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STUDENT ACHIEVEMENT MONITORING (SAM) TOOL IN PEDAGOGICAL PRACTICE

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Abstract

This paper presents two closely related researches that explore the use of the Student Achievement Monitoring (SAM) tool in pedagogical practice. The SAM tool is based on a three-level model of mastering cultural ways of action (formal, reflexive, and functional levels are distinguished). The researches discuss pedagogical strategies that allow school pupils to move from a low formal level to a higher - reflexive and functional - level. In order to find and describe effective pedagogical practices, the authors have conducted two researches of pedagogues. The first research was concerned with exploring different pedagogical strategies of teacher pedagogical actions and their connection with the educational outcomes of school pupils. It was aimed at correlating the results of SAM testing of students with the real pedagogical practice of the school in order to test the working hypothesis that high results at the second and third levels of students' mastery of learning materials are connected to a particular qualitative teaching model. The second research was related to the search for optimal ways to organize pedagogue professional development in mastering the level-based model of school pupil learning. During this research the main pedagogical difficulties and ways to compensate for them were analyzed. The result of the research was the construction of a matrix of pedagogical actions based on SAM methodology, typology of diagnostic assignments for teachers, description of the technology for training teachers to make three-level diagnostic blocks on their subject material and to design process maps of lessons with built-in three-level diagnostics.

1. Introduction

In recent years there has been much discussion about new educational outcomes for schools, but little discussion about how to achieve these outcomes. No matter what direction the teacher's role changes, he/she still plays and will continue to play a significant role in school education.

2. Problem Statement

A group of national experts in developmental teaching led by Elkonin and Nezhnov developed a level-based learning model that allowed the school itself to determine levels of quality in general education (Nezhnov et al., 2009). In order to assess these levels of cultural knowledge appropriation by school pupils, first of all, a special tool named SAM (Student Achievement Monitoring) was developed, which allows to determine the levels of students' learning material capturing at different stages of schooling (Nezhnov, 2018b). The proposed model distinguishes qualitatively different levels of mastering a cultural way of action:

- the first (formal) level is characterized by the fact that it allows action by example, without reliance on understanding the content of the concept underlying this way;
- the second (reflexive) level is shown only by those students who focus not on external, but on essential (entity) characteristics of the analyzed way of action;
- the third (functional) level assumes that students not only act with understanding, but also see the limits of the way, are oriented to the field of possibilities of application of this way.

3. Research Questions

In order for school pupils to reach the second and third levels of capturing knowledge, effective pedagogical practices are needed. And what do effective pedagogical practices mean? Who owns these practices in today's schools? And can teachers master such practices and solve today's educational problems?

4. Purpose of the Study

In order to answer these questions, two researches of adults (pedagogues) were conducted based on the development of this tool for assessing the level of educational outcomes of school pupils. One research was concerned with exploring different pedagogical strategies of teacher pedagogical actions and their connection with the educational outcomes of school pupils. The second research was related to the search for optimal ways to organize pedagogue professional development in mastering the level-based model of school pupil learning.

5. Research Methods

5.1. The first research

Our task was to correlate the results of SAM testing of students with the real pedagogical practice of the school in order to test the working hypothesis that high results at the second and third levels of students' mastering learning materials are connected to a particular qualitative teaching model. From our perspective, if the construction of pedagogical practice in the school is based on the model of learning in the theory of cultural development, such pedagogical practice has more chances and opportunities to achieve good results and quality education in modern conditions.

For this research we described a model of such pedagogical practice which, in our opinion, could provide a fundamental change in students' educational outcomes through the formation of school pupils' learning and subject-specific competencies (Level 2-3 in SAM technology). The SAM technology emphasizes another approach to subject-specific outcomes - the measure of students' appropriation of cultural subject ways/means of action. This approach, on the one hand, sets a different way of allocating levels of learning material capturing and, on the other hand, allows forming key competences without special emphasis on the so-called "meta-disciplinary" educational outcomes.

The developed model of pedagogical practice and the package of diagnostic tasks created for this practice to assess the level of mastering of pedagogical ways/means of action by pedagogues allowed not only to identify pedagogues, schools of cultural development, but also managed to set the "area of the nearest development" for schools which are interested in improving the efficiency and quality of general education. It allowed a different way to build work with the teacher, organizing a fundamentally different system of professional development of pedagogues.

During the work on creation of the model pedagogical practice the research group identified its key elements, which, according to the group, determine the effectiveness and quality of general education (performance of level 2 and 3 tasks as per SAM technology). These key elements were the following pedagogical skills (Vorontsov, 2019b).

A teacher who focuses on comprehension rather than formal learning must be able to reduce the time required to form and practice skills. In order to do this, he/she needs to learn how to identify the core concepts, cross-cutting content lines, basic means, and ways of action in the academic subject.

It is important that the teacher knows how to organize a task-based approach to the subject and is able to set a problem and convert it into a task together with the students. If teachers have teaching materials that implement the task-based (activity) approach to learning, it helps them to design lessons and testing-and-assessment tasks. No matter how good the ready-made teaching materials are, they require correction and follow-up revision in accordance with the features of the educational institution, with the conditions for conducting lessons in class and out-of-class forms. Essential here is the level of independence and initiative of the teacher.

The teacher often does not distinguish between demonstrativeness and modeling. One of the basic pedagogical skills consists in unfolding the action of modeling when solving educational tasks. Mastered modeling with the use of various schemes, sign and symbol-based means provides better results in solving tasks of the second (reflexive) level.

When problem translation and extended modeling are supported by specially selected instructional texts, teachers can also achieve important meta-disciplinary goals such as reading proficiency and information competence during the course of subject-based training.

Another pedagogical skill that deserves special attention is the ability to organize educational collaboration in classrooms and groups. The teacher must also keep the focus on individualization (personalization) of learning when organizing collaborative and distributed activities.

When organizing an educational dialogue, the teacher should listen carefully and record children's hypotheses, from which future projects and research often grow. This is facilitated by creating special conditions for provoking (initializing) exploratory activities, which can be carried out at different stages of learning activities and using different means.

The teacher must be fluent in the technology of formative assessment (Vorontsov, 2018), which allows cultivating control-assessment independence of children, which, in turn, determines the success of the formation of learning independence.

Finally, the teacher should be able to design a system of students' independent work, which requires the latter to be able to determine the boundaries of knowledge-ignorance, select the necessary learning material to solve the tasks set by the teacher, make a responsible decision about the readiness to present their work to the teacher and other students.

On the basis of the above-mentioned pedagogical actions an assessment tool for pedagogical actions (Vorontsov, 2019a), indicators of teacher evolvement in activity pedagogy (Lvovsky, 2019), as well as a general matrix for constructing diagnostic tasks on its basis were developed (see a fragment of the matrix, Table 1). Just as with school pupils in SAM diagnostics, three levels (types) of mastering pedagogical actions are supposed to be distinguished for teachers. The third type is the highest (functional) level of the teacher's mastery of a particular pedagogical action. The possible actions of the teacher are described for each type. There is also level 0 (type) - it is the pedagogue's lack of a certain way of action.

So, the general criterion for the use of pedagogical actions of **the first type** are the actions of the teacher, which are oriented to the external characteristics of the task situation and action patterns. In pedagogical actions of the first type reproductive methods and forms of training, orientation on standard types of tasks and algorithms of their solution, predominance of traditional (marking) system of evaluation, class-lesson form of organization of the educational process are manifested. Accordingly, the teaching material used is a model curriculum and a traditional (reliable) textbook as the main teaching aid. Texts are used where information is given in an explicit form, there are no different points of view, the relationship between form and meaning is presented clearly and unambiguously.

The general criterion for the use of pedagogical actions of **the second type** is the pedagogue's ability to act, focusing on the essential relations of a given situation. The teacher is theoretically aware of the task-based approach in teaching, knows how to act in the organization of learning activities, but in educational practice the initiator and the pivotal figure remains the teacher. Many teacher's actions are either "imitative" or formal in relation to the key pedagogical actions.

The general criterion for the use of pedagogical actions of **the third type** is to hold the boundary of the method of pedagogical action, allowing the construction of the field of its opportunities.

Pedagogical actions of the teacher correspond to the task approach and are aimed at organizing and managing the learning activities of school pupils. The content of teaching is dominated by children's trial-and-error activities, discussion forms and formative assessment.

Thus, the diagnostic work for the teacher is structured so that he/she can use one of the three types of pedagogical actions to perform the tasks. All three types of pedagogical actions have the right to exist in educational practice. However, according to the hypothesis of the research group, only the predominance of actions of the second and third types in the teacher's activity can contribute to an increase in the number of reflexive and functional level tasks performed by children when testing with the SAM tool.

Table 1. Pedagogical action matrix

Content of action	Pedagogical action levels		
	1	**2**	**3**
1. Preparing for lessons and self-reflecting			
1.1. Selecting key (core) concepts of the subject Task #1	Does not distinguish between the key concepts underlying the general way of action and the manifestations of this concept in all possible specific-practical situations. Understands subject matter as a set of uncompiled facts not connected by common grounds.	Is able to identify the key concept but cannot construct a teaching situation which leads to it, reducing his/her pedagogical actions to translation of ready-made ways of action. Is unable to select task material through which the multidimensionality of the concept in question is manifested.	Selects key concepts, builds pedagogical actions on their introduction and selects or develops tasks of different levels, allowing him/her to analyze the understanding of the concept through its various manifestations.
1.2. Planning pedagogical actions to introduce the concept Task #2	Ready to set forth a problem to the class and demonstrate a way to solve it. The presentation is jammed with secondary information not directly related to the matter in hand. Prepares tasks of a purely reproductive nature for students.	Prepares questions for students which unambiguously lead them to the correct way of solving a new task. Selects tasks mainly at the reproductive level; more difficult tasks are offered only to "strong" students or if one so desires.	Predicts possible variations of hypotheses and actions of students in the course of mastering a new concept and plans appropriate pedagogical actions. Uses multilevel tasks.
1.3. Work with teaching and learning aids Task #3	Uses a model curriculum in its entirety without modifying it. Prepares a linear outline of a lesson based on a resource book. Strictly adheres to recommended practices. Uses mostly textbook for work in class and at home.	Makes changes in a model curriculum and modifies resource materials according to own creative ideas. The textbook is used by students mostly for work at home.	Is able to transform teaching materials into a lesson project, taking into account different possible routes. Independently develops a lesson scenario in accordance with the activity approach. Designs his/her own (author's) work program.

For each pedagogical action of the teacher the diagnostic tasks were developed for. Due to the fact that 15 pedagogical actions were identified in the model pedagogical practice, the diagnostic package

included 15 situational pedagogical tasks, each of which consists of three tasks, a task corresponds to one of the three types of mastering the pedagogical action. The total number of tasks in the test is 45. Given the created matrix, it is possible to develop a similar package with diagnostic tasks for any subject. It is essential that all diagnostic tasks are based on the content of the subject. Each subject teacher performs work in his subject. At the moment the complete package of tasks in mathematics of elementary school has been developed and tested (an excerpt from the description of tasks in mathematics is given in Table 2). At present the work on creation of similar diagnostic tasks for other subjects has begun.

Table 2. Characteristics and description of tasks in the diagnostic test (excerpt)

Task No.	Pedagogical actions	Content of pedagogical actions	Type of action[1]	Type of task[2]	Index
1.1.1.	Identifying key concepts and acting on them	identifying the key concept underlying the general way of action against the background of the concepts derived from it	1–3	CA	1–3
1.1.2.		determining the way of working with a concept	1–3	DA	1–3
1.1.3.		choosing the tasks for checking the understanding of the chosen concept	1–3	CA–DA	1–3
1.2.1.	Actions to introduce the concept	choosing a way to introduce the "area of a figure" concept	1–3	CA–DA	1–3
1.2.2.		describing the teacher's own actions to introduce the "area of a figure" concept	1–3	DA	1–3
1.2.3.		choosing a block of tasks to check understanding of the "area of a figure" concept	1–3	CA–DA	1–3
1.3.1.	Working with teaching and learning aids	description of the educational results for one of the topics of the course in mathematics	1–3	DA	1–3
1.3.2.		evaluation of an excerpt from the mathematics curriculum	1–3	DA	1–3
1.3.3.		designing an excerpt from the curriculum	1–3	DA	1–3
1.4.1.	Independent analysis of a conducted lesson (class)	an analysis of a video lesson: defining the goals, tasks, and means of solving the tasks, and summarizing the results	1–3	DA	1–3
1.4.2.		defining the role of an adult in the lesson	1–3	DA	1–3
1.4.3.		formulating the main idea of the lesson on a given topic	1–3	DA	1–3
2.1.1.	Formulation of a problem in a class	choosing the way of the formulation of the problem from the three offered options	1–3	CA	1–3
2.1.2.		analysis of the way of posing a problem on a given topic	1–3	DA	1–3
2.1.3.		Designing a part of the lesson on work with a problem situation	1–3	DA	1–3

5.1.1. Excerpts from the descriptions of different pedagogical strategies

The first type of teacher treats the course in mathematics as a set of uncompiled facts and patterns of action, usually works at a formal level, transmitting ready particular ways of action to students; that is, in the classroom the teacher presents all material to students in a ready form, starting with the lesson topic, the formulation of which at this stage is most likely not clear to children. All the

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[1] Depending on the choice of the way of solving this or that task, the expert defines the type of pedagogical action (1-3) and consequently assigns one of three indices to the solution (1-3).

[2] CA - choice of one or several answers out of many, DA - detailed answer.

teacher does is to tell them and show them the ways that should be mastered by children, in a ready-made form. Such a teacher does not consider it necessary to set a problem through task solving, joint discussion of different points of view (there is simply no reason for them to appear). Students are offered mostly reproductive-level assignments, in the performance of which "recognition" of the type of task and mastery of a standard algorithm of action is sufficient. In the course of learning sessions during the study of new material at the lesson the teacher may ask a number of questions, but they ~~are~~ largely rhetorical in nature, asking students to "remember" what they have studied lately, and formulating the next step himself/herself. Thus, the initiative in goal-setting in lessons belongs entirely to the teacher.

The second type of teacher is able to identify the key concept but cannot construct a teaching situation which leads to it, reducing his/her pedagogical actions to translation of ready-made ways of action. Is unable to select task material through which the multidimensionality of the concept in question is manifested.

In preparation for lessons, prepares questions for students that clearly lead them to the right way of solving a new problem, but selects tasks mainly at the reproductive level and offers more difficult tasks only to "strong" students or to ones who so desire.

In terms of methodology he/she makes some changes in a model curriculum and modifies resource materials according to own creative ideas. The textbook is used by students mostly for work at home. Sees inconsistencies between the actual lesson and the linear project and their causes, but does not revise the project.

At the lesson he/she sets a specific-practical task and organizes work to convert it into a learning task (the task of searching for a new way of action/concept), but rigidly adheres to the version he needs and avoids questions and opinions of students which do not fit into it. The teacher invites students to express their points of view about the way of solving the task, gives them a critical assessment and sums up the results himself/herself. Practical actions of students are mostly demonstrative rather than exploratory in nature.

The third type of teacher correctly and appropriately emphasizes key concepts that allow the teacher to interpret primary course in mathematics not as a set of uncompiled facts and action patterns, but as an integral system based on common grounds, and to develop this understanding among students. The teacher can construct a "map" of his subject. With this teacher's approach to the subject, students can also be expected to move beyond formal, "pattern-based" activities, i.e. to higher levels of mediation.

The use of reflexive and functional level tasks in learning session tests (unfortunately, many Russian Federation math textbooks have very few tasks at these levels) suggests that the teacher tries to make students understand and apply the subject content in different and unconventional situations.

The teacher of this type plans pedagogical actions in the activity-based voice using the task-based approach: he/she organizes the lesson in such a way that there is both a situation of success and a "gap" situation which leads the students themselves to setting a new task; the ways of action are not readily given by the teacher but are "discovered" by students; different forms of work are expected in the lesson, including group work in situations requiring students to present options for action and discuss them. The teacher constantly challenges the students to find a new way of action by presenting them with a system

of specially selected specific-practical tasks. Such a teacher is able to predict the development of events in the class and to organize intragroup and classwide discussion.

The peculiarity of the presented teacher diagnostics is that all three strategies of teachers' actions have the right to exist. Which one of them has more influence on getting good results from children as per SAM technology is the objective of the next stage of research. However, the results of the first stage have already been used for our second research.

5.2. The second research

The second research was built on the results obtained in the first research and focused on the problem of using SAM in teacher professional development in the process of mastering activity-based educational practices. The research was conducted in 2016-2021 in different urban and rural settlements of the Russian Federation: Aginskoye (Trans-Baikal Territory), Armavir (Krasnodar Territory), Barnaul (Altai Territory), Izhevsk and Mozhga (Udmurt Republic), Moscow, Naberezhnye Chelny (Republic of Tatarstan), Surgut (Khanty-Mansi Autonomous Area - Ugra), Yakutsk (Republic of Sakha-Yakutia). It was attended by 480 primary and middle school teachers.

The program of professional development courses is based on the results obtained as part of research on the possibilities of including activity-based educational practices trainers-technologists in the processes of supporting teachers' professional growth (Lvovsky et al., 2018; Lvovsky, 2019; Lvovsky, 2021), as well as on the data obtained by graduate students under the supervision of Nezhnov (Khakhalina & Nezhnov, 2021; Lvovskaya & Nezhnov, 2021).

The main goals of the professional development courses are:

- understanding of the three-level model of assessment of learning and subject competencies, distinguishing between formal, reflexive, and functional level tasks;
- enhancement of the subject-based competence and reflexivity of teachers by means of experience in designing or selecting tasks of different levels on their subject material;
- improvement of general pedagogical competence of a teacher due to the experience of expertise of three-level tasks on different subject content;
- increasing teacher's diagnostic skills, which enhance the ability to manage the educational process based on assessed results;
- a shift in the teacher's goals from the traditional ones associated to a greater extent with the development of tasks at the formal level, to the developmental one, which relies on the reflexive and functional levels.

In the process of trying out different options for constructing a professional development course on mastering SAM methodology by pedagogues (Agapov et al., 2018; Agapov & Lvovsky, 2018; Lvovsky et al., 2015; Lvovsky & Sanina, 2018; Lvovsky, 2021) we concluded that the optimal structure is the following one:

- a theoretical introduction, including an explanation of the main provisions of the cultural-historical theory of L. S. Vygotsky as the basis of SAM methodology; a brief description of D. B. Elkonin's age periodization with reference to the papers of Slobodchikov, Tsukerman, Nezhnov; theoretical description and justification of the SAM tool (Nezhnov, 2018a; Nezhnov, 2018b; Nezhnov et al., 2018; Slobodchikov & Zuckerman, 1996);
- demonstration and commentary of tested blocks of subject tasks;
- group work of teachers to design one or more blocks of three-level tasks for different subjects and for different age groups of students;

- primary expertise of developed blocks of three-level tasks by trainers-technologists or supervisors;
- follow-up revision or creation of new blocks taking into account the comments of experts (typical difficulties for teachers are described below); approval of blocks for testing;
- testing of the blocks created with whole classes or groups of students and presentation of the results;
- analysis of the results of testing by experts (trainers-technologists, methodologists, supervisors); decision-making on the results of testing (the block may be sent for follow-up revision or additional testing in other age groups of students);
- drawing up and presenting the most successful blocks for different subjects to all the trainees of the professional development courses (the presentation includes the history of creation to show the mistakes made, as well as all the intermediate and final results of the testing);
- summarizing, recommendations for using the SAM methodology in different formats and at different levels of education.

Let us elaborate on some of the presented stages.

The general theoretical introduction should give the trainees an idea of the model of functional development (according to L.S. Vygotsky) which includes three qualitatively different levels of mastering a cultural way of action (formal, reflexive, and functional).

Teachers are offered several blocks (mainly in mathematics and Russian for elementary general education) to demonstrate the basic principles of their construction as well as the results of testing. At this stage, three levels of indicator systems are discussed with teachers (Nezhnov, 2018b), which can be briefly characterized as follows.

The first (formal) level brings together the tasks where, as a rule, learning takes place, which are solved by standard methods mastered by students in the classroom.

The second (reflexive) level demands that students understand the essential relations of a task. It includes the so-called "trap" tasks, which are externally similar to the formal level (that is, as if they push students to use the samples of solutions known to them), but in essence it is impossible to solve them without understanding.

The third (functional) level is demonstrated by those students who not only act with understanding, but have so mastered the method that it has become easily transferable to unknown situations, students are ready to quickly go through different situations, choosing the best line of solution.

Trial development of blocks of tasks is carried out in subject or cross-curricular groups (for example, in a group uniting teachers of natural sciences). It is reasonable to offer each teacher to create his/her own block of tasks, and the resulting blocks are discussed with colleagues in the group.

6. Findings

The primary expertise reveals the difficulties that teachers have in composing the blocks of tasks.

- More than 80% of the teachers in our experiments do not distinguish between qualitative levels (formal, reflexive, and functional) and levels of difficulty. As a result, the blocks of tasks compiled by them lose their diagnostic value: when tested, a decrease in the percentage of solvability is observed, but not due to the fact that students do not understand the concept at the reflexive/functional levels. All three tasks are not qualitatively different, and from the results of the diagnostics we can only say that students have difficulties in moving from simple to complex tasks. Thus, an important area of professional development for teachers is learning to

equalize tasks by the level of difficulty within a single block (as a rule, it is recommended to set a minimum level of difficulty).

- Approximately 50% of teachers have difficulties with the structuring of learning content. This manifests itself in the fact that within one block the conceptual unity of the three tasks is not retained, as a result it is more difficult to diagnose the causes of students' difficulties. In the professional development courses we have to pay attention to the content analysis of subjects, the identification of cross-cutting content lines, key concepts.

- Difficulties are also caused by the distinction between functional level tasks and creative tasks. Since the professional development courses focus on distinguishing between the first (formal) level and the second (reflexive) level, we have no quantitative data about this difficulty. An indication that this difficulty is present is the inversion of the results during the transition from the second to the third level: instead of a decrease in the percentage of completion there is often an increase (sometimes a significant one). This means violation of the principle of leveling in the construction of the block of tasks, since those students who mastered the second (reflexive) level had to show statistically significant results at the third (functional) level. Inversion can mean that the proposed creative task can be solved in a non-normative way (intuitively, with reliance on worldly experience).

- Quite often teachers strive to move away from test-type tasks with a choice of one or more correct answers and formulate open-ended tasks (especially this concerns tasks of the third - functional - level). This facilitates the invention of tasks, but greatly complicates the testing procedure. Teachers should explain that open-ended tasks should be provided with all options of correct answers (detailed evaluation criteria should be attached to the task).

After the blocks have been revised and approved by the expert, teachers proceed to testing. Testing under different conditions may take place in different ways, in particular, the school may continue to work routinely, teachers enter the classroom for 15-20 minutes for testing. Less frequently, the testing requires an entire lesson.

Teachers record the results, indicating the percentage of completion of each level for each block of tasks. When analyzing the results, the experts adhere to the following approximate guidelines: first-level tasks should be solved by at least 70% of students, second-level tasks by about 50%, and third-level tasks by at least 15%.

The main thing the experts pay attention to is the absence of inversion (when more students solve higher-level tasks than lower-level ones). It is not uncommon for first-level tasks to be solved by 90-100% of students; this is quite acceptable. In elementary school it often happens that no one solves third-level tasks, which is also acceptable because the third level is not the target level in elementary school (in elementary school the target level is the second level).

In the case of a strong deviation from the set indicators (for example, very low percentage of solving first-level tasks, or too sharp difference between the first and second levels, or inversion of results), first of all the experts should return to the analysis of tested blocks and make sure that they meet the content criteria. Namely: all tasks of the block are based on the same concept (the same content of educational material), the tasks meet the criteria of the corresponding levels, the answers minimize the probability of guessing, the intuitive solution is excluded, etc. Then a more in-depth analysis of the textual design of the task is conducted, the reasons for low percentage of completion in complex or ambiguous formulations are looked for. The expert also draws attention to multiple-choice tasks, since quite often teachers do not specify exactly how many correct answers should be marked (this disorients students and leads to a sharp decrease in the percentage of completion).

Depending on the context in which the professional development courses take place, teachers are recommended different ways to revise the blocks of tasks. For example, it may be advisable to offer this block not to a class or a group, but to individual students (both who show high performance in a given subject and those who demonstrate low success). Discussion with students about how to solve these tasks often suggests the direction in which the block should be revised.

This specified sequence of stages in the development and testing of the SAM tool is not strictly set: testing and revising tasks can be done many times. In our practice there were cases when some blocks of tasks were developed, for example, for students of the 4th-5th forms, and testing showed that they were accessible only for students of 7th-8th forms (this was found out by testing in all age groups).

Special attention should be paid to the professional development of teachers engaged in developmental teaching (the system of D. B. Elkonin - V. V. Davydov), which are equipped with special means of formation and diagnostics of learning activity (Vorontsov & Lvovsky, 2020).

7. Conclusion

Our research has shown that SAM methodology is expedient to use not only in teaching teachers to develop and apply three-level tasks in pedagogical practice, but also for designing lessons with built-in diagnostics. The design, subsequent implementation, and analysis of a lesson with built-in diagnostics should be presented as a detailed and multidimensional process. The main tool is a special lesson process map (LPM) of the activity-based type, which is fundamentally different from the conventional LPM, primarily because of its non-linearity. That is why it is literally a map and not a preconceived plan.

The LPM focuses on several key points. First, it contains a task (let's call it conditionally a learning task), which must lead the participants of the lesson to a new way of action (in SAM logic, it may be a second or third level task). In many cases this "learning task" is preceded by a task which allows the teacher to evaluate the class's readiness to the next step (it may be a task which evaluates both curricular and meta-disciplinary competencies). The culmination of the lesson in the task-based approach should be the situation of problematization, in the design process it is necessary to provide different routes leading to the problem situation, as well as those indicators using which the teacher can promptly assess the children's actions in this situation. The map should include various subtasks, which allow, first, to slow down the general movement and contribute to the awareness of most students of the problematic situation, and secondly, help to find a way out of the problematic situation.

In order for LPM with built-in subject and meta-disciplinary diagnostics to become a tool for teachers to master ("make their own") the activity-based approach to learning, a number of conditions must be met. LPM must not become a formal demonstration product; it is usually designed in teamwork of several teachers under the guidance of a trainer-technologist "for themselves" (not for controlling bodies, not for satisfying someone's formal requirements). LPM is not needed in every lesson; its design is no simple matter, but it is important for the successful progress of a teacher on the path of activity-based pedagogy. The trainer-technologist should strive to ensure that at some point the teacher starts to give productive lessons that include activity-based educational practices, acting spontaneously and effectively without the "scaffolding" of LPM.

LPM is contradictory: on the one hand, it implies both certain actions of the teacher and certain actions of the student (thus limiting the teacher's freedom of maneuver), but on the other hand, it should be so variable as to become a teacher's assistant in various situations that may arise during the implementation of activity-based practices. In fact, LPM is a powerful accelerator for the emergence of new pedagogical intuition, which is nothing less than curtailed experience. Designing, conducting, and subsequent analysis of a lesson with feedback (a lesson where a teacher sees, feels, and understands students' actions in a problem situation) brings together, curtails, and twists key pedagogical skills: to set a "learning task" and organize the process of its solution, to select and use subject tasks of different levels as per SAM as formative and diagnostic ones, to organize metadisciplinarity assessment and development situations.

Acknowledgments

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