ISSN 0798 1015

REVISTA ESPACIOS

HOME Revista ESPACIOS ÍNDICES A LOS AUTORES

EDUCACIÓN • EDUCAÇÃO • EDUCATION Vol. 39 (# 05) Year 2018. Page 20

Experimental verification of efficacy of educational test construction technology

Verificación experimental de la eficacia de la tecnología de construcción de prueba educativa

Nataliya A. SENOGNOEVA 1

Received: 18/10/2017 • Approved: 01/11/2017

Contents

ABSTRACT:

The research is topical, since the educational activity is a long and labor-intensive process, the effectiveness of which depends on the correctness of the organized structure, the curriculum compiled. Therefore, the goal of the work is to test the effectiveness of the technology for creating tests of learning activities on the basis of experiment. This is a kind of tool for transferring accumulated scientific knowledge to others, which includes the processes of teaching and learning. The author analyzed fourteen principles, which are the basis for constructing the contents of tests of educational activity. These principles contribute to the management of learning activities; transition from teaching to self-study; joining research and scientific work; selection of the learning material's studying sequence. Running tests helps you to get step-by-step actions using an existing list. Testing allows you to evaluate not only the correctness of answers, but also the logical scheme for solving the task. The author established that such an opportunity is provided to both the teacher who conducts the test and the learner himself.
Keywords Educatory test, principles of educational activity, educational tasks, pedagogical results,

RESUMEN:

La investigación es de actualidad, ya que la actividad educativa es un proceso largo y laborioso, cuya efectividad depende de la corrección de la estructura organizada, el currículo compilado. Por lo tanto, el objetivo del trabajo es probar la efectividad de la tecnología para crear pruebas de actividades de aprendizaje sobre la base del experimento. Este es un tipo de herramienta para transferir conocimiento científico acumulado a otros, que incluye los procesos de enseñanza y aprendizaje. El autor analizó catorce principios, que son la base para construir los contenidos de las pruebas de actividad educativa. Estos principios contribuyen a la gestión de las actividades de aprendizaje; transición de la enseñanza al autoaprendizaje; unir la investigación y el trabajo científico; selección de la secuencia de estudio del material de aprendizaje. Ejecutar pruebas lo ayuda a obtener acciones paso a paso utilizando una lista existente. Las pruebas le permiten evaluar no solo la corrección de las respuestas, sino también el esquema lógico para resolver la tarea. El autor estableció que tal oportunidad se proporciona tanto al docente que realiza el examen como al alumno mismo.

algorithmic process.

Palabras clave Prueba educativa, principios de la actividad educativa, tareas educativas, resultados pedagógicos, proceso algorítmico.

1. Introduction

During the XX century many attempts to technologize the educational process were made in the world pedagogy. Until the mid-1950's they were mainly focused on the use of various technical means of teaching (TMT). Another area of research and practical development is based on a special, technological approach to the construction of learning in general, which has so far been used as much as the pedagogical technologies associated with the use of TMT. Its essence consists in the maximum possible maintenance of controllability by activity of educational institutions. This is a learning process whose level of management is enhanced if there is feedback in the "teacher-student" system and the interaction of the two activities - teaching and learning - is clearly established, and the monitoring system responds in a timely manner to changes in both external factors towards the student (education), and internal (motivation, emotional and value sphere).

Based on the literature analysis, we come to the conclusion that the development and implementation of innovative technologies are characteristic for the current stage of the didactics' development. We will name the authors of the most informative articles on the technological approach in education, whose ideas can be used to solve the problems of testing educational activity: O.B. Zaitseva (2004, p. 13), I.A. Lipsky (2004, p. 34), V.M. Monakhov (1997, p. 84), T.S. Nazarova (1997, p. 31), V.P. Ovechkin (2005, p. 52), G.I. Sarantsev (1999, p. 63). Delineating the concepts of theory, methodology and technology of education, G.I. Sarantsev believes that technology is designed to streamline all the elements of the learning process, to build its stages, to name the conditions for implementing the planned action plan, to relate to the possibilities. The main goal of technologization is to get the product of a given sample. With this approach, the role of technology is reduced to diagnosing goals and identifying conditions (methods, forms, means, dependencies), that is, to correct the process, the implementation of which will contribute to the achievement of the projected goals (Sarantsev, 1999, p. 97).

2. Materials and methods

Supporters of the introduction of innovative technologies question the use of such traditional forms as the class-lesson system, a 45-minute lesson. Therefore, it is necessary to use various materials and methods that contribute to improving the effectiveness of the learning process. Some scientists call them "pedagogical absurdities". We shall note that this is a traditional technology of class-lesson learning, which is still in use. It is well mastered and can still serve for a long time to improve the educational process. However, the school is forced to change in connection with changing educational goals. It needs such a system of studying evaluation that could ensure the quality of education, development and upbringing of each student in accordance with their inclinations, interests, opportunities. The class-lesson system does not solve some new tasks of such an organization of students' learning activities.

Let us consider the approach in which testing becomes a means of evaluating learning activities, which makes it possible to implement a "soft" learning model.

The attractiveness of testing as a means of monitoring the learning results is provided by the presence of a measurement that allows delivering objective quantitative and qualitative information about the progress of studying, to diagnose gaps and forecast success. In the testing process, the interaction between the teacher and the student is provided, on one hand, by creating a test, and on the other hand, by performing and interpreting the results. Many researchers today have a negative attitude toward pedagogical testing. This, in particular, is due to the fact that currently applied tests control, as a rule, the result of training, but do not

allow to adequately assess the learning process itself. Therefore, from the point of view of didactics, it is important to define possible functional directions of testing that are different from the control purposes. In particular, it would be useful to identify the real possibilities of this procedure in determining the entire course of the trainee's learning activity. The forms proposed for achieving this goal will be called tests of educational activity.

The experimental verification of the effectiveness of the application of educational activity tests was carried out in two stages:

– ascertaining stage: the identification of one of the effective problem solving ways going beyond the paradigm of knowledge – the technology of educational activity's tests,

– forming stage: development of technology for constructing tests of educational activities.

Students of pedagogical universities of Nizhny Tagil and Kirov and students of general education schools took part in conducting the formative experiment. Tests were conducted on various topics of the mathematical course.

1) We came to the effectiveness of applying the tests of educational activity on the basis of the opinions of the students who compiled the tests, namely:

In particular, as noted by students, the effectiveness of working with tests of educational activity was expressed in the fact that the record in the notebooks, obtained during the work with the tests of learning activity, was in demand by the students in their further work; students were satisfied with the independent fulfillment of the proposed task; the responsibility of students for the results of their activities increased; students were able to exercise the right to choose.

2) The effectiveness of the tests' of educational activity application can also be inferred from the questionnaire survey conducted by students who performed tests of educational activities.

To confirm the effectiveness of the tests of learning activity, the students were offered a questionnaire, the answers to the questions of which allow us to draw conclusions about the effectiveness of the influence of both the individual indicator and the tests as a whole.

Thus, it was found out that the level of the step-up, the diagnostic, the complexity of the action's performance and the evaluation of each action, the other factors – the width and degree of alternative, the form of evaluation – influence the effectiveness of the educational activity's tests to a lesser extent.

Trained in working with this form of assessment, students and schoolchildren, having received a study assignment, first plan the course of its implementation (in particular, they compare and evaluate the methods of solution known to them, deliberately select the most rational of them, consider the possible consequences of their application) and only after that begin the task. If there is a need, they can return to the required stage of the task, check the composition of the performed actions, understand the mistakes and correct them. Thus, a development of fundamental competencies can be seen in the students in the course of working with the tests of learning activities.

Thus, the experiment showed that the formation of the students' needs in the justifications, the ability to critically evaluate their actions, independently evaluate the solution of problems, to think logically, find their solution in the tests of educational activities.

Tests of educational activities created by the developed technology have a high degree of efficiency, recognized both by the creators of the tests, and their users.

---

3. Results and discussion

It is known that the educational process is characterized by two categories: learning – external to the subject process and teaching – internal. Creation of effective means of evaluating these processes is impossible without identifying the factors that affect them. In this context, the notion of "learning activity test", and even the "educatory test", which is sufficiently established

in modern pedagogy, highlights the relationship between the evaluation of both the learning and the schoolchild’s studies.

One of the key problems is the problem of building the management of the learning process. In "hard" models of learning, they try to fix such management, at times adjusting the regulation to algorithms. It should be noted that in such a model, monitoring only the results of training is often quite effective, because the discrepancy between the normative result and the one received by the learner often allows one to uniquely restore the place of the "failure" in the algorithm. When implementing a "soft" model, the role of feedback increases sharply throughout the entire learning process at each moment. In this case, the evaluation system responds to changes in both external factors in relation to the student, as well as internal factors. The organization of feedback acts as an internal learning factor, generating interest in the subject for students.

During the test, the learner constructs the desired sequence of actions, selecting them from the list. The content of educational activity’s tests allows us to evaluate not only the correctness of the answer received by the student, but also the way of solving the problem. It is important that this opportunity is provided to both the teacher who conducts this test and the learner himself.

The ongoing evaluation of the choice of the path, and not only the final result, becomes the main feature of the learning activity’s test. This ensures the conscious fulfillment of the educational task at all its stages, accompanied by the timely correction of errors through the operational control, which allows the student not only to identify difficulties, but also to realize to what stage of the problem solution they concern. Moreover, in the tests of learning activity tasks can be designed so that the operational control could be treated both as already performed actions, and as planned. This, in turn, provides an opportunity to analyze the work on the learning task before it is performed, anticipating the results.

As shown by our experiment, students and schoolchildren who have been trained to work with this form of testing, having received a study assignment, first plan the course of its implementation (in particular, they compare and evaluate the methods of solution known to them, consciously select the most rational of them, consider the possible consequences of their application) and only after that they start the task. If there is a need, they can return to the required stage of the task, check the composition of the actions taken, understand the mistakes and correct them. Such actions of the learners can be called planning. Mastering them indicates that the educational activity has become sufficiently spontaneous and self-regulating. A superficial view can reveal a significant external similarity between the implementation of learning activity tests and the branched type of programmed instruction (Crowder program). Indeed, in both cases the learner is invited to make a choice from several alternatives, and in case of choosing the wrong variant the student returns to the control question. There is, however, a fundamental difference between the tests of learning activity and the Crowder programs, in which only the level of assimilation of immediately presented knowledge is checked and the level of mastering algorithmic skills with a rigidly built trajectory from the initial data to the result. In the tests of educational activity, the content of the activities that make up the learning activity comes to the forefront. Therefore, they initially have alternative ways to achieve the goal, and in this case, the choice of the learner of one or the other option cannot be evaluated as correct or incorrect, but allows, for example, assessing the level of curtailment of this action or its other characteristics. The different level of coagulation at each stage of the solution implements the principle of adaptability - the student chooses an acceptable path for him. In turn, the choice of the path makes it possible to measure the level of curvature available to the student and thereby judge such characteristics as strength, awareness, generalization of knowledge. In this case, the student is guaranteed to reach the result and will not encounter stressful situation of a negative evaluation of his work. He can compare his chosen way of solving the problem with other options, either by looking at the alternative paths available in this test, or from a discussion with his peers or teacher.

We classify such things as the peculiarities of educational activity's tests: 1) the presence of adaptive properties in them, when the algorithm for selecting and presenting tasks is built on the feedback principle; 2) the individualization of the test execution rate is taken into account; 3) special attention is paid to increasing the level of motivation for testing among the weakest students by eliminating unnecessarily difficult tasks that contribute to the appearance of fear in these subjects from the process; 4) the presence of operational feedback, that is, informing each subject of the result immediately. If there is one way to solve the problem, the student's goal is to find the right answer. In the tests of educational activity, he faces a choice of the most rational method of solution, which requires the actualization of much theoretical knowledge, known methods, techniques, including new ones for this situation. At the same time, the learner accumulates a certain experience of applying knowledge, which promotes the development of logical search techniques and, in turn, develops his creative abilities. In the process of finding a solution, he can try out different strategies and different ways of acting. Finally, the final stage of the decision is coming – choosing one of the strategies implemented by certain ways of acting. In the tests of learning activity, alternatives are represented by variants of a sequence of actions aimed at solving the problem, each step being selected by the test subject, depending on the result of the previous one, when the desired sequence is constructed, and the learner chooses the preferred option from the list of proposed actions. This makes it possible to evaluate not only the answer posed in the problem, but also to think about how to design the way to solve it. This opportunity is provided to both the teacher who offers this test and the learner. Control over the choice of how to solve the proposed test task, and not only for the final result, becomes the main feature of the learning activity's test. The application of tests of educational activity is aimed at the assimilation of knowledge, the development of methods of action. When they are used, the process of mastering knowledge is controlled, which involves taking into account the ways students work, appealing to methods of mastering new knowledge, recording the individual steps in the problem solution, and understanding how the work's result is obtained. This, in particular, facilitates the student's reorientation from the final result to the intermediate result and to make a general assessment of the procedure for completing the assignment as a whole. The basis of testing - is understanding of tests as a form of learning activities' evaluation, its structure, as well as ways to perform actions and their sequence. Multiple choices of ways to perform a test task is correlated with subject characteristics of the student, which determine not only the choice and sequence of operations, but also the overall strategy for solving problems in various ways. Note that when solving a problem in one way, the student's goal is to find the right answer. In the tests of educational activity, he faces a choice of the most concise, rational solution, which requires the actualization of much theoretical knowledge, known methods, techniques, but new for this situation. At the same time, he accumulates a certain experience of applying knowledge, which contributes to the development of logical search techniques and, in turn, develops his research abilities. In the process of finding a solution, the learner can test different strategies and tactics of action. The final stage of the decision is the choice of one of the strategies focused on certain methods of activity. In the tests of training activities, the products of each action are subject to control. It is important that the actions' control is not carried roughly, but with the help of objective and independent characteristics: the volume of operations in the procedures; time of their implementation; the level of actions' minimization; the step of action; the complexity of its implementation, etc.

Correspondence to the revealed signs allows considering construction of educational activity's tests as a certain technology of training. The effectiveness of training with the use of educational activity's tests is provided by designing tests that meet the quality criteria and following the developed method of applying tests of educational activity.

Issues related to tests of educational activity have already been considered in the pedagogical literature: the criteria for selecting content, the structure, design principles, as well as the measurement factors and performance indicators of the learning activity's tests (Senognoyeva, 2006, pp. 38-43; Senognoyeva, 2003, p. 18; Senognoyeva, 2013, p. 104). Let us describe the

experimental verification of the technology's efficiency for constructing these tests.

Tests of educational activity are designed as a sequence of actions that ensure the solution of the problem, therefore, the characteristics of the learning activity test, on one hand, are integrated from the corresponding characteristics of the actions (the volume of operations in action, the operation time, the level of action minimization, the step of action, the level of minimization of the step of action, the level of complexity performance of the action), on the other hand, express the structural links between these actions, ensuring the integrity of the process of solving the problem by this test (minimum test's level swing, maximum test's level swing, average test's level swing, the stage of test's evenness, the test's length, the width of the test, the maximum level of test alternatives, the minimum one, the average one, the degree of the test branching, the maximum level of test complexity, the minimum level of test complexity).

The construction of the tests' of educational activity content is carried out in accordance with the principles of: competence approach, reliance on the theory of step-by-step formation of mental actions; orientation to the mixed type of orientation in the task; control of the way (method) of solving the problem, the actions of students, the passage of the students at all stages of learning; exact adherence to the boundary values for the characteristics of the learning activity's test (uniformity, level of coherence, level of structuring, limited breadth and degree of alternatives to the learning activity's test); implementation of self-control; system quantization; concentrism; processibillity.

1. The principle of reliance on the theory of the step-by-step formation of mental actions. To form a full-fledged action, a strict sequence is required in the development of the stages and properties of the action on each of them.

The characteristics of actions by stages, in the tests of educational activity are presented in the form of comments to the answers. It allows not only to ascertain, but also to reveal the reasons for the student's problems with mastering the material.

The formation and quality of a new action also depends on the distinctive division of actions between the student and the teacher. This is reflected in the doctrine of the types of activity.

2. The principle of orientation to a mixed type of orientation in the task. Singling out the action as the central link in the management of the formation of cognitive activity's process, management must be directed, first of all, to its tentative part. Each of the orientation types corresponds to a certain character of the processes, the quality of the product, the student's relationship to the subject and the process of learning. Let us remind that, according to the theory of the mental actions' formation (Galperin, 1985, p. 85), there are three main types of orientation of the student in the job: I type: the student is shown the process of performing the action and its final result; II type: the student is shown the performance of the actions and the final result, while he is presented with the guidelines and methods of performing the work; III type: the student is not provided with ready-made landmarks, and he learns to find them independently, all the while the student learns the best method of not one single operation, but an entire class of operations.

In the tests of educational activity there is, in our opinion, the so-called "mixed" type of orientation of the student in the assignment, which is characterized by the following:

– the student constructs the orientation himself;

– interaction "student – test of learning activities" is carried out with the activity of the student;

– systematic phased training;

– created such conditions under which the correct performance of the action is not only possible, but also inevitable;

– students are offered an "outwardly fixed plan" (Galperin, 1985, p.38), with which the student can orientate in the operations for its implementation, with the orienting basis being for the student new, that is, the student creates it himself – such a connection solves the problem of

understanding;

– the selection of a criterion having a qualitative characteristic, and also quantitative, in the case of measurement.

Orientation to a certain standard in the evaluation of specific values – with the identification of the relevant side of things and its quantitative indicators – leads to a differentiation of the initial global perception of these quantities. In a particular thing, its individual parts begin to differ clearly – naturally, because the indicators on one parameter do not mix with the indicators of other parameters.

In our case, such parameters are: the level of coagulation, the level of alternatives, the degree of branching of the test, etc.

Thus, the tests of learning activities are a "mixed" type of orientation of the student in the task, when the student, on the basis of assistance in the form of alternatives to the task and comments to the answers, constructs the problem solution.

3. The principle of activity. The principle of activity means that tests of learning activities are one of the forms of educational activity, that is, in them the characteristics, structure of educational activity, as well as ways of performing actions and their sequence are expressed.

Tests of educational activity express the characteristics of educational activity, namely: the use of these tests is aimed at mastering the educational material, in particular, the solution of problems; secondly, they are supposed to master the general methods of action and scientific concepts; thirdly, the general methods of action precede the solution of problems.

We will describe the features of the structure of educational activity when using tests of educational activity.

1. The basis of the motivational component of educational activity is the focus formation on the ways of their actions. In addition, because the motivation for a student’s actions is often a successful result, positively evaluated by an adult, there is orientation in the tests of educational activity and the results of training activities.

2. Educational tasks are offered to the student in a certain form of tasks, when the method of solution is correlated with the subject characteristics of the solver. Solving the learning problem, students consciously perform and control their actions.

3. Educational tasks are implemented in the form of a sequence of training activities. The sequence of training activities is systematic.

4. Control in the tests of educational activities can relate not only to the actions already performed, but also to the planned ones. Control over the actions of students goes into self-control, assessment – in self-esteem.

The highest educational activity is achieved with the systematic nature of its organization. In the tests of educational activity, the action is divided into five stages. We dwell on the process of the activity of the studying and, as the basis for determining the activity of the studying, we adopt the general formulation stating that there are two stages in it – the emergence of some new quality in the student (the procedure of understanding) and then of its improvement (the procedure of working out).

At the first stage of the activity (the procedure of clarification) the student must receive a preliminary ability to perform a specific object-specific action, which is only a "semi-finished product" and has two essential features: 1) the action performed on its basis is presented in an ideal form; 2) is realized only by some, although the most significant, operations. The main sense of doing this action in obtaining its by-product is the trace of this action fixed in the learner’s brain.

With regard to the second stage or the working out process, in the tests of learning activities it is presented as follows:

1. As the process of primary consolidation of knowledge and application of knowledge; in

connection with this, it is proposed to create two types of tests of educational activity – the primary consolidation of knowledge and the application of knowledge.

2. Contains only stage-by-stage types of training – semantic memorization and stage-by-stage training in solving problems. Depending on this, different stages of learning can be represented in the tests of learning activity and a parameter such as the degree of the action's swing is determined. The value of this parameter can vary from 1 to 5.

Thus, the principle of activity is manifested in the fact that in the tests of educational activity the structure of educational activity that make up the activity of the exercise is presented – the stage of understanding the orienting basis and the working out of the formed action.

4. The principle of controlling the way (method) of solving the problem. The method of solving the problem will be considered a procedure that, when it is passed, can provide a solution to this problem. Since in the very concept of the learning activity's test there is a multiplicity of choice of ways of performing a test task, the method of solving in the tests of educational activity corresponds with the subject characteristics of the student, which determine not only the choice and sequence of operations, but also the overall strategy of the solution. The solution of the problem presented in the form of a learning activity's test is assumed in various ways and presents great opportunities for improving the educational activity and development of the subject itself. Note that when solving a problem in one way, the student's goal is to find the right answer. In the tests of educational activity, the student faces a choice of the most concise, rational solution, which requires the actualization of much theoretical knowledge, known methods, techniques new to the situation. In this case, the student accumulates a certain experience of applying knowledge, which contributes to the development of methods of logical search and, in turn, develops his research abilities. In the process of finding solutions, the student can try different strategies and different ways of acting. The final stage of the decision is the choice of one of the strategies implemented by certain methods of action.

5. The principle of monitoring the actions of students. It was emphasized above that in the tests of educational activity the products of each action are subject to control.

Action as a control over the implementation of previous actions is carried out using the very form of the test of learning activities. The realization of the action "mastering the general method of solution" is described in the previous principle.

It is important that the control over actions is not carried out roughly, but with the help of objective independent characteristics: the volume of operations in action; time of operation; the level of action's swing; the step of action; the level of the action step's swing; the complexity of the action.

6. The principle of control of the assimilation stage. We emphasize that the requirement to control the actions of students remains valid not only at the first, but also at the last stages of assimilation. Empirically, the formation of an action can occur with the omission of certain stages of the step-by-step formation of mental actions scale. Such a pass is psychologically justified.

In this regard, an independent characteristic is introduced, such as the level of the action's swing, which makes it possible to control the number of missed stages – it can vary from 0 to 4 (considering that the number of stages involved in constructing the tests of learning activity is 5). Accordingly, the level of the action's swing can be equal to: 0, 1, 2, 3, 4. Its zero mark means that the action is minimized, that is, all five stages of the formation of mental actions are present in the test, and the degree of swing, equal to four, means that the action is minimized, that is, there are only two stages in the test.

Based on the experience of constructing tests of educational activity (Volkova, 2015, p. 557; Volkova, 2015b, 126; Volkova, 2014, pp. 218-219; Koksharova and Gein, 2010, p. 79; Koksharova, 2009, p. 67; Senognoyeva, 2006, p. 14; Senognoyeva, 2003, p. 56; Senognoyeva, 2013, p. 102), one can assert that the actions of one form differ by no more than 1 in terms of

the level of swing. Therefore, in the tests of educational activity, requirement of uniformity – the difference between the maximum and minimum level of of the test's swing takes a value of not more than 1.

7. The principle of control of the swing level of the educational activity's test. Control of the swing level of the test is carried out by introducing such parameters of the tests of educational activities as the average value of the level of the test's swing and the degree of the test's uniformity (the latter characteristic is controlled by introducing the maximum level of the test's swing and the minimum level of the test's swing). The detailed procedure for calculating these characteristics is described in our studies (Senognoyeva, 2006, p. 38; Senognoyeva, 2003, p. 23; Senognoyeva, 2013, pp. 36-38).

Control of the test's swing level is made possible by following the principle of uniformity of the test, the description of which is given in the previous principle.

The average value of the test's swing level can be determined for each decision path. The experience of design showed that the most rational way of solving is the most curtailed.

Consequently, the student, depending on his chosen way of solving, can get an estimate of the swing level, which is an informal assessment of the development of the student's thinking.

Such an estimate of the swing level can also be found for the entire class, for parallels, and so on.

8. The principle of limiting the width and degree of alternative to the learning activity's test. The main thesis of this point is that the width and degree of alternatives should not exceed four.

Let us proceed to its justification. Considering the problems of constructing tests of educational activity, we need to consider the concept of attention, and one of its main properties is the amount of attention.

Attention is the focus and concentration of mental activity on certain objects or phenomena while at the same time distracting from others. Attention is the dynamic characteristic of the activity, its necessary side. The object of attention can be both the impact of the external environment, and their own thoughts, experiences, actions.

Human attention has the following basic properties: stability, concentration, switching, distribution and volume.

The amount of attention is such a characteristic of it, which is determined by the amount of information that can simultaneously be preserved in the sphere of the person's increased attention (consciousness). The numerical characteristic of the average attention span is 5-7 pieces of information. It is usually established through experience, during which a very large amount of information is presented to a person for a very short time. What he has time to notice during this time – characterizes his scope of attention. Since the experimental definition of the amount of attention is associated with short-term memorization, it is often identified with the volume of short-term memory.

Taking into account the numerical characteristics of the amount of attention and the fact that it is established experimentally, if we determine the width and degree of alternatives of the educational tests, we turn to the experience of creating tests of a controlling nature.

In the materials of A. N. Mayorov, an instruction is given to compile test tasks for the Dutch Institute of CITO, which determines the number of alternatives: "The usual question consists of the introduction, the question itself and a number of alternatives, each of which is the answer to the question. The optimal number of alternatives is 3 or 4. Having two alternatives, the examiner will start to guess the correct answer, especially if the alternatives are similar (less able examinees will encounter more difficulty than more able to identify differences between these alternatives). Usually it is difficult to find more than 4 interesting and original alternatives, and in addition they will take more time from the examinee to read them" (Mayorov, 2000, p. 21). At the same time, A. N. Mayorov specifies that the optimal number of

alternatives in cases with digital expressions is 5, "while," he writes, "it must be taken into account that this is not always possible" (Mayorov, 2000p. 43).

Taking into account that in the tests of learning activity the student meets not only and not so much with digital expressions, but also with theoretical material and comments to the answers, the optimal number of considered characteristics is 3, and the maximum number of them is 4.

9. The principle of self-monitoring in the tests of educational activities. We advance this thesis as a principle, since we understand self-control not only as a structural component of educational activity, but also as an act of mental activity (a form of manifestation and development of self-consciousness, thinking, the quality of the mind, a sign of its criticality, discipline): "... every activity has its own history, – writes T. V. Gabai, – and certain circumstances determine the very fact of its initiation, as well as the fact that it is realized in this way, and not in some other way. These circumstances, being put under the control of a person, are in his hands a means of "provoking to life" the process of the desired activity. If such a person is the subject of the forthcoming activity, then we can talk about self-government, otherwise there is an external control over the behavior of this subject" (Gabai, 1989).

According to Galperin's theory (Galperin, 1985p. 30), the feedback should carry the following information:

a) whether the learner performs the action that is planned;

b) whether he correctly fulfills it;

c) whether the form of the action corresponds to this stage of assimilation, and so on.

Note that we are talking about controlling the result of an action, and monitoring the result is meaningful only when the student has made a mistake. From this it follows that, in addition to control over the result, there is control of the process – a kind of self-control. In addition, according to D.B. Elkonin, the control of the result does not set the task of conscious assimilation of the educational effect of goals before the students (Elkonin, 1989).

For this purpose, a sample of the mode of action is formed in the tests of educational activity. It must contain reference points, on the basis of comparison with which the control action can be made before the desired action for which this applied method is carried out.

Taking into account what has been said, we will distinguish the following structural elements of self-control in the tests of educational activity:

– attention to the results of their work;

– the presence of control over the course of mental operations;

– observation of the work progress on previously known criteria;

– accurate and timely detection and correction of deficiencies in work.

***10. The principle of system quantization*.** The principle of system quantization fulfills the requirements of the theory of compression of educational information and the theory of integration of didactic units, which were considered above.

The principle of system quantization is provided by appropriate structuring of educational information. Each portion of the training material, called the quantum, takes into account not only the objective structure of the process, but also the actual capabilities of the student. If the level of the student's preparation is insufficient, then the volume of individual operations decreases, and increases with a higher level of training. Therefore, we defined such a quantum structure:

1. Clear statement of the didactic goal in the form of a specific task.
2. Presentation of training material that allows you to overcome difficulties for students.
3. Stimulating the reactions of students.

4. Providing feedback.

5. Management of intellectual activity.

6. Stimulating the recall of necessary knowledge and skills, and also the strength of the acquired knowledge and skills and their transfer.

7. Evaluation of students' actions.

11. The principle of concentricity. At the heart of this principle is the concept of concentricity, which means returning to the previous from the position of the next (movement from the abstract to the concrete).

Building knowledge assimilation according to Galperin's theory of goals (Galperin, 1985, p.32), we, on one hand, free the student from doing unnecessary operations, some acts of action begin to be performed in abbreviated form, according to the "formula". On the other hand, thanks to the concentric system, the action is enriched by additional useful operations that result in a more perfect product.

Note that the theory of concentrates is the basis for the measured characteristics of learning activity's tests, such as the volume of operations in action, time, the step of the test, the level of the step's swing, the length of the test, the width of the test, the testing method of which was performed in the works (Senognoyeva, 2013, p. 18). This means that the identification of such concentrations in the tests of learning activity is of fundamental importance for the construction of educational activity's tests.

12. The principle of technology. We will show that the tests of educational activity are pedagogical technology.

Theoretical questions related to the essence of pedagogical technology were considered in the first chapter. The rationale for this principle will be based on its results. In particular, the main features of pedagogical technology were singled out:

– the technology is an algorithmized and structured process aimed at achieving an unambiguously set learning goal;

– the technology assumes the presence of subjects (people, devices, equipment, machines and tools);

– availability of diagnostic tools;

– this process is the most effective in comparison with similar processes, at least for some parameters;

– reproducibility of pedagogical results;

– the focus of technology on achieving product efficiency;

– the quality of the product can be characterized by performance parameters.

Let us consider the conformity of the creating tests' technology to the marked features.

1. The method of setting goals, which offers innovative pedagogical technology of tests of educational activity, is characterized by increased instrumentality. It consists in the fact that the learning objectives are formulated through learning outcomes expressed in the actions of the students. Let us remind, that the peculiarity of the learning activity's test is that it specifies one or another sequence of actions aimed at solving problems. That is, the implementation of this requirement becomes obvious.

2. The technology is an algorithmized and structured process: the student's actions are systematized according to the theory of the planned formation of learning activity.

3. Manageability means controlling the creation by the student of an indicative basis of actions to solve a problem, while not the result itself (that is, the answer to the problem) is evaluated, but the designed way of its solution.

4. Reproducibility is provided by the possibility of objective step-by-step measurements of the

pedagogical activity of the teacher.

5. Tests of educational activities in their form are diagnostic tools.

Correspondence to the selected features allows us to consider the construction of educational activity's tests as a specific pedagogical technology. Its innovativeness is determined by the fact that, unlike ordinary tests, tests of educational activity control the creation of an indicative basis for action to solve a problem by the student.

13. The principle of application of tests of educational activity at various stages of the learning process. The application of educational activity's tests in the educational process has its own characteristics. The use of the same test at different stages of the learning process can give different effects. So, for example, if the test is applied at the stage of learning a new material, then students are required to solve the problem in any of the proposed ways. If the test is applied at the stage of fixing a new material, then the students are required to follow the path that indicates the assimilation of a new material that has already been studied. Therefore, the tests of learning activities are classified as follows:

– tests of educational activity of the first kind – these are tests used in the study of new material;

– tests of educational activity of the second type – these are the tests used to fix the studied material.

Tests of educational activity of the first kind are characterized by the fact that the average value of the level of swing takes a value greater than or equal to one, but less than four. Tests of educational activity of the second kind are characterized by the fact that the average value of the level of swing takes a value greater than one, but less than or equal to four.

Thus, tests of learning activity, in which the average value of the level of swing is equal to one, is used only at the stage of studying new material; tests of learning activity, in which the average value of the level of swing is equal to four is applied only at the stage of consolidation of the studied material. All other tests can be used both at the stage of studying new material and at the stage of fixing the studied material.

As a result of observance of the above principles:

– management of educational activities is carried out taking into account all its features at all stages of solving the educational task;

– there is a transition from teaching to self-study;

– the student has the opportunity to reach the correct solution of the problem of any complexity;

– there is a choice of a sequence of learning material;

– the student is released from performing routine operations;

– the student has the opportunity to obtain the required information, including the method of solving the problem without turning to the teacher;

– the student gets rid of the fear of making a mistake;

– the student gets the opportunity to get involved in research;

– the object of studying of the student is his own activity.

4. Conclusions

Thus, the test of learning activity consists of two parts. The first part – let us call it the actual teaching one – is connected with shortcomings in the ability to think, analyze the problem, in the ability to apply knowledge, that is, with shortcomings in analytic and synthetic operations. It includes content that learners should know according to their goals, and is a fairly complete information structured in accordance with the parameters of the educational activity's test,

allowing to make an assessment, which is mentioned in the previous paragraph.

The second part, controlling, is subordinate in nature and is associated with the identification of existing deficiencies in knowledge. The main purpose of this part is to establish whether the knowledge and skills of students studied at the previous stage of training are mastered, so that the requirements for the preparation of this part of the educational test may be limited by the requirements for drawing up tests for control over learning results.

The construction of the content of educational activity's tests is carried out in accordance with the principles: reliance on the theory of the step-by-step formation of mental actions; orientation to the mixed type of orientation in the task; principle of operation; control of the way (method) of solving the problem; control of the students' actions; control of students passing through all stages of learning; exact adherence to the boundary values for the characteristics of the learning activity's test (uniformity, level of swing, level of structuring, limited width and degree of alternation of the learning activity's test); implementation of self-control; the principle of system quantization; the principle of concentration; principle of technology.

The construction of tests of educational activity passed a wide approbation, which confirms the effectiveness of technology for creating tests of educational activity.

Bibliographic references

Volkova, Ye.A. (2015). Some aspects of assessing the quality of development of educational tests in mathematics. *Educational technology and society (Educational Technology & Society)*, 18 (2), 555-568.

Volkova, Ye.A. (2015b). *Scientific and methodological approaches to automating the evaluation of the quality of eductional tests (based on the example of teaching math teachers)*. Nizhny Tagil: NTGSPI (f) RSLPU.

Volkova, Ye.A. (2014). Automated system as a means of assessing the quality of educational tests. Herald of the SOGU, 4, 218-219.

Gabai, T.V. (1989). Educational activity and its means. Moscow: University of Moscow. Publishing House.

Galperin, P.Ya. (1985). Methods of teaching and mental development of the child. Moscow: MGU Publishing House.

Zaitseva, O. (2004). Information competence of the teacher of the educational field "Technology". *Pedagogy*, 7, 17-23.

Koksharova, Ye.A., Gein, A.G. (2010). *Use of a pedagogical expert system for assessing the quality of educational tests*. Informatics and education. Moscow.

Koksharova, Ye.A. (2009). Selection of efficiency criteria for a pedagogical expert system that assesses the quality of educational tests. *Herald of Adyghe State University*, 12, 64 – 67.

Lipsky, I.A. (2004). Technological potential of social and pedagogical activity. *Pedagogy,* 9, 34-41.

Mayorov, A.N. (2000). Theory and practice of creating tests for the education system (How to choose, create and use tests for education purposes). Moscow: Public education.

Monakhov, V.M. (1997). Axiomatic approach to the construction of pedagogical technology. *Pedagogy*, 6, 26-31.

Nazarova, T.S. (1997). Pedagogical technologies: a new stage of evolution? *Pedagogy*, 3, 20-27.

Ovechkin, V.P. (2005). Education in a changing cultural and technological environment. *Pedagogy*, 10, 18-26.

Sarantsev, G.I. (1999). Theory, methodology and technology of teaching. *Pedagogy* 1, 19-24.

Senognoyeva, N.A. (2006). Testing as one of the forms of evaluating the learning activity of students. *Pedagogy*, 5, 38–43.

Senognoyeva, N.A. (2003). Some aspects of the technology of creating educational tests. *Mathematical Education and Culture: Collection of scientific works on the materials of the 1st Int. Scientific Conference of October*. Togliatti: TSU.

Senognoyeva, N.A. (2013). Tests of educational activity. Principles of construction and effectiveness of the application of tests of educational activity. Saarbrücken: Lambert Academic Publishing.

Elkonin, D.B. (1989). *Selected psychological works*. APN of the USSR. Moscow: Pedagogy.

---

1. Doctor of Pedagogic Sciences. Department of professional pedagogy. Russian State Pedagogical University. Russian Federation. E-mail: sennataliya2005@yandex.ru

---

Revista ESPACIOS. ISSN 0798 1015
Vol. 39 (Nº 05) Year 2018

[Índice]