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IMPROVING METHODOLOGY OF DEMONSTRATION EXPERIMENTS FOR DEVELOPMENT OF PUPILS' KNOWLEDGE, COMPREHENSION AND SKILLS

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Abstract. *The article offers a model including ideas from psychological-pedagogical theories, which explain how pupils acquire knowledge and which allow a teacher to see the possibilities of applying demonstration experiments within the framework of these theories. There is described the procedure of the carried out pedagogical experiment, put forward the criteria for acquisition of physics and development of learning skills as well as evaluated the effectiveness of the created demonstration experiments model. The model mentioned above envisages more effective acquisition of physical knowledge and skills, deeper understanding of mechanics content and development of learning skills, which is expressed in the quality of knowledge.*

Key words: *comprehension, demonstration experiment, knowledge application competence, learning, teaching.*

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Introduction

Physics is one of the fields, which is able to introduce meaningfully with changing bodies of the world, phenomena occurring in the surrounding world and their application for satisfaction of humans' interests and needs.

In the learning process at school the most important issue is acquisition of the basics of physics, which enables to understand the course of physical processes as well as forms a world reflection in every child's consciousness. The process of teaching physics at school has a crucial role in cognition of the world.

Research of any problem on physics lessons begins with observation, an experiment and analysis of its results. There is a traditional view that acquisition of physics at secondary school must be based on experiments. An experiment in physics enhances formation of correct views about physical phenomena, facilitates deeper comprehension of cause-relation effects in physics as well as enhances acquisition of thinking operations and development of learning skills, which, in its turn, ensure learning independence and qualitative changes in pupils' knowledge. An experiment causes pupils' interest in physics as a subject and physics as a science, which is extremely topical nowadays, when the number of pupils continuing their learning in natural sciences programs at secondary school is decreasing. Pupils lose their interest and motivation for learning in this field. One of possibilities to change this situation is forming pupils' comprehension about the idea, that the knowledge of physics is necessary in everyday life as well as in professional activities because human life is full of various physical processes and technical appliances based on them. It means that the teaching process in physics must be based on observations, experiments and research.

Consequently, a desire to solve the problem how to organize teaching-learning process on physics lessons observing

the themes of physics and performing demonstration experiments in order to deepen comprehension and facilitate the development of learning skills determined the choice of the theme of the research: "Improving Methodology of Demonstration Experiments for Development of Pupils' Knowledge, Comprehension and Skills".

The object of research: study process at comprehensive secondary school.

The subject of research: demonstration experiment in acquisition of physics.

The aim of research: to work out a theoretically based and practically tested model of demonstration experiments, that induces pupils' comprehension of the cause-effect relationships in physics and acquisition of physical skills as well as development of learning skills.

The methods of research: examination and analysis of resources and documents on education, observation of the pedagogical process, modeling, pedagogical experiment.

Demonstration Experiments Model in Acquisition of Physics

The author offers a model for acquisition of physics, which includes several approaches to organization of the knowledge acquisition process. In the model worked out by the author (Figure 1) a demonstration experiment has a key role.

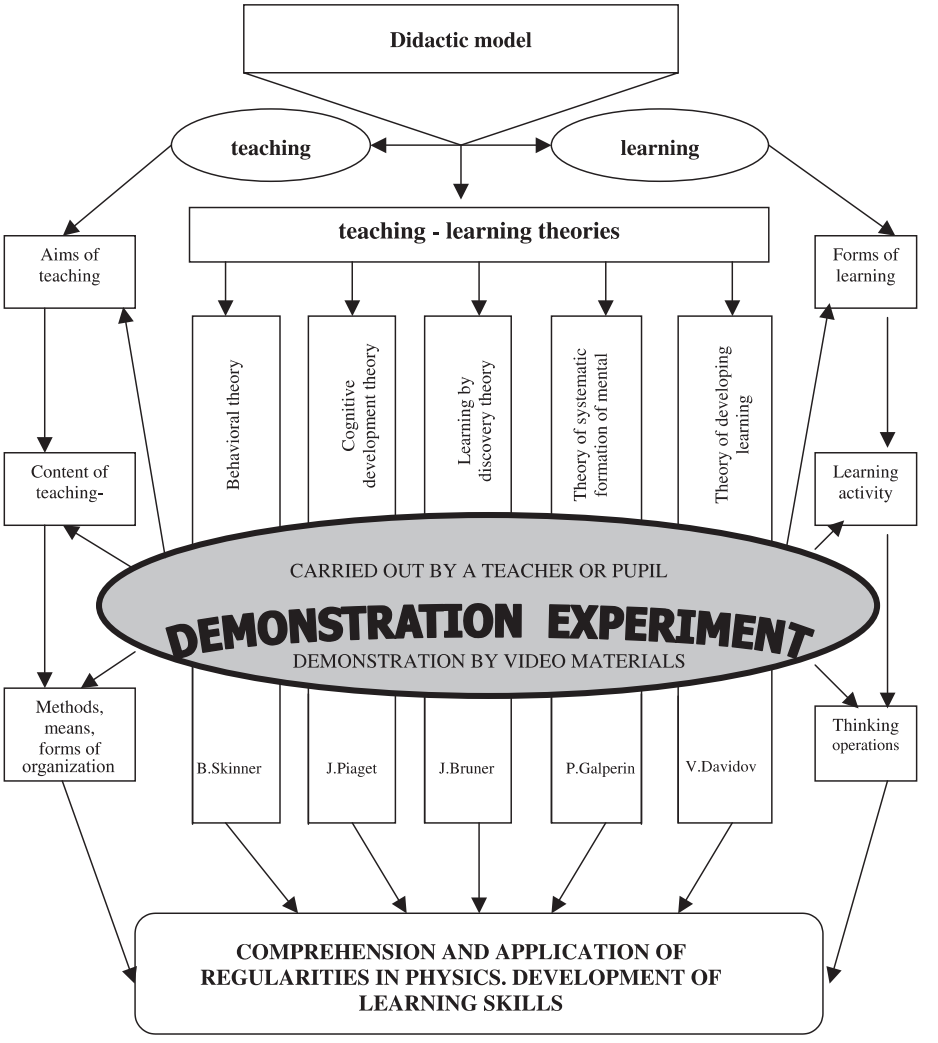

Figure 1. Scheme of the demonstration experiment model.

The teaching-learning process in physics as didactic reality becomes possible when three components are united: pupil's learning, teacher's teaching, content of physics. These components are interrelated. The relationship "pupil-teacher" covers the attitude of both subjects involved in the teaching-learning process towards each other, their communication and cooperation, coordinated and mutually acceptable work organization. In the structure mentioned above the author is mainly interested in the interrelationship "teacher-content", which includes professional preparation of curriculum in physics, teacher's performance transforming material into teaching means at a lesson, choice of teaching methods of a didactic model, creation of teaching-learning environment corresponding to the aim and tasks of the lesson. The second interrelationship is "pupil-content", which covers learning motives, aims, learning skills in general and specific physical skills, attitude towards learning in general, towards the subject of physics and its teacher, skill to organize one's learning. Demonstration experiments, which usage for acquisition of physics is determined by the specifics of physics as a subject, belongs to the interrelationship "teacher-content" in this structure. Therefore a demonstration experiment, which is planned by the teacher to be carried out at a lesson in order to reach specific teaching-learning aims, can be viewed as a teaching method as well as a teaching means and through the syllabus it becomes a facilitator of comprehensive aspects expression in the interrelationship "pupil-content".

In acquisition of physics two completely different activities - teaching and learning merge. I.Žogla indicates that teaching is a purposeful action enriching pupil's learning, help provided to a pupil to improve learning skills, reach individually possible effectiveness in his cognition. It is a teacher's activity stimulating formation of a cognition task, intensifying mental development, formation of attitudes by solving increasingly complicated intellectual and practical tasks. In its turn, learning is a pupil's activity aimed at acquisition of individual experience, which is a basis for simultaneous development of cognitive skills and attitude (Žogla, 2001a). In order to ensure these two different activities mentioned above and reach the necessary teaching-learning result, the process of acquiring physics shall be based on specific teaching-learning theories.

Learning is a time-consuming process. During it a pupil changes his behavior as a result of experience. If behavior has changed in the teaching-learning process, then it can be considered that learning has occurred. Behavior is an action, speaking, writing, moving and other similar activities, which let research the desired cognitive behavior - thinking, feelings, desires, remembering, problem solving, etc. Some psychologists pay attention only to external behavior; they are called behaviorists. Others use the kinds of external behavior in order to conclude what happens in human mind; they are called cognitive psychologists (Geidžs, Berliners, 1999). Another approach to the issue of learning is created within the framework of performance psychology, where one of the most developed theories is a theory of developing learning based on techniques of theoretical thinking (Панов, 1998). The ideas of the representatives of these movements - B.Skinner (behavioral theory), J.Piaget (cognitive development theory), J.Bruner (learning by discovery theory), P.Galperin (theory of systematic formation of mental actions and concepts) and V.Davidov (theory of developing learning) are included in the model of demonstration experiments. These theories provide explanation how pupils acquire the knowledge a teacher must teach them (Dzerviniks, 2003). The description of the theories mentioned above in the context of application of demonstration experiments and development of learning skills will be provided further.

Within the framework of these theories there can be seen the possibilities of applying demonstration experiments. The model envisages that acquisition of physics shall completely be based on implementation of various experiments. The main of way of implementing demonstrations is a demonstration carried out by a teacher or a pupil using the resources available in the physics room. In order to demonstrate those experiments, which cannot be carried out in the physics room due to the lack of appropriate resources, there is used the educational video film. Therefore, in all content units of physics there is ensured observation

of the complete demonstration experiments complex.

The notion of learning usually comprises the answers to four relevant questions: for whom, what, why and how to be taught (Žogla, 2001a). In this specific case a teacher teaches physics to the pupils of secondary school choosing specific methods, organizational forms, means, especially focusing on demonstration experiments. Teaching of physics as a purposeful activity has its aims envisaging providing knowledge, forming skills, creating comprehension, developing thinking, and enriching attitudes and relations. In order to ensure formation of pupil's individual experience, mental development and enrichment of attitude, it is important to have a variety of learning, activity of cognitive processes, which can also be achieved through demonstration experiments. Therefore, demonstration facilitates reaching of teaching aims.

Teaching as any activity has aware teaching content. For example, the content of mechanics is comprised of 8 chapters, within the framework of all the chapters there is an opportunity to demonstrate a wide range of experiments.

Teaching cannot be imagined without textbooks, technical aids and other sources of information. Demonstration experiments belong to this structural component of the model because they can serve as a visual aid, a source of information; demonstration also is a teaching method, carrying out a demonstration experiment is possible in various organizational forms of teaching and learning.

According to the model the pupil's learning process is realized through concrete forms of learning. The learning process by the help of demonstration experiments is facilitated through such forms as: imitation, repetition (Krüger, Helsper, 1998), formulation of a hypothesis and research, observation, measuring, weighting, asking, answering (Žogla, 2001a). Using varied learning forms pupils acquire not only physical knowledge and skills, but also learning skills. Forms of learning stimulate learning activity. Pupils' activity in the teaching-learning process is of high importance as it determines to a great extent the effectiveness of the process of mechanics acquisition. An activity is a relevant characteristic of an action; basing on specific teaching-learning theories a teacher must form social and material environment necessary for teaching and learning. The objects required for carrying out demonstration experiments are elements of material environment; pupils' involvement into formation of this environment enhances their aware activity in learning.

The acquired knowledge lets pupils enrich their experience further and develop their mind using thinking operations. They are techniques of mental activity ensuring processing of information and transformation into individual consciousness. Demonstration experiments in physics include objective opportunities for development of pupils' thinking operations. In order to comprehend various physical notions, regularities, and processes, it is necessary to have comparison and generalization skills as well analytical skills. Thus, physics demonstration experiments in the learning process activate pupils' cognitive processes, stimulate development of thinking operations, and facilitate development of learning skills.

In the model of demonstration experiments it is seen that in the process of acquiring physics the activity of a teacher and a pupil are united, however, both teacher's teaching and pupil's learning are oriented towards a common result - acquisition, comprehension and application of regularities in physics. In addition, applying demonstrations purposefully pupil's learning is led and learning skills are developed, which become a prerequisite for acquisition of specific subject content, development of skills typical for the subject of physics and pupil's ability to learn independently.

Further in the article in the context of application of demonstration experiments and development of learning skills there are described the teaching-learning theories included in the model of demonstration experiments.

Behavioral theory. The key element of the behavioral approach is reaction. According to Skinner's theory the essence of learning is making links between reaction and external events (Первин, Джон, 2000). According to this theory operative behavior is followed by a result as a

positive stimulus making to repeat the respective action or behavior or as a negative stimulus making not to be willing to repeat it (Puškarevs, 2001). If a teacher wants to firm a certain type of behavior, then he must use an appropriate intensifier as soon as this behavior appears. For example, if after explanation of a cause-effect relationship, which is illustrated by a demonstration experiment, a pupil answers all the questions precisely, then the teacher intensifies this behavior (pupil's answer) by praising or by giving a positive evaluation at the end of the lesson. Therefore, a positive intensifier will make a pupil listen and observe a demonstration attentively at the next lesson as well. The psychologist B. Skinner asserts that using the right intensifier it possible to firm the desired behavior. Of course, praising, approval, positive evaluation and other rewards make pupils act better, work and learn more diligently, however, it is very complicated to change pupils' reaction by the help of forming operative conditioning reflexes (Хьелл, Зиглер 1999). Skinner's theory explains different kinds of behavior, but it does not reveal how to learn by observing others, how to solve problems, etc. Nevertheless, forming operative conditioning reflexes is one of the possibilities to ensure successful teaching-learning at physics lessons.

Cognitive development theory. Cognitive psychology does not argue against behavioral psychology, but considers it to be overly simplified. Cognitive theory stresses conceptual understanding and thinking skills (Geidžs, Berliners, 1999).

According to J.Piaget's cognitive development stages the secondary school period corresponds to the formal logical operations stage. Formal operational thinking has the following characteristic thinking functions-analysis, generalization, assumptions, etc. If a pupil has acquired formal logical thinking, he must be able to perform abstract thinking, assumptive thinking, combinatory thinking, hypothetically deductive or scientific thinking (Пиаже, 1981).

The subject of physics at secondary school contributes to development of such thinking, demonstration experiments let test the hypothesis, prove or rebut assumptions, help to think about logical possibilities, etc. According to the cognitive theory the main learning mechanism is mutual structuring of the existing experience and the new information in the process of accommodation and assimilation (Piažē, 2002).

Learning by discovery theory. Application of demonstration experiments in acquisition of physics is grounded by a learning by discovery theory of psychologist J.Bruner. This theory supposes to formulate hypothesis and test them independently, not just take teacher's words for granted. Discovery learning leads to experience in formulating general laws and principles as well as identifying useful notions (Geidžs, Berliners, 1999). In J.Bruner's discovery learning pupil's activities and actions are considered as a factor measuring action: knowledge and skills form more successfully, they are more stable if learning is based on pupil's natural desire to discover (Žogla, 2001b). Teacher's comments have a leading force as they are a basis for further discovery learning activities.

Theory of systematic formation of mental actions and concepts. A psychologist P.Galperin has worked out a theory about the structure of the knowledge acquisition cycle. The essence of this theory lies in the following: external, material activities gradually turn into internal, mental activities, which occur solely in the mind.

According to P.Galperin's point of view, transformation of external activities into internal processes has several steps passing definite stages. The first stage determines preliminary introduction to the activity, notion, and their division into operations, which are understandable for pupils and adjusted to their knowledge and skills. This introduction is an orientating basis of the new activity and notion (Гальперин, 1981).

The second stage of P.Galperin's theory supposes formation of activities in a material way. When pupils are introduced with a new activity or notion, then, according to this theory, it is necessary to work with the appropriate material objects. In order to see better the relevant features of the notion to be acquired, it is necessary to ignore the irrelevant features under the given conditions. It means that pupils shall pass from work with material objects to work with their substitutes - models (Фридман, 1984). Here you can see the role of demonstration

experiments in acquisition of notions in physics because every demonstration experiment in physics can be viewed as a model, where you can observe the processes and features, which are necessary for acquisition of a new notion or activity. Therefore, a demonstration experiment can be included in P.Galperin's theory scheme if it is applied in physics.

The next stages in this theory are connected with formation of an activity, notion by talking loud and silent, which is followed by transformation of the activity to deeper thinking processes. As a result, the activity is performed automatically but with comprehension.

Theory of developing learning. Psychologist V.Davidov has created his own approach to the process of acquiring new knowledge. One of the main ideas in his theory of developing learning is that learning shall ensure reaching the theoretical, not empirical level of thinking. V.Davidov considered developing of pupils' theoretical thinking as an aim of developing learning (Яковлева, 1997). V.Davidov asserts that the main technique used in the teaching-learning process to acquire new knowledge shall be moving from general to particular by generalization (Лернер, 1996).

The acquisition of knowledge in developing learning is as follows: new information shall find its place in pupil's memory in order it is acquired. The perceived facts are connected and coherent with the existing knowledge. Mostly these are hidden, but analytical activities. If the new information does not contradict the existing views and does not repeat them, then it remains in memory as new knowledge. However, if it contradicts, then reasonable questions appear and deeper layers of thinking are included in analytical activities. These layers of thinking are based on the laws of logic, induction, deduction, analysis, synthesis, etc (Козлов, 1998). Everything mentioned above develops pupil's intellect and stimulates identifying links between subjects. It occurs automatically on the level of associative thinking.

V.Davidov points out that nowadays education content includes more scientific terms, notions and theories, therefore pupils need well developed theoretical thinking to acquire them (Давыдов, 1981). Physics syllabus at secondary school comprises complicated systems of abstract concepts. The generalizations included there can be acquired basing on the chains of reasoning and concluding. Being aware of the interrelationship between causes and effects of different objects and phenomena and understanding them, pupils are able to acquire concepts and notions about the laws of the surrounding world (Давыдов, 1996).

The approaches of the psychologists mentioned above (B.Skinner, J.Piaget, J.Bruner, P.Galperin, V.Davidov) for the acquisition of new knowledge can be applied in physics. Acquisition of the syllabus in physics is a cognitive activity tended towards acquisition of knowledge and skills. Within the framework of these theories a demonstration experiment can be applied. Its implementation is determined by the specifics of physics as a subject. According to the author's views, acquisition of physical notions, understanding of processes, phenomena and interrelationships can be based on these five approaches using each of them in a specific teaching-learning situation.

Criteria of Physics Acquisition and Learning Skills Development for Testing the Effectiveness of the Model

According to the demonstration experiments model physics is acquired in a pedagogical process oriented towards pupil's learning, where a pupil himself has an important role in acquisition of knowledge. Comprehension, which is personally important and meaningful, is considered to be a relevant feature of learning. The acquired knowledge must not remain passive - remembered and not applicable, therefore purposeful learning also includes such component as application of knowledge. The links between physical phenomena and processes explored in physics and practical life, their applicability in nature and technics are undeniable, thus it is important to make pupils be aware of these various interrelationships and be able to apply them in different spheres of life. Besides, purposeful learning enriched by external factors also includes the presence of adequate emotional experience and a stable positive

emotional experience dominant. Therefore learning of physics can be viewed as pupil's purposeful activity for enrichment of his experience in specially organized environment and by the help of a teacher, who makes emotional experience and motive to be active.

The worked out model of demonstration experiments requires testing its effectiveness, therefore, it is necessary to put forward criteria characterizing acquisition of physics and development of pupils' learning skills. The author considers the respective criteria can be as follows: comprehension, knowledge application competence, emotional experience.

Further every criterion is described.

Comprehension. In order to explain physical processes and phenomena, pupils must have good preliminary knowledge. Precise and wide knowledge of facts lets involve pupils more successfully in solving more complicated tasks and problem situation, which are relevant in scientific cognition. In learning thinking is directed towards possibly deeper comprehension of knowledge. To comprehend phenomena, processes and objects means to reveal the relevant and ignore the irrelevant (Žogla, 2003). Comprehension can be expressed as recognition of things and phenomena and their classification (in the simplest cases). Pupil's ability to find out the internal structure or operational mechanism principle, reveal causes and effects, perceive interrelationships, associate the observed phenomena and processes with general physical notions prove that a pupil has a high comprehension level.

From the aspect of learning skills comprehension is an aim and a result of learning. Learning with comprehension is searching for evidence, facts, causation and the main. Reproductively acquired knowledge is a means for comprehension. Knowledge become consistent, their operability increases, logical memory enhances, positive attitude towards learning becomes stable. Learning with comprehension is a new dimension of learning skills, which is based on skills of analysis and synthesis and lets transform knowledge to new situations (Žogla, 2001b).

Knowledge application competence. V.Zelmenis talking about application of knowledge indicates that knowledge is not an aim itself; it is a means for improvement of life. Their value lies in person's opportunity to obtain deeper and broader views about the surrounding world, development of mental abilities, opportunity for better inclusion in society and better understanding of the current processes using them for satisfaction of person's needs and improvement of life quality (Zelmenis, 2000). The knowledge, which a person does not use or cannot use, has no value, thus in the process of knowledge acquisition it is important to reach not only consistency and wideness, but also a skill to apply knowledge.

Application of knowledge facilitates their acquisition, enhances learning motivation and by revealing the practical meaning of the issues to be taught makes knowledge closer to real life and to be understood really, not abstractedly. A teacher organizes the knowledge application competence formation process and gradually moves pupils from application of knowledge according to the pattern to independent and creative activities by teaching pupils to control by themselves the procedure of solving tasks and analyze the causes of success and mistakes.

Pupils' knowledge application competence forms gradually inducing thinking operations; a teacher shall strive to achieve formation of pupils' ability to apply knowledge in non-standard situations. Such level of knowledge application competence is characteristic for productive learning, where a pupil is ready to solve problems, discover objectively new causation, formulate generalized conclusions and is able to transform knowledge to solve new tasks. In interpreting learning this competence is expressed in the ability to apply knowledge in analogical or familiar situations. Operating with concrete assumptions, pupils define causations, use facts to explain and prove. The lowest level of knowledge application competence is characteristic to reproductive learning, where knowledge is applied according to a pattern.

Emotional experience. The effectiveness of physics acquisition to a great extent depends on the level of pupils' emotional sphere development. Emotions influence person's behavior,

working skills, increase or decrease his activity. Joy, friendly cooperation, delight enhance working skills (Frijda, 1986). Under influence of such emotions the activity of the body increases, but fear, concern and shame have a depressing influence and weaken body life processes and reduce energy. Under influence of these emotions a person becomes inert and tended towards inactivity (Čehlova, 2002).

According to I.Lerner's point of view emotional experience is a condition and kind of emotional experience and experience of feelings (Skatkins, Lerners, 1984). I.Zogla points out that it is easier for a pupil to learn and teaching-learning activities are more productive if positive emotions are domineering. If a general positive emotional attitude is prevailing, then episodic failure and disappointment cause a desire to learn, eliminate a mistake and prove yourself and others what skills you have (Žogla, 1994). An optimal balance between positive and negative emotional experiences, when positive experiences are prevailing, but negative experiences teach strength and will power, is a key to enhancement of productivity of pupils' intellectual activity.

Demonstration Experiments Model Effectiveness Analysis

The duration of the research was one school year. The base of the research was comprehensive secondary education institutions in Rezekne city and district. The respondents of the research are 106 pupils of form 10 of the educations institutions mentioned above.

In the experimental group there was implemented an experimental program - during the school year the teacher of physics applied a demonstration experiments model. In the control group there were made no changes; they were working under typical conditions: the teachers of physics at the respective educational institutions were working as usual using a typical work style; in the physics acquisition process there were demonstrated only those experiments, which were possible to carry out using the obsolete material and technical resources available in the room.

The author of the thesis envisages that in the end of the school year the pupils of the experimental group will have acquired the content of physics better, besides, their achievements in physics shall be better than those of the pupils in the control group. The indicator of achievements of the pupils involved in the pedagogical experiment is the number of points obtained in a test, which was completed both by the pupils of the experimental group and control group in the end of the school year after completion of the whole course of physics of form 10.

Evaluating the effectiveness of the demonstration experiments model according to the determined criteria, first of all there are analyzed the data obtained from the comprehension-based tasks in the tests. This range of points is divided into 3 equal sectors according to the level of consistency, consolidation and episodic comprehension.

Evaluating pupils' comprehension, the effectiveness of the demonstration experiments model lies in a larger number of pupils, who have a consistency comprehension level, and also in a smaller number of pupils, who have an episodic comprehension level. It means that the experimental program, which was implemented in the experimental group, had positive results by facilitating formation of deeper comprehension regarding the content of the mechanics course.

As the next criterion for evaluation of the demonstration experiments model effectiveness it is put forward knowledge application competence. These tasks are divided into 3 types-these are the tasks, where there is tested: knowledge application skill following a pattern; knowledge application skill in similar situations; knowledge application skill in unfamiliar situations.

The quantitative indicators prove that the results are higher on all three competence levels in the experimental group. The pupils from both researched groups are the best at applying knowledge according to a pattern. It is also the easiest and simplest way of knowledge

application because there no necessity for developed thinking operations, logical thinking, independent judgments, but pupils shall be able just to repeat or imitate a pattern.

A smaller number of pupils has the next competence level - a skill of application in similar situations, but the smallest number of pupils in the researched groups belongs to the third competence level - knowledge application skill in unfamiliar situations. However, if results are compared separately on third competence level, it is seen that in the experimental group there are 3 times more pupils, who are able to use knowledge independently in new situations, than in the control group. It can be viewed as a positive indicator. The higher indicators of pupils in the experimental group in comparison to the control group can be explained by a higher level of thinking operations development, which has been enhanced by implementation of the experimental program.

As the last criterion for evaluation of the demonstration experiments model effectiveness is emotional experience. In the conducted research the author does not use any quantitative indicators to describe the levels of expressing emotional experience. For this purpose there are used ideas from: observations made in the pedagogical work with the pupils of the experimental group, observations of the teaching-learning process in the control group, interviews with the pupils from both research groups, interviews with teachers of physics of the control group.

Expressions of the situational level emotional experience were observed with the same frequency in both researched groups. It is usually characteristic for this level to have emotional experiences of teaching-learning activities social consequences. Joy for the praise, joy for the desired evaluation, joy for the correct answer - such kind of emotional experiences serve as a stimulus for further work. However, sometimes pupils attribute to these emotional experiences greater significance than it should be.

The expressions of emotional experiences corresponding to the level of the learning skills were also observed in both researched groups. Although in general these emotional experiences were indicated more rarely than in the previous case, they were not too rare phenomenon. The main difference between these emotional experiences and the previous ones is that pupils separated practical success and achievements of intellectual activities and adequately experienced them emotionally.

The main differences in the researched groups appeared in emotional experiences corresponding to the self-regulation level. In the control group the expressions corresponding to this level of emotional experiences could be sometimes observed for some individual pupils. On the contrary, in the experimental group the emotional experiences of independent cognition activities and emotional experiences of practical application of intellectual activities results were observed more often.

Conclusions

1. In order to make the application of demonstration experiments in the teaching-learning process more effective and pedagogically more influential, the didactic causation formulated in classical pedagogy and modern pedagogy shall be observed when implementing them.
2. The acquisition of physics content is to be carried out basing on the demonstration experiment model, which envisages perception of teacher's verbal information and perception of models and material objects. By the help of purposefully organized thinking operations perception of objects and phenomena gradually transfers into their comprehension. The psychological-pedagogical theories included in the model envisage not only acquisition of "ready-made" knowledge, but also stimulation of pupils to master rational thinking techniques to acquire the knowledge.
3. The demonstration experiments model has shown positive results by enhancing formation

of deeper comprehension about the content of the physics course, development of physical knowledge application competence, enrichment of a positive emotional attitude as well as development of learning skills, which have facilitated qualitative changes in the learning achievements of the pupils of the experimental group.

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Резюме

УСОВЕРШЕНСТВОВАНИЕ МЕТОДИКИ ДЕМОНСТРАЦИОННОГО ЭКСПЕРИМЕНТА ДЛЯ РАЗВИТИЯ ЗНАНИЙ, ПОНИМАНИЯ И УМЕНИЙ ШКОЛЬНИКОВ

Янис Дзервиникс

Вместе с протекающими переменами общественных процессов меняется и взгляд на образование, происходит изменение педагогической парадигмы и переход всей системы образования на учение учащегося в результате чего учёба в школе стала ориентирована на учение школьника и на развитие его самостоятельности. Изчезает старые представления о школьнике как пассивном усвоителе знаний и возникает новые представления о нём как социальном конструкторе знаний. В месте с тем формируется новые взгляды на то, как должна протекать учёба. В данный момент акцент в образовании перемещается на умение учителя способствовать учение и разностороннее

развитие учащихся. Потому, основываясь на на новые положения педагогики и психологии, возникает необходимость совершенствовать и методику демонстрационного эксперимента физики, чтобы способствовать развитие знаний, понимания и умений школьников.

Из попыток систематизировать знания об учении возникли многие учебные теории – от бихейвиористического до когнитивных направлений. Идеи нескольких учебных теорий автор использовал для разработки психолого – педагогического моделя усвоения физики, операющегося на демонстрационный эксперимент.

Эта модель предвидит более эффективное усвоение знаний и умений по физике, более глубокое понимание учебного содержания физики и развитие умения учиться, которая отражаеться в качестве знаний. Чтобы убедиться об эффективности моделя был произведен педагогический эксперимент. Сравнение учебных достижений школьников до и после эксперимента служила как способ оценки эффективности данной разработки. Результаты исследования позволяют судить об целесообразности моделя в учебном процессе физики.

Ключевые слова: демонстрационный эксперимент, компетентность использования знаний, обучение, понимание, учение.

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