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DEVELOPING PROSPECTIVE PHYSICS TEACHERS' SKILLS OF INDEPENDENT EXPERIMENTAL WORK USING OUTDOORS APPROACH

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Abstract. *This paper discusses the development of an Introductory Physics course at a Pedagogical University in Russia. The course focuses on developing students' skills of independent experimental work. Piotr Gal'perin's (1902-1988) ideas, that learning should begin with a profound orientation to the learning task and integrate students' self-reflections, provide a theoretical ground for the course development. An outdoor context was used to inspire and implement the students' self-directed projects. Evidence of the outcomes of different elements of the course implementation was collected through action research methodology. The results show that the students deepen their skills of inquiry and value doing independent planning and implementation of experimental activities in an outdoor environment.*

Key words: *introductory physics, students' projects, outdoors.*

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Introduction

Currently, the Russian educational system is experiencing many innovations and is being rapidly reformed. The new educational paradigm, *personality oriented education*, calls for the creation of optimal conditions for the development of potential capacities of learners and their self-realisation. Particular emphasis is placed on the development of learning skills (e.g. to collect, process and critically value information) and generic modes of learning activity (e.g. problem solving, experimenting). However, schools and teacher education institutions hardly manage to keep up with these transformations (World Bank /Āńåģčšķūé įąķź/, 2005). School practice is still based on studying the 'fundamentals of sciences'. This emphasis in the curriculum was introduced during the Soviet school reform 1964-1966, leading to an excessive academisation of school programs and textbooks, and an overloading of teaching with the collection of facts to be reproduced in formal exams (Dneprov, 2005).

According to recent international comparative studies on school students' performance in science e.g. PISA, Russian students have problems in applying school knowledge in an everyday context and exercising critical thinking skills. They demonstrated greater problems than pupils from some other countries when working with information, reading and analysing texts and interpreting data presented in non-textual forms. Many Russian students also have difficulties making observations and inferences, drawing conclusions from data and controlling the results (Kovaleva, 2005a, 2005b).

Currently, Russia is an active partner in OECD educational collaboration. The OECD (2003) suggests the importance of learning about general methodological principles of scientific activity (inquiry), such as:

- recognising scientifically investigable questions
- identifying evidence needed in a scientific investigation
- drawing up or evaluating conclusions
- communicating valid conclusions.

Ideas of teaching physics *through* and *for* learning basic principles of scientific exploratory activity that are attuned to the OECD's definition of scientific inquiry are well known, recognised and promoted in Russia. Borisenok and Kondratiev (2003) emphasise that induction into inquiry includes learning the general methodological foundations for investigative work. According to Źondratiev (1998), students should learn to carry out independent research activities, which include: identification of researchable problems, development of strategy and the tactics of posing and solving problems using a combination of algorithmic and heuristic approaches.

In an educational context, we can distinguish three types of inquiry: open, guided and structured (or closed) inquiry. Open inquiry assumes students' ability to independently formulate a study question (goals), design and conduct investigation and communicate results. In guided inquiry the teacher assists students in choosing the questions for investigation and developing the experiments. Structured inquiry is characterised by a rather strict "cookbook like" type of teacher's instructions (prescriptions) on what and how to study. These three types of inquiry are also described in Russian educational literature as research-like, heuristic and reproductive methods of teaching/learning (*obuchenie*) correspondingly (Lerner, 1981).

The need for special physics courses for pre-service teachers that are preparing to teach science to students as a process of active inquiry is recognized by leading physics education researchers (McDermott, 2006). Examples of such courses and projects developed in the USA could be "Physics by Inquiry" (McDermott et al, 1996) and "Explorations in Physics" (http://physics.dickinson.edu/~eip_web/EiP_homepage.html) which integrate the use of guided-inquiry techniques with self-directed hands-on students' activities.

Russian teacher education students have to master and acquire competence in teaching the foundations of inquiry in a manner consistent with how they are expected to teach. Thus, the task that teacher educators face is to engage students into practices that support learning science as inquiry.

Below, we will discuss the development of an Introductory Physics course at Karelian State Pedagogical University (KSPU) aimed to shift the focus of teaching/learning from structured (closed) inquiry in laboratory setting to more open forms of inquiry also using outdoor settings.

Background

The ideas and incentive for the course development came from a cooperative project between the Swedish and the Russian science teachers' educational institutions. In Sweden, the teacher education curriculum has long been open for local variations and creative solutions. The Swedish colleagues' search for innovative methods and contexts in physics education has led to an exploration of the possibilities of outdoor teaching.

Outdoors physics education was introduced at the Department of Mathematics, Technology and Science education (Umeå University) as a part of science teacher training at the beginning of the 1990's. The teaching/learning strategies included:

- Students' investigations of real-world problems in natural settings,
- Collaborative work in small groups of students (2-3 persons) on school-oriented problems outdoors,
- Peer assessment of the results of group activities.

The teacher framed the guided inquiry work of students by introducing the context of learning (outdoors settings) and tools available (simple and easily accessible equipment). Students had time (two days per project) to discuss the ideas in the particular area of physics, plan and implement activities. Each group was assessed by the results of their practical demonstration of activities outdoors and a report of the study that was distributed to each participant of the class.

The ideas of this approach were used and developed further in the Russian partner teacher training institution in an Introductory Physics course. The 'outdoor physics approach' with examples/cases for study is presented on the website of our collaborative project http://outdoorphysics.educ.umu.se.

Theoretical framework

A general theoretical framework used for reflection on the course development was an approach to learning developed by Gal'perin (Gal'perin, 1969, 1985) and his followers. This approach assumes the importance of creating a basis for the students' orientation to the learning activity and the acquisition of generic modes of activity (Gal'perin, 1969, 1985; Talyzina, 1984). The orientation basis includes revealing the implicit rational structure of empirical objects and their essential relationships. It provides the students with the means to make conceptual generalisations allowing them to perceive the studied phenomenon as a meaningful whole (Arievitch, Stetsenko, 2000).

Following the ideas of Gal'perin and Ņąlysina, we assume that prospective teachers should create a model and generic mental structure of the activity when approaching concrete experimental activities and actions. Ņąlysina (1984) underlines the importance of creating the learning situations (using a limited number of concrete activities) and giving students the necessary time to reveal a structure, construct consistent mental models and develop a basis for orientation to the activity rather than superficially cover a large number of experiments.

Another important theoretical statement of Gal'perin and Ņąlysina (ibid.) is about the way a basis for orientation is developed. It can be introduced by the teacher or acquired independently by the student. The latter is considered more effective. In Gal'perin's approach, teaching/learning always occurs in the form of students' active exploration of the subject studied under the guidance of a teacher (Arievitch, Stetsenko, 2000).

Let us consider the structure of experimental activity (in physics education) developed by Usova (1988). This structure includes the following steps:

- define the goal of an experiment, theoretically justify the experiment
- plan a sequence of actions
- create material conditions for the experiment
- execute the work according to the plan
- mathematical treatment of data, estimate uncertainties in measurements
- analyse the results, draw conclusions.

The elements of this structure exemplify the generic skills of inquiry that students should be able to manage and reflect about. In accordance with Gal'perin's approach, students have to focus on goals and plans (a basis for orientation) before they carry out the activity practically, and control and validate the results at the end of the activity. This allows students to be active agents of the learning activity.

Management of the *process* of experimental activity at a metacognitive level is emphasised here. The importance of the development of metacognition ("knowledge, awareness and control of one's own learning", Braid (1990)) in students for effective organization of scientific inquiry is broadly accepted in the science education community. For example, White and Frederickson (2000) describe use in a school project of an inquiry cycle: *question – predict – experiment – model – apply* and argue for the importance of students' systematic reflection and self-assessment of their progress through the elements of the cycle. White and Frederickson (2000) also focus

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(as Gal'perin does) on development of students' *self-regulatory skills*, including "skills for planning and monitoring such as determining goals and developing strategies for achieving those goals and then evaluation their progress to see whether their plan needs to be modified".

In the experimental activity, basic and advanced levels of skills can be distinguished (Kondratiev, 1989). Basic level skills consist of the specific skills of collecting and treating data such as managing equipment, making measurements, presenting the results, etc. These skills can be trained and repeated in order to achieve the form of *algorithmic procedure* that can be done rather automatically, without the necessity of doing much 'thinking work' about these elements of practical activities.

An advanced level skills, such as identification of problems, formulation of goals, posing hypotheses, planning experiments, searching for alternative means and methods, analysis, evaluation and interpretation of results, can not achieve algorithmic form. These are creative, productive skills in comparison with rather reproductive basic skills.

Thus, the approach used in the course emphasises the importance of providing experiences for the students to develop advanced experimental skills and a methodological awareness of practical investigations.

Research questions

The general aim of this paper is to analyse the development and the outcomes of an Introductory Physics course for prospective teachers

The specific questions of the study were

- how the new design of the course has influenced students' abilities to formulate goals, plan experiments, analyse and evaluate results.
- what role can an outdoor context play in developing students' skills of inquiry and independent work during experimental activities.

Methodology of Research

In this part of the paper we will briefly present the course development and methods of research used for its study.

The context of the course development

The Introductory Physics course is a locally developed course for the prospective physics teachers at KSPU. It is conducted during one term (September-January, 17 weeks, 2 hours every week). The general aim of the official course plan is to introduce students to a university tradition of physics and prepare them for further studies.

All the first year students at KSPU have passed through the "Single State Exam" which is used to define school graduation marks and serves as a selection tool for university entrance. Our analysis of the results of this exam in physics shows that students' subject knowledge is relatively low, rather formal and readily applied mainly in standard situations.

The benchmarking test that was given at the beginning of the Introductory Physics course also shows that students have many conceptual problems. They can use physics terminology without a real understanding of the concepts and have poorly developed skills in applying these concepts to explain everyday phenomena.

The students come from schools to KSPU with very limited experience of independent work and self-directed activities. Usually, they have had little chance to ponder what and how to investigate during practical physics activities. They have just followed algorithmic type of laboratory work instructions in the textbooks or teachers' hand-outs.

The focal points of the course design

In the current design, the Introductory Physics course aims to engage students in scientific inquiry in both laboratory and outdoor contexts. There is a gradual shift from closed inquiry (frontal laboratory activities) at the beginning of the course towards more open inquiry forms of work (small groups' project activities) at the end of the course. This also defines two main stages in the course organization; we can call them a *preparatory* and a *project* part. They are separated by time and place. The preparatory stage (the first part that is organised in an indoors laboratory setting) focuses on the deepening of basic experimental skills and planning simple experiments. The project stage (the second part that is organised in outdoor settings) focuses on the development of advanced experimental skills and meta-process skills (development of generic modes of experimental activity).

Work outdoors is considered as a means to liberate students' initiative, developing their skills of independent design and implementation of experiments. The following analytical structure for the course development was suggested based on the theoretical framework of the paper:

Table 1. Analytical structure for the course development

Learning problem	Teaching/learning activities	Mode of activity
	Basic level	
Learn how to do basic actions	Prescriptive, step-by-step instruction	Reproductive
	Advanced level	
Learn how to plan experiments	Heuristic dialog[1] between the teacher and the students, guided planning	Reproductive + heuristic
Learn to develop theoretical justification of experiments	Independent pair work + discussion with the teacher	Heuristic
Improve acquired skills and learn their complex application	Independent pair (group) activities + discussion	Heuristic + research

Table 1 above reflects the principle of the gradual evolution of students' actions in the structure of experimental activity. In this table "learning problem" describes generic tasks for the students; "teaching/learning activities" describes the organisational form of students' work, and "mode of activity" describes the degree of openness and creativity in students' activities.

In the current organisation of the course, particular attention is paid to the development of advanced level skills such as goal formulation, planning, analysis and evaluation of the results of the experiments. Development of physics communication skills was also an issue to consider. As a rule, students do not bring with them from schools the skills of oral, written and diagrammatic communication in physics. So, it was necessary to pay constant attention to how students talk, draw and write physics, in order to facilitate their orientation in and implementation of experimental activities.

Research methods

Action research methodology was used to collect evidence about the outcomes of the course development. According to McNiff and Whitehead (2002), action research is a form of practice

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[1] Heuristic dialog is a Socratic form of dialog where the teacher does not tell students the answer, but rather asks probing questions or guides their search for information.

which involves data gathering, reflection on the action as it is presented through the data, and making claims to knowledge based on validated evidence.

The choice of research methods was justified by the need for the approbation of the new course structure and methods, in the situation where the course teacher was also an active researcher of her own practice. Action research encourages the use of a range of techniques in order to look at what is happening from a variety of angles and points of view while monitoring intended and unintended outcomes of actions. Most action research studies have a built-in spiral of activity e.g. idea > reconnaissance > plan > act/implement > evaluate > amend plan > act/implement > etc (Weiner, 2003). Document analysis, participatory observations of the students' activities, analysis of the students' assignments, questionnaires and course evaluations were all used to gather evidence in this study.

The teacher in the Introductory Physics course (one of the authors) kept a diary with personal accounts of observations over her own and students' group activities, including notes on hypothesis, interpretations, reactions and explanations that provided an overview of the course development over time. She also conducted informal interviews with students on a regular basis during the course implementation to monitor the effect of actions. Analytical memos on evidence collected, emerging problems, new hypotheses and ways of conceptualising the situations in the course were exchange by the researchers (authors) via email, Skype contacts and during face-to-face meetings in order to get shared insights.

The new course design has been gradually developed over the last three years. The number of students in the group was about 15 each year. All of them wrote course evaluations that were introduced for the first time in the physics department.

Results of Research

Students entering the Introductory Physics course already have a perception of what the practical aspects of an experimental activity are and possess basic level experimental skills that are further developed in the course. However, they have a low awareness of the methodological aspects of the experimental activity and low level of advanced experimental skills. We provide below our analysis of students' work at different stages of experimental activities following Usova's generic structure of experimental activity (Usova, 1988). Our reflections on students' difficulties with learning problems (presented in table 1) lead us to make some suggestions for further development of the course.

Planning the experimental activity

There are several important actions in the process of planning experimental activities, including the choice of the study object, identification of the goals and the sequences of executive actions to reach the goals.

Choice of a study problem

The work to prepare students for carrying out independent investigations was done consistently and purposefully during the whole course. After refreshing and learning new basic skills of experimental activity during the preparatory part of the course, students were asked to select a topic for self-directed project work. The students had to design their own studies and construct solutions to the problems. They got some ideas from popular science TV programs and their personal life experience, suggesting, for example, the study of a person's reaction time to different types of signals (light, sound, etc) in different contexts, the measurement of different parameters of a snowflake (weight, size, volume, shape, etc). Many natural and everyday objects were used for solving experimental problems outdoors.

Often, students had a general interest in some issue or phenomenon, but did not know how to approach a problem. In other words, they could not see how to connect it to physics and formulate study goals. There was also an affective aspect to consider, many students did not have experience in searching for problems to investigate and seeing themselves as capable of formulating and solving new problems. The strategies used to change students' from being *consumers* to becoming *generators* of physics problem were of using heuristic dialog between the teacher and students, encouraging brainstorming in small groups of students, and changing the context of the study, i.e. using an outdoors approach.

In general, the students were interested in having the possibility of doing self-directed experimental study in an environment unusual for them (outdoors). However, most of them preferred to select a topic from the list suggested by the teacher or from the website http://outdoorphysics.educ.umu.se.

We came to the conclusion that students should be stimulated to think about their own experimental problem formulations already at the beginning of the course. Thus, they will have time to discuss possible options with the teacher, peers and other people. They can also try out their ideas in parallel with developing the basic skills of experimental work.

Goal formulation

Many of the students have difficulties in defining the goals of their inquiry. The lecturer's observations during the course show that students can hardly distinguish between the theme and object of study and the goal of the experiment. For example, students were asked in a process of guided inquiry to study the cooling of hot water *(theme). The object of the study is given (hot water) and the students have to define for themselves the goal of the study. They have to formulate what exactly should be done in the experiment, i.e. formulate the study questions, like how temperature changes with time and on what parameters and how it depends on? This was not an easy task for many of them at the beginning of the course.*

We can suggest that improvement of the students' goal formulation activities needs particular attention during the course. For example, the use of specific exercises has been planned where goals initially are not clear, but after the goal is identified the process of work is easily understood and becomes routine procedure. When carrying out the experimental work, students have to be aware of the necessity of returning to the formulated goal in order to control that the goal has been achieved and perhaps partially reformulate it or find new goals for further studies.

However, it is not possible to state that all students can manage the formulation of goals well by the end of the course. This process deserves constant attention as clear goals are necessary for the success of any experimental activity.

Developing a systemic view of the experimental activity

An important part of an orientation base for experimental activity is thinking through the experiment as a whole. This is a complex task for students to learn. We found that asking students to prepare a written instruction for an experiment (before doing it) that gives guidance for 'the next group coming for the course' is useful for developing orientation and planning skills. Students have to think through, discuss and present in a brief form the sequence of actions, and what they should pay attention to. Thus, the task stimulates their meta-reflection about experimental activity. This also gives training in communicating about developing experimental procedures.

Planning experimental activities outdoors introduces additional difficulties for the students. They are not used to thinking about the influence of the surrounding environment on the occurrence of an experiment. They tend to idealise a situation as it would be in a traditional laboratory setting. For example, they do not consider that the wind can influence the speed of sound propagation, or that a parachuting object moves first with acceleration and if its uniform motion should be studied, there is a need to shift the point of timing from the point of releasing the object, etc.

The purposeful work on developing students' skills of planning the experimental activities gave the results. By the end of the course, most of the students could create and write down the design of the experiment, select the proper equipment, and choose methods of data analysis quite independently.

The results of the questionnaire delivered at the end of the Introductory Physics course (a part of the course evaluation) show that the independent development of experimental procedures or with some guidance by the teacher are considered as the most productive ways of work. As students wrote in their comments, this helps them to develop their thinking and gives better understanding of the activity and freedom of actions, "I always remember better, what I have solved on my own after some struggle". But they value the teacher's guidance as it can save time and help to avoid dead ends in the search for problem solutions in experiment development.

Within the framework of a single course, it is not possible to teach students to 'think and do experiments like a physicist'; and it was not the task. For us it was important that students gained a systemic view of the experimental activity, which they showed in planning, presenting the results of their work and reflecting about their activities.

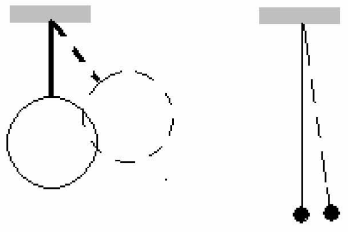
Theoretical justification of the experiment

This stage of experimental activity is also very demanding for students as they do not have much experience from school physics of the theoretical underpinning of their practical work. Several aspects of students' activities based on the lecturer's observations are lifted below.

Identifying a model

One of the major problems for students in 'thinking about the physics of the experiment' was the identification of a suitable model to describe the object or phenomenon. It was challenging for many of them to think about the fact that the same object can be described by different models depending on the situation. For example, the same metal sphere can be considered as a material point, rigid body, elastic body, mathematical pendulum, physical pendulum, etc in different contexts.

The students had difficulty in seeing the limitations of the models as they are applied in certain circumstances. For example, in the preparatory part of the course students were asked to prove formula describing the correlation between the period of a mathematical pendulum and its length using a graphical method of data analysis. During the discussions and in their drawings students revealed confusion about the relative size and mass of the pendulum's body and suspension and the concept of small amplitude, which is important for satisfying a mathematical pendulum model. Their drawings of the experiment could look like the left-hand diagram in contrast to the right-hand (correct) diagram.



At the beginning of the course, students often tried to search directly for known formulas and equations that suited the problem posed, without understanding that the choice of formulae comes after creating a clearly defined physics model *describing the phenomenon. For example, a student was asked to discover the water pressure at the bottom of a barrel. He picks up the Mendeleev-Clapeyron equation for ideal gas (where all relevant parameters are present, like mass, pressure and volume) and tries to find a solution. He did not reflect first about the physics of the phenomena and find a suitable model and start to calculate later. It takes time for students to become aware of the nature and utility of physics models as well as the processes by which they are created, tested, and revised.*

Making students aware of the functions and limitations of the models was an issue of constant attention during the course implementation.

Finding proper language and concepts

Many problems appeared in the course because students lacked the skills of applying physics concepts and physics language. They had difficulties in using appropriate terminology to describe physical phenomena. For example, many of them could not distinguish between the properties of objects/phenomena and physics quantities, e.g. between air resistance as a phenomenon and forces of resistance that describe this phenomenon. If they could not identify physical parameters describing the phenomenon, they could not define goals and plan experiments either.

Another aspect of physics language usage was the relevance of language for the context and situation. When asked to explain *phenomenon, students often tend just to* describe *it in physics language rather than make explanation. For example, "Why does a body move uniformly?" The usual responses were that it happens when a body has a constant velocity, or when acceleration is zero, instead of making an analysis of forces acting on the body.*

In the course, students had to develop skills of working with literature that were new for them when approaching experimental problems. Usually, they have learned in school that physics problems have well defined methods of solution and a single answer and also that it is possible to find "ready made knowledge" (necessary theoretical foundations, laws and formulas, model problems, etc.) in a certain section of the textbook.

Students were facing physics problems during the course that were not easy to solve using "ready made knowledge" from a single textbook. They had to refer to different sources of information in order to formulate a hypothesis, choose a method and an appropriate model to work with. Often, they had to go over disciplinary borders in search of the necessary knowledge and this was also an unusual task for them.

In general, development of students' physics communication skills and work with information, concepts and terminology was a component of the course under constant attention of the teacher.

New forms of student-teacher collaboration

When students work with experimental problems outdoors expected results *can be quite* unexpected*. It was difficult to foresee what physics knowledge students can gain and need in order to solve problems that they identify and plan solutions to. This also tested the lecturer's competence, openness and readiness to support the students' initiatives even if the design of inquiry was not clear from the beginning and outcomes were unpredictable.*

Many authentic problems appeared during the outdoor work that challenged the course teacher. She had to supervise in new conditions where no standard answers could be offered as in the case when dealing with traditional "model problems" (e.g. with blocks and inclined planes). The complexity of the real world situations demanded the deep analysis and use of fundamental principles of physics in order to answer students' "simple questions". The lecturer had to be more researcher and partner for students in this work rather than possessor of the right answers. This situation, when the teacher had to think together with a student about genuine problems is not what teachers are normally trained to do in teacher education. This was a rather new experience for the course participants.

Many students have experienced 'a joy of discovery' and 'intellectual surprises' while working with outdoors projects. The interviews and course evaluations revealed that students became more interested in working with physics. Many of them indicated intentions to improve their work, to find out details or verify their data collected in the outdoor experiments. Several of them expressed surprise that the simple equipment and common school knowledge allowed them to "make exciting discoveries". By the end of the course, students also felt more comfortable working with outdoor cases.

These responses give us evidence of the positive outcome of the Introductory Physics course where student acquired important skills of inquiry through experimental activities and active collaboration with the teacher and peers.

Conclusions

In the new course design, priorities shifted towards developing students' advanced skills of experimental activity and understanding of inquiry. The students learned to reflect about experimental activity as a whole. The generic skills of inquiry developed indoors were applied and further developed when solving practical problems outdoors.

The evidence collected during the course revealed a generally positive attitude of the first year students towards the new teaching methods. The students had more time and possibilities to discuss the ideas and to plan and implement investigations. They felt responsibility for their own learning and ownership of their projects. Positive changes in students' attitudes towards the experimental work could be identified. The most significant improvement took place in planning the inquiry, as well as in results analysis.

The course development work gives us evidence that the students' orientation in generic forms of experimental activity is productive and particular important in teacher education. Prospective teachers get better possibilities of acquiring skills of inquiry and not only content. The outdoors approach enriched the design of the introductory physics course. It inspired the new vision of the objectives and structure of this course. Generally, students gave a positive response in evaluations of outdoor studies ranging from satisfaction to a very positive attitude.

However, one course can not change the system. Unfortunately, we can state that the courses where students continue their studies after the Introductory Physics course represent the rather traditional scholastic culture of physics courses, with creativity limited to finding standard solutions for standard problems.

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Резюме

ОБУЧЕНИЕ СТУДЕНТОВ ПЕДАГОГИЧЕСКОГО УНИВЕРСИТЕТА САМОСТОЯТЕЛЬНОЙ ПОСТАНОВКЕ ФИЗИЧЕСКОГО ЭКСПЕРИМЕНТА С ИСПОЛЬЗОВАНИЕМ ВНЕАУДИТОРНОЙ РАБОТЫ

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В статье рассматривается курс элементарной физики, разработанный в КГПУ для студентов 1 года обучения и направленный на формирование у них умения самостоятельно выполнять эксперимент. Методологическую основу курса составляют идеи П.Я.Гальперина о том, что выполнению деятельности должно предшествовать выявление и осмысление учащимися ее структуры. Особенностью курса является выделение специального этапа внеаудиторной самостоятельной экспериментальной работы студентов. Исследование процесса и результатов работы по курсу велось с использованием методики action research. Результаты показывают, что курс решает поставленные задачи формирования у студентов методологических знаний и адекватных им способов деятельности и обладает высоким мотивационным и эвристическим потенциалом.

Ключевые слова: физический эксперимент, проектная деятельность, внеаудиторная работа.

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