



Assessing the Quality and Effectiveness of Additional Vocational Education

Evaluación de la calidad y efectividad de la educación vocacional adicional

Artemy G. VARZHAPETYAN [1](#); Elena G. SEMENOVA [2](#); Alena V. FOMINA [3](#); Viktor M. BALASHOV [4](#); Karina v. BALASHOVA [5](#)

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ABSTRACT:

Modern requirements bring to the forefront the concept of continuing education throughout the whole life including such important component as corporate education. The article deals with the aspects related to additional vocational education in technology and management that contribute to improving one of every company's main values – organizational knowledge of processes, phenomena, and mechanisms of functioning. Such education is significant for improving a company's innovative activity. The authors propose an algorithm aimed at identifying and minimizing educational risks, as well as criteria for assessing the effectiveness of corporate education within the system of additional vocational education. The article addresses the external and internal spheres of education quality assessment, educational programs, and education process management methods.

Keywords: additional vocational education, corporate education, education quality assessment

RESUMEN:

Los requisitos modernos ponen en primer plano el concepto de educación continua a lo largo de toda la vida, incluido un componente tan importante como la educación corporativa. El artículo trata sobre los aspectos relacionados con la educación profesional adicional en tecnología y gestión que contribuyen a mejorar uno de los valores principales de cada empresa: el conocimiento organizativo de los procesos, los fenómenos y los mecanismos de funcionamiento. Dicha educación es importante para mejorar la actividad innovadora de una empresa. Los autores proponen un algoritmo destinado a identificar y minimizar los riesgos educativos, así como criterios para evaluar la efectividad de la educación corporativa dentro del sistema de educación vocacional adicional. El artículo aborda los ámbitos externo e interno de la evaluación de la calidad de la educación, los programas educativos y los métodos de gestión del proceso educativo.

Palabras clave: educación vocacional adicional, educación corporativa, evaluación de la calidad de la educación.

1. Introduction

High rates of scientific and technological progress and revolutionary changes in production technology have led to a peculiar situation that is characteristic for the whole world – that university graduates' level of competence fails to correspond to industry and business companies' requirements. In light of this, corporate education that contributes to acquiring new competencies is taking on greater importance (Gackstatter *et al.*, 2014; Ponchek, 2016; Thune, & Børing, 2015). Continuing vocational education is instrumental in improving one of every company's main values – organizational knowledge of processes, phenomena, and mechanisms of functioning.

Additional vocational education based completely on the Education → Research → Innovations triangle is becoming sought-after (Cervantes, 2017; Hartl *et al.*, 2014; Pascoe, & Vonortas, 2014; Unger, & Polt, 2017). Corporate education within the additional vocational education system is aimed at improving existing competencies or acquiring new ones, and all this contributes to the innovational development of a company and increasing the consumer value of products or services that such company produces.

Empirical analysis to assess the relationship between the knowledge management capabilities, processes and performance of the company has indicated the existence of conditioning factors (Luhn *et al.*, 2017). Similar trends are traced when studying the relationship between the adapted measurements of services quality and students' satisfaction (Dalati, & Al Hamwi, 2016). Thus, the research focuses on studying additional vocational education (AVE) from the perspective of possibilities to develop the innovation potential. Within the research, the following tasks were set:

- To propose the algorithm for implementing approaches to corporate education;
- To analyze the situation in the sphere of assessing the AVE quality and identify specific tendencies;
- To offer methods for self-checking the quality of educational programs.

2. Literature review

Corporate education in AVE is implemented in compliance with the ISO 9001 standard (ISO 9001:2015. Quality Management Systems – Requirements, 2015), according to which in managing a company its strategic, tactic, and operative goals must be taken into account. The detailed analysis of various AVE models is performed in reports and articles (Diner, & Sturova, 2016; Savina, 2016; Mendoza, 2015; UNESCO, 2014; Wilson *et al.*, 2014); here the authors aim at describing the main aspects only. Among European AVE models, the Swedish model taken as a basis at several Russian universities is highlighted (Mozhaeva, & Mozaheva-Renha, 2014; Rashidi, 2013). The model is based on the principle of continuing education, its forward-looking nature and close interaction with employers with financial support from the state and adapting the AVE system to the needs of the job market.

In recent years, the method aimed at developing students' creative skills, the ability to construct one's knowledge independently, acquire necessary competencies, orientate oneself in the informational space, as well as critical thinking, has been actively implemented at all levels of education. General ideas and algorithms of the project work method in a higher education institution are detailed in the paper by Yakovleva *et al.* (2013). Knowles (1980) identifies three main models of using a project approach in the educational process: a project as an exercise; a project as an element of the educational process; and a project as the educational method.

In Canada and the US (Wilson *et al.*, 2014), such form of additional vocational education as "experience-based education" has been developing actively in close connection with students' practical professional activity. The American AVE system means developing own educational techniques. The main task of all the forms and types of training and professional development is "to make knowledge productive". In the US, this system involves about 20 million people, each of whom takes a professional development course during 500 days in

10 years of work (approximately 10-15% of the work time). By comparison, in Russia this parameter amounts to approximately 30 days in 10 years (Primshits, 2016).

The Japanese model (Savina, 2016) of professional education in firms is based on the "flexible employee" concept – an employee is trained not in one but in two or three fields with further professional development throughout his/her whole life. It should be noted that the Japanese model of AVE pays less attention to graduates' level of competence; the focus is mostly on various aspects of AVE that allow taking into account the specific features of a company. Personnel rotation is a significant element of improving managers' qualification. Lately, these mechanisms have been also developing in Russian companies in the form of on-the-job training or appointment ad interim, especially as regards training of top managers.

3. Methods

In order to develop the algorithm of managing additional vocational education, the authors have used the experience of interacting with various departments of OOO Toyota Motor factory (Saint Petersburg). Upon stating the aim of the training, the algorithm of the AVE process can be presented as a consequence of the following stages: 1. Planning → 2. Implementation → 3. Monitoring → 4. Evaluation of the results.

The content of the stages is briefly presented below.

1. *Planning*:

- Setting the tasks of the educational program and defining the scope and time limits;
- Defining the composition of participants/attendees, drawing up their short resume and possible wishes;
- Creating a functional and organizational structure of the educational program;
- Identifying possible educational risks;
- Defining the composition of means of the information and communication technologies (ICT);
- Specifying the sources and planning provision of resources (classrooms, laboratory equipment, financing of the educational projects, etc.).

2. *Implementation*:

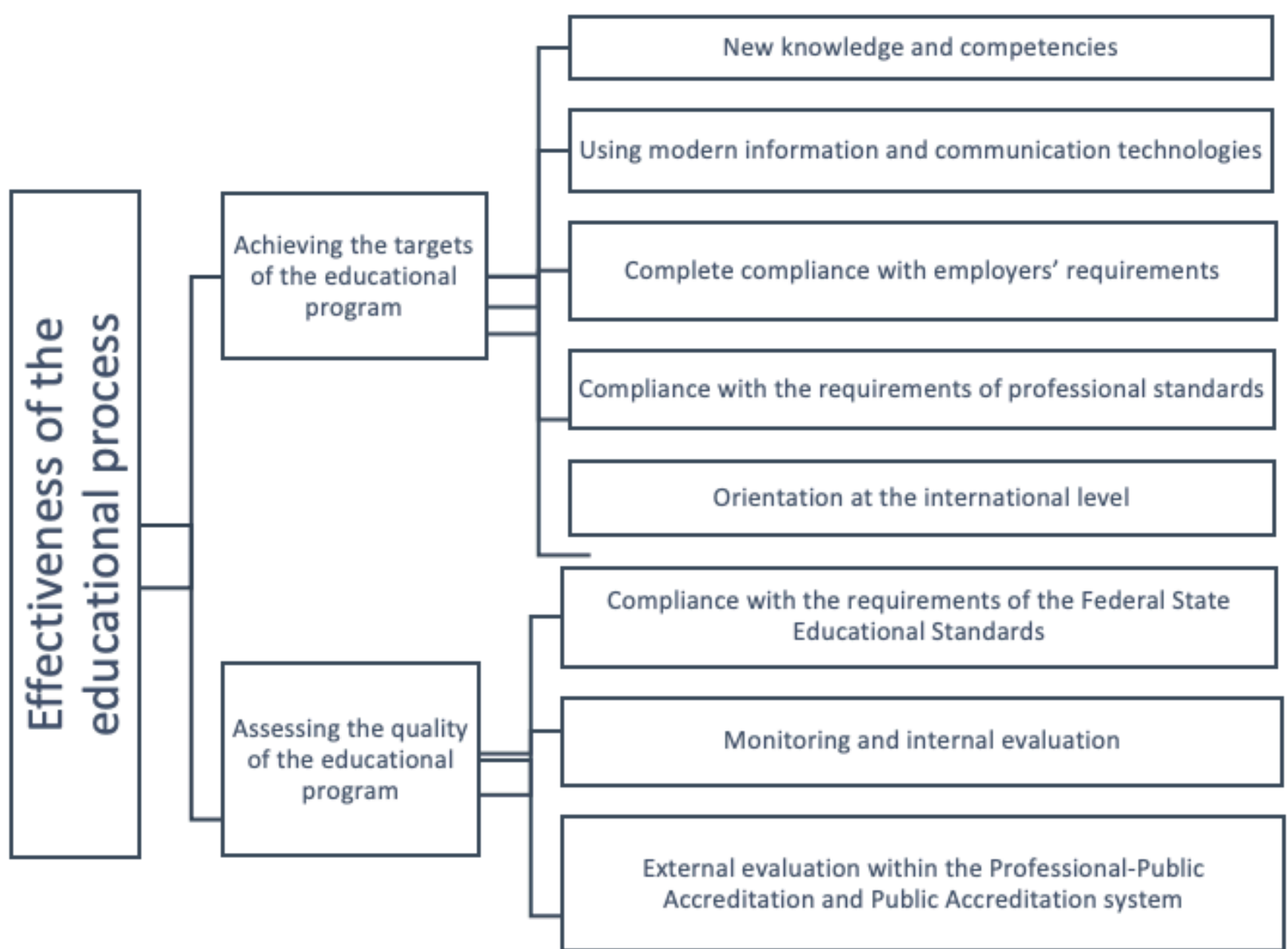
- Studying special literature and the sources recommended by a teacher or selected by an attendee independently with further approval from the head of the group;
- Collecting data, interviewing, drawing up a list of confidential questions;
- Analyzing data and finding a solution for a presented task;
- Preparing a written report and a presentation.

Within the implementation of an educational program, all possible training activities may be included (seminars, laboratory practicals, practices, business games, trainings, etc.).

3. *Monitoring*. The effectiveness of training stages is evaluated by a teacher leading the educational program (and a representative of a branch that sent a student, if necessary). Following each stage, participants of project groups discuss the results and directions for further work and identify areas of concern.

4. *Evaluation of results*. This stage includes the analysis of achieving the planned values of the educational process parameters. In order to do this, a quantitative assessment method is used that includes two groups of parameters: achieving the targets of the educational program and quality assessment shown in Fig. 2. The set of parameters can be expanded based on the specific features of a certain educational program.

Figure 1
Educational program effectiveness evaluation parameters



The list of parameters and their significance coefficients are determined by expert evaluation methods (Durham College, 2016; Antokhina *et al.*, 2017). If the parameters are evaluated within the 0.1 range, the effectiveness E of executing the plan of educational program implementation work plan can be evaluated according to the following formula:

$$E = x_k \left[1 - \sum_{i=1}^n w_i \frac{(x_i - x_{fi})}{x_i} \right], \quad (1)$$

where x_k – the value of the critical parameter taken on the basis of the current company's technical education systems; n – the number of target parameters; w_i – the significance coefficient of the i -th target parameter; x_i – the planned value of the i -th target parameter; x_{fi} – actual quantitative assessment of the i -th target parameter.

One of the possible grades of educational program effectiveness evaluation is presented in Table 1.

Table 1
Levels of educational program effectiveness evaluation.

Category	Target function value	Managerial decision
Effective	At least 0.75	To declare effective
Effective with comments	At least 0.5 but less than 0.75	Additional consideration is required to take a final decision
Ineffective	Less than 0.5	To declare ineffective

In some cases, the effectiveness is not evaluated as the company’s management may be interested in evaluating the aggregate of local target parameters that allows having a more detailed evaluation of the results of the performed training activity.

4. Results

Training results should be presented as a measurable and differentiated level of grasping competencies required for performing job functions within the professional activity. Applying widely used systems of knowledge control and assessment systems (for example, Moodle) allows evaluating the quality of an educational program quite correctly.

Three components of the education quality are generally indicated: (1) the quality of education results (knowledge, skills, competencies); (2) the quality of educational programs of AVE, the criterion of a program’s quality being its ability to ensure the expected results; and (3) the quality of managing a company performing corporate education. As an example, the results of self-checking the quality of the educational program "Quantum Electronics Devices. Magnetometers" implemented by the Institute of Additional Education of the Peter the Great St. Petersburg Polytechnic University and the R&D company "Radar MMS", JSC.

The scope of the educational program was 72 hours including 36 lecture hours, 18 hours of seminars and laboratory practicals, and 18 hours of a student’s independent work. The program was focused on creating the following competencies of students:

- Ability for professional use of modern scientific and technological equipment and instruments;
- Readiness and ability to use physical methods of theoretical and experimental research and methods of mathematical analysis and simulation to create innovative principles, set tasks on developing, implementing, and commercializing new knowledge-intensive technologies;
- Ability to perform critical analysis of modern physical problems, set tasks and develop a program of research, use adequate ways and methods of solving experimental and theoretical problems, and to present and apply the obtained results;
- Ability to independently perform physical and technical scientific research in order to optimize the parameters of objects and processes using standard and specially developed instruments and program means;
- Readiness to study and apply modern physical and mathematical methods and the methods of artificial intelligence in order to solve professional problems and develop practical recommendations on using the obtained results.

The examination took place from April 12, 2017 to June 29, 2017 for a group of students consisting of 15 persons (Table 2). In order to self-check the quality of the educational project, a method of evaluating under a 10-point scale according to seven proposed criteria was used; the criteria allowed comprehending the level of implementation and usefulness for students.

Table 2
Assessing the quality of the educational program

Assessment parameter	Average point acc. to a 10-point scale
• Informational value (receiving new information)	7.33
• Attractiveness	6.93
• Applicability, the possibility of practical use of the received knowledge	6.73
• Comprehensibility of presenting the material	6.27
• Novelty, modern tendencies	6.93

• The possibility to share the experience with colleagues	7.27
• Qualification of teaching staff	8.36

The high grade of teaching staff qualification is caused by quite high requirements that the university set for selecting lecturers, arranging a required laboratory and production facility, preparing educational materials and sets of test cases.

The analysis of the obtained results confirmed the advisability of combining theoretical classes and practical sessions in the educational project. Students noted the informational value and novelty of the presented material, as well as its applicability and the possibility of practical use. During sessions, additional opportunities for contacting and sharing experience with colleagues from related business units were provided.

5. Discussion

Any company providing corporate education should include the issues of managing corporate education processes in its management system. The way to do that most effectively should be selected by each company independently. Creation and constant improvement of the system of assessing the quality of corporate education within additional vocational education is an objective necessity preconditioned by satisfying the need in competent specialists that exists in society.

Within the AVE system, selecting this or that model of independent assessment and quality recognition is defined by the subtype of a program and the target consumer group to a much larger extent than within the system of secondary vocational or higher education. The following parameters can be proposed to characterize the quality of corporate education:

- Parameters of providing resources for the educational process (financial, material and technical, personnel, information and methodology resources, etc.);
- Parameters of quality processes (managerial, educational, scientific, economic, etc.) in the organization;
- Parameters of the quality of results (assessing the quality of education, work in the acquired area, career advancement, etc.).

The strategic aim of inter-corporate education is to ensure the process of improving the competence level that corresponds to the innovative type of development. This includes three areas of education: first, necessary education that includes the minimal amount of knowledge required to carry out effective professional activity within the performed competencies; second, focused education of a strategic nature aimed at a limited number of personnel, in order to create reserve for future advancement; and third, developing education that allows obtaining additional knowledge and developing skills that are not necessary for one’s current professional activity.

The general presentation of the goals, levels, and forms of AVE and companies organizing the process is shown in Fig. 2.

Figure 2
The system of additional vocational education

Goals of AVE	<ul style="list-style-type: none"> • Training of specialists • Advanced training • Retraining of specialists
Levels of AVE	<ul style="list-style-type: none"> • Elementary vocational education • Secondary vocational education • Higher vocational education • Post-graduate vocational education
Forms of AVE	<ul style="list-style-type: none"> • Intramural (full-time) • Part-time (evening classes) • Extramural • Distance (SMART technologies) • External program
Organizations of AVE	<ul style="list-style-type: none"> • Centres of AVE • Higher education institutions • Corporate education

6. Conclusion

The article deals with the aspects of additional vocation education performed as corporate education. The carried out research allows making the following conclusions – as compared to basic education, the AVE system reacts to changes in the job market in a more operative manner. Advanced training and retraining programs are implemented within shorter periods, are oriented at a specific customer, and react to changes in the market in a more mobile manner. The proposed algorithm of corporate education is invariant to applied models due to taking into account the process related to identification and minimization of educational risks and the criteria for evaluating the effectiveness of the AVE process.

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1. Dr. Sci. (Engineering), Professor, Saint Petersburg State University of Aerospace Instrumentation (GUAP). Email: vagbnm@gmail.com
 2. Dr. Sci. (Engineering), Professor, Saint Petersburg State University of Aerospace Instrumentation (GUAP). Email: egsemenova@mail.ru
 3. Dr. Sci. (Economics), Assistant professor, JSC "Central Research Institute of Economy Management and Information Systems "Electronics". Email: fomina_a@instel.ru
 4. Dr. Sci. (Engineering), Professor, JSC Research and Production Enterprise 'Radar mms'. Email: balashov_viktor@mail.ru
 5. Deputy General Director for Strategic Development, Scientific-research institute "Mashtab". Email: karina.balashova.87@inbox.ru
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