Digital educational platform as a personnel management tool

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Abstract. External and internal challenges facing the domestic system of vocational education today require structural and managerial changes in professional educational organizations that facilitate the adoption of effective timely management decisions and, at the same time, create conditions for the emergence of initiatives focused on the sustainable development of an educational organization including those related to the professional activities of teachers. The article deals with the management system of the educational process of vocational education from the classical theory of automatic control point of view. The structure of combined management, allowing to implement the management process of the educational organization of vocational secondary education, based on the process management model of the “Deming cycle” principle is proposed. The input and output parameters, control and setting actions are concretized. The implementation of control systems based on subsystems for monitoring the effectiveness of educational and methodological support activities and management, integrated into the digital educational platform of secondary vocational education, is proposed.

1. Introduction

The modern system of vocational education, on the one hand, is based on the basic concepts and requirements of federal state educational standards (FSES); on the other hand, it is subject to constant changes from external factors (including regional authorities) and must meet the expectations of the regional labour market. As a rule, the main goal of the changes is to increase the level of mastering professional competencies by students.

Thus, in the modern conditions of the transformation and digitalization of vocational education, there is a need to develop and use new management mechanisms for an educational organization (EO) and the educational process, contributing to the adoption of effective timely management decisions and, at the same time, creating conditions for the emergence of initiatives focused on sustainable development of an educational organization, associated with the professional activities of teachers as well. At the same time, the main goal of management should be to ensure compliance with the requirements of the Federal State Educational Standard and representatives of the labour market.

The management of the educational process as an organizational (pedagogical) system ensures not only the preservation of its integrity and the possibility of influencing the component constituents, but also ensures the functioning of the educational organization as a whole, an indicator of which is the achievement of the goals of the educational process. Based on this, the management of the educational process is a purposeful, systemically organized process of influencing the structural components of this
process and the connections between them. Management ensures the integrity and effective implementation of the functions of the constituent elements of the educational process, its optimal development.

To achieve the goal of managing the educational process, we propose to use a digital educational platform of secondary vocational education (DEP SVE), designed for the integrated management of the activities of a professional educational organization and built on a modular principle with the inclusion of the following subsystems:

- performance monitoring;
- management of educational and methodological support;
- management of personalized educational trajectories;
- taking into account the achievements of students and promoting employment;
- virtual laboratory educational and research complexes.

2. Educational process management system

Consider the educational process control system from the point of view of the classical theory of automatic control. The educational process in its dynamic aspect acts as a control object (educational process as a process of movement from goal setting to result, characterized by continuity, consistency, efficiency in solving general and specific problems [1]) (figure 1).

The combined control principle is put into the structure of the control system. The control system (CS\(^I\)) is based on the deviation control principle; the control system (CS\(^II\)) – according to the principle of disturbance control. CS\(^I\) is the subsystem for managing the educational and methodological support of the DEP SVE, which implements an integrated approach to the creation of documentation that ensures the implementation of the educational process, as well as an information model of the educational system that determines the structure and reflects the elements of the educational process. The input parameters of this control system are the deviation (\(\Delta \bar{Y}\)) of the actual values of the output parameter of the control object (\(\bar{Y}\)) from the given parameters (\(\bar{Y}^*\)). The output parameter - the control action (\(\bar{U}_I\)) – is a complex of educational and methodological support developed as part of the implementation of a certain EP.

The compensating subsystem (CS\(^{II}_1\)) is a subsystem for monitoring the effectiveness of the DEP SVE, which allows the automatic calculation of performance indicators for both teaching staff (TS) in the conditions of work under performance-based contract of employment, and structural units of an educational organization in the main areas: educational and methodological work, organizational and educational work and other activities. The input parameters for the control system CS\(^{II}_1\) are the current level of training of subjects (TS and students) of the educational process according to a certain educational program (\(\bar{W}_{EPC}\)), and the output parameter - the control action (\(\bar{U}^{II}\)) – are stimulating influences defined based on the rating assessment of TS activities. This is shown in figure 1.

![Figure 1. The structure of the educational process management system.](image-url)
\( \bar{Y} \) – actual values of the control object output parameter - the level of mastering general and professional competencies in the educational program (EP), \( \bar{Y} = \left( \bar{Y}_{GC}, \bar{Y}_{PC} \right) \),

where \( N_{GC} \) and \( N_{PC} \) are the number of general and professional competencies, respectively by EP; \( \bar{Y}^* \) – given parameters - requirements of the Federal State Educational Standard for the implementation of EP, requirements of regional authorities, labour market requirements.

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\bar{Y}^* = \left( \bar{Y}_{SES,1}^*, \bar{Y}_{SES,2}^*, ..., \bar{Y}_{SES,N_{SES}}^* \right),
\bar{Y}_{RMB}^* = \left( \bar{Y}_{RMB,1}^*, \bar{Y}_{RMB,2}^*, ..., \bar{Y}_{RMB,N_{RMB}}^* \right),
\bar{Y}_{JM}^* = \left( \bar{Y}_{JM,1}^*, \bar{Y}_{JM,2}^*, ..., \bar{Y}_{JM,N_{JM}}^* \right)
\]

where \( N_{SES}, N_{RMB} \) and \( N_{JM} \) – are the number, accordingly, of the target indicators characterizing the requirements of the Federal State Educational Standard, regional authorities and employers' expectations regarding the graduate in EP; \( \Delta \bar{Y} \) – is the deviation of the actual values of the control object output parameter from the given parameters, \( \Delta \bar{Y} = \bar{Y}^* - \bar{Y} \); \( \bar{W}^I \) – uncontrollable external factors affecting the educational process in EP, for example, the introduced self-isolation regime, which led to the transition to distance learning; \( \bar{W}^II \) – controlled external factors - the level of material and technical support of the EP, the level of training of subjects of the educational process in the EP, \( \bar{W}^II = \left( W_{MTS}^II, W_{EPC}^II \right) \),

where \( N_{MTS} \) and \( N_{EPC} \) – are the number of parameters characterizing the level of material and technical support and the level of training of subjects of the educational process in EP, respectively; \( \bar{U}^I \) – control actions generated by the CS\(^I\) system and characterizing the composition and content of educational and methodological support of the EP; \( \bar{U}^II \) – compensating influences generated by the CS\(^II\) system and characterizing the level of motivation of the teaching staff of the EP; \( \bar{k} \) – corrective actions generated by the CS\(^II\) system and characterizing the structure and significance coefficients of the components of the rating assessment procedure of the teacher's efficiency indicator.

Also, the correcting subsystem (CS\(^II\)), is a separate link which, based on the current indicators of the level of competencies development, produces the coefficients of significance \( (\bar{k}) \) of the components of the rating assessment of TS activities (parametric and, indirectly, structural adaptation of the assessment procedure to the changing conditions of the EP implementation).

The functioning of the entire control system (figure 1) is as follows. When implementing the EP, the educational organization analyses the requirements of the Federal State Educational Standard and the regional labour market. Based on these requirements, an educational program is developed, represented by a set of documentation - educational and methodological support of the EP (which can be adjusted, adapting to new requirements, once a year). On the basis of the developed educational and methodological support (EMS), training means (material and technical support) are determined, the selection of TS and the recruitment of students is made. Training is in progress; making constant monitoring of the training level of students (the level of mastering general and professional competencies), the head of the educational program, together with the leadership of the educational organization, makes a decision on adjusting the educational system. Thus, the development of new control actions is carried out in order to minimize the deviation of the current level of training of students and the requirements of the Federal State Educational Standard and the labour market.

One of the controlled disturbing factors of the management system is the level of training of subjects of the educational process in EP - teachers and students. In order to correct the negative factors arising from the insufficient level of preparation of subjects for the implementation of EP, a control system for monitoring the effectiveness of teachers' activities was introduced. This corrective control system makes
it possible to comprehensively assess the current level of training of the subjects of the educational process and form such control actions (simulating effects) that will encourage the development of TS qualifications in accordance with the requirements of the Federal State Educational Standard and the regional labour market to ensure a sufficient level of mastering by students of EP competencies. Planned indicators of achievement of the TS qualification level, as well as the coefficients of significance of the components of the rating assessment are formed by the corresponding control system based on the deviation of the current level of training of students and the requirements of the Federal State Educational Standard and the labour market.

The considered management system makes it possible to fully implement in practice the management process of an educational organization of secondary vocational education, similar to that shown in figure 2, based on the process management model [2] of the Deming cycle principle (PDCA cycle - plan, do, check, act - planning, execution, control and analysis).

The regional education management body forms the educational policy of the region, bringing it to educational institutions and the regional resource centre. The resource centre generates planned performance indicators and enters them into the general regional information system of educational organizations - the DEP SVE. Educational organizations, together with teachers, staff and students, enter the actual indicators of their activities into the information system. The regional education management body receives from the information system reporting forms with information on the functioning of the EO. Based on the plan-fact analysis, it forms (corrects) the educational policy of the region, thereby determining the updated planned performance indicators.

3. Control system for educational and methodological support

From the point of view of documentation support, any educational process is strictly formalized since it is regulated by the requirements of federal standards. Moreover, it should be borne in mind that educational standards do not remain “frozen”, as society develops, they change, which is recorded in legislative documents. The following documents can be referred to the documentation support of the vocational education process: educational program; syllabus; work programs by discipline and practice; calendar and thematic plan; complexes of control and assessment tools for academic disciplines and practices, etc.

![Figure 2. Management model of an educational organization.](image)
The control system (CSI) (figure 1) is implemented as a separate software complex integrated into the general information environment of an educational organization - a management system for educational and methodological support. This system allows users to develop and upload educational and methodological documentation to the information base. The documentation uploaded to the system is subject to verification and validation by the educational and methodological departments of the educational organization. In the future, the approved EP documentation signed with an electronic digital signature is stored in electronic form and is available for submission upon request. In addition, some documents can be generated in an automated mode using data from related systems of an educational organization.

The control system for educational and methodological support, among other things, allows you to reduce the costs of processing and maintaining documentation of the educational process, to ensure control of the readiness of current documents, and also to serve as a source of information for such systems of the information environment of the EO as: an Internet portal (subsection “Education” in accordance with the order of the Federal Service for Supervision in Education and Science of May 29, 2014 N 785 “On approval of the requirements for the structure of the official website of an educational organization in the information and telecommunications network “Internet” and the format for presenting information on it”); electronic educational environment (list of disciplines, topics and content of classes, list of intermediate certifications, etc.); virtual admission committee (list and composition of implemented educational programs for which recruitment was announced), etc.

4. Monitoring system of teachers' performance

A review of various sources [3, 4, 5, 6] indicates that one of the tools for managing the professional activities of teachers can be performance monitoring, which is considered as a separate independent direction in modern pedagogical science and is used in the practice of managing professional educational organizations: firstly, as an objective way of obtaining information, and secondly, as an innovative technology that contributes to the qualitative solution of the professional activity problems of teachers.

The objectives of monitoring the effectiveness of the teaching staff and structural units are:

- determination of the results of the TS activity, which can serve as the basis for the establishment of remuneration and reflection in the employment contract;
- stimulation of professional development, growth of professionalism, productivity of pedagogical and scientific work, development of the creative initiative of teachers;
- assessment of the structural units work quality that implement the functions of an educational organization;
- formation of complex analytical information characterizing the results of the educational organization and the provision of reporting documents to management for the development and adoption of management decisions.

The performance monitoring system, integrated into the general information environment of an educational organization, is a software-algorithmic complex consisting of [7]:

- a database that comprehensively reflects the activities of both the educational organization as a whole and its structural divisions and teachers separately;
- procedures for calculating a single comprehensive criterion for assessing and monitoring the effectiveness of an educational organization, departments and teachers;
- user interface, implemented using Internet technologies and allowing to enter the initial data for determining the rating, provide information on the values of performance criteria for analysis, and also administer this subsystem in a convenient form.

One of the advantages of the subsystem is the ability to flexibly adjust the procedures for calculating performance indicators to take into account the specifics of a particular educational organization. In
addition, it is possible to implement automatic procedures for obtaining initial data from adjacent automated information systems.

According to the calculated performance indicators obtained in the course of calculating the rating, the decision-maker (for example, the head of the educational institution) can determine the incentive mechanisms for both individual teachers and structural divisions, thereby ensuring the growth of qualifications, professionalism, productivity of pedagogical and scientific work, contribute to the development of the creative initiative of teachers when working with students. In addition, the encouragement of teachers will indirectly improve the level of training of students within the EP.

5. Conclusion
The proposed digital educational platform for SVE provides all the necessary tools to fully achieve the set management goals. The presented management system ensures the fulfilment of the requirements of the Federal State Educational Standard and regional educational authorities, and also allows you to quickly respond to changing requirements of the labour market. The introduction of a system for monitoring the effectiveness of teachers' activities in practice made it possible to understand the effectiveness of the work of an educational organization as a whole and to develop stimulating influences that would motivate teachers to increase their professionalism and increase the productivity of pedagogical and scientific work. The introduction of a management system for educational and methodological support made it possible in the shortest possible time to establish work on the documentation of the educational process.

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