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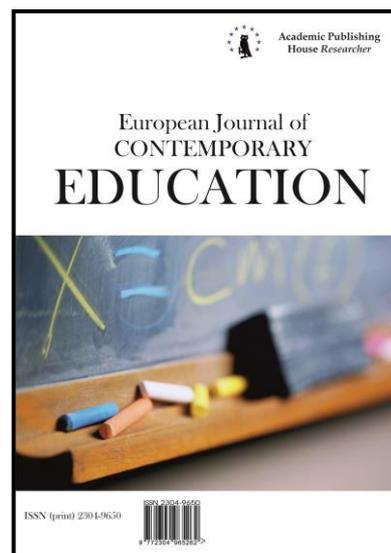
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A Computer Test as a Means to Assess Formation of the Teacher's Metasubject Competences

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Abstract

In the article here is up-to-dated the problem of creation and implementation of the complex system on measurement and assessment of the teachers' competences. Here are presented approaches and approbations of the computer test as a means to assess formation of the teacher's metasubject competences on the example of researching of the group of teachers working with gifted children and youth. Here is revealed the theoretical basis of the competence-based approach, its basic concepts – competence and competency, metasubject competence. The level of methodological bases readiness of the competence-based approach in the aspect of organization of the pedagogical measurement process of the teacher's professional competences is provided. The review of a number of methods and means to assess the teacher's competences is presented, features of the computer competence-based oriented test as a special complex evaluation means are presented, which will provide detection of deficits of the teacher's professional competences and will allow creating conditions for development its realization in the teacher's professional activity of its cognitive, behavioural and valuable components. The description of the computer test is provided: approaches to develop the system of test tasks, determination of their contents, forms and options of representation, results of testing, working conditions with a set of tasks. Screenshots of some pages of the computer test are shown, the operation algorithm, approaches to formation and interpretation of the basis of statistics, the form of presenting recommendations on work with testing results are described. Results of the test approbation on the group of 96 teachers working with gifted children and youth are provided. The subject of testing is a cluster of the teacher's metasubject competences including communicative, research, motivating, organizing, information,

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creative, tutorial, methodical competences and the self-improvement competence. Analysis results of tests are provided in the aspect of mean scores, generalized characteristics of formation of teachers' competences and also generalized characteristics of professional deficits, which respondents have. In outputs of the article the conclusion is made that the offered computer test allowed not only evaluating the level of formation of competences, but also to define teachers' professional deficits and to reveal measures to eliminate these deficits.

Keywords: competence-based approach; competence; competency; a teacher's metasubject competences; the teacher working with gifted children; estimated methods and means; computer testing; a competence-based focused computer test.

1. Introduction

In realization of modern personnel educational policy a question on formation and assessment of a certain set of the teacher's professional characteristics, promoting high-quality realization of the pedagogical activity, is becoming more and more urgent. To replace a simple set of knowledge, skills nowadays new concepts appear such as a competence-based approach – "competence", "competency", in general as a new direction in scientific and pedagogical methodology. Purely "knowledge" education is already inefficient and inexpedient (Zimnyaya, 2004). Competences are necessary not only to form, but also to estimate. Now, despite rather full readiness of the competence-based approach theoretical base in the educational process, there is a problem of creating and introducing a complex system of measurement and assessment of teachers' competences (Zolotareva, 2016).

The interest to the problem of a competence-based approach in the Russian scientific community, especially in recent years, is increasing (V.I. Baidenko, I.A. Zimnyaya, T.M. Kovaliova, Yu.G. Tatur, A.V. Khutorskoy, etc.) (Baidenko, 2005; Zimnyaya, 2004; Kovaleva, 2003; Tatur, 2004; Hutorskoi, 2003). The competence-based approach appeals to a modern paradigm of cross-disciplinary education, it is considered as some kind of instrument to strengthen a social dialogue of the higher school with a professional world (V.I. Baydenko) (Baidenko, 2005); it focuses attention on the result of education, and the result is not considered to be the sum of the acquired information, but the person's ability to work in different problem situations (D.A. Ivanov, K.G. Mitrofanov, A.V. Sokolova); the result is revealed through a set of different competences (Yu.G. Tatur) (Tatur, 2004).

Competences, as a set of the personality's interconnected qualities (knowledge, learning skills, ways of activity), set in relation to a certain circle of objects and processes, and which are necessary for high-quality productive activity in relation to them, being presented in behaviour, the person's activity, become his personal qualities, properties, become competences. Competences are characterized with both motivational, and semantic, and relational, and regulatory components, along with cognitive (knowledge) and experience. According to leading scientists' researches, working in this field (I.A. Zimnyaya, V.D. Shadrikov, I.G. Galamin, etc.), the teacher should have a certain set of competences characterizing him as a person and expert (Zimnyaya, 2004). The level of formation of competences is to be diagnosed and measured.

The measuring procedure is offered to be a set of empirical operations (a choice of the measurement subject, a choice of empirical referents, a choice of measuring procedures, constructing and use of measuring tools, a scale choice, making a display of measurement results on the scale, the analysis and interpretation of measurement results) allowing to set estimates of the measured characteristics and to present them in the quantitative or qualitative scale. According to the most widespread definition, given by American psychologist S. Stevens in 1946, measurement is a procedure of attributing numbers to some characteristics of objects according to certain rules. In empirical sciences all estimating characteristics have generally a latent (hidden) character, preventing from direct measurement. Owing to latency not characteristics by themselves, but their empirical referents – observed signs of characteristics are under estimation (Chelishkova, 2011). Inevitable latency of variable measurements, which used to be in education levels of mastering of knowledge and learning skills, and nowadays competences, leads to the necessity to check adequacy of the received estimates of a conceptual variable of measurement and accuracy of estimates, that is provided due to correction of properties of the measuring instrument.

The correct organization of the pedagogical measurement process is quite important as any mistakes of the standardized conditions of carrying out, processing, the analysis and interpretation

of measurement results decrease validity and accuracy of the received estimates. In case of the organization of the process of assessment of the teacher's professional competences it is necessary to follow these step-actions:

1. To reveal a whole set of competences according to requirements to a pedagogical position and the performed labour functions, set with relevant normative documents (the professional standard, FGOS VPO (Federal state educational standard of higher professional education), etc.);
2. To integrate competences into clusters (to develop a cluster or competence-based model, a cluster structure);
3. To describe signs of cluster demonstration or a certain competence of the future professional activity (competitive knowledge, learning skills, valuable orientations, etc.);
4. To develop competence-based oriented tasks for assessing each cluster or competence;
5. To find evaluation means, which is adequate to task logic for assessing competences.

2. Materials and Methods

To assess the teacher's competences it is possible to offer a certain number of estimated methods and means: pedagogical and competence-based tests; a case method (English Casemethod, a case method, a case-study, a method of certain situations, a method of situation analysis); the situational, integrated and practice-focused tasks; a portfolio (a selection of the certified achievements, the most significant works and reports on them); project tasks, etc. (Zolotareva, 2014).

However, a rather difficult assessment procedure of the teacher's competences assumes development of a more special complex estimated means which will provide identification of deficiencies of the teacher's professional competences and will allow creating conditions for demonstration development of the teacher's professional activity of its cognitive, behavioural and valuable components. Such estimated means may be a computer competence-based focused test (Razumova i dr., 2016).

Implementation of the competence-based approach is happening with transition from traditional testing to the testing developed on the basis of the theory of pedagogical measurements (psychometrics, the Item Response Theory, testology) (Zolotareva, 2014). The test is understood as a set of the control tasks in the standardized form, which have necessary backbone statistical characteristics and provide reliable and valid estimates of the conceptually chosen the measurement variable. The definition of the test has requirements to its quality, which are absent in traditional evaluation means. The radical difference of the test from normal tasks consists not in the form of representation of questions and responses, but that it is based on the theory of pedagogical measurements in the process of its creation and application, and that allows receiving a number of the important advantages, which are absent when tests are not used (Chelishkova, 2011).

Competence-based tests for assessing the teacher's professional competences should contain competence-focused tasks with a freely constructed answer, it is desirable it should be of the interdisciplinary character, on use of knowledge in the subsequent training, life or professional situations. They are developed within the criteria-oriented approach or for each competence, or for each cluster of competences.

The base of the computer test, described in this article, is the case method (English Casemethod, a case method, a case-study, a method of certain situations, a method of the situation analysis) – the technology of training and assessment using the description of real educational situations. The teacher should analyze a situation, understand the essence of problems, propose possible solutions and choose the best ones. Cases are based on real actual material or are brought closer to a real situation (Neiman, 2000). A characteristic feature is submission of ambiguous information on this problem, which can be based on real life facts, material sources, etc. The case is not just a truthful description of events, but the unified information complex allowing to understand the situation (Ansimova, Zolotareva, 2016).

The test for assessing competences is developed as a computer test for teachers and is approved by of SAI FPE of the Yaroslavl Region "Institute of Education Development".

The description of the computer test (further – the Test):

- the system of test tasks is developed for the whole set of learning skills (experience, actions) or abilities presented in passports of competences;

- the content of test tasks includes knowledge, describing each competence, and is directed to assess external demonstration of having it (actions) and abilities to use the competence in practice;
- to assess one competence there are from 20 to 25 developed test tasks;
- to assess each skill (experience) or ability – not less than 2 test tasks (in different options of assessment);

- the set of test tasks provides a free choice of a set of tasks in different variants (to avoid repetition of test tasks in different testing situations – at self-assessment, entrance test, assessment of formation of the competence after the course of advanced studies, the delayed test, etc.).

The free choice of tasks is provided with the testing computer programme. Generation of the Test is carried out by the choice of a certain quantity of tasks from the category (categories) with their reordering in a random order.

The test task contains:

- a single question on assessing one of abilities or skills (actions, experience) of this competence; the question is the formatted text of the case (a pedagogical situation) to demonstrate the ability or skills of this competence;

- the task offers 5 possible answers according to the chosen type of answers; variants contain answers of the different competence extent (abilities or skills): wrong, partially correct, correct;

- each possible answer contains the assessment - 0, 1, 2 (0-incorrect; 1 - partially correct; 2 – correct)

- each possible answer has estimating recommendations (a formatted short text – what the teacher can do, cannot do, what else he should learn, master within the content of this test task), which a tested person will receive after passing the whole test.

If an examinee hasn't done a task, he can't pass to the following test task. When the examinee answers the last question, the button will change the name to "Finish".

Results of testing:

- each examinee gets assessment Grade Point Average on each competence, characterizing the level of its development (below basic; basic; advanced);

- each examinee can receive the list of recommendations, containing the text of estimates and recommendations according to the choice of answers on each competence.

On completing the test there will be a page, where will be presented the test name, summary result of passing, result on each competence (if there are some) and recommendations, corresponding to answers to questions.

Results of testing are the personified data and are available only to the examinee. It is possible to save them in the html file, pressing the button "Save", or to print, pressing the button "Print". To transit to the main menu it is necessary to click "Return to the homepage".

Testing results are supposed to be used for formation of a statistics basis (data collection on the held sessions of testing and their analysis): storage of complete (with keys of answers) results of passing the test by Users and a possibility of its export to the xls and/or csv format.

Statistical results of testing are available to each User, represented by the educational organization, which has the name and the password of access to the testing system. The User's representatives (administration or methodical service) can analyze data, as for assessing the level of competences development by pedagogical employees of the educational organization, which are necessary for work with gifted children and youth, and for determining teachers' deficiencies in development of these competences.

According to testing results the administration of the educational organization can make a decision to make an application for professional development of teachers in order to remove these deficiencies ([Ansimova, Zolotareva, 2016](#)).

3. Discussion

96 teachers working with gifted children and youth took part in approbation of the test. The assessment subject was teachers' metasubject competences.

The teacher's metasubject competences are understood as the universal abilities and readiness of the teacher, promoting to achieve metasubject results in work with children.

Professional competences of the teacher, working with gifted children, are characterized by the general metasubject properties, such as:

- many sidedness of knowledge and open mindedness allowing the teacher to be beyond the professional activity;
- universality, polysubjectivity and polyfunctionality of the skills used in different spheres and areas;
- fundamental nature of knowledge, skills, their thoroughness, which is a base for successful development in life and in the profession;
- the qualities of the new type identity characterizing it as a flexible, mobile, competitive individual, who can be successful and effective in dynamically developing society (Muhamedyarova, 2016a, 2016b).

The cluster of the general professional metasubject competences of the teacher, working with gifted children, included the following competences (competencies): communicative, research, motivating, organizing, information, creative, tutorial, methodical, self-improvement competence (Ansimova, Zolotareva, 2016).

The figure 1 presents the GPAs, gained by examinees on each competence.

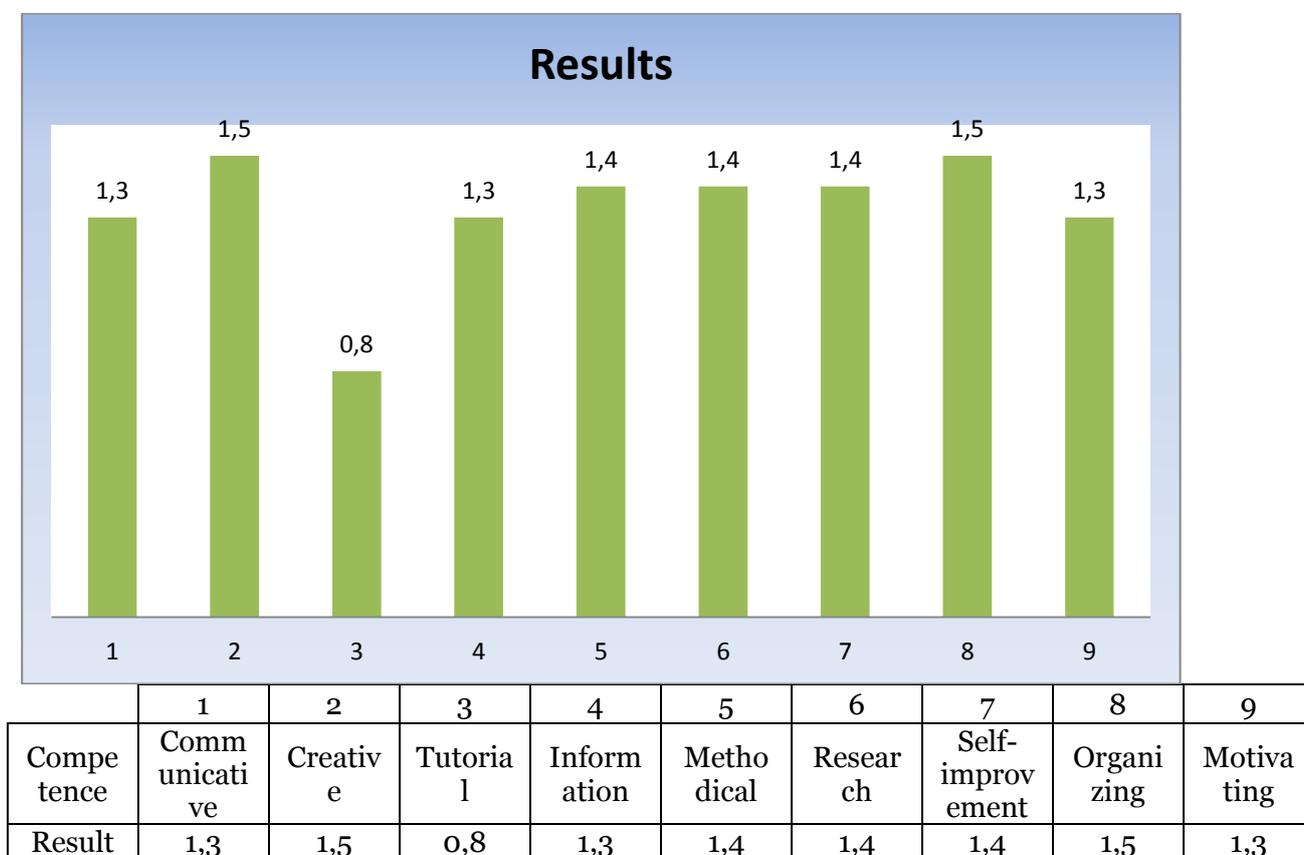


Fig. 1. GPAs, gained by teachers on each competence

The test assumed that the examinee could gain 0, 1 or 2 points on each of components of this or that competence. Thus, we see that dispersion of estimates of competence formation is presented by teachers who passed test in range from 0,8 to 1,5. It is also important to note that the distribution of values for each scale is normal, which was established during the Kolmogorov-Smirnov test (Kolmogorov-Smirnov Z $p > 0,05$). The obtained result allows us to speak about sufficient representativeness of the sample when organizing the test development procedure. The research and motivating competence have the greatest values of points, it is supposed to be logical for teachers who work with gifted children and youth (Chi-Square = 15,68, $p = 0,05$). However, on this background, a rather low level of creative competence (0,8 points) raises questions.

We shall pass to the more detailed analysis of components of competences, considered by us. We will pay attention that testing results allowed us not only to estimate the level of competence

formation, but also to define teachers' professional deficiencies and measures to remove these deficiencies.

The analysis of results of the communicative competence formation shows GPA – 1,3, i.e. it is formed at the level slightly above the average one (it is possible to consider it as a satisfactory result), at the same time, some dispersion of points on its components (from 0,6 to 1,8), speaks about the different level of their development. This result should be considered reliable from the standpoint of the normality of the distribution of the results obtained during the survey. The Kolmogorov-Smirnov test is statistically insignificant (Kolmogorov-Smirnov Z $p > 0.05$). We recall once again that the distribution of values over the remaining scales also corresponds to the normal form. So, the ability to influence the gifted child is adequate to the purposes of communication and problems of the joint activity, and most teachers have it at the average level and it demands additional development. Testing results do not allow us to assume that examinees have a high level of formation of the ability to operate the process of communication with gifted children, showing the ability to take their views, purposes and features into account.

The analysis of respondents' answers demonstrates that they have insufficiently created the ability to solve communicative problems of gifted children, they should correlate the strategy of communication to features of the gifted child, considering his age, a type of endowments and another. At the same time, it is necessary to look at the communicative problems arising in the course of communication of gifted children more widely. Teachers need to develop the ability to solve gifted children's communicative problems, paying attention that it is important not only to defuse the conflict, but to transfer it to the course of the situation contributing to his talent development.

Examinees' skills of interaction experience with various groups of gifted children (different in age, status, a kind of activity, etc.) is at the average level and demands additional development. Probably, the experience which is available for the tested teachers is insufficiently various. The ability to use skills to work with various means of communication in different types of the professional activity in working conditions with gifted children is at the level above the average one and is getting closer to the good result. This block of the communicative competence least of all needs special additional development. However, it indicates that it is necessary to develop the teacher's Information and Communications Technology competences.

Therefore, it is relevant to include into professional development programmes questions of communication process management of the teacher with the gifted child, goal-setting in the organization of the joint activity process of the teacher and gifted children and also the choice of means of influence on this child, adequate to goals and the child's interests. In programmes of professional development it is necessary to provide the methods, directed to motivate teachers to expansion and variety of the teacher's experience on interaction with gifted children (a case method, Portfolio, a teacher's presentations, etc.)

The average value on research competence was 1,5 points, that shows a rather high level and demonstrates that most of respondents have it. However, there are components, which points are at the average level, are basic for the teacher's research competence and therefore need additional development. It is possible to refer to these abilities such as search of necessary and qualitative resources for research projects, to find and involve investors in realization of results of gifted children and youth's research activity; make recommendations to gifted children on carrying out researches; to have skills on technologies of the organization of research laboratories and etc.

Therefore, in programmes of professional development it is necessary to provide questions of theoretical and methodical support of students' research activity; to acquaint them with new material equipment of the educational activity, technospheric technologies; development of the teacher's enterprise competence, skills to attract investors and introduce gifted children's research developments in activity practice; and also questions of design and organization of students' research laboratories.

Due to the general GPA (0,8) the creative competence is at the lowest level in the cluster and, certainly, requires additional development. Including a study of the personal qualities defining creativity; organization and implementation of the educational process of the creative type, possession of creativity development technologies and activation of the gifted child's innovative thinking; creation of favourable psychological climate for creative self-realization of the gifted child; ability to make own creative products, but not fruits of somebody's work. The programme of teachers' professional development can be devoted to bridge these professional deficits.

Assessment of the tutor's competence has shown a rather good indicator (1,4 points), which characterizes teachers' readiness and ability to realize pedagogical support of gifted children. At the same time it is necessary to pay attention to development of those abilities, which are at the average and slightly above than the average one levels. Such as choice of means of forming the talented student's request for the educational activity; use not only traditional, but also innovative technologies of supporting of gifted children's development, helping him to set individual purposes and to solve individual problems; formation of the teacher's subject position in interaction with students; search of educational resources; assessment of results of the tutor's support. Therefore there is a sense to include into professional development programmes the whole range of questions of teacher training in realization of the tutor's position.

Teachers' organizational and administrative competence has gained high GPA (1,4), however "the ability to distribute and organize work of gifted pupils at the lesson and in extracurricular activities" seems to be quite significant, and has an extremely low GPA (0,95). Besides, some other components of other abilities are at the average level, and that requires additional attention to their development anyway.

Examinees define the leading forms of developing skills of independent acquisition of students' knowledge correctly, plan individual work with the gifted child correctly within all contents of the educational programme to the subject, can control the way of realization of objectives set to pupils, as well as in educational, and extracurricular activities. At the same time examinees should study more attentively forms of organization of gifted pupils' independent work; ways of training of gifted pupils for competitions, Olympiads and other forms of competitions; ways to split up talented pupils' work (0,95 points).

Having analysed testing results of the information competence, it is possible to draw a conclusion that in general it is at the level above the average one (1,4 points), that examinees rather successfully use a technique of choosing the content, using navigation technologies and search of necessary information in the Internet, possibilities of multimedia, choose correctly the equipment for the experience presentation. Teachers do not use only their experience, but also programme and Internet products opportunities for preparing didactic and methodical materials. Examinees know possibilities of information technologies use and can orient in search of information scientific resources.

But, at the same time it is necessary to use possibilities of new information technologies more actively, which allow developing gifted children and youth's mental abilities (for example, the online magazine, spreadsheets, electronic on-line portfolio, Wiki – technology, etc.); it is better to study questions concerning information accumulation about actions with use of information resources. The revealed contradictions allow us to think that there is need in additional work on development of this competence. It is necessary to include the questions concerning practical development of the certain new information technologies, applied in information search, the organization of gifted students' research and design activity, preparation of didactic and methodical materials in professional development programmes.

The teacher's motivating competence in general is formed at a very high level (1,5 points). Examinees in general can attract interest of gifted children in the subject, can show gifted children's progress to parents and also can effectively choose tasks so that gifted pupils may feel success; can build activity at the lesson taking into account the level of educational motivation development, besides they have a great range of material and tasks, which can attract gifted students' interest to various topics of the taught subject. At the same time, they should learn to make various conditions allowing to involve talented children in additional forms of knowledge to the subject; to make an individual educational route with children, basing on requirements and interests. Thus, except some components it doesn't require special additional attention.

The teacher's methodical competence (1,3 points). The analysis of testing results allows seeing that teachers own abilities to develop educational programmes; know what pedagogical technologies due to the nature of interaction must be applied in work with gifted children and youth; know quite good the types of methodical production, promoting introduction of the most effective methods and forms of work into the educational practice; can choose methods to unite the group of gifted children and youth.

However, they should know better who and how carries out psychological and pedagogical support of gifted children and youth; what body in the structure of the educational organization

management is responsible for coordination of programme and methodical ensuring work with gifted children and youth; to master forms of generalization and distribution of pedagogical experience; instruments for developing talented children and youth's mental abilities and also to know better how to define the personal need of talented children and youth and what pedagogical technologies provide training of gifted children and youth to public presentations and debatable discussions. They should know better what diagnostic technologies allow tracking results of talented children and youth's creative development.

In general the methodical competence is formed at the level slightly above the average one (1,3 points), however there are a lot of results of indicators which are at the average level. Therefore, there is a need to give special additional attention to this competence. The revealed deficiencies must be in the programme of additional professional education of the teachers working with gifted children and youth.

The GPA on the self-education competence (1,3 points) could be considered satisfactory, however, attention is drawn with extremely low knowledge of specifics of the teacher's self-education during the work with gifted children and youth (0,6 points), and lower knowledge of features of self-control of the self-education and self-improvement process (0,5 points). Nevertheless high points on questions of the self-analysis of their professional activity and also understanding by teachers conditions of self-education efficiency, give the grounds to believe that the situation with this competence can be improved in case of teachers' additional training. Teachers are in great need in studying self-education subjects, features of self-control of the self-education and self-improvement process, development of reflexive abilities.

4. Conclusion

Use of the competence-based focused computer test allows receiving results describing an overall picture and drawing a conclusion that respondents have the competences not at the highest level, which are necessary for work with gifted children and youth. Study of logical blocks of abilities (where there is the corresponding gradation) and a component structure of competences allowed determining professional deficiencies or, on the contrary, seeing strong sides of examinee-teachers. By results of the research the modular programme of teachers' professional development will be worked out, where topics will be offered in modules, revealing approaches to remove teachers' professional deficiencies. We also note that the results, obtained and the analysis performed on the scales, indicate the reliability and validity of the developed test. This makes it possible to use the test in solving many applied problems in education.

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