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TEACHING METHODS OF ECONOMICS CONTRIBUTING TO ECONOMIC COMPETENCE OF BACHELORS OF ENGINEERING

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Abstract

Nowadays, bachelors should be good production engineers, and they should also understand economic, environmental, social and other problems. When appointing bachelor's graduates as low- and middle-level managers and preparing them for a professional career of directors of private industrial companies, it was revealed and proved that it was necessary to apply didactic methods and methods of responding to economic challenges as fundamental for teaching economics to bachelor's students. The study is aimed at revealing, providing a theoretical and methodological rationale for methods contributing to a growth of efficiency of shaping economic competence among bachelor's students in technical majors, when teaching economics. In view of the above objective and subject of the research, a key task is to develop economics teaching methods contributing to shaping economic competence among bachelor's students. In the paper the following research methods were used: analysis, synthesis, statistical methods of processing educational research result. Following the conducted research, the authors suggest that economics teaching methods should include a set of didactic methods and methods of responding to economic challenges, equally ensuring an appointment of bachelor's graduates as managers and contributing to their orientation to a professional career of a private industrial company director.

Keywords: Economic competence, professional competence, professional education, economics teaching.

1. Introduction

A key factor of development of present higher education is social and economic reforms in the country. At present, higher education is under constant improvement (Cervantes, 2017; Romanov, 2018; Zinovieva & Usmanova, 2018). The 2020 Concept of Long-Term Social and Economic Development of the Russian Federation, the 2025 National Doctrine of Education in the Russian Federation, the Bologna Agreement signed by Russia in 2003, the State Program of the Russian Federation on Information Society (2011–2020), Federal Law on Education in the Russian Federation No. 273-FZ dated 29 December 2012 focus on development of the Russian system of professional education, increasing competence of graduates and their compliance with current labor market requirements.

Total elimination of the institution of young specialists and difficulties with finding a job for university graduates are drivers of teaching bachelor's students in such a way that upon university graduation they could carry out a set of duties and have required professional skills. Practical experience shows that a lot of bachelor's graduates start their professional career from low management positions in private industrial companies.

Pedagogy pays a lot of attention to shaping professional competence in general and its components. A wide range of issues has been already settled: new federal state standards on higher education were developed and introduced, a wide set of problems regarding improvement of efficiency of teaching bachelor's students in changing economic conditions was studied, etc. However, there are still open issues of job-oriented economic education of bachelor's students, as social, economic and professional courses were removed from the federal state standards on higher education, which formerly aimed at shaping economic competence of specialists.

Thus, the study is important today because future bachelor's graduates in technical majors should be prepared for their professional activities at low and middle levels of management in compliance with market economy requirements.

General methods

In the paper the following research methods were used: analysis, synthesis, statistical methods of processing educational research result**.**

2. Problem Statement

A key task is to develop economics teaching methods contributing to shaping economic competence among bachelor's students.

3. Research Questions

The subject of the research is shaping economic competence among bachelor's students in technical majors.

4. Purpose of the Study

The study is aimed at revealing, providing a theoretical and methodological rationale for methods contributing to a growth of efficiency of shaping economic competence among bachelor's students in technical majors, when teaching economics.

5. Research Methods

In the research, a methodology aimed at shaping economic competence is deemed as a set of methods and techniques. Studying the methodology integrating a variety of combinations of methods and techniques for shaping economic competence is a very massive task. Therefore, the paper describes only the aspects serving as a ground for a hypothesis of this research, namely economic competence will be efficiently shaped, if economics teaching methods provide for appointing bachelor's graduates as low and middle level managers, contribute to preparing them for a professional career of a director of a private industrial company. Consequently, we will reveal a set of professional duties of low and middle level managers and determine economic methods to cope with such duties.

A theory and methodology of the research were findings of Russian and foreign scientists, who deal with production and financial management, economics of an industrial company, and marketing (Ivashina et al., 2018; Koptyakova, 2004; Mogilevkin, 2012; Romanov, 2018; Sadler, 2016; Shekhmirzova & Gribina, 2017). The mentioned research is required to determine economic methods applied by low- and middle level managers to cope with professional tasks.

The structure of duties of both low- and middle-level managers includes four types of professional activities: production and technology, organization and management, research, and project activities. Differences between activities performed by low- and middle-level managers include a nature of professional functions and types of taken solutions. Low-level managers mainly perform executive activities and take operating decisions, and middle-level managers carry out managerial activities and take current decisions. The analysis of professional tasks of low- and middle-level managers showed that to perform them, it was required to apply a set of economic methods, as a rule. When determining a composition of such methods, we deemed it possible to classify them by the following groups:

Group I – methods to solve tasks of production management, including: 1) production preparation methods; 2) production programming methods; 3) reliability analysis methods; 4) quality assessment methods; 5) rate setting methods; 6) production simulation methods.

Group II – methods to solve tasks of financial and economic activities, including: 1) key macroeconomic performance evaluation methods; 2) financial and economic analysis methods; 3) market price determination methods; 4) costs determination methods; 5) production cost evaluation methods; 6) company economic development forecasting methods.

Group III – methods to solve marketing tasks, including: 1) marketing information collection methods; 2) marketing information analysis methods; 3) goods distribution and delivery methods.

The above methods focus on performing tasks of professional activities of managers.

What didactic methods and techniques should be used in teaching economics to ensure that students have learnt methods of performing professional tasks? Theory and methodology of teaching

accumulate over one hundred of classification of teaching methods. A classification of teaching methods by Belikov et al. (2018) helps us to implement to the fullest extent possible principles of activity, person-centered and system approaches and serves as a methodological basis for shaping economic competence among bachelor's students, when teaching economics. Following the classification, all methods were divided into four groups, which are implemented by a set of teaching methods:

1) Algorithmic methods – use of algorithms to organize profession-oriented, learning and cognitive activities (an activity approach).

2) Role playing – learning professional activities, when playing a game (an activity approach).

3) Reflection methods, analyzing a set of personality traits, which are significant for the occupation (critical mind, commitments to facts, raising and settling questions, holding a discussion, readiness for a proper evaluation, understanding personal motivations) – a person-centered approach.

4) Creative thinking development methods, fostering development of skills to apply professional knowledge in a new situation, finding non-conventional approaches to solving professional difficulties (a system approach).

When appointing bachelor's graduates as low- and middle-level managers and preparing them for a professional career of directors of private industrial companies, didactic methods and methods of solving economic challenges form an integrated complex. Didactic methods form the basis for teaching bachelor's students how to use methods of responding to economic challenges.

When choosing personal development methods to form a career orientation for bachelor's students during teaching mandatory (basic) and elective subjects of learning programs in technical majors, we used a classification of personal development methods, including their target, content and process parameters (Kostina, 2004).

In a teaching process, teaching and personal development are closely related, dependent on each other, and represent unity and integrity. It is difficult to separate them from each other in a teaching process. Separating them by independent categories is conditionally to a greater extent. A set of methods to develop consciousness, organize activities and broaden experience, shape behavior, and encouragement methods was determined with regard to every individual trait of a career-oriented personality, considering goals, tasks and specific scope of personal development, age of bachelor's students, a level of building a students' team, individual and personal traits of students, personal development means and expected consequences.

A set of personal development methods to develop traits of a career-oriented personality (according to Chiker's (2003) test):

1) technical and functional competence (story, explanation, lecture, dispute, exercise, educational situations, competition, encouragement),

2) general managerial competence (instructions, explanation, dispute, exercise, assignment, encouragement, competition),

3) autonomy and independence (conversation about ethics, infusion, persuasion, example, public opinion, educational situations, encouragement),

4) security and stability (story, explanation, persuasion, example, public opinion, educational situations, encouragement),

5) service and dedication to a cause (explanation, conversation about ethics, persuasion, dispute, public opinion, educational situations),

6) pure challenge (story, infusion, dispute, example, educational situations, competition, encouragement),

7) lifestyle (lecture, explanation, infusion, public opinion, example, encouragement),

8) entrepreneurial creativity (story, explanation, conversation about ethics, dispute, example, exercise, assignment, educational situations, competition, encouragement).

A need for proving efficiency of development of economic competence among bachelor's students determines a task of setting criteria and indicators of efficiency.

It should be noted that in this research the concept of criterion is understood as a leading characteristic (or a group of similar characteristics) of a subject, a phenomenon, a process under study, used as a basis to evaluate their state or efficiency.

An indicator is used to measure such characteristic.

When choosing criteria, we followed the statement of Duranova and Lesher (as cited in Belykh, 2006) that professional competence of students is revealed:

- at a level of professional knowledge,

- at a level of professional skills,

- by attitude, orientation of a personality with regard to its profession, and results of work, motivation for professional activities,

- by personality traits of bachelor's students, consisting in a way of thinking, reflection, self-assessment, goal setting, commitment and businesslike manners.

Professional competence includes creativity at work, integral interest in future professional activities.

Economic competence is a part of professional competence; therefore, a criterion of its efficient development is a level of efficient development of economic competence among bachelor's students (Kostina et al., 2017).

Quality indicators of levels of efficient development among bachelor's students majoring in technical courses during teaching mandatory (basic) and elective subjects of learning programs may be (Drovyannikov, 2009; Popov et al., 2007):

- level of bachelor's students' knowledge about economic activities of industrial companies,

- level of bachelor's students' practical skills of economic activities,

- bachelor's students' ability to put economic knowledge into practice,

- bachelor's students' assessment of their economic competence.

A quantitative comparative evaluation of the above indicators will be determined by calculating the following efficiency factors based on mathematical statistics methods (Zhuchok, 1985):

1. A coefficient of efficient learning of knowledge about economic activities of industrial companies (Q_l) is calculated using formula (1):

$$Ql = \frac{M_2 - \Delta 2 + \Delta\beta}{M_1 + \Delta 1}, \tag{1}$$

where M_1, M_2 are empirical average values of academic performance of groups before and after the experiment (or control and experimental groups),

$\Delta 1$, $\Delta 2$ are the confidence interval limits of the mathematical expectation of academic performance of groups before and after the experiment at confidence probability p (or control or experimental groups),

$\Delta\beta$ is a difference in an average point of academic performance of groups after and before the experiment (or between values of experimental and control groups).

When performing a statistical assessment of acceptance of the hypothesis, we assume the statement that in pedagogical research in this case it is acceptable to limit the probability error to 0.05 (p = 0.95).

2. A coefficient of efficient practical training of bachelor's students (Q_p) is calculated using formula (2):

$$Qp = \frac{Mn_2 - \Delta n_2}{Mn_1 + \Delta n_1},\qquad(2)$$

where Mn_1, Mn2 are empirical average values of practical training of students before and after the experiment (or control and experimental groups),

$\Delta n1$, $\Delta n2$ are limits of confidence intervals Mn1 and Mn2 at confidence probability p.

3. A coefficient characterizing bachelor's students' skills of applying economic knowledge into practice (Qpl) is calculated using formula (3):

$$Qpl = \frac{Qp}{Ql}.\qquad(3)$$

Bachelor's students' self-assessment of developed economic competence was studied by giving the professional career test by Chiker (2003).

4. A coefficient of bachelor's students' self-assessment of economic competence is calculated using formula (4):

$$Qsa = \frac{\sum Np}{50},\qquad(4)$$

where $\sum Np$ is an arithmetic sum of points given to bachelor's students, when answering the questions aimed at assessing a level of developed economic competence.

In this research, a quantitative characteristic of self-assessment of levels of developed economic competence is presented as follows:

- high (34–50 points; $0.68 \le Qsa \le 1.00$),
- medium (17–33 points; $0.34 \le Qsa < 0.68$),
- low (0–16 points; $0 \le Qsa < 0.34$).

At maximum number of points, which may be given to a student under test, amounting to 50, the quantitative characteristic of self-assessment of these levels has the following values:

- a high level of readiness to manage people applying his/her economic competence (the student constantly strives to apply economic knowledge in his/her future professional activities, is sure about the quality of his/her economic training and its support of his/her professional growth),
- a medium level of readiness to manage people applying his/her economic competence (the student is not always ready to apply his/her economic knowledge in his/her professional

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activities; he/she is not quite sure about his/her economic training or its support of his/her professional growth),

- a low level, not ready to manage people applying his/her economic competence (the student is afraid to apply his/her economic knowledge in his/her professional activities; he/she is not sure about the quality of his/her economic training or its support of his/her professional growth).

5. A coefficient of self-assessment of developed economic competence is an efficiency coefficient, i.e. "a quantitative relative factor determining a value of the effect", is calculated using formula (5):

$$Q_S = \frac{Q_{SA2}}{Q_{SA1}}, \tag{5}$$

where Q_{sa1}, Q_{sa2} are coefficients of bachelor's students' self-assessment of economic competence before and after the experiment (control and experimental groups of bachelor's students).

Using the calculated values of Ql, Qp, Qpl and Qs, we may determine efficiency of developed competence of bachelor's students with regard to three levels: high, medium and low (Table 1).

Table 01. Efficiency levels of developed competence of bachelor's students

Description	Levels		
	High **Qef>1**	**Medium** **Qef=1**	Low Qef<1
1. Knowledge	Deep and profound economic knowledge in all fields of private industrial companies. Economics teaching methods contribute to achieving Ql>1.	Deep and profound economic knowledge in the majority of fields of private industrial companies. Economics teaching methods contribute to achieving Ql=1.	Superficial economic knowledge. Economics teaching methods contribute to achieving Ql>1.
2. Practical skills	A student freely applies skills of calculating indicators and analyzing economic activities to solve professional tasks. Economics teaching methods contribute to achieving Qp>1.	A student applies skills of calculating indicators and analyzing economic activities to solve professional tasks. Economics teaching methods contribute to achieving Qp=1.	A student experiences difficulties, when applying skills of calculating indicators and analyzing economic activities to solve professional tasks. Economics teaching methods contribute to achieving Qp<1.
3.Ability to apply knowledge into practice	A student transforms and creatively applies economic knowledge to solve professional tasks. Economics teaching methods contribute to achieving Qpl>1.	A student applies economic knowledge to solve professional tasks. Economics teaching methods contribute to achieving Qpl=1.	A student experiences difficulties, when applying economic knowledge to solve professional tasks. Economics teaching methods contribute to achieving Qpl<1.
4. Self-assessment of developed economic competence	A student continuously strives to apply economic knowledge	A student rarely strives to apply economic knowledge to solve	A student is afraid to apply economic knowledge to solve

	to solve professional tasks. He/she is sure that a high quality of his/her economic education will help him/her in his/her professional growth. 0.68≤Qsa≤1.00 at Qs>1.	professional tasks. He/she is not quite sure that a quality of his/her economic education will help him/her in his/her professional growth. 0.34≤ Qsa <0.68 at Qs=1.	professional tasks. He/she is not sure that a quality of his/her economic education will help him/her in his/her professional growth. 0≤ Qsa <0.34 at Qs<1.

A quantitative assessment of efficiency of developed economic competence of bachelor's students was calculated with regard to a coefficient of efficiency of developed economic competence (Qef) using formula (6):

$$Qef = \frac{Ql + Qp + Qpl + Qs}{4}.$$
(6)

A high efficiency level of developed competence in the course of studying mandatory (basic) and elective course by bachelor's students of engineering programs corresponds to efficiency coefficient Qef>1; a medium level corresponds to Qef=1, and a low level to Qef<1.

6. Findings

To prove that a set of applied didactic methods and methods of solving economic tasks influenced the orientation of bachelor's students to a professional career of private industrial company directors, we used the test results of bachelor's students from control and experimental groups. The test was taken at the end of the experiment using the professional career test by Chiker (2003). This test was preferred as its content was aimed at assessing personal traits composing a foundation for a professional and psychological portrait of a modern director of a private industrial company.

The test results of bachelor's students from control and experimental groups were compared with average values of results obtained, when determining an original level of developed competence relevant for a profession of future bachelor's graduates.

Having analyzed the tests results, we found that a deviation in every parameter of a career orientation among students from the control group as compared with average values of relevant parameters did not exceed 5 %, acceptable for such research, i.e. career orientations correspond to average values of their assessment.

Regarding the test results of students from the experimental group, values are distributed as follows:

- technical and functional competence: 6.1 points against 5.0 points of the average value (Qef=1.22),

- general managerial competence: 7.1 points against 6.8 points of the average value (Qef=1.04),

- autonomy and independence: 7.4 points against 6.7 points of the average value (Qef =1.10),

- security and stability: 8.2 points against 8.2 points (Qef =1),

- service and dedication to a cause: 7.3 points against 7.0 points (Qef =1.04),

- pure challenge: 7.1 points against 6.0 points (Qef =1.18),

- lifestyle: 7.5 points against 7.1 points (Qef =1.05),

- entrepreneurial creativity: 7.5 points against 5.8 points (Qef =1.29).

Following the test results, we make a conclusion that a set of didactic methods and methods of solving economic tasks, used in a methodology of teaching mandatory (basic) and elective subjects of learning programs in technical majors, fosters bachelor's students' orientations to a professional career of a private industrial company.

7. Conclusion

The results obtained during a theoretical and experimental study on the problem of development of bachelor's students' economic competence, while learning economics, allow making the following conclusions:

1) At present, this problem is relevant due to changes in the nature of duties of modern industrial company directors, when it is critically important to train future directors to functional roles at low and middle levels of management integrated into their professional activities, and to develop economic competence.

2) Dominant content of studying economics is activities of industrial, financial, marketing departments of private industrial companies.

3) The economics teaching methods include a set of didactic methods and methods of solving economic tasks, ensuring the assignment of future bachelor's degree graduates to low and average levels of management and development of orientations to a professional career.

The research performed did not fully cover the problem under study; consequently, it is feasible to carry out further research.

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