Creative Independent Learning for Developing Students' Professional Competencies
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Abstract
Over the last decade or more, the development of professional competencies has come into sharp focus for higher education. The paper considers the results of studying the organizational and pedagogical conditions for developing the professional competencies of undergraduate students through independent learning. Due to the transition to a two-tier education system, a weighing factor of the independent learning has increased, causing the necessity to reframe a traditional model of organizing the process of teaching. As pointed out by employers, the level of graduate competencies does not always correspond to the operational tasks for bachelors in the field of quality management; the tasks are related to the development, implementation and maintenance of quality management systems and system efficiency analysis. Bachelors should be able to plan activities, set goals, make decisions, but this is impossible without developing the self-organization and independent learning. The necessary pedagogical conditions for developing the professional competencies during the process of independent learning have been identified. The paper provides some examples of organizing the students' work in making projects, classroom activities, individual home tasks and tests on the Moodle e-learning platform.

Keywords: competencies; competency-based approach; Federal State Educational Standard 3+ (FSES 3+); pedagogical conditions; creative competencies; students' independent learning

1. Introduction
Currently, Russian education applies competency-based approach in order to organize the process of teaching, since the approach is relevant in today's complicated world with its growing amount of information and knowledge rapidly becoming obsolete. The competency-based approach stated in the FSES 3+ implies general cultural, general professional and professional competencies necessary for the graduates. The competencies acquired by students are target settings for designing the university educational programs. The educational programs list industrial and

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technological, organizational and managerial, designing and engineering activities for bachelors which assume a number of general cultural and professional competencies to be mastered by the students. Let us identify a number of current contradictions in forming the core professional competencies of bachelor's degree students:

- the contradiction between students' objectives, content, and terms of educational activities and the professional's work activities;
- the contradiction between predominance of theoretical training for students, traditional learning in the form of static schemes, ready knowledge and algorithms of actions to remember, and the necessity to apply knowledge in the professional activities, to form dynamic design thinking;
- the contradiction associated with a higher weighing factor of independent learning in the FSES and the current condition of students' motivation for independent learning as well as practical elaboration for organizing the process of independent learning (Verbitskiy, 2004, Kozyreva, 2009).

A lot of issues related to development of professional competencies are considered in the Russian pedagogics by I.A. Zimniaya (2003), A.V. Khutorskoy (2003), A.A. Verbitskiy (2004), A.V. Gamov (2008), V.M. Rostovtseva (2009) and others. A 4-year bachelor's degree course assumes the high importance of early professional competencies development. To develop the competencies in undergraduate students is not easy as the students do not have a high level of theoretical and practical experience. Creative independent learning which involves implementation of the competency-based approach components such as individual approach, subject-subject interaction and activity-based approach is one of the possible ways of solving the problem. In addition, creative abilities and competencies of the graduates are in demand for today's Russian economy which will be transformed on the basis of innovation in terms of transition to the knowledge-based economy. Although the FSES does not contain the term *creative competencies*, these competencies are implicitly observed in the standards, i.e. the terms for professional competencies imply mastering creative competencies (Table 1).

<table>
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<th>FSES 3+ professional competencies in the field of 27.03.02 Quality management</th>
<th>Corresponding creative competencies</th>
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<td>the ability to apply problem-oriented methods of analysis, synthesis and optimization of the quality assurance processes (PC-4);</td>
<td>The ability to search for causes of the phenomena, to find unknown relationships of certain qualities and new approaches to the problems, and to identify opportunities for practical application of laws of certain disciplines in unconventional situations;</td>
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<td>the ability to identify and evaluate the productive and non-productive expenses (PC-5);</td>
<td>the ability to solve non-standard problems including the areas which seem to be unrelated to the area of knowledge considered;</td>
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<td>the ability to conduct corrective and preventive measures aimed at quality improvement (PC-10);</td>
<td>the ability to identify basic contradictions in the area of study, to set new goals and objectives.</td>
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<td>the ability to take reasonable risks when making decisions (PC-11);</td>
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<td>the ability to correctly formulate the objectives (problems) of the activity (project, research), to establish relationships, to create the task system models (problems), to analyze, and to diagnose the causes of problems (PC-13).</td>
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2. Objectives, methodology, and research design

The following directions of work by Russian and foreign scientists became the theoretical and methodological basis for our research:

- the competency-based approach to the process of teaching;
- the theory of designing the educational content, including professional education.

In recent years, the issues of forming and intensifying the independent learning in higher education have actively been discussed. So the basic directions of research are:

- the technology of organizing the independent learning;
- general pedagogical features of organizing the independent learning.

The paper focuses on the organizational and pedagogical conditions for forming the professional competencies in the independent learning of bachelor's degree students enrolled in the quality management program. The purpose and content of work result in the choice of research methods. We have used some theoretical methods: investigation,
comparison, analysis, systematization, compilation and synthesis of the psychological and pedagogical literature, Russian and international regulatory documents, educational documents, teaching experience as well as some empirical methods such as questionnaires and surveys. Theoretical and empirical research methods have been used to identify the organizational and pedagogical conditions for developing the professional competencies of bachelor's degree students in the field of quality management during the process of creative independent learning at the Physical Methods and Tools of Quality Control department in Tomsk Polytechnic University (TPU).

The first stage of research (July-September 2014) involved finding out the topic status in Russian and foreign theory and practice; determining the goal of the research; studying and analyzing professional competencies of bachelor's degree students enrolled in the quality management program. The second stage (October-December 2014) involved conducting surveys and interviewing the teachers (14 people) and students (94 people). The survey results have been processed to draw the conclusions.

3. Results and discussion

The analysis of the survey results has revealed the following organizational and pedagogical conditions:

- motivational;
- didactic;
- communicative;
- infrastructural.

The first group of conditions is fundamental. The issues of motivation for independent cognitive activity of students require special attention. According to the survey, 78% of the students apprehend the importance of independent learning and have a positive attitude towards this type of activity which gives opportunities for self-development. The students interpret independent learning as tasks assigned by the teacher.

At the same time, just 48% of the surveyed ones have self-organization skills (ability to prioritize, to efficiently spend time, to take responsibility). According to the teachers, the majority of students (72%) understand the importance of independent learning but they are not motivated enough to implement this approach. At the same time, the students' skills essential to perform the independent work are evaluated by teachers as average (about 4 points out of 10). Perhaps, this is the reason for lack of motivation to work independently. The teachers of the Physical Methods and Tools of Quality Control department in TPU have identified some skills necessary for the students to successfully perform independent work: skills of working with information sources (search, analysis, synthesis of information), self-control, self-discipline, and creative approach to independent work assignments.

The second group defined as didactic is the group of organizational and pedagogical conditions for developing the professional competencies of the bachelor's degree students enrolled in the quality management program in the process of creative independent learning.

According to the survey results, the most common form of students' independent learning is doing the homework. Also, the students consider reading professional literature to be rather efficient. However, about 30% of students define the research on the chosen topic and the project committed by a company/organization as the most efficient independent learning. Some students (64%) believe that it is teachers who must teach students to study independently. About one third of the students are ready to learn from each other. According to the respondents, the assignments performed as a part of independent learning should be assessed both by teachers and students. The idea of mutual assessment by students is not very popular. The teachers from TPU consider some traditional forms of learning (course paper, homework) as well as some innovative forms of learning (project activities, development of the visual models of objects, processes and systems, Moodle-based e-learning) to be the most efficient for students' independent learning. The teachers frequently use such common forms of independent learning as essay, course paper, and individual homework. This may be due to the teachers' lack of technical literacy.

Practice-oriented independent learning can be used rarely due to some difficulties in interaction between the teachers and staff of various enterprises. It means, therefore, that students have no opportunities to perform practical tasks. According to the teachers, the most desirable form of self-evaluation is assessment by the teacher and other students. The research results show that the teachers underestimate the importance of students' self-assessment for independent learning.
The communication conditions are the third group of the organizational and pedagogical conditions. The conditions at the Physical Methods and Tools of Quality Control department in TPU are favorable for interaction between students and teachers. It should be noted that the teachers of the department can be contacted yet some students (about 10%) have difficulties communicating with them. The teachers believe their role in organizing the independent learning can vary. Most respondents think the most important roles of a teacher are: to be a Supervisor, Consultant, Expert, and Coordinator. A minor part of the surveyed teachers consider themselves to be the transmitters of knowledge (5%). Only one third of the respondents individualize the independent learning, with most teachers using an individual approach to students from time to time. The students' unwillingness and lack of preparation to take responsibility for their learning results as well as teachers' ignorance contribute to slow development of the students' independent learning. At the same time, the teachers almost always take into account the students' opinions when preparing tasks for independent learning. The majority of the teachers (95%) have tutorial classes for consulting the students. However, the students are underinformed on the tutorial classes schedule.

The fourth group of conditions is infrastructure conditions. The students survey results allow making the following conclusions. Most students use the Internet as a primary source of information. They rarely go to the scientific and technical library to work on independent learning tasks. Most students experience some difficulties getting the information. They rarely refer to foreign sources of information, and only a third of students read books beyond the scope of educational process.

Most teachers believe that the University scientific and technical library contains a sufficient quantity of information sources to perform the tasks. The most preferred source of information both for teachers and students is the Internet. It should be noted that most teachers were reading books on professional subjects at the moment of the survey.

The ‘Quality’ debating club for the students, graduates and employers has been established at the Physical Methods and Tools of Quality Control department. The sources of information have been discussed at one of the meetings using the focus group method. Here are the results of the discussion (they are arranged as answers to questions). It is essential to develop professional competencies of undergraduate students via creative activities and creative independent work.

**Why should this be done?**
* FSES 3+ requirements.
* The training time in universities is limited to 4 years. Within this period, a student has to acquire competencies sufficient to succeed in the professional area.
* The development of knowledge-based economy. Specific, unique skills which can be generated through innovations have come to the foreground. The innovative development of the country is emphasized, with innovation being the result of creative activity.
* Undergraduate students lack theoretical training and practical experience.
* Creativity is an activity. Students use a variety of methods to transform information into knowledge, for example, visualization (drawing schemes and pictures), structuring the material, interpreting, and passing it through the prism of their own experience. Creativity is aimed at the result, and the authors' achievements can be estimated. Creativity is interdisciplinary in its nature. The techniques, approaches, methodologies considered in various disciplines can be used for solving the designated problem (Vostroknutov & Razuvayev, 2012). The student creative activity does not require enormous resources. Modern economic situation leaves Russia no other chance of a worthy place among economically developed countries except development of innovative economy (Sbornik metodov poiska novyh idej i reshenij upravlenija kachestvom, 2011; Rjaby & Mezhueva, 2014). And for this purpose it is essential to:

**Where? When?**
At the degree-granting department of the university. Throughout the first and second years of study.

**How?**
Put interesting and educational tasks corresponding to the students' level of competence, abilities, and inclinations. Use modern educational technologies including the development of critical thinking, organize the independent cognitive activity of students (Abrashkina, Boev, Voronova & Ephin, 2012; Red'ko, Plotnikova, 2014). Provide regular training for the teachers in the form of educational and professional activities (Smyshlyaeva &
Develop the possibilities of free access to the information field and provide algorithms for performing the purposeful 'flying around' in the information space.

Who?

Teachers and students in the subject-subject interaction.

The responsibility for the results of educational process cannot be imposed only to teachers. The teachers' role in the educational process is much more diverse when using the competency-based approach. The focus of teaching has shifted from the knowledge transmitter to students' cognitive activity, creation of pedagogical conditions within the frame of responsibility and authority.

Under good pedagogical conditions, the expected level of professional competencies depends on the students' abilities and motivation to develop knowledge. With regard to this, reflective thinking is rather important. Ask yourself the question: what has been achieved and realized? This should be done to set goals and objectives for further development and the ignorance level identification.

4. Conclusion

The research has revealed the following organizational and pedagogical conditions to develop professional competencies through creative independent learning:

1. Motivational;
2. Didactic;
3. Communicative;
4. Infrastructural.

The analysis of the motivational conditions has shown the students of the Physical Methods and Tools of Quality Control department in TPU apprehend the importance of independent learning and have a positive attitude towards this type of activity but they are not motivated enough to implement this approach (e.g., doing the tasks which develop creative thinking). Half of the students lack self-organization skills essential for efficient independent learning.

The analysis of the didactic conditions has demonstrated that the most common forms of independent learning are doing homework, writing essays, reports, and course papers.

The fact that practice-oriented independent learning is rarely used can be caused by some difficulties in interaction between the teachers and staff of various enterprises. It means, therefore, that students have no opportunities to perform practical tasks. The research has shown that the teachers underestimate the importance of students' self-assessment for independent learning.

The staff of the Physical Methods and Tools of Quality Control department has developed electronic courses and implemented the mixed learning approach aimed to provide efficient students' self-studying. The electronic educational resource (Moodle) provides the opportunity to organize students' independent learning at a higher quality level. The process of teaching based on education program for bachelor's degree students in the quality management program allows us to amass the wealth of experience related to students' creative projects (Itogi finala konkursa «nacional'nyj molodezhnyj proekt – jestafeta kachestva», 2013).

According to the results of analysis of communicative conditions, the atmosphere at the Physical Methods and Tools of Quality Control department in TPU favors the interaction between students and teachers. However, some students consider the teachers indifferent to their success, and the teachers sometimes demonstrate the authoritarian style of communication. It should be noted that the teachers of the department can be contacted but some students (about 10%) have difficulties communicating with them.

The analysis of infrastructural conditions has confirmed most students' using the Internet as a primary source of information. Students rarely go to the scientific and technical library to work on independent learning tasks. Most students experience difficulties getting the information. They rarely refer to foreign sources of information.

The research has revealed the following problems of organizing the process of professional competencies development via creative independent learning:
1. The existing rating system for assessing the students' achievements contributes little to their motivation for creative independent learning.

The work assessment (control) is one of the difficult aspects in implementation of the creative independent learning. As far as students are concerned, there is nothing more crucial to the learning experience than assessment. Progress is unachievable without assessment. In order to map out the direction for the future development, it is important to understand what has already been achieved. At the same time, the existing rating system, and the scholarship awarded for getting good marks contribute little to the motivation for students' creative independent learning. Furthermore, the assessment causes erosion of positive teacher-student relationships. The modern educational approach implies a trust-based partnership. The assessment validity highlights the difference in the status of 'partners' and destroys the motivation for creative work. We suggest to assess the work in the form of the students' self-reflection (what students have learnt) and the interaction between students and teachers (teachers and students' expectations of the results, ways of improvement).

2. The time resource is not always sufficient for methodical support of students' independent learning.

Teachers should be able to perform the educational process as their main activity. Organizing the creative independent learning (methodological support, forms of control) is even more time-consuming than specified in the documents regulating the teachers' activities. In general, preparation for classes is the main teachers' activity which always remains 'behind the scenes' and is unclear to those not involved in the process of teaching. Nor do we diminish the importance of teachers' scientific activities.

Despite the existing problems, the development of professional competencies of students enrolled in the quality management program is provided at the Physical Methods and Tools of Quality Control department in TPU. The fact that almost 100% of the graduates work within their speciality, students participate in conferences, competitions, contests winning prizes proves the efficiency of developing professional competencies in students enrolled in the quality management program. In addition, the graduates keep in touch with the department staff, and they actively participate in development and implementation of the General Education Program.

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