

## SENIOR PUPILS' VIEWS AND APPROACH TO NATURAL SCIENCE EDUCATION IN LITHUANIA AND LATVIA

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**Abstract.** The global tendency is obvious: interest in science is on the decrease, the number of pupils choosing university science curriculums has been constantly declining, and scientific knowledge in society (especially among young people) is inadequate. In our opinion, humanity verges on social cataclysms owing to inadequate natural science education as well as on insufficient and often improper knowledge of nature and human. Natural sciences give us most fundamental knowledge about the world of nature. Encouragement of young people's interest in science is the essential scientific problem. As educational paradigms are being altered we must search for new quality approaches to teaching chemistry and other science subjects.

The research, which involved 350 senior pupils from Latvia and 762 from Lithuania, analyzes present-day situation in natural science education. We tried to analyze the factors that cause the interest in natural sciences to decline: inadequate content of teaching, issues related to teachers' competence, general attitude of society to natural sciences etc.

**Key words:** natural science education, upper secondary school, interest in science.

### Introduction

It is a substantial characteristic of any reform in the system of education that it can never be fully completed. The content and forms of implementation differ in any case of alteration. In many countries, alterations in natural science education have been conducted at all levels of the system of education. At this point, it is very important to regularly analyze opinions, views and approaches of those who participate in the process of education, i.e. teachers, pupils, education managers. It is one of the essential indicators of the situation in education. When choosing a certain educational programme (e.g., in Latvia) or a certain educational profile (e.g., in Lithuania), pupils actually associate it with their future – the choice of their future occupation.

A variety of researches have been carried out in the world during recent years in order to analyze the situation, tendencies and perspectives in science education. The TIMSS and TIMSS-R research (*Third International Mathematics and Science Studies* /<http://timss.bc.edu/>), OECD PISA research (*OECD Programme for International Student Assessment* /<http://www.pisa.oecd.org/pisa/summary.htm/>), ROSE research (*The Relevance of Science Education* /<http://folk.uio.no/sveinsj/>) and other smaller researches have been carried out in many countries as well as in Latvia and Lithuania (Gedrovics, 2000; Lamanuskas, 2000, 2003a, 2003b). Inadequate level of scientific knowledge, the decline of interest in natural sciences on the whole and the attitude of the present-day society to significance of natural sciences raise the need to disclose what these issues are caused by. U. Slabin notices a paradox that under the circumstances of environmental crisis, the popularity of the majority of natural sciences and chemistry in particular is decreasing (Slabin, 2002). Research made by Kennedy (1996) shows, that for most of the topics the pupils nominated as easy or difficult (bonding, energy, equilibrium, formulae/valencies, ions in solution, molarity/stoichiometry, reaction types and redox) a greater percentage of pupils found them difficult than found them easy. Chemistry is too

difficult and takes too much time for 16% pupils and chemistry is a boring subject for 19% pupils (Kennedy, 1996). Many pupils state openly that they do not like schoolwork in natural science at all. Most pupils do not achieve an understanding of physical or chemical phenomena (Lechner, 1996). According to H. Lechner, many pupils find it very difficult to grasp the material of the natural sciences with their abstract formulations. M. Janiuk (1999) also notifies that difficulties exist in understanding some chemical concepts (misconceptions), and D. Treagust says, that learning difficulties exist at chemistry lessons (Treagust, 2001). Research indicates that generally pupils have very poor conceptions of the properties of matter. They cannot differentiate between macroscopic and microscopic descriptions of matter (Viiri, Hirvonen, Saari et al., 1999). R. Delpech (2003) also notifies the increasing concern across the UK that pupils are bored with science.

On the other hand, according to data of the most recent researches (Gedrovics, 2000), almost 20% of parents and 15% of teachers pointed out that they had no use of knowledge in chemistry and physics acquired at school. Although a more profound analysis of such assessment has not been carried out, this fact is alarming indeed.

Some comparative researches conducted in Latvia, Finland, and Sweden (Gedrovics, 2000) also testify a conditionally low popularity and status of natural sciences. The research revealed that only 50-65 % of respondents in these countries think that natural sciences are necessary at the higher level of secondary school (11<sup>th</sup> – 12<sup>th</sup> forms). Almost 80% of pupils – pre-service and in-service teachers – held the same opinion. It is worth here to emphasize that Swedish respondents (pupils, students, and teachers) rated sciences at the lowest position. It can be explained by the fact that Sweden is quite experienced in programme-based teaching in secondary school. This cannot be said about Latvians who have started the transition from choosing subjects to choosing educational programmes.

A research conducted in Sweden (Dahlbom, 1988), which analyzed extensive data on natural science education (1896-1988) revealed that the situation has not altered much (time-wise as well as according to school levels. Thus it is necessary to state that examples discussed above (Slabin, 2002; Lechner, 1996; Gedrovics, 2000 and others) are not simply isolated notices but on the contrary, they are constitutive parts of a very complicated problem – general attitudes of various social groups to natural sciences and learning natural sciences at school. This situation is also analyzed in the most recent monograph on problems of natural science education at present-day schools, published in Lithuania (Lamanauskas, 2003b).

Thus this research analyzes senior pupils' approach to natural sciences. The principal *aim* is to determine pupils' favourite natural sciences, their self-assessment of knowledge in natural sciences, and fields of studies they intend to choose after graduation. We have tried to reveal differences and similarities existing between pupils in Latvia and Lithuania.

### **The methods of research and characteristics of the respondents**

This research was conducted in September-October 2003 in Lithuania and Latvia. The pupils of forms 11 and 12 from Lithuanian schools have participated in the survey. 762 respondents including 420 (55.1%) female and 342 (44.9%) male applicants have been the object of the research (a consecutive "bunch" system has been applied). 428 (56.2%) eleventh-formers and 334 (43.8%) twelfth-formers have been involved in the survey. A smaller number of Latvian respondents, 350 (200 (57%) female and 150 (42.5%) male applicants) participated. The research and analysis of its results were carried out considering the fact that Lithuanian and Latvian schools differ in their structure. Latvian secondary school consists of three forms (10<sup>th</sup>, 11<sup>th</sup>, 12<sup>th</sup>) and Lithuanian consists of only two forms (11<sup>th</sup> and 12<sup>th</sup>). The Latvian survey involved 82 (23.6%) tenth-formers, 124 (35.6%) eleventh-formers and 142 (40.8%) twelfth-formers. The method of research was a questionnaire in writing (nominal and ordinal scales were applied). In addition, it was taken into account that models of differentiated teaching in Lithuania are substantially different from those in Latvia. In Lithuania, pupils choose between two profiles –

the profile of sciences and the profile of humanities, while Latvian pupils choose an educational programme – programme of general education, programme of humanities-social sciences, mathematics-natural science, and vocationally oriented educational programme. Surveys reveal that major part of Latvian pupils choose the programme of general education.

The respondents have answered the following questions:

- how do you evaluate natural science education acquired in basic school;
- what is your favourite subject in natural sciences;
- what is your field of the future studies after secondary school is graduated;
- what is your activity in nature;
- what are the most negative points of learning natural sciences;
- which of the natural sciences would you choose if you had no other choice but become a teacher of natural sciences.

The statistical bundle of programmes SPSS was applied to analyze the research data. To determine the differences between features under analysis the  $\chi^2$  criterion and Fisher's multifunctional criterion  $\phi$  were applied.

## Results of the research

Interesting results had been revealed after the research was completed. Table 1 displays Lithuanian and Latvian pupils' assessment of their own knowledge in natural sciences.

**Table 1. Pupils' assessment of their own knowledge in natural sciences.**

Level of evaluation	Lithuanian pupils		Latvian pupils		$\phi_1-\phi_2$	Fisher's criterion $\phi$	
	N	%	N	%		$\phi_{\text{empir.}}$	p
Satisfactory	317	41.6	195	56.9	0.307	4.72	0.000
Partially satisfactory	362	47.5	125	36.4	0.226	3.47	0.000
Unsatisfactory	83	10.9	23	6.7	0.149	2.29	0.011

As can be seen in the table, less than half of Lithuanian respondents consider their knowledge in natural sciences as satisfactory, 10.9% - as unsatisfactory. No statistically significant differences between evaluations of different sexes were noticed ( $p>0.05$ ). Pupils in forms 11 and 12 evaluate their knowledge similarly ( $p>0.05$ ). Those who had chosen either the profile of exact sciences or the profile of humanities also treat their knowledge in natural sciences in a similar way ( $p>0.05$ ). Here are some of pupils' most interesting ideas: "My knowledge is partially satisfactory because I am going to fill the "gaps" in my knowledge"; "It is partially satisfactory. I don't know many things but I know what an atom, molecule or a cell is"; "I think there should be more practical things than theoretic"; "My knowledge is unsatisfactory because there are students in my form who are better at sciences and I can't make it together with them"; "In my opinion, we don't get adequate knowledge in natural sciences at basic school"; "I am going to choose humanities, and I don't need chemistry and physics"; "My knowledge is satisfactory because I am not going to study natural sciences"; "Nothing is enough for human"; "We get no practical tasks and theory is boring without that"; "In my opinion, the course in natural sciences is very extensive and difficult and we acquire a great deal of knowledge"; "It is unsatisfactory because teachers not always understand everything themselves and they don't elicit things properly"; "Unsatisfactory because all we did was just making notes, studying them on our own and a test in the end - and nothing else"; "Satisfactory, because when I am outdoors, in town or somewhere else I understand what's going on, I don't need other people's help"; etc.

56.9% of Latvian pupils evaluate their knowledge in natural sciences as sufficient and 6.7% as insufficient. Any statistically significant differences between evaluations of different sexes and forms were noticed. Opinions of Latvian respondents were different: "I understand the

subjects well”, “they’re interesting, I like them”, “I had good teachers at basic school”, “I didn’t study hard enough”, “I’m not interested in natural sciences and I don’t like them”, “I had bad teachers” etc. We compared Latvian and Lithuanian pupils’ evaluations and revealed statistically significant differences. We can assert that Latvian pupils assess their knowledge in natural sciences higher than Lithuanian pupils do.

Evaluation of natural sciences may also seem of interest (see table 2).

**Table 2. Natural sciences subjects pupils like best (N%).**

Subject	Lithuania			Latvia		
	Girls	Boys	Total	Girls	Boys	Total
Biology	181/43.1	62/18.1	243/31.9	62/31.0	17/11.5	80/22.9
Geography	114/27.1	86/25.1	200/26.2	72/36.0	65/43.9	137/39.1
Physics	43/10.2	120/35.1	163/21.4	18/9.0	34/23.0	52/14.9
Chemistry	52/12.4	33/9.6	85/11.2	13/6.5	13/8.8	26/7.4
None of these	30/7.1	41/12.0	71/9.3	27/13.5	7/4.7	34/9.7
Several subjects	-	-	-	9/4.0	12/8.1	21/6.0

As you can see, biology is liked best and chemistry – least among Lithuanian pupils. Even 9.3% of respondents indicated they liked none of the subjects. Statistically significant differences were noticed in evaluations of different sexes ( $\chi^2=97.55$ ,  $df=4$ ;  $p=0.000$ ). Girls rate **biology** as the best liked subject while boys prefer **physics**. Latvian pupils indicated that they liked geography best, and chemistry – least. Actually, Lithuanian and Latvian pupils’ assessment of chemistry is quite similar. Statistically significant differences between the evaluations of sexes have been determined ( $\chi^2=45.96$ ,  $df=5$ ;  $p=0.000$ ). Both sexes prefer geography. 31.0% of female respondents regard biology and 9.0% - physics as their favourite subject while a greater percentage of male respondents (23.0%) indicated physics. 11.5% of male respondents indicated biology. Thus we can state that statistically significant differences between assessments of the issue have been determined ( $\chi^2=74.29$ ,  $df=5$ ;  $p=0.000$ ). Lithuanian pupils prefer biology while Latvian pupils – geography. In addition, 6.0% of Latvian pupils indicated several subjects.

Here are some of Lithuanian pupils’ most interesting opinions: “*Most things depend upon the teacher*”; “*I enjoy learning human anatomy, diseases, animals, plants*”; “*I like learning about foreign countries, other cultures, customs, religions, landscapes*”; “*I like various experiments*”; “*I like chemistry best because it is interesting and I find it quite easy to learn*”; “*Biology is the most useful subject, because we should know as much as possible about our own organisms and others*”; “*I enjoy geography because I like travelling, I’m interested in foreign countries*”; “*I like chemistry because it is really interesting, especially experiments, but it is not easy*”; “*I used to like chemistry and biology but later it became too difficult and I don’t like them any more. Geography is interesting, besides, we had a very good teacher who knew how to make things comprehensive*”; “*Chemistry is interesting because I like experiments and it is useful in everyday life*”; “*Biology is the easiest subject, chemistry and physics are difficult, and geography is boring*”; “*I like physics because it gives a good deal of practical knowledge which is useful in life*”; etc.

Latvian pupils who indicated several subjects preferred geography and biology as a rule. This was a dominant combination. Here are some repeated opinions of Latvian pupils: “*the subject is interesting and not very difficult*”, “*the knowledge I have acquired is useful in my everyday life*”, “*I have a good teacher*”, “*it’s difficult to learn*”, “*I think what we learn is not useful in my future life*”, “*I’m interested in other subjects*” etc.

Respondents’ future plans concerning studies after finishing secondary school may also seem of interest (see table 3).

**Table 3. Pupils' future plans concerning studies after finishing secondary school (N/ %).\***

Area of studies	Lithuania	Latvia	$\phi_1-\phi_2$	Fisher's criterion $\phi$	
				$\phi_{\text{empir.}}$	<b>P</b>
Social science	170/22.3	38/17.6	0.118	1.53	>0.05
Technological studies	139/18.2	33/15.3	0.077	0.99	>0.05
Humanities	76/10.0	17/7.8	0.078	1.01	>0.05
Natural sciences	44/5.8	23/10.6	0.177	2.29	0.011
<i>Undecided</i>	331/43.4	102/47.3	0.079	1.02	>0.05
<i>Aren't going to study further</i>	2/0.3	3/1.4	0.127	1.64	=0.05

\* as research data on this question was analyzed only full responses of 11/12th-formers from Latvia were taken into consideration (216). 18.8 % of Latvian 11/12th-formers indicated several subjects or subjects which were not in question.

Fisher's criterion fixes the differences existing between the approach of Lithuanian and Latvian pupils' to natural sciences. More Latvian pupils give priority to natural sciences than Lithuanian pupils. The number of those who did not decided yet is substantially the same (43.4% of Lithuanian and 47.3% of Latvian respondents). It is interesting that 18.8% of Latvian respondents indicated other possible areas of studies (e.g., military, art, sport, etc.) or selected several areas, in contrast to Lithuanian pupils. A problem common to both countries has been brought out: despite the fact that differentiated teaching has been introduced in both Latvian and Lithuanian schools (profiles in Lithuania and programmes in Latvia) the system is likely to fail in helping pupils to make up their minds. It is quite surprising that a considerable number of twelfth-formers have not decided yet upon their future choice of studies. Thus we may state that the choice of a profile/programme is not always coincident with pupils' interests and their future plans. One more problem has been distinguished: pupils do not distinctly recognize areas of studies, e.g. some Lithuanian respondents assigned management studies to humane studies. Apparently pupils lack information on this subject.

However, natural science education is not only a theoretical teaching (learning) of natural sciences. Practical exploratory activities are far more significant. These include educational excursions, project work on nature studies, experiments, etc. What activities connected to nature do respondents like best? Their responses are presented in Table 4.

**Table 4. Activities connected to nature (%).**

Type of activity	Lithuanian pupils	Latvian pupils	$\phi_1-\phi_2$	Fisher's criterion $\phi$	
				$\phi_{\text{empir.}}$	<b>P</b>
Picking berries, mushrooms, etc.	12.3	5.0	0.266	4.11	0.000
Relaxation	62.5	53.8	0.176	2.72	0.002
Observing wildlife	15.9	12.6	0.094	1.45	>0.05
Other interests	9.3	28.6	0.509	7.87	0.000

The dominant type of activity in nature is relaxation. 15.9% Lithuanian and 12.6% Latvian respondents like observing wildlife. According to this criterion there are no statistically significant differences. However, more Lithuanian pupils give priority to relaxation outdoors than Latvian pupils. Lithuanian respondents indicated such types of activity as being with friends, hiking, sports, fishing and other forms of entertainment. Surprisingly, some of respondents indicated they disliked being outdoors. Thus, having analyzed results of the survey, we may assert that nature study is not a popular activity and pupils take little interest in it.

Respondents have expressed different views on essential aspects why they didn't like subjects of natural sciences (see table 5). It reflects particular units of teaching content. In respect to physics and chemistry opinions are similar.

**Table 5. Negative points in learning physics and chemistry.**

Lithuanian pupils		Latvian pupils	
Physics	Chemistry	Physics	Chemistry
Difficult, incomprehensible subject, some topics very difficult; Complicated formulas, a lot of them to learn, difficult to apply; Difficult problems, tasks, experiments, schemes; Disliked teacher; Boring subject; Too few practical and laboratory tasks; Very difficult tests.	Difficult chemical equations, formulas, problems; Too much theory, very difficult; Boring, incomprehensible subject; Too many practical tasks, laboratory experiments; Disliked teacher; Too few experiments, project works, laboratory experiments;  Difficult to perceive atom's structure; Too many tests and homework tasks.	Complicated formulas and laws, difficult to understand; Dislike learning theoretical things; Dislike certain topics, e.g. molecular physics, mechanics, alternating current, dynamics; Complicated tests, we must study very hard, difficult to understand textbooks; Can't put anything into practice, too few laboratory tasks.	Complicated formulas, chemical equations, difficult to memorize what they are called; Can't stand, boring etc; Dislike specific topics, e.g. inorganic chemistry, entropy and enthalpy, properties of acids; Too much to be learned by heart, the teacher does not explain things clearly; We do not have a chemistry classroom, learning based only on textbooks, too few laboratory tasks.

In addition, we have also analyzed dominant responses considering biology and geography. These are also similar and bring out generality of problems again.

**Table 6. Negative points in learning biology and geography.**

Lithuanian pupils		Latvian pupils	
Biology	Geography	Biology	Geography
Some topics are very strenuous, for example, genetics, human body, etc. There are plenty of complicated concepts, definitions, terminology; Much theory, books are too large, a great amount to learn; Something boring; Hard investigations of animals and plants, for example, the structure of organisms, drawings, work with a microscope; A teacher is not interesting; Too many home tasks; Too many practical tasks; Not enough practical tasks.	Some topics are very strenuous, much learning by heart; A teacher is not interesting; I don't like reading maps; In general, it's an intricate and boring subject; Much reading, writing, etc.; I don't like practical tasks; No suitable textbooks, the books in use are too difficult; I don't like tests.	Too many difficult terms, too much reading and memorizing; Complicated topics, facile learning; Dislike topics, e.g. cell structure, tissues and their structure, human anatomy, genetics; Dislike teacher, teaches without enthusiasm; Too few work with a microscope, too few laboratory tasks, no experiments, etc.	Too much map studies, reading and memorizing; Dislike topics, such as relief, setting map references, minerals, population and demography, geography of Latvia, problems of other countries; Dislike the teacher; Too few Geography lessons, etc.

Despite the friendliest assessment of geography, respondents have indicated some negative aspects. Both Lithuanian and Latvian respondents indicated they disliked work with maps because it is difficult. Besides, there are too many geographical names to memorize, in their opinion. Presumably, it may be influenced by inadequate regard to the geography component in the educational content of primary school.

The patterned situation highlights the approach to natural sciences. The respondents have been asked to imagine that they have the only choice of future occupation, which is to become a teacher of natural sciences (see table 7). We suppose that such attitude makes the approach to natural sciences more emphatic.

**Table 7. Choosing natural sciences for studies under certain circumstances (N/ %).**

Subject	Lithuanian pupils	Latvian pupils	$\phi_1-\phi_2$	Fisher's criterion $\phi$	
				$\phi_{\text{empir.}}$	<b>P</b>
Geography	308/40.4	166/52.20	0.237	3.54	0.000
Biology	231/30.3	76/23.9	0.144	2.15	0.015
Physics	140/18.4	49/15.40	0.08	1.19	>0.05
Chemistry	83/10.9	27/8.5	0.081	1.21	>0.05

Chemistry is again the least popular subject. The majority of the respondents would settle upon the studies of geography. Both Latvian and Lithuanian pupils' assessment coincided in this respect – ration of the subjects is almost the same. The biggest percentage of respondents, if they had no other choice, would choose to become a geography teacher and the smallest percentage – a chemistry teacher. This proves that there exist serious problems in learning natural sciences, especially chemistry and physics. Statistically significant differences in assessment of geography and biology have been determined as Fisher's criterion was applied. More Latvian than Lithuanian pupils would choose *geography* for their future studies while more Lithuanian respondents would prefer *biology*. The percentage (5.7%) of Latvian respondents indicated several subjects.

Answers of pupils demonstrate that natural sciences is not so attractive sphere. What to do, what steps to undertake to raise them, youth, interest to natural sciences? Respondents have offered some ways (methods) of increasing pupils' interest to natural sciences (see table 8).

**Table 8. The methods to be used to increase the youth interest in natural sciences (natural history) /%/.**

Method	Lithuanian pupils	Latvian pupils	$\phi_1-\phi_2$	Fisher's criterion $\phi$	
				$\phi_{\text{empir.}}$	<b>P</b>
1) To extend the network of natural history and technological centres for pupils	14.3	10.8	0.106	1.64	=0.05
2) The media should be more involved into solving science problems	8.7	13.9	0.165	2.55	0.004
3) To coordinate the content of teaching of natural sciences and other subjects	23.2	16.6	0.166	2.57	0.004
4) To encourage general projects that involve schoolchildren and students	30.5	28.6	0.041	0.63	>0.05
5) To devote more attention to nature study in primary school (forms)	17.8	21.8	0.101	1.56	>0.05
6) Other offers	5.5	8.2	0.108	1.67	=0.047

Latvian pupils give the priority to press (media), and Lithuanian pupils do to the integrated contents of natural sciences and other subjects of teaching. Both Lithuanian and Latvian pupils consider joint research project of pupils and students as the basic method to increase their interest in natural sciences.

## Conclusions

Thus, we may conclude that:

- the respondents positively evaluate natural science background, although their arguments differ. A part of them suppose that the knowledge acquired in basic school is sufficient. The others assume that natural science knowledge will not be necessary in the future. The pragmatic aspect is very clear. Quite a few pupils do not relate their future profession with natural sciences, and therefore believe that obtained information is fully enough;
- the respondents, obviously, are self-critical of already received natural science background at basic school. The role of a teacher, his/her competence and ability to engage pupils are highly relevant. An important point is to catch the moment when a pupils is “misunderstanding something”. Systematically growing gaps of knowledge negatively influence a learner’s approach to natural sciences in general. Then s/he is out of conceit, sees nothing important to learn, many things become uninteresting. A crucial aspect is a very small amount of practical, experimental works of natural history. An educational process of natural sciences is clearly theoretic. It should be stressed that natural sciences are mainly experimental. Therefore, experimentation has to be included into the educational process;
- the respondents’ approach to the future intentions is determined by public social-economic tendencies. Evidently, that rich life in the future is related to social, humanitarian and technological sciences;
- the evaluations of the respondents draw a conclusion that a problem of educational content still exists and will be a burning issue in the future. The increasing amount of information implies to renovate the content of education systematically and flexibly. The question of the compatibility (integration) of the content of natural sciences remains one of the central tasks. Traditional textbooks do not meet the requirements of contemporary teaching/learning;
- a considerable gap between chosen programme of general education (in Latvia) or an educational profile (in Lithuania) and the intended area of further studies has been determined. This demonstrates a partial incongruity between theoretical aims of the educational reform and their implementation in practice, especially in Latvia.

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## Резюме

# МНЕНИЯ И ВЗГЛЯДЫ СТАРШЕКЛАССНИКОВ ЛИТВЫ И ЛАТВИИ ПО ВОПРОСАМ ЕСТЕСТВЕННОНАУЧНОГО ОБРАЗОВАНИЯ

**Винцентас Ламанаускас, Янис Гедровицс, Екабс Райпулис**

В статье рассматриваются некоторые аспекты изучения естествознания в современной средней школе Литвы и Латвии в основном по самооценке учащихся.

Около 400 анкет было распространено в ряде школ Латвийской республики, и от них получено 350 анкет, а литовскую выборку составили 762 респондента. Ввиду того, что в средних школах Латвии обучаются учащиеся трёх классов, т. е., 10, 11 и 12 классы, в Латвии несколько расширился возрастной интервал. Кроме того, в отличие от школ Литвы, в Латвии учащиеся средней школы обучаются по 4 профилям или группам программ.

В ходе исследования задавался вопрос, что побудило респондентов выбрать тот или иной профиль обучения в средней школе. Разумеется, ответы весьма различны, но преобладают такие, как: *школа не предлагает других профилей (программ); не было конкретных интересов; чтобы получить среднее образование; хочу изучать иностранные языки* (в основном те учащиеся, избравшие профиль гуманитарно-социальных наук) и др. Эти и другие приведённые ответы респондентов свидетельствуют, что в ряде школ, особенно небольших по количеству учащихся, девятиклассникам по-прежнему не представляется достаточно широкого выбора профилей обучения в средней школе. Да и сами учащиеся недостаточно мотивированы к выбору того или другого профиля.

Изучение естествознания старшекласники начинали уже в основной школе, поэтому возникает вопрос, как они оценивают свои знания по предметам естественнонаучного цикла (естественнонаучное образование, ЕНО) к настоящему моменту. Из всего количества респондентов ЕНО считают достаточным 56,9% в Латвии и 41,6% в Литве, отчасти достаточным ЕНО считают 36,4% в Латвии и 47,5% в Литве.

Выявлено, что наиболее привлекательными предметами этой группы являются *биология* в Литве и *география* в Латвии, а *химия* занимает последнее (4-е) место среди учащихся обеих стран. В качестве наиболее отрицательных аспектов изучения естественнонаучных предметов учащиеся называют отсутствие или недостаточность практических работ, сложность теоретического материала (в т. ч. в связи с методикой преподавания), отсутствие достаточно ясного представления о практической значимости усваиваемой теории и т. д., что косвенно свидетельствует и о недостаточной подготовленности самих учащихся к самостоятельной работе. Частично это проявляется и в выборе учащимися дальнейшей сферы учёбы, в качестве которой преобладают *социальные науки*, после которых идут *технологические*. К сожалению, *естественные науки* пользуются еще меньшей привлекательностью. В целом, анализ ответов учащихся средних школ Латвии и Литвы свидетельствует, что естествознание – это отнюдь не привлекательная сфера.

Некоторые аспекты изучения естествознания рассматриваются также с учётом пола респондентов.

**Ключевые слова:** естественнонаучное образование, средняя школа, интерес к естествознанию.

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