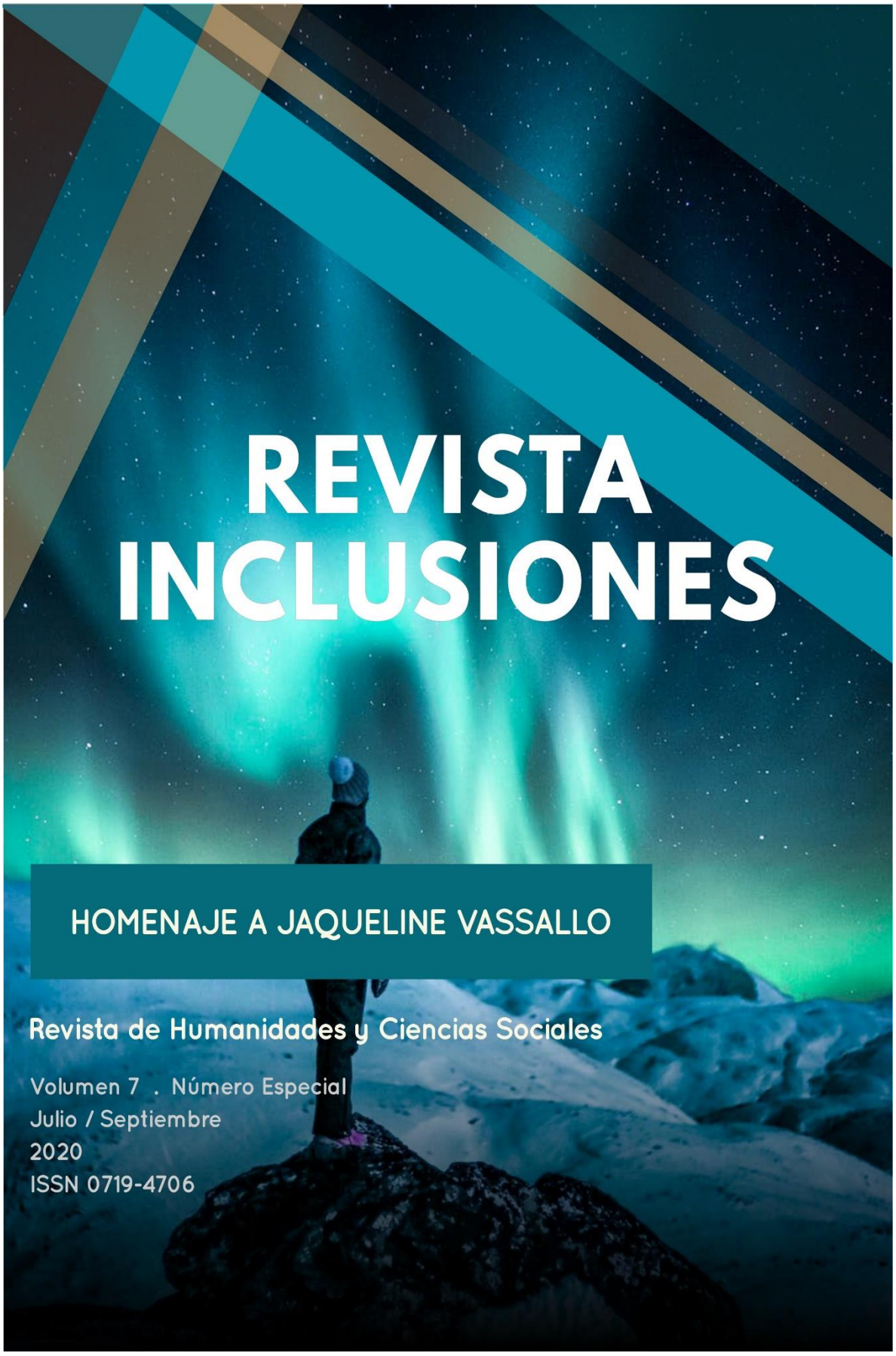

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PROBLEM OF QUALITY OF EDUCATIONAL PROGRAMS: AUTOMATED ASSESSMENT METHOD

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Abstract

The article substantiates a relevant problem of education in Russia: an objective assessment of the quality of educational programs. The article substantiates the need to develop a quality system of educational programs for educational organizations in Russia. To do this, the analysis of the main normative documents regulating the educational process is carried out. These documents primarily include the Federal State Educational Standard and the professional standard. The analysis of the content of educational programs used in the activities of educational organizations is carried out. On its basis, the significance of its elements and their connection with each other is determined. An assessment package is developed to assess the compliance of each element. This allows evaluating the content in the appropriate educational program. The composition of such an assessment complex is formed based on a survey of experts specializing in the organization, control or audit of the educational process. Using this expert survey, the significance of each element is determined at the level of its corresponding criteria and the educational program as a whole. The mechanism for determining the weight values of each element for a separate level of the educational program model is presented in detail. To calculate the significance of each element, the Kendall concordance coefficient is determined and the result is evaluated using Pearson's chi-squared test with a set level of accuracy. It is found that the obtained values meet the requirements for use in the methodology for determining the quality of the educational program. The article presents the obtained values for each level of the hierarchical model of the educational program.

Keywords

Educational program – Educational standard – Audit, monitoring – Quality of education

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Introduction

At present, the formal representation of the requirements of the Russian system for assessing the quality of education is expressed in the form of a model of state accreditation, which consists of the following components:

1. List of indicators of an educational organization;

2. Forms, methods and procedures for evaluating the performance of an educational organization as a whole and its educational programs by external experts;

3. Forms, methods and procedures of self-examination of an educational organization.

In the process of self-examination, information is collected and analyzed on the organization's performance indicators (for example, staffing, employment indicators of graduates, publication activity, etc.), as well as on all implemented educational programs (for example, methodological support of the educational process, the use of electronic educational resources, the results of final state certification, independent assessments of the level of knowledge of students, etc.)[1]. The main problem in evaluating the documents of each educational program is their number and ways of evaluating the content[2]. Within one educational program, there is an average of 60 academic disciplines. To form the content of an educational program, it is necessary to have a work program, control and evaluation tools and methodological recommendations for classroom and extracurricular independent work of students[3]. Thus, one needs to create at least 240 documents with a content of at least 30 sheets. In one educational organization, there is an average of 80 educational programs; therefore, to ensure the educational process, it is necessary to prepare about 20 thousand multi-page documents (576 thousand sheets). At the same time, verification of the content of documents (both within the educational organization and by external specialists) is carried out according to criteria, the evaluation of which has a subjective nature of the verifier. Thus, the same educational program may have a significantly different number of comments when checked by separate commissions. According to statistics, the number of educational institutions has decreased significantly over the past 19 years[4]. This is due to the consolidation of educational organizations. At the same time, the number of educational programs is increasing, including through the introduction of new professions and specialties. However, the number of specialists responsible for preparing and maintaining documents does not change, increasing the burden not only on specialists of educational organizations but also on external auditors performing self-examination or accreditation procedures[5].

[1] M. V. Guskova, Osnovy evolyutsii v upravlenii kachestvom obrazovaniya (Moscow: Infra-M, 2018).
[2] G. S. Zhukova, Korrektirovka processa obuchenija s uchetom otzyvov rabotodatelej. Vestnik Akademii prava i upravlenija Vol: 2 num 47 (2017): 134 – 139.
[3] L. M. Gohberg; G. G. Kovaleva y N. V. Kovaleva, Obrazovanie v cifrah: 2018 (Moscow: HSE, 2018) y S. S. Tatarchenkova, Problemy kachestva obrazovanija i ih reshenija v obrazovatelnom uchrezhdenii (Moscow: Karo, 2012).
[4] S. M. Vdovin y T. A. Salimova, Sistema menedzhmenta kachestva organizacii (Moscow: Infra-M, 2019).
[5] M. S. Logachev; Ju. N. Samarin y O. A. Vinokurova, “Integralnyj pokazatel kachestva obrazovatelnyh program”, XXI vek: itogi proshlogo i problemy nastojashhego pljus Vol: 8 num 4(48) (2019): 77-82.

Thus, the implementation of objective monitoring of the content of educational programs is relevant in modern education in Russia.

Materials and Results

An educational program can be divided into two components: formal and creative[6]. The formal part includes objects that are part of the normative documents regulating the content of the educational process. The creative part includes elements determined by the teacher of the discipline. Each of the two components can be evaluated by an automated system. The formal part is the basic part (defines the creative part), so for the automated verification method, first of all, algorithms must be formulated specifically for it.

An educational program is a set of work programs for each of the academic disciplines[7]. Thus, each work program must comply with the main normative documents regulating its content. Figure 1 shows the distribution of elements of the work program according to the content of the main regulatory documents (educational and professional standards, curriculum and sample work program).

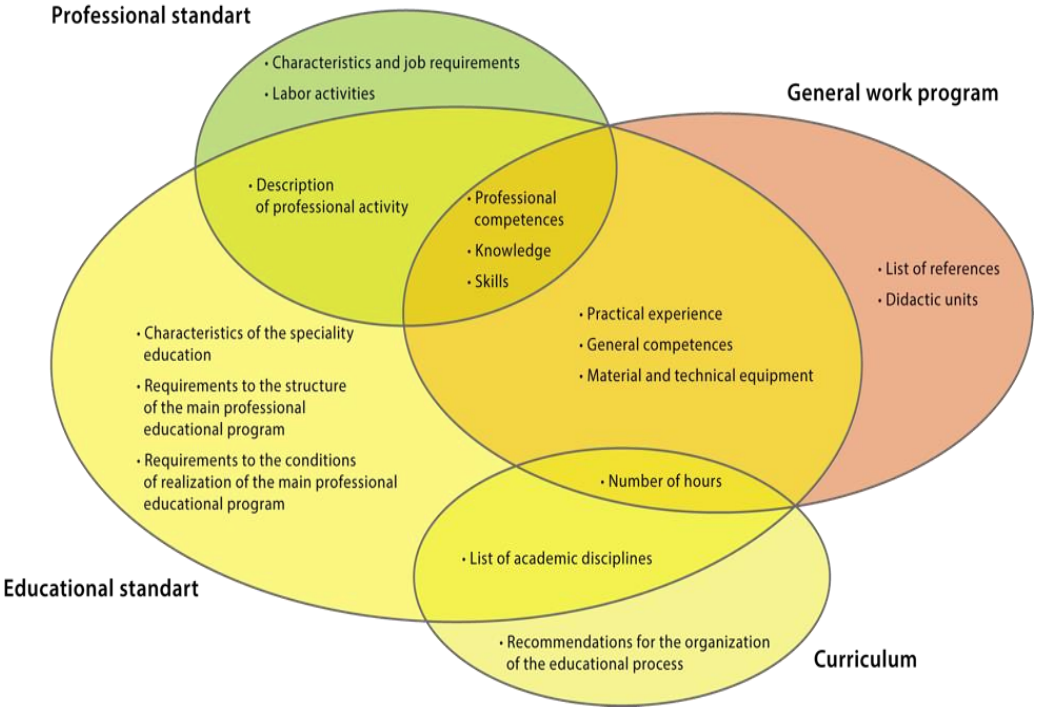

Figure 1
Documents regulating the content of an educational program[8]

[6] M. S. Logachev; G. V. Tkacheva y Ju. N. Samarin, Obrazovatelnaja programma kak instrument sistemy upravlenija kachestvom professionalnogo obrazovanija (Moscow: Infra-M, 2019) y O. A. Vinokurova y Ju.M. Abramov, Problemy organizacii informacionnyh potokov pri razrabotke uchebno-metodicheskoj dokumentacii. Obrazovanie i nauka v sovremennyh realijah: sb. materialov V Mezhdunar. nauch.-prakt. konf. (Cheboksary: Centr nauchnogo sotrudnichestva Interaktiv pljus, 2018), 59 – 64.

[7] M. V. Guskova, Osnovy evolyutsii v upravlenii kachestvom obrazovaniya (Moscow: Infra-M, 2018).

[8] M.S. Logachev, G.S. Zhukova. Problems of professional education in Russia: Quality monitoring of educational programs. Revista Inclusiones Vol 7 num Jan-Mar (2020): 263 – 274.

It should be noted that the submitted documents relate to different structural divisions that approve them (for example, educational standards are approved by the federal government, and the curriculum is approved within an educational organization).

The creative part should include all sections, based on which, the content of each work program is formed. Didactic units are defined based on the topic of the section.

Each structural block of the work program is formed from a list of certain elements that meet certain criteria. All this forms the criteria and evaluation complex of the content of the educational program. Thus, the following structural blocks can be distinguished: title page, title page turnover, content, passport, learning results, discipline structure, distribution of hours, implementation conditions and monitoring of results evaluation.

Each of the blocks is a collection of different elements. For example, the title page turnover consists of the number of the educational standard, approval status, approval and approval positions and information about the author and reviewers. The following approaches are used to evaluate such elements:

1. Soft – checking elements for technical errors or errors that occur when they do not match the document template. Multiple errors of the same class are allowed if they do not affect the integrity of the structural block or the sequence of elements[9];

2. Hard – checking elements for compliance with regulatory documents. Each element must not contain any class of corresponding errors.

Based on this assessment, the user is given a graphic representation of the primary score of the assessment results for each structural block. To get an integral indicator for the entire educational program, it is necessary to establish the significance of each element and structural block. To do this, an expert survey is conducted in the form of a questionnaire. Each expert (a specialist participating in accreditation or self-examination procedures) is asked to rank each element relative to the corresponding block and each block relative to the entire document. The number of experts is determined by the requirements of GOST (state standard) and is set at eight people (corresponds to the allowed range of 6-15 people)[10]. In this case, the competence of each expert must be established.

Based on the value of the integral indicator, a conclusion is made about the possibility of using a proven educational program in the educational process.

Table 1 shows the results of the analysis of the expert survey to determine the weight values of the structural blocks of the educational program. To determine the non-randomness of the expert consistency indicator and the possibility of using the corresponding values for further calculations, a significance level of 0.01 is set.

[9] M. S. Logachev, Struktura, metodika i algoritmy funkcionirovanija sistemy monitoringa upravlenija kachestvom obrazovatelnyh programm: diss. kand. tehn. Nauk (Moscow, 2017), 191.
[10] M. S. Logachev, “Ocenki soderzhanija obrazovatelnyh dokumentov”, Statistika i jekonomika Vol: 5 (2016): 14 – 17.

Structural block	**Consistency of experts**	**Pearson's chi-squared test**		**Weight, %**
		Tabular	**Received**	
Title page	0.93	6.0	6.87	14.5
Title page turnover	0.92	11.1	18.51	14.5
Content	0.71	6.0	6.38	5.6
Passport	0.58	14.1	15.61	9.4
Learning results	1.00	6.0	6.0	8.3
Structure and content	0.92	11.1	20.62	13.6
Distribution of hours	0.87	12.6	18.21	21.4
Conditions of implementation	0.72	9.5	11.25	6.3
Monitoring the evaluation of results	0.85	7.8	8.50	6.3

Table 1
Significance of structural blocks of the educational program

The number of criteria before checking the educational program may be undefined and depend on its subject[11]. In this case, the value is calculated and obtained after downloading the reference files.

To determine the value of the integral indicator for evaluating the content of an educational program, the values shown in Table 2 are used. The interpretation of the integral indicator of the educational program is presented in Table 3.

Structural block	**1**	**2**	**3**	**4**	**5**
	None	**Low**	**Medium**	**High**	**Total**
Title page	2.9	5.8	8.7	11.6	14.5
Title page turnover	2.9	5.8	8.7	11.6	14.5
Content	1.1	2.2	3.4	4.5	5.6
Passport	1.9	3.8	5.6	7.5	9.4
Learning results	1.7	3.3	5.0	6.6	8.3
Structure and content	2.7	5.4	8.2	10.9	13.6
Distribution of hours	4.3	8.6	12.8	17.1	21.4
Conditions of implementation	1.3	2.5	3.8	5.0	6.3
Monitoring the evaluation of results	1.3	2.5	3.8	5.0	6.3
TOTAL	**20.0**	**40.0**	**59.9**	**79.9**	**99.9**

Table 2
Integral indicator of the educational program[12]

[11] M. S. Logachev, “Ocenki soderzhanija obrazovatelnyh dokumentov”, Statistika i jekonomika Vol: 5 (2016): 14 – 17.

[12] M. S. Logachev y Ju.N. Samarin, O. A. Vinokurova, “Integralnyj pokazatel kachestva obrazovatelnyh program”, XXI vek: itogi proshlogo i problemy nastojashhego pljus Vol: 8 num 4 (2019): 77 – 82.

Value, point	Interpretation
1 (none)	Does not meet the educational standard and curriculum. Design rules are violated. Employees involved in the preparation and maintenance of the document must be subject to disciplinary measures provided for in the statutory documents.
2 (low)	Does not meet the requirements of regulatory documents of the specialty. It cannot be used in the educational process. Employees involved in the preparation and maintenance of the document may be subject to disciplinary measures provided for in the statutory documents.
3 (medium)	Partially meets the requirements of regulatory documents. There are significant comments that require mandatory correction or revision. Not recommended for use.
4 (high)	High level of formation. However, there are comments on the design or content. It is recommended to pay attention to the requirements of the curriculum or educational standard, as well as the design standards. Recommended for use.
5 (total)	Fully formed. Meets the requirements for registration of an educational organization. The content meets the requirements of the educational standard and curriculum. Availability of descriptions. Can be used in the educational process.

Table 3
Interpretation of the integral indicator[13]

In addition to the integral indicator and its interpretation, the user must have access to the results of intermediate verification of each structural block or corresponding element. This result can be represented as a petal diagram, as shown in Figure 2.

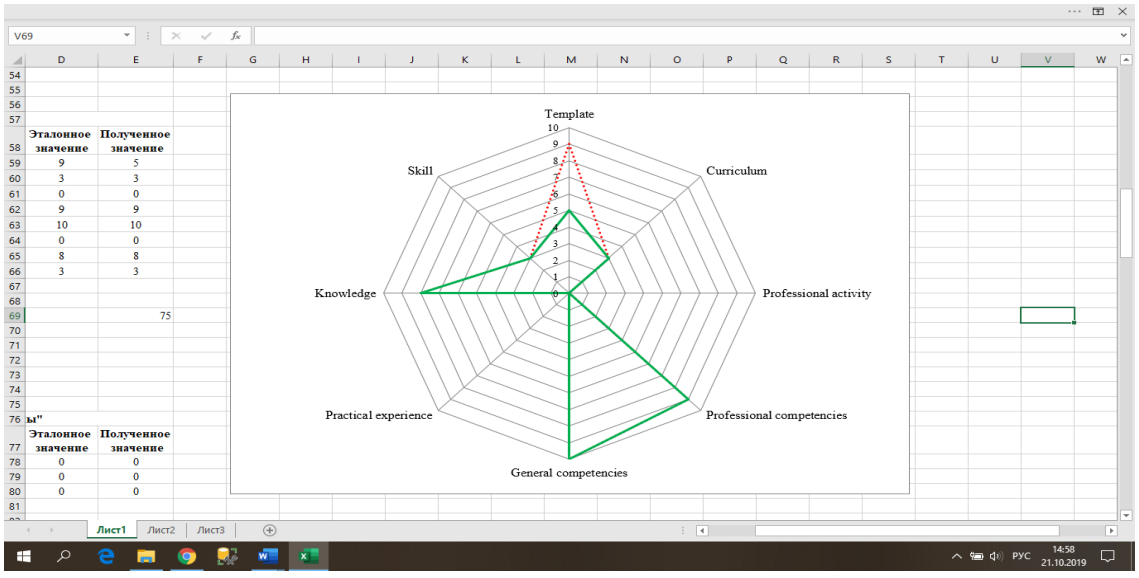

Figure 2
Displaying the primary result of the structural block evaluation[14]

[13] M. S. Logachev, Struktura, metodika i algoritmy funkcionirovanija sistemy monitoringa upravlenija kachestvom obrazovatelnyh program diss kand. tehn. Nauk (Moscow, 2017).
[14] M. S. Logachev; Ju. N. Samarin y O. A. Vinokurova, “Integralnyj pokazatel…

If there are no errors, the two areas (reference and tested) must match, in all other cases (with errors) — one of the two areas will stand out.

Thus, based on the results obtained, the following methodology can be developed for automated verification of an educational program:

1. Get the file for evaluation (EF) (checking compliance with the format, determining the cypher, the name of the specialty and discipline).

2. Determine the reference files (RF) for the specialty.

3. Select the structural block and its criteria in the RF.

4. Determine whether the label in the RF corresponds to the search range in the EF.

5. Compare with the content of the RF label. The following cases may occur as a result of comparison:

5.1. the content of the EF label completely matches the content of the corresponding RF label: increase the criterion parameter by one;

5.2. the beginning of the EF content completely matches the content of the corresponding RF label, but the rest does not match: increase the corresponding criterion parameter by zero;

5.3. the beginning of the content or any part of it does not correspond to the content of the RF label: increase the criterion parameter by zero;

5.4. the beginning of the EF content completely coincides with the content of the corresponding RF label and after that, the text is missing: check the next line for the remaining content. The search ends when the missing content is found (go to 5.1), the first five lines are without text (go to 5.3) or the missing part is found (go to 5);

5.5. the end of the search range has been reached: increase the corresponding criterion parameter by zero.

6. Create and save recommendations and petal charts based on the results of the structural block evaluation.

7. Repeat steps 3-6 until all the criteria of one structural block are checked.

8. Determine the weight coefficients corresponding to the tested structural block.

9. Convert the primary result of the criteria check to a percentage according to the weight criteria in 8 and save the result.

10. Repeat steps 3-9 until all structural blocks are checked.

11. Define or load weighting factors.

12. Get an integral indicator of the quality of the educational program based on 10-11 and save the result.

13. Print and save the resulting integral indicator and its corresponding explanations.

14. Output the saved recommendations and petal diagrams for the structural blocks from 6.

Conclusion

The developed criteria-based assessment system allows evaluating the content of any educational program. The result obtained will be objective and will not depend on the auditor's competence, availability of documents and time of verification[15]. Verification can be performed at any time, thus keeping the main documentation of the educational process up to date[16].

To use the developed complex, one needs to complete several stages:

1. Get reference copies of documents that will be checked for compliance.

2. Get the weight values of each criterion.

3. Undertake the preparation of the document to the desired file format suitable for evaluation.

Verification of documents can be carried out by each teacher remotely or in an educational organization by a specialist. In the presence of remote verification, it is possible to obtain the dynamics of the development of various indicators by an educational organization and their external control, for example, for passing the preliminary accreditation procedure[17].

Preparation of the content of educational programs is an important element of educational activity that requires constant attention and updating[18]. The development of individual industries ensures continuous changes in educational and professional standards, which entails updating educational programs as a whole or its components. With the increasing burden on specialists of educational organizations in providing and maintaining document flow, the probability of a formal approach to evaluating the content of any documents is high[19]. However, this formal approach may not be systematic but implemented before the inspection of supervisory authorities. In addition to the lack of constant monitoring,

[15] E.V. Romanov, Metodologija i teorija innovacionnogo razvitija vysshego obrazovanija v Rossii (Moscow: Infra-M. 2016).
[16] V. V. Levshina, Sistema kachestva vuza (Moscow: Infra-M, 2016), 280.
[17] G. V. Sirotkin, “Model sistemy integralnoj ocenki kachestva obrazovanija i jeffektivnosti dejatelnosti vuza”, Innovacii v nauke Vol: 6 num 43 (2015): 38 – 59.
[18] M. S. Logachev; Ju.N. Samarin y O. A. Vinokurova, “Integralnyj pokazatel kachestva obrazovatelnyh program”, XXI vek: itogi proshlogo i problemy nastojashhego pljus Vol: 8 num 4(48) (2019): 77 – 82.
[19] O. M. Gusarova, Monitoring kljuchevyh pokazatelej jeffektivnosti biznes-processov. Aktualnye voprosy jekonomiki i upravlenija v uslovijah modernizacii sovremennoj Rossii: monogr (Smolensk: Smolenskaja gorodskaja tipografija, 2015).

a subjective approach to evaluating documents both within the educational organization and by external auditors is not excluded. All this justifies the need to use unified and objective methods for evaluating the content of educational programs[20]. The solution to this problem is the use of developed criteria and evaluation complex, which considers all features of regulatory documents and requirements of the educational organization itself[21]. This complex is flexible and can be adapted to any profile of educational activity, the values of indicators can be updated. There is a prospect of developing an automated system for checking the content of educational programs using the results obtained.

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[20] L. M. Gohberg; G. G. Kovaleva y N. V. Kovaleva, Obrazovanie v cifrah: 2018 (Moscow: HSE, 2018).
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