

NATURAL SCIENCE EDUCATION IN LITHUANIAN SECONDARY SCHOOL: SOME RELEVANT ISSUES

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Abstract. The natural science education is one of the most important areas of general education which includes education of all children's ages. Trying to satisfy requirements of the society and all learners it is necessary to modernize the preparation of natural science teachers. Natural sciences are of great importance in helping students to form conception of world based on the knowledge of modern nature research, emphasizing the character of link between nature and society, as well as between nature and culture. Natural sciences education can be characterised by a variety of content provisions, forms and methods of teaching/learning, and practical activities. All these are expected to make the process more effective to widen intellectual knowledge and skills of students, to provide conditions for students activities, to develop students reasoning skills, to influence their aesthetical outlooks etc.

The *aim of the article* is to discuss some relevant questions on natural science education in Lithuanian comprehensive school which are of a philosophical – pedagogical character and observes the issues of teachers' natural science literacy and integral education (teaching).

Key words: science education, secondary school, integral teaching.

Introduction

The General Programs (1997) of Lithuanian secondary schools declare that natural science course at school creates conditions for schoolchildren to take over the basis of present natural sciences knowledge and to foster modern culture of scientific thinking and practise as well as the ability to employ it for practical purposes. It is extremely important that natural sciences would help students to create a concept of natural world based on the results of current scientific research, laying particular emphasis on the character of ties between nature and society, nature and culture.

The problem of natural science education is a burning one in Lithuania as well as in a major part of the world. Foreign countries pay more attention to the issues of natural sciences education than Lithuania does. A world scale practice testifies to the fact that great importance is accorded to the clarification of the standpoint held by the participants of education towards one or another issue of natural science education. Feedback admits adjusting the process and the content of education.

The priority of natural science education is a matter-of-course one, because it encompasses the entire students' environment, the spectrum of self-expression and their relations with nature. It cannot be proposed that the problems of natural science education have not been given proper theoretical consideration in Lithuania. However, it is especially consequential to the present time because in the recent years a special concern has been shown toward the natural environment and our ability to survive as human is a part of the animate nature. This tendency has manifested itself in a variety of forms (*Greenpeace* movement, social actions and protests against nature pollution and destruction of ecosystems, different ecological projects, etc.). In the 9th decade environmental study activities performed by students were extended to a considerable degree and subsequently various natural sciences forms and clubs sprang up in the said period. According to the professor E. Šapokiene (1990), the development of students' environmental study is speedy and the quality of exploration works has been improving. Thus, not only get students involved into social life but also accumulate experience, develop skills, perceive their humane value, relive the beauty of nature, comprehend the perfection of forms, apprehend harmony in nature and the sense of

ecological activities. There is no doubt that today's school must look after the moral structure of the inner world of the young people, develop a new quality of relations with nature and form the ecological consciousness, duty and responsibility of a person. This is because the problem of the approaching ecological crisis, which has already taken place in some other countries, can be tackled only after having solved the crisis of human spirit.

Therefore, when discussing the problems of natural science education it is necessary:

- to test teachers' point of view towards the educational processes on the basis of the social – pedagogical aspect;
- to estimate the conditions of natural science education throughout all the stages of comprehensive school;
- to analyze current, reveal new and submit possible strategies and tactics of natural science teaching;
- to organize and implement a permanent monitoring of natural science education and on the basis of its results to advance the content, process, etc. of natural science education;
- having estimated the current situation, submit recommendations for further perspectives related to the development of natural sciences education in Lithuanian comprehensive school.

Working on the problems of natural science education it is essential to focus on the following ideas:

1. The holistic character of research that defines the evolution of natural science education within the period of the educational reform.
2. The systematic – structural character of research in the process of estimation of natural science education.
3. Value based character of research, directed toward the systems: “Teacher ↔ Student”, “Nature ↔ Human being”.

The *aim of the article* is to discuss some relevant questions on natural science education in Lithuanian comprehensive school which are of a philosophical – pedagogical character and observes the issues of teachers' natural science literacy and integral education (teaching).

Philosophical – pedagogical aspects of natural science education

After having heard the pattern “Natural science(s)” we usually perceive the subjects of natural science such as physics, chemistry, biology, astronomy, etc. that is we imagine inanimate and animate nature. Such an extensive list of sciences testifies to the complexity of nature and its problematic character. The senior forms are taught natural sciences as separate subjects that have little interdependence. Thus, the undivided materiality of nature is being disjointed and the general view of that is being actually lost. After all, the only part of deeply and properly researched nature can hardly disclose the entirety. In this particular case any subject of nature cannot describe the whole nature. It goes without saying that the general view of nature cannot be disclosed within the frame of one of the branches. Therefore, it is necessary to form a system of knowledge that would comprise the knowledge accumulated by all natural sciences, establishing interrelations between subjects and integrating the knowledge of natural sciences. Thus, in order to clearly know and understand the environment and nature, to comprehend therein existing relations between the phenomena and laws, to have orientation in nature following the latest requirements for the scientific knowledge, it is equally important both parts differentiation of natural sciences and integration of those. This is the reconstruction of the “disjoined” nature as a unified system in a significantly more elevated theoretic level of knowledge. The task to be resolved is in no manner easy but still the solution has to necessarily be found.

The task that is more difficult and complicated is studying and perceiving the objects that are more complex than nature itself but share organic ties with it. It should be developed that the human being (society), pertaining not only to natural sciences, but also to social ones, i.e. is an absolutely different branch of science.

The natural – biological origin is his body and the brain. This constitutes the material basis of his psychics and consciousness. The social phenomenon of the human being developed on the ground of natural-biological evolution of the human origin. The former is preconditioned socially, not biologically by the social, sociocultural environment where a human lives.

Consequently, trying to perceive the human being, one has to understand them without limitation to any solitary sciences or their groups. One has to combine plenty of sciences, i.e. sociology, economics, history, philology, and so forth. It is relevant to have a look at reality (nature and the human being) through the eyes and the mind of a philosopher to wider perceive nature and the human being. Philosophy, that makes use of empirically generalized and collected social sciences data, as well as the statements, created by way of philosophers' *apriori* thinking, draws generalized conclusions about the human being, nature, humans' place and its role in nature and society.

The uniqueness of the human phenomenon is evidenced by the fact that the human being, apart from the biological material and social origins (consciousness, self-consciousness, intellect) that reside in him, owns the moral, spiritual ones (emotions, instincts, intuition, irrational origins). Furthermore, the human being strives to know not nature (natural sciences knowledge), society and himself as a rational representative of homo sapiens only, but also reveals himself through senses, emotions, instincts and effects as an irrational being. They seek to understand their own inner irrational world and each of them makes efforts to become a master of it, trying even to gain independence therefrom. On the contrary, the human being fails to be one and his consciousness is unable to operate the subconscious phenomena. Next is clear - the human being is able to perceive neither nature nor other people.

Thus, dealing with the problem of cognition of natural science education we immediately encounter the concept of the human being as a measure of everything (Protogon) that is the perception of the human being organically combining biological, social and spiritual origins. The core of natural science education is composed of the perception of the human being – human studies (the combined science still in the process of formation and joins natural and social, ideological – spiritual sciences thus enabling to more profoundly perceive the human being, society and nature). In case of today's worldwide globalization, natural sciences have been closely brought together with the social ones when dealing with problems, pertaining to natural sciences (particularly ecology). R.Baubinas (1999) comments that “the movement of ecology out of the sphere of biology sciences into the more integrated systems of knowledge is obvious. The period of imparting a totally biological character to ecology has come to an end, i.e.

1. The range of social knowledge is expanding. At the collision of biological and social sciences a new branch - social ecology - is being formed. Therefore, it is hardly worth to create such a new branch of science as “human biology” that has been named by the authors of the General Programs;
2. Refusing to elevate the human being above the animal world (biology), ignoring the issues of social cognition of natural sciences perception is not the way to perceive natural science knowledge. Social knowledge is the highest level of human understanding. It is a problematic one, because the fourth – inner measurement, according to S.Salkauskis, is included herein and manifests itself not purely elementally as in nature, but volitionally and purposefully and possesses a ground for values;
3. Social knowledge is altogether the basis of natural sciences perception and natural sciences education is one of the most intricate philosophical problems, possessing not a theoretical value only, but also that of practical application. Only a wide and deep bio-sociological insight into nature and a human being as the “product” of nature and

society, enables to comprehend the interrelations of the three phenomena and to draw methodological lines both ways for natural environment research and education of the human being.

The issue of teachers' natural sciences literacy

It is obvious that natural science education is one of the most outstanding spheres of comprehensive education in Lithuanian school being reformed. It is primarily due to the fact that virtually natural science education is integral one. Different alterations have been taking place in the sphere of natural science education: content is changing (though a single concept is not available), there is a pursuit for more efficient forms and ways of teaching, etc. On the other hand society appears to set requirements for a new quality. The General Programs of Lithuania comprehensive schools attempt to give an answer to a majority of problematic points by stating that the principle objective of natural science education is to shape the general scientific culture of a person and to contribute to their scientific literacy (Lamanauskas, 1999a; 2000). It is no less important though, that starting from primary school students would acquire skills of observation, examination, experiment and some others knowing both the animate and the inanimate nature. It has been observed that, "through study and observation one discerns varieties of the animate nature, its links with the inanimate nature and comprehends that each component of the environment is significant and performs its function. This is the manner in which nature preservation attitudes, respect for life and responsibility for the fate of nature are formed" (Makarskaitė, 1996). Thus, it is obvious that school should undertake to care for the moral structure of the inner world of the young generation, to form new qualitative relations with nature, the ecological consciousness of a person, duty and responsibility. In any case there must be an opposition to the rational and self-seeking type of a person, i.e. the "liberated" personality. To put it differently, it is a disaster **when school educates a person with the brains of an engineer, but with the consciousness of a bug.**

Hence, in pursuit of the satisfaction of the demands of both students and society, it is necessary to modernize professional preparation of teachers who concentrate on natural sciences, particularly those of primary school (studying programs, the content and organization of teaching practice, etc.) in terms of natural sciences literacy (qualification). Having estimated the majority of parameters, we can state that natural sciences literacy of primary school teachers is actually insufficient. For instance, teachers often ignore excursions to nature as they are scarcely familiar with the varieties of the animate nature, their skills do not meet the requirements set for work with special instruments for research, etc. The analysis of didactic regulations of natural science course initials for primary school renders it evident that a primary school teacher must be advanced enough in biology, physics, chemistry, technical matters, ecology, etc. Apart from imparting knowledge and skills to primary school students, it is consequential to teach them to discern different links and interrelations, etc. in nature through observation and study. It does not suffice for a primary school teacher to know a few names of plant or animal varieties. The teacher is expected to comprehend what the plant is in the main and how it differs from the animal, the animal from the human being, the continent from the World, the World from the Universe, the Cosmos, the Existence. In other words, he ought to be more competent in natural sciences, compared to secondary school level, i.e. to reach the methodological level of philosophy in natural and human anthropology. Alas, **natural philosophy and that of human anthropology today is like a "servant" waiting outside the door of a school.** Therefore, the provision of a concise university course for the future primary school teachers can not be considered satisfactory. It is usually a course of a lower level where that of natural science is disintegrated into separate subjects – botany (floristics), zoology (faunistics), ecology, etc. If it is clear enough, then it follows that when preparing teachers to be qualified specialists the primary school teacher needs **a systematic, integral preparation in natural science** (Lamanauskas, 1999b). Moreover, would-be teachers of primary school do not study chemistry or physics at all, though these are of

particular importance for the perception and controlling of the material world. As professor L.Jovaiša puts it, their “education has to also be subordinated to the furtherance of the ideal of material and spiritual progress of the nation” (Jovaiša, 1995).

Though natural sciences education varies in schools of foreign countries', there are numerous common tendencies. One of them is a high-level professional qualification of teachers working in primary schools (e.g. aspect of natural sciences). At present various countries employ different textbooks and other means for natural science education, e.g. for teaching separate subjects (Germany, Russia, Finland), for delivering integrated course of a narrow profile (Germany, Denmark, Russia, Switzerland, Finland) and for that of integrated course of a broad profile (Russia, the USA). Abroad the content of textbooks is selected and incorporated in a different manner. Much attention is given to the hands-on study of natural objects and phenomena. USA educational programs regulate mathematics and natural sciences will be taught at more advanced level within all stages of the educational system, particularly in primary school. The project “**America in the Year 2000**” allots much attention to natural science education. The new schedule for the forms 1 to 4 in a newly presented course “Introduction into Nature Study” envisages the provision of knowledge about plants and animals, nutrition, the Solar system, mountain rocks and minerals, climate, motion and energy, properties of substances, simple experiments, scientific facts about the Earth, etc. Nature conservation and natural sciences in Finland enjoy 2,5 hours per week (the 1-4th forms). Much attention is given to the tuition of preservation of the environment. In the Norwegian school system science is a compulsory school subject from form 1 to form 11. There are not separate courses in chemistry, physics, and biology until in form 12 and 13. The reform of natural science education in Germany has been in progress since 1970. The harmony of relations between the human being and the animate nature is not feasible provided that one has not familiarized with the structure and variety of the form of living organisms. In France natural sciences and technologies are taught from primary school. Currently Latvia has prepared an integrated broad profile natural science course for the forms 1 to 4 that embraces the main subjects such as biology, chemistry, physics, astronomy, geography and geology. Estonia is deliberating regarding the relation of systematic, classical, encyclopedic facts and skills to the structure of knowledge.

On the ground of an exhaustive study based on the experience of foreign teachers as well as of those from Lithuania the following statements can be set forth:

- natural science literacy of primary school teachers is insufficient;
- scientists' attitude bearing on theory towards preparation of teachers are controversial;
- the essential question to be answered is – what should be given priority – the general or the professional qualification of teachers, general natural science education or methods of teaching, etc.;
- high and higher schools of pedagogical profile preparing primary school teachers, should give preference to the methodology of natural sciences teaching, not to the disciplines of academic character;
- would be primary school teachers should attend courses on the following subjects: a) *introduction into nature and environment study*; b) *integrated natural science education in primary school*; c) *nature and technologies*; d) *the methodology of nature observation and testing in primary school*; e) *ecological education in primary school*, etc.;
- it is requisite to immediately advance the qualification of currently working primary school teachers in the sphere of natural science education organizing specific refresher courses and seminars.

Integrated natural science education

Modifications in the social life of Lithuania and the system of education develop in parallel that is alongside with the development of the society the content of education changes together with the requirements for the education results. Today's society faces a powerful onrush of information and technological novelties. It originates a necessity for modern people to manage orientating themselves in the above mentioned abundance of ideas. The traditional content of education characterized by a variety of separate subjects in fact dominates in schools, makes students to memorize a great number of unrelated facts, decreases motivation for learning and does not develop the ability to adapt the acquired knowledge etc.

Due to the forgoing fact the problem of integrated teaching has become one of the most pressing problems of the educational reform. The former has been attached a considerable amount of attention both in the General Programs of Secondary Schools and the projects on the standards of secondary education.

When introducing reforms into the content of education an attempt to identify only natural connections among natural sciences does not suffice. The objective of the integrated teaching is to forward the development of the integral and concordant world outlook of the child.

Proceeding of integration in one of the systems (e.g. teaching content), the quality and intensity of connections and interactions among separate elements (components) enhance and the system develops into a more integral and concordant one. A number of publications on pedagogical literature have been increasing and pedagogical, didactic, methodological aspects of the integrated teaching are being exposed to analysis. The aspects contain integration of taught subjects, integration of methodology and sociocultural integration. Still there has not been a sufficient interest in the problem of integrated and differentiated types of teaching and their relation.

The aim of differentiated teaching is to create grounds for the child's structural type of thinking, to form possibilities for a learner to master knowledge according to the degree of abilities (individual teaching) while teaching separate subjects (subject teaching). The application of differentiated teaching seeks to develop learners' powers. The presumption that individual differences of students are disregarded (psychological distinction in memory, comprehension and temperament) is not tolerated as the mentioned factors have a direct connection with the results that a student can achieve.

Differentiation can be comprehended and defined in the following ways: first, as a result of splitting of a particular entirety into segments, levels etc. second, as the formation of new qualitative connections between the separate components of the system due to the processes of integration. In the latter case the system acquires a new quality – it becomes more complex.

Integration should be carried out by placing biology in a core position with chemistry and physics round it. It is very important to make a content model for natural science teaching and test it in practise. Heretofore, the structure of subjects comprising natural science is not clear that makes us discuss regarding the integration of natural sciences content.

While discussing the integration of natural sciences content, one should bear in mind the realistic ratios of students' psycho-physiological potentials, abilities and interests for certain age periods and their manifestation in the process of learning. If not, the principle of didactics to take into account individual and age features of students will be a mere declaration.

The curriculum of natural science should reflect not only the integration of content, but the process should be seen as well. Integrated courses of natural sciences should agree with systematic courses, and all presented information should be bound together by sensible meaning. The efficiency of the integrated learning is directly dependant on the activities of students. Integrated courses should be well supported by a set of teaching / learning aids such as textbooks, workbooks, visual / demonstration aids, teacher's books, etc.

The issues related to the integration of natural sciences should be dealt with an entire system of personal values, theoretical knowledge, practice skills because all of them are parts of the system, which should function smoothly. The objective is to develop an integral personality with orientation for values and directions for activities.

Integration also presupposes the increase of the abstract. The younger are the students, the less is their knowledge. Consequently, the degree of integration should be limited in this respect. The integration of content should be combined with differentiation and individualization of teaching, because every child has his / her own ways or models for learning. The range for individualized approach is very broad and can be characterized by numerous parameters. Our survey reveals that 88.57% of students are positive about getting individual tasks and assignments. Future school should be paying more attention to the development of individual potentials, individualization, collection, classification and analysis of information and interchange ability of personal skills development or individual and group work in the teaching process.

The efficiency of integrated teaching is accentuated by a number of authors. Still Lithuania is not rich in studies on the foregoing problem, particularly when being reformed. One of the most important achievements is the investigation of efficiency of the experimental textbook "Nature and the Man" for the form 5 (Motiejūnienė, and Lekevičius, 1998). Despite, it is not clearly stated at what age this type of education is the most effective and how long the integrated natural sciences teaching should continue.

In addition, various authors seem to differ in their opinions to the problem. V. Mostukas (1991) maintains that integrated teaching is effective in the forms 5 to 7. According to P. Chamberlain, integrated natural science teaching is a preparation stage for the advanced level "A" studies on physics, chemistry or biology.

When analyzing changes on physics in the integrated classes V. Vjukov (1992) arrived at the conclusion that the efficiency of knowledge is notable in various groups of students (including pupils of low, medium and high abilities). The most tangible influence was observed between the students of medium abilities (1.4 - 1.5 times), the least tangible - between the students of lower (1.1 times) and those of high abilities (1.2 -1.3 times) (Vjukov, 1992).

Thus, we can claim that the following points influence the efficiency of integrated natural science teaching:

- a complex view towards integrated natural science teaching;
- the completeness of inner relations and those between the subjects;
- the selection of teaching content;
- logically grounded structure of teaching course taking into account the relation of integrated and differentiated teaching.

We consider that integrated teaching, if involved into the sociocultural context, will help the student to comprehend the causal relations. It will develop the personality and form moral orientations and standpoints together with habits to independently apply the acquired knowledge in real life situations. Such teaching and learning are characterized by integrity. Integrated teaching diminishes inconsistencies between the knowledge that separate subjects impart as well as the necessity and inevitability of the synthesis. The only fact of presenting the content is not the essence of teaching. The main point is work, a widely sided and motivated activity. In order to direct the teaching process in the desirable direction, it is imperative to encourage the motivation for learning. In this respect the principle moment cannot be neglected. A student cannot only master but also apply the basic knowledge in practice. Therefore, the duty of every teacher is to reveal and show to the students their potential powers.

The present Lithuanian school runs a task that seems to be not very easy - to train honest, creative, responsible for their behaviour human beings. Thus, the problems of integrated natural science education and its ways of decision are especially relevant. Integrated natural science education related to the sociocultural context will help pupils to perceive causal relationship that trains their personality, valuable orientation and regulations and the ability of acquired knowledge to independently apply in life. Professor Jonas Laužikas conception about integrated education reflects the great humanism of the scientist and his comprehensive view touches child's needs and interests. According to Juozas Vaitkevičius, incomplete, wrong natural science education, insufficient recognition of nature and the human being phenomenon drive the mankind to the social catastrophes (Vaitkevičius, 2000).

Trying to introduce the ideas of integrated natural science education in our schools it is very important to properly estimate concrete social environment and its influence to human's education.

It should be necessary to look at integrated natural science education from philosophical, social and didactic points of view. From the philosophical point natural science education should be directed to form a comprehensive (integrated) personality. Children's spirituality must be expanded in nature. It must be reached unity with nature and this is possible only by knowing it. The philosophers - existentialists ascertained that taught subjects had to enrich the inner life of a child, to form a conception of kindness and beauty. In the 20th century the biggest influence played neotomism, pragmatism, existentialism and other philosophical streams which synthetic reflection is being easily found in contemporary Lithuanian school being reformed.

The systematic point of view requires to join related subjects (for example natural sciences) into one unity and to create conditions for learners to investigate, make conclusions, edit abundant and different information, improve, change and enlarge your own knowledge, etc.

The course of natural science subjects should be integrated taking into consideration pupils' age peculiarities and implicitly adapted to the local regional conditions, which settle:

- political - ideological factors;
- cultural, social, economical conditions;
- customs and traditions (from the point of view of national upbringing).

The questions of teaching integrated natural science subjects must be analyzed in complex with a personal value system that includes personal theoretical knowledge and personal practical skills. It is a closely connected, indivisible system that functions only through concrete, active practical personal activities. The existing social environment also makes significant influence to the personal value system.

At school's level integration is being understood various. When integrating natural science subjects three serious didactic problems appear:

- the integrated subjects vary (structure, tasks, the logic of a subject, the complex of concepts, etc.);
- the methodological appliances reach a higher level;
- the character of teachers and pupils' activities of teaching and learning change.

Only after having solved these problems it will be possible to reach a desirable (information, knowledge, etc.) level of the whole complex.

From the standpoint of didactics, the most important issues are as follows: possibility to model teaching integrated natural subjects at school; possibility to inculcate conditions to reach the goal; to establish the level of natural sciences integration; to point out essential differences between integrated and linear natural sciences learning. It is very important that integrated teaching would be the optimal one.

When fulfilling one of the principles (*humanity, democracy, nationality, renovation*) of the educational reform it is purposeful to notice that the principle of renovation (change) must be improved to prepare natural science subjects' teachers for work. To accomplish the task it is necessary to reorganize the matter of programs of the studies and arrange pedagogical practise using the latest technologies in the process of teaching etc. Such integration can in fact be adjusted when preparing teachers and integrating subjects of natural sciences.

Teaching subjects should be integrated into the mentioned field of studies. It should be emphasized continuous connection with present, surrounding and processes taking place inside. Though plenty of different information is being presented in the textbooks of natural sciences prepared for secondary school pupils, teachers are short of the same data supported by more professional points of view at more advanced level.

Thus, the issues of integrated natural science education require exhaustive analysis and research of the area. On one hand, clear evidentiary material of the efficiency of the significance of integrated natural science education is existing. On the other hand, integrated natural science

education is not always efficient. It depends on different objective and subjective circumstances (see table).

Aspects of the significance of integrated natural science education	Circumstances preventing efficiency of integrated natural science education
<ul style="list-style-type: none"> • helps to model the entire (holistic) world-view; • forms pupil's individuality; • deepens and develops the kid's world outlook (understanding of nature); • establishes conditions for better mastering, perceiving and structuring natural sciences knowledge; • establishes conditions to comprehensively perceive relations between reason and result; • establishes conditions to practically apply knowledge; • helps to advance practical abilities and skills; • establishes conditions for the teacher to more colorful convey information; • directly influences the quality of conveying knowledge, evolves the motivation of cognitive interaction with nature etc. 	<ul style="list-style-type: none"> • the unsuitable, perverted view to natural science education; • lack of teachers' initiative and creativity; • teachers' (particularly those of primary school) weak motivation of cognitive interaction with nature; • lack of teachers' experience in the area of integrated natural science education; • sufficiently high expenditure of working hours in order to efficiently formulate strategy of natural science education; • lack of the visual aids of natural science education and the discrepancy of those to the required standards; • unequipped textbooks; the translated textbooks from foreign languages are particularly inefficient (not adapted to Lithuanian schools); • the entire concept of integrated natural science education is missing; • the teachers of elder generation are inert; • natural science education is a supporting part etc.

In conclusion, the following premises summarizing the earlier discussed ideas can be emphasized:

- natural science literacy of natural subjects' teachers working in Lithuanian secondary schools is insufficient;
- contradictory statements of scientists - theoreticians were revealed when discussing integrated natural science preparation of teachers;
- teaching of integrated natural sciences subjects in Lithuanian comprehensive school must be inseparable from national - cultural and economical conditions of the country;
- it is important to analyse the aims of integrated training, tasks, matter, methods, the questions of organization of the integrated teaching process etc. and to prepare teachers for general natural science education in comprehensive schools having a pedagogical profile, proposing priority to the methods applied for teaching natural sciences subjects;
- it is advisable to raise the qualification of natural subjects teachers in the sphere of natural science providing appropriate courses, workshops etc.

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Резюме

ЕСТЕСТВЕННОНАУЧНОЕ ОБРАЗОВАНИЕ В СРЕДНЕЙ ШКОЛЕ ЛИТВЫ: НЕКОТОРЫЕ ВАЖНЫЕ ПРОБЛЕМЫ

Винцентас Ламанаускас

В Литве во всех важнейших документах, регламентирующих образование – в *Общих программах /General Programs/* образования (1997) и в *Стандартах общего образования* (1997, 1999) приоритетным становятся учёба в течение всей жизни */lifelong education/*, качественное образование, подчёркивается способность критического мышления, постоянное обновление знаний и проверка (переосмысление) своих убеждений. Всё это относится и к естественнонаучному образованию /ЭНО/.

В этой статье внимание уделяется таким главным сферам ЕНО: философские-педагогические аспекты, проблематика естественнонаучной грамотности /компетенции/ учителей общеобразовательных школ, некоторые вопросы интегрированного обучения естественнонаучных предметов.

Интегрирование учебного содержания и учебной деятельности в преподавании естественнонаучных предметов на второй ступени общеобразовательной школы - актуальная дидактическая задача. При подготовке учебных пособий (учебников, программ, тетрадей для упражнений, информационной и др. литературы) нужно искать более разнообразные и эффективные способы и формы изложения учебного содержания. Это первый шаг к осуществлению интегрирования естественнонаучных предметов. Внедряя в практику работы школ интегрированное естественнонаучное обучение, необходимо параллельно готовить и переквалифицировать педагогов.

Вопросы интегрированного обучения естественнонаучных дисциплин должны рассматриваться комплексно: система ценностей личности, теоретические знания личности, практические умения и навыки личности. В учебных программах должна проявляться не только интеграция содержания, но и интеграция учебного процесса.

Обучение естественным наукам требует интегрального отношения. Учитель естественных наук должен хорошо усвоить различные технологии обучения, иметь хорошую базовую подготовку по естествознанию. В настоящее время в Литве особенно актуальной задачей является подготовка учителей для работы в десятилетней основной

школе, в которой преподавание естествознания в большей части интегрировано. Например, в 5 - 6 классах преподается интегрированный курс "Природа и человек", преподавание данного курса предусмотрено и в 7-8 классах, в начальной школе (1 - 4 кл.) курс "Познания мира". Для преподавания этих курсов педагоги должны быть подготовлены соответствующим образом.

Очевидно, что важная задача системы образования – формирование миропонимания на основе современной естественнонаучной картины мира. Холистическое понимание явлений природы – *главная стержень естественнонаучного содержания* на всех уровнях системы образования. На всех уровнях системы естественнонаучного образования */аспекты содержания обучения и практической деятельности/* должно непрерывно совершаться осмысление единства живой и неживой природы, системности взаимных отношений человека – природы - общества.

Ключевые слова: естественнонаучное образование, средняя школа, интегрированное обучение.

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