SOME FEATURES OF INITIAL SCIENCE TEACHER TRAINING IN LITHUANIA[1]

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Abstract

After gaining the independence, well-grounded, qualitatively new and intensive changes took place in the education system of Lithuania. The issues of science education became even more burning and though more complex. One of the directives requires solving the problems of science education on the grounds of a general culture rather than separately as the questions should be treated as a part of culture. A teacher of sciences must fully master different training technologies and have a thorough preparation for teaching sciences. Obviously, science pedagogical education undergoes serious changes. The majority of the recent international studies face an alarming situation in the field of science education. A critical situation has been encountered by the ROSE project (Sjøberg, 2004). It is obvious, that preparation of the qualified science teachers is actual and difficult task.

Key words: *science education, teacher training, educatedness.*

Introduction

Obviously, that natural science education is a crucially important area of a general background (educatedness). The 21st century, an era of modern biology, chemistry, physics and advanced technology, proves that it is extremely difficult to operate without a broad background in this field. Moreover, natural science education is an integral phenomenon that requires a systemic approach and assessment. Therefore, most of the issues should be discussed in a broad context of general natural science education (Lamanauskas, 2003a).

The system of teacher training in Lithuania has to lay down conditions for effective preparation of qualified teachers. Next, the system has to be oriented to the models prevailing in the EU teacher training practice and general tendencies of this process. Modern didactics is more devoted to the child rather than to the teacher. However, researchers mark (Kavaliauskienė, 2001, etc.) that it does not depreciate the role of the teacher but on the contrary, requires more thorough professional competence. A social survey of Lithuanian teachers' carried out by the centre of studies of the Open Society Fund Lithuania in 1999 confirmed the results of the previous investigations conducted by various authors (Purvaneckienė, 1996; Būdienė, 1997 etc.). Research reveals that the amount of theoretic subjects is too big and that of practic subjects is too small, teaching practice is short and often is not effective, methodological knowledge is insufficient, etc. B.Bitinas stresses a dominant role of theory in the preparation process of teachers (Bitinas, 1996). V.Rajeckas accentuates the relevance of pedagogy in the studies and supports an idea that the whole process of studies should be oriented

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to the student's preparation to work at school (Rajeckas, 1994). Pedagogy literature highlights that a wide gap between theory and practice of pedagogy studies can be noticed in Lithuanian pedagogic higher schools (Pūkelis, 1998). The assessment of the results of the investigations conducted by different authors demonstrates that preparation for work at school is a key problem that can hardly be solved.

Research in the field discloses that natural science teacher training determines the approach of the young generation to natural sciences in general. Thus, natural sciences teacher training has to be efficient and permanently investigated. Teachers' natural science competence can be examined in a general cohesive system:

Natural science education standards – teacher's natural science competence – professional teaching skills – results of natural science education

Therefore, in this entire context, the teachers of sciences play a crucial role. Training quality directly influences and determines the efficiency of science education in comprehensive school.

There are three main professions - science teachers, science-teacher educators, and university science or education faculty members. For all of them the main two questions should be how to train science teachers and about how to teach science. Their understanding of the given questions is different enough. For science teachers the methodical recommendations (scenarios) are more useful and interesting, than the results of scientific researches. Two inconsistent moments can be mentioned:

- the correlation between research and practice is weak. First, teachers' competence level in the field of educational research is rather low; second, partnership with the researchers' community remains unexpanded; the teacher is, first of all, a subject of pupils' training for life and their integration into society (socialization) who is responsible for high quality education and better results. Therefore, there are a few bitter reproaches about problematic research of educological natural science education that might be irrelevant in terms of teachers' work experience. According to Keogh and Naylor (2002), many teachers who are committed to applying research in their classrooms of a constructivist approach find that in practice it is more problematic;
- the correlation between a higher school lecturer and comprehensive school and educational practice in general, is very weak in most of the cases; a mission of the scientist is knowledge about scientific educational reality. From this point of view, teaching natural sciences at higher school seems to be rather complicated when educating the teachers of this profile. Often teaching science subjects at higher school is limited by "dry" academicism, a didactic cover is thin. The "real" naturalists hypothetically renounce the educologists working in the field of natural science education. The latter frequently feel being misunderstood by the "real" pedagogues – didacticists.

Nowadays it is clear that the main trend prevails - training for science teachers is focused on learning, not teaching strategies. On the other hand, the constructivist perspective is becoming a dominant paradigm in the field of the science education. Also it is obvious, that the constructivist approach in the initial science teacher training is not still too common at many European teacher training institutions. Therefore, there is a certain interest in the analysis of a current situation in system of initial science teachers training in the different countries of the Europe.

The object of the research is the system of initial science teachers training of Lithuania (current state). The main goal of the research is to highlight the principal peculiarities and tendencies of training teachers of sciences in Lithuania at this stage. The tasks of the research are:

- to disclose the existing current situation of training teachers of sciences in Lithuania;
- to discover the possible tendencies towards developing the training systems of science teachers.

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Methodology of Research

The conducted research includes assessment of scientific literature, a comparative assessment of documents (curricula of studies), analysis of some examples from universities, systemic analysis ect. The main idea is that the curricula of studies instantly reflect the main aspects of the science teachers` training system. The given research is based on researches which are carried out earlier (Lamanauskas, 2002; Lamanauskas, 2003b; Lamanauskas, Gedrovics, 2006). In opinion of the author, it is important to observe constantly (monitoring) the process that it is better to understand possible tendencies of development, and also to offer recommendations for improvement of the process. This research is carried out in May, 2007 in the frame of international project IQST.

Results of Research

General background

The description of a few key points defining a system of teacher training in Lithuania can be found rather purposeful.

- Professional teachers' qualification and competence is the pivot of the whole teacher training system.
- The candidates' sample /contingent/ of participation in the pedagogical curricula. Motivation for becoming a teacher and working at school constantly decreases. The pedagogical curricula usually choose the candidates with medium-based abilities. On the other hand, a demand for the teachers of sciences is fairly low.
- Education received by teachers /university or college education/. A new concept of the teacher training system basically answers the question.
- Material and intellectual resources of higher educational institutions. To train the teachers of sciences, not only intellectual but also large material resources are required (properly equipped research facilities, rooms of didactics, botanical gardens and zoos etc.).
- Elitistic and mass education.
- The ways of training mentors of teaching practice. A system of granting licences for teachers.
- Two models of teacher training: ***parallel*** /individual subject training + pedagogical training + practical activity/ and ***consistent*** /academic studies of a certain subject proceeding with realization of teacher training/. Primary and pre-primary school teacher training is received applying the parallel model whereas gymnasia teacher training uses the second model. The colleges also employ the parallel model.
- A right to work as a teacher /licence/ is granted when studies or successful pedagogical practice-traineeship in basic school (half a year under the parallel model or one year under the consistent model) is over (Lamanauskas, Gedrovics, 2006).

Assessment Guidelines on the Present Situation of Teacher Training

The teachers of natural sciences are trained by Universities in Lithuania. Although the binary system of higher education including universities and colleges is prevailing in Lithuania, however, at the moment, the teachers from colleges are not involved in teacher training. Table 1 presents a list of institutions preparing the teachers of natural sciences.

Table 1. The major institutions training the teachers of natural sciences.

Name of the curriculum chosen	Name of institution	Length of service (in years)			Qualification acquired
		Full time	University Extension	Part time	
Biology	Vilnius Pedagogic University	4	4	5	BA in biology, teacher
Biology	Vilnius Pedagogic University	2	2	2	MA in biology, teacher
Biology	Vilnius Pedagogic University	2	2	2	MA in biology, teacher
Chemistry	Vilnius Pedagogic University	4	4	5	BA in chemistry, teacher
Chemistry	Vilnius Pedagogic University	2	2	2	MA in chemistry, teacher
Chemistry	Vilnius Pedagogic University	2	2	2	MA in chemistry, teacher
Physics	Šiauliai University	2	-	2	MA in physics, teacher
Physics	Kaunas University of Technology	1	-	1	teacher
Physics	Vilnius Pedagogic University	2	2	2	MA in physics, teacher
Physics and astrophysics	Vilnius Pedagogic University	2	2	2	MA in physics, teacher
Physics and physical education	Vilnius University	4	-	-	BA in physics, teacher
Physics and informatics	Šiauliai University	5	-	-	BA in physics, teacher
Physics and informatics	Šiauliai University	4,5	-	-	BA in physics, teacher
Physics and elements of other natural sciences	Šiauliai University	4	-	-	BA in physics, teacher
Physics and applied computer science	Vilnius Pedagogic University	4	4	5	BA in physics, teacher
Pedagogy of the subject studied	Šiauliai University	1			BA / a degree meeting requirements at University level
Educology and object of study	Šiauliai University	4	-	4	BA in Educology, teacher

Curricula of Studies

The teachers of natural sciences in Lithuania can choose between studying a bachelor's and a master's degree (can be either broadly-based or focused) curriculum.

The curricula of studies fall into three categories:

1. Basic studies;
2. MA studies;
3. Specified professional studies.

The curricula of studies can also be subdivided into two sections:

- Theoretical studies;
- Scientific research.

A module is the fundamental unit of planning studies. It is a subject studied or a part of it taught along the term. The module of studies can be either compulsory or optional and includes different forms of learning: lectures, laboratory experiments, practice, individual student's work, scientific research and planning.

A measurement unit of the scope of studying is a credit which on average makes 40 hours of effective and independent work in and outside the classroom and equates with one weak of studies. The curricula of studies are designed following the Rules of quality assessment for institutions of research and higher education approved by Order No 1326 of the Ministry of Science and Education of the Republic of Lithuania on October 10, 2000 and the regulations of the curricula of studies and modules of a higher school.

The scope of the bachelor's degree curriculum is 160 credits. The length of service of full-time studies makes 4 and university extension and part-time studies – 5 years.

The curriculum of studies schedules three groups of the subject studied.

- ***General education subjects at university level*** make no less than 15% of the scope of the whole curriculum;
- ***Subjects discussing the fundamentals of studies*** make no less than 25% of the scope of the curriculum;
- ***Subjects dealing with special education*** take the rest of the scope of the curriculum but not less than 40%.

The scope of the term of full-time is 20 and of the 4th year of studies - 16 credits. Thesis takes 8 credits. The number of the subjects studied in the 1st and 2nd year cannot exceed 7, in the 3rd - 6 and in the 4th - 5 credits per term. From the beginning of term 4, the curriculum may enclose no more than 2 term papers/projects in each of the terms. The curriculum may also include practice. The examination session should accept no more than 5 exams (Type E). The bachelor studies ends in completing thesis and taking final exams.

The number of the modules of the subjects taught, the term papers and projects as well as the scope of the exams of the curricula of university extension and part-time studies agrees with that of the curricula followed by the full-time students except from the length of service, the number of credits and hours studied within the term.

The teachers having a bachelor's degree have a possibility of gaining a master's degree. The scope of the curricula of all forms of MA studies makes from 60 to 80 credits. The university extension and part-time studies may also last for 2 years and take 80 credits or 1,5 years and take 60 credits.

The scope of the term curriculum of full-time studies is 20 credits. The term may include no more than 4 theoretical modules, 1 module of research work and no more than 2 term papers/projects. The master's studies ends in completing thesis.

According to the number of exams, term papers, projects, modules and its scope, the curricula of university extension, part-time studies and remote education are equal to those of full-time studies

except from the length of service, the number of credits and hours studied within the term.

The curricula of studies of the same field include a part of general subjects. A general part of a field curriculum is coordinated by the University board of studies and approved by the rector.

Planning Individual Studies

Every spring term, along the modules chosen, the students work out individual plans of studies for the forthcoming year. The questions of planning individual studies are discussed with the Dean Office and lecturers. The individual plans of studies can be adjusted within two first weeks of the term started. The final versions of individual plans and changes are approved by the Dean Office.

Types, Stages and Forms of Studies

The University offers two types of studies – continuing and incoherent. **Continuing** studies are aimed at all-round higher education confirmed by the obtained university degree and (or) professional qualification. **Incoherent** studies embrace only separate subjects or their cycles studied and focus on improving or changing one's professional qualification as well as on developing professional and general education. These studies also encompass supplementary (retraining) studies.

The stages of continuing studies are:

1. Bachelor's and professional studies;
2. Master's, and specified professional studies;
3. Postgraduate studies.

Bachelor's studies are continuing the first degree studies at university level. A student is awarded a bachelor's degree after studying is over. Professional qualification may also be obtained. The graduates are allowed to take up postgraduate or specified professional studies.

Complete studies concentrate on receiving master's degree and (or) professional qualification when first and second degree studies at university level are combined.

Specified professional studies are continuing the second degree studies for graduates from university devoted to the students seeking for professional qualification of a particular field. Studying helps with a better preparation for work that requires special practical abilities.

Master's studies are continuing the second degree studies for those improving individual professional and scientific qualification focused on scientific activity. The students are trained to be either scientists-researchers or teachers and directed to be involved in analytical applied activity.

Postgraduate studies are the third stage studies at university level concentrating on would-be scientists training. The applicant must have a master's degree or be a graduate from complete studies. When postgraduate studies are over and thesis is defended, a student is awarded a degree in Educology.

Examples Given

Pedagogy of the subject can be studied at the Department of Educology at Šiauliai University. The students are provided a possibility of obtaining a bachelor's degree in Educology. The curriculum mainly covers studying pedagogy and psychology and includes 4 week teaching practice in secondary school. Studying the curricula of pedagogy awards the graduates **professional qualification of teacher**. The latter curriculum of studies is most frequently chosen by those having natural science education but not teacher qualifications.

A certain curricula of studies may specialize in natural sciences. For example, the curriculum *Specialization in Educology* by the Department of Educology at Šiauliai University is designed so that gained qualification will successfully allow teaching geography and integrated courses on sciences (e.g. *Nature and Human* in forms 5 and 6 and possibly in 7 and 8 if the course is included in the curricula of teaching). The curriculum points to training highly qualified and having professional competence teachers of sciences, geography and Educology. Within their studies, the students will be

offered an opportunity of implementing natural science and environment protection education and ecology curricula at national level, gain a bachelor's degree in Educology and acquire high professional qualification of secondary school teacher of sciences and geography. The graduates dealing with these curricula will have better career prospects as curriculum implementation is supported by the educational establishments of Northern Lithuania, students' parents and naturalists and teachers of Educology at Šiauliai University. Having graduated the curriculum of studies *Educology (sciences and geography)*, a student is awarded a bachelor's degree in social sciences (Educology). ***The goal of the curriculum*** is *to train highly qualified and having professional qualification teachers of Educology, sciences and geography*.

The teachers of physics are trained by the Department of Physics at Vilnius University, by the Department of Physics and Technology at Vilnius Pedagogic University and by the Department of Sciences of Šiauliai University.

Bachelor's and professional studies

180 credits, full-time studies, 4 years

Qualification acquired: a bachelor's degree in physics and teacher's professional qualification

The main subjects of the curriculum. General educational subjects at university level: introduction into philosophy, culture of the mother tongue, law, foreign language, history of cultures and civilizations etc.

General subjects of studies: classical physics, differential equations, informatics, mathematical physics, mathematical analysis, linear algebra, probability theory, theory of atoms and molecules, astronomy, physics of waves, electrodynamics, experimental physics, history of physics, fundamentals of solid state physics, computer applications, biophysics, statistical physics etc.

Specific subjects: research methods of environment pollution, personalities and social pedagogy, education, research methods of biological objects, electronics, energetic and environment, methodology of teaching physics, historical and comparative pedagogy, computer applications in teaching physics, psychology, spectroscopy, applied nuclear physics, education elements and didactics, hygiene at school etc.

Vilnius Pedagogic University – *physics and applied computer science*

Bachelor's and professional studies

Full-time studies and university extension, 4 years

Qualification acquired: a bachelor's degree in physics and teacher's professional qualification

Šiauliai University – *physics and informatics*

Bachelor's and professional studies

180 credits, full-time studies, 4,5 years

Qualification acquired: a bachelor's degree in physics and professional qualification of teacher of physics and informatics.

The would-be teachers of physics and informatics study general education subjects (focused on fundamentals broadening world outlook and understanding of the principles of sustainable development): fundamentals of philosophy, history of culture, psychology, education management, history of physics, culture of the mother tongue, terminology, foreign language; **subjects discussing the fundamentals of studies** (focused to build up a professional image of the physical world and to develop abilities and skills required for studying subjects of special education and taking up studies at the second stage at university level): higher and discreet mathematics, differential equations, mathematical statistics and probability theory, computer systems, fundamentals of programming, mechanics, thermodynamics, electricity and magnetism, optics, astronomy, biophysics, solid state, nuclear and elementary particles and statistical physics, mathematical methods in physics etc.; **special (professional) subjects** (focused on accumulating knowledge and abilities allowing to successfully deal with the job that corresponds with education acquired): computer physics, laser physics, electronics, objective programming, database management, information teaching technologies, Educology, didactics of physics and informatics, hodegetics etc.

Practical studies take place at two stages. Teaching practice the purpose of which is practical student training to introduce the professions of teacher of physics and informatics and class tutor is accomplished twice. At first, practice takes place in forms

from 7 to 10 of comprehensive school or may occur in certain forms of gymnasium (240 hours); the next step involves the students from forms 11 and 12 or certain forms of gymnasium (160 hours). In total, the length of service makes 400 hours.

The major qualities.

- In order to ensure the mobility of students, the curricula of physics teacher training of all universities are coherent.
- Qualified and experienced teachers are involved in the process of curriculum development.
- A substantial number of educational laboratories and equipment used.
- Quickly advanced computer technology and software are applied.
- A firm experimental basis of didactics of physics.
- Close collaboration with teachers of physics and physicists of other higher schools nationwide.

Weaknesses:

- Due to low prestige of teacher's profession, the latter is chosen by those having no success at school.
- To more precisely define the curricula, there is lack of regulations observing the curricula of teacher training.
- Scant attention devoted by the Government.

The majority of teachers of chemistry and biology are trained by Vilnius Pedagogic University. The structure of the curricula of these studies is similar comparing to those of other sciences.

It is supposed that in the future, the number of primary school teachers will decrease due to demographic problems, whereas the need for teachers of chemistry, biology and physics will rise (Dzemyda, Gudynas, altenis, Tie is, 2001).

Conclusions

In conclusion, we can maintain that:

- After restoring independence, the new teacher training curricula using experience of Western countries and considering national needs were developed.
- The teachers of natural sciences mainly have to meet new social, pedagogic and subjective requirements. They are treated not only as providers imparting knowledge and facts but also as those helping the learner with choosing the required information on an individual basis. The changes in society and the process of teaching show that higher schools must take into account these facts while training would-be teachers.
- The training curricula of teachers of natural sciences are designed on the basis of the regulations of the field of studies and standards of teacher training and are aimed at training teachers able to teach a few subjects of natural sciences.
- The curricula focused on preparing teachers able to teach natural sciences integrated into other subjects taught are designed.
- The curricula of natural sciences include education management, an introductory course on Educology, didactics and hodegetics that are involved into the process of competence development; however, it is not enough to gain general competence in pedagogical practice.
- The training curricula of teachers of natural sciences encounter a problem pointing to the recession of the parallel teacher training model. In this case, the prospects of professional

studies that proceed receiving a bachelor's degree are confirmed by the new curricula of professional studies scheduling a general core section of the subjects developing pedagogical competence and didactical subjects of different fields of science that will be applied for the purposes of improving didactical competence of a certain subject.`

- Lack of specific methodology, examples of good practice and recommendations for solving the problem of integrated education can be noticed in Lithuania.
- No detailed systemic recommendations and methodical and organizational tools of how to integrate modern Information Communication Technologies (ICT) into the processes of teaching/learning natural sciences are created.
- The teachers of natural sciences are not experienced enough in the field of general competence in modern ICT and suffer from shortage of methodical experience of how to effectively apply ICT in the educational process. The teachers should gain relevant experience in the seminars in methodology, training courses and accepted pedagogical practice at school using the latest Lithuanian versions of natural science training aids based on ICT.

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