. The issue of training a professionally mobile specialist within the walls of an educational institution, capable of solving various professional tasks, designing its own professional activity, ready for purposeful professional creativity is considered. It points to the importance of forming a creative beginning only after acquiring all the necessary knowledge and skills in the process of applying them.

The need for the innovative development of any society sets a task before the modern community related to the provision of effective assistance to teachers of technical universities in training of specialists with superior skills and a creative potential, who are ready for and capable of creative activities. At each specific manufacturing site young professionals are trained and more often retrained to perform their basic professional production tasks and, of course, it would greatly simplify the task, if young professionals receive the necessary basic skills at the educational institution. In any case motivational incentives and feeling of a real need for the innovative level of solving of arising or long-standing production problems are of great importance. Personal characteristics of each specialist should also be taken into account, since the ability to absorb job instructions and methodological materials are not the same, and only persons with pronounced creative emphasis can absorb them in short time and follow the requirements and recommendations of their governing documents. Unfortunately, when studying compulsory educational disciplines teachers cannot divide students into those who are capable of creative work and are not capable of creative work and are forced to work with everyone equally, although it was proved long ago that creatively working specialists make up only a very small part of all workers. For companies, including innovative ones, it would even be harmful, if all specialists are innovative enthusiasts, because there are standard, restricted

works that must be performed without technological imagination, in due time and in a quality manner, in accordance with the requirements of the specified guidance and methodological documents. Again, unfortunately, teachers believe that a professionally mobile specialist is typically an innovative specialist, a creative specialist who is able to make innovative solutions in own and related fields of science, engineering and technology. The basis for this level of qualification is a high level of education in the field of humanitarian and exact sciences, special disciplines. Is that the case? Possession of computer technology, design techniques and information search, system engineering, methods of creative thinking activation, social and value orientations helps to reveal an engineer as a professional specialist. In the process of studying at a technical university students should acquire general professional competencies related to the ability to master new knowledge independently, use natural scientific, mathematical and engineering knowledge to solve problems of innovative development of the society. But at the same time it is impossible to take into account the specifics and peculiarities of all existing manufacturing sites in the course of training, and this determines the importance of methodological and guidance documents and papers on site. Competencies associated with engineering and manufacturing activities, as well as organizational and management activities, planning and carrying out of experiments and design developments are important. General cultural competences are related to the ability to negotiate, establish contacts, show initiative, take organizational and managerial decisions and bear responsibility for them. The craving for self-development, improvement of qualification and skills, realization of the social significance of their profession, comprehension of gained experience and readiness to change their professional profile, adapt to changes in the content of social and professional activities are relevant to a future specialist, regardless of the branch of industry. In fact, there is much tension around the issue of training at an educational institution of a professionally mobile specialist, capable to solve professional problems, design and coordinate own system of professional activity, ready for results-oriented professional creativity. Many teachers believe that during the study at a university it is not enough to develop ways of adapting to a changing environment and achievements of the scientific and technological progress in a person. Education, as many believe, should form creativity, promote creativity in becoming the norm and form of its existence, an instrument of achievements in all spheres of human activity — at work, in science,

technology, culture, arts, management, politics — in a person. The higher the pace of change in the world is, the higher the requirements for education are. This statement cannot be accepted. First of all, education must be education, i.e. it should give fundamental knowledge and a clear ability to use it to a future specialist. If during the study part of the study time of a person, who does not yet have basic skills and knowledge, is devoted to innovative exercises, then nothing good will come of it — he will not have fundamental knowledge and will not become a new inventor. So, the most important feature of engineering activity is its creative nature, but only after acquiring all necessary knowledge and skills in applying it. Creativity is understood to be the process of human activity, during which qualitatively new material and spiritual values are created. But with the best will such a process cannot be infinite. Unfortunately, it is often not explained to future inventors that an innovative idea should be adjusted to a real product and not always generators of ideas can be effective in this process. Creativity is an emerging ability of a person to create a new reality on the basis of knowledge of the laws of the objective world that can satisfy diverse social needs using the material delivered by reality. Types of creativity are determined by the nature of the creative activity. If we evaluate results of the innovation process by economic categories, it becomes clear that certain commercial conditions are necessary for the innovation process, and not always even the most talented young engineer can get into such conditions and, especially, create such conditions. Therefore, it makes no sense to assert that the level of education creates an innovative specialist; it is only in some lucky cases that he can be one of the components of innovation success.

The author of this paper has already noted several times, based on the experience of the best technical universities in the United States of America, it is impossible to train innovative engineering specialists without an Institute of Innovative Entrepreneurs.

Only when the teaching staff is completed with entrepreneurs, innovative education can give certain advantages to talented young engineers, but the specifics of each manufacturing site or peculiarities of the manufacturing process of each specific company could be studied and understood only on site and on the basis of methodologies and guidelines prepared by the specialists of the enterprise.

Il vaut mieux prévenir que guérir. -French proverb
 "It is better to prevent than to heal."

1. Primary check of Avaya Communication Manager telephone systems

This manual describes the primary actions for checking a Avaya Communication Manager telephone system status, availability of its services, and determining the current errors in the system software.

Avaya Site Administration application or a free terminal emulator TuTTY can be is used.

The following figure illustrates some common Avaya server-gateway architecture.

FIGURE 1. Excerpt from the author's study guide.

Obviously, not all can get high results in certain areas of activity, so it makes it possible to state that the level of creative potential, i.e. creative ability, is different in different people.

We can agree with this statement, but under the sole condition — if high creative potential is available, if an innovative entrepreneur notices it and promotes in time.

Another most important feature of this adaptive process is the ability of an entrepreneur to link general requirements and provisions with certain conditions and demands put forward at each specific manufacturing site considering all latest and newly emerging opportunities that harmoniously take into account the principle of technical feasibility and its stage-by-stage association to commercial viability.

Based on the classification proposed by teachers, we will distinguish levels of personal creative development that were found among students of technical universities. *Low* level is manifested in the ability to analyze the subject situation with the aim of transforming it, in realizing real-life problems and own experience in solving practical problems. The peculiarity of

this level is rational arrangement of knowledge, a pragmatic view of the situation, and the reproductive nature of tasks performance.

Students of this level of creative development find it difficult to look at the situation in a new, unusual way, show a wide range of actions when performing problem tasks. The alternativeness of thinking is not a real factor of integration of knowledge of all academic disciplines. Students show only some independence in decision-making. In this regard it is extremely necessary to systematize and correctly direct the alternativeness of thinking, since it is very often possible to lose the basic idea when you strive to think alternatively.

Here we should turn to computer modeling and check all the options using the whole process and its variants for a comprehensive analytical tool for the intensification of the personal stage of brainstorming.

In this case brainstorming involves consideration of all options and possibilities that come from new materials, fundamentally new control systems and fundamentally new systems of computer design and detailed design.

Medium level of personal creative development is manifested in reflection about what I “can” and what I “want”, in understanding the determinants of own development, in the ability to set goals and objectives for self-transformation and self-improvement. An adequate reflection of yourself, the ability to analyze your own actions and foresee their consequences are psychological innovations of this level. As a rule, this level assumes creative inclusion of knowledge into a real production process.

The specialist’s ability to solve production problems independently and efficiently is the criterion of the achievement of this level of training in production conditions. This raises the question of maximum integration of the educational process with real problem situations that are typical for each company and each type of manufacturing sites.

Any template in this process can lead to a conceptual error and movement of the whole process away from the desired direction.

So, developers of methodical guidelines and standard operating procedures, who have a handle on the situation and are creative individuals by default, should first consider niceties of local specifics in combination with general provisions, taking into account the role of innovation

in the transformation of modern science and its linkage to specific tasks and needs of each specific manufacturing site.

High level of personal creative development makes it possible to solve at each particular inventive level complex problematic tasks that arise, inter alia, at the junction of classical disciplines. Results of activities of an innovative and creative specialist spark, as a rule, a public outcry gradually turning into the commercial equivalent of success.

The ability to take technical decisions at this level, the ability to find the required information and learn, the ability to communicate and convince, maintain the atmosphere of creativity in the team, understanding of contemporary problems, adherence to the rules of professional ethics are the qualities that are the basis for the creative, productive activity of a technical university graduate.

People of this level are both dreamers and pragmatists; they are self-sustained and independent, flexible, effective and emotionally stable. But the basic skill is an innovative, inventive approach. It is no coincidence that an engineer in Latin means “contriving, devising”.

References

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