LITHUANIAN AND LATVIAN STUDENTS' ATTITUDE TOWARDS SCIENCE TEACHING / LEARNING METHODS: COMPARATIVE ANALYSIS

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Abstract

A number of the latest investigations specify the necessity of improving science education at all levels of the education system. A decreasing interest in sciences is one of the most acute problems of present education. The purpose of this research is to analyse how students evaluate the current situation on using different teaching/learning methods and means in the process of science education. Research was carried out in Lithuania, Estonia and Latvia (Lamanauskas, Vilkonis, 2008). This article presents more exhaustive research results, which were obtained after carrying out comparative analysis between the respondents of two countries – Lithuania and Latvia. It is very important to compare the evaluation, attitudes of the students belonging to the same region country, because earlier carried out researches show that in spite of common natural science education tendencies, rather significant differences exist between countries. It is believable, that they are predetermined by various educational approaches, teachers' competence and other different reasons.
Key words: *science education, methods, learning process, ICT.*

Introduction

Science education is evidently a crucially important area of a general background. 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 (Lamanauskas, 2003). According to A. Toldsepp and V. Toots (2003), the main goal of science education is to prepare young people for a full and satisfying life in the world of the 21st century. The others underline science-technological literacy for all and mastery for professionals (Broks, 2002). It is clear, that teaching sciences faces problems in the majority of countries. Recently, the international research project ROSE (Schreiner, Sjøberg, 2004) has showed some differences in students' opinions and attitudes in Western and Eastern countries. The key feature of ROSE is to gather and analyse information from the learners about several factors that have a bearing on their attitudes to S&T and their motivation to learn S&T (Rose in brief, http://www.ils.uio.no/en-

glish/rose/about/rose-brief.html). There are interesting and significant differences between countries in terms of the number of students choosing S&T education and careers and the public perception of S&T (Schreiner, Sjøberg, 2007). We admit that students' motivation and attitudes has a big impact on learning efficiency and, finally, on education quality (educatedness). Certainly, it is important to identify a situation in the given area. Our methodological approach is different as on the basis of students' opinions, we should know the reasons of the given situation.

On the other hand, nowadays, ICT is rapidly developing. Different technologies are being created. The implementation of new technologies in the educational process raises new possibilities for both teacher and learner, enhances education quality and makes the educational process itself more versatile (Lamanauskas, 2007). However, education quality still remains insufficient, as the content of education is poorly oriented towards developing new abilities and competencies necessary for people living in an open public society and market conditions. We need to know the situation of using modern ICT in the process of science education. For example, the research results indicate that using ICT for learning purposes has a little impact on the attractiveness of a subject taught (Lamanauskas, Vilkonis, Klangauskas, 2007). The students agree that texts and pictures included in the printed edition are more useful than the information in the same format on computer. Only slightly more than one fourth of the students use a virtual environment during their science classes. To conduct science experiments, real objects and substances are usually used. A question if we can support an idea that modern ICT helps with the educational process is not explicit? ICT improvement leads to applying them in different areas of our life (Lamanauskas, 2006). It is essential to know, how students' opinions concerning an evaluation of different methods and means of teaching/learning (traditional and based on applying modern ICT) are distributed.

By the way the results in ROSE project show that there do not are significant differences between 15 y.o. girls and boys, resp., students at Lower secondary school, in some activities by using ICT such as search for information in internet, using a word processor on the computer etc. (Sjøberg, 2010). It confirms that ICT can be used as an important resource for innovative science teaching/ learning.

For more than the last two decades, Western countries have tried to advance the teaching techniques of sciences and suggest using a constructive system instead of didactical one (Zoller, Tsaparlis, 1997). However, in general, there is little research on the lower and upper secondary school learners' opinions and evaluations.

The main research question is as follows: how the students from Latvia and Lithuania evaluate the usefulness and the efficiency of teaching/learning methods in science education.

The goal of research is to analyse students` opinion on learning methods in the process of science education in comprehensive school.

Methodology of Research

The methods of inquiry (questionnaire) and systemic and comparative analysis etc. were employed in research. The on-line questionnaire prepared in national languages was used. To ensure the quality of translation and an adequate understanding of the questionnaire, the questions were interpreted by the translators-native speakers. Moreover, they were required to have experience of pedagogical work. The questionnaires were completed in the rooms for teaching informatics under the supervision of a teacher-coordinator.

Research was carried out in October-December, 2007 in Lithuania, Latvia and Estonia. 3345 respondents including 1637 students (48.9 %) from Lithuania, 1043 (31.2 %) participants from Latvia and 665 (19.9 %) learners from Estonia[1] were involved in the survey. Comparative analysis data of Lithuanian and Latvian respondents are given in this article. The distribution of the respondents depending on the age of students is presented in Figure 1.

[1] Results from Estonia will be analysed separately (Authors)

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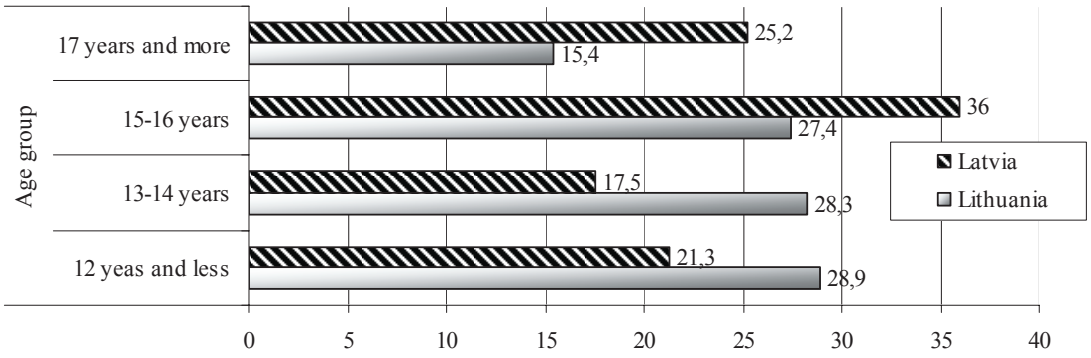

Figure 1. Distribution of the respondents depending on the age of students (%).

The distribution of the respondents depending on the sex of students is shown in Figure 2.

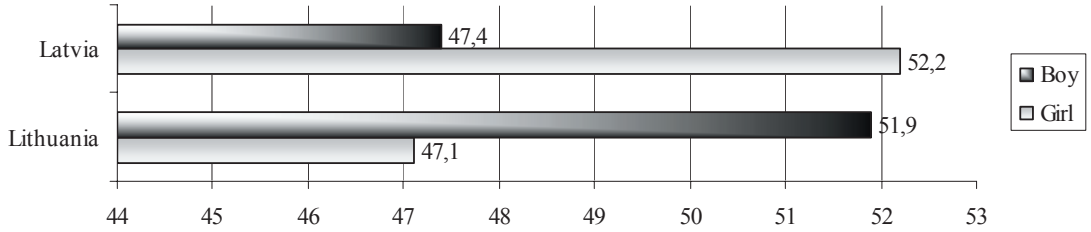

Figure 2. Distribution of the respondents depending on the sex of students (%).

Sampling was structured applying the stochastic method of group selection i.e. a consecutive 'bunch' system. In total, the volume of the sample was 3322 respondents. When sampling capacity is between 1500 and 2000, the bias of capacity does not exceed 3 % (Dobrenkov, Kravčenko, 2004). Other reliable sources indicate that when taking capacity is 1500 respondents, the bias of capacity deviate from 1 % to 1.5 % (Gallup, 1978). Thus, in order to obtain accurate data, a sampling capacity of the undertaken research can be fully accepted.

The statistical bundle of the SPSS programmes has been applied to analyze research data. To determine the differences between features under analysis the χ^2 criterion have been used. Every statement (learning method) was given the calculated popularity index ($0 \leq PI \leq 1$). The closer is PI value to 1, the more important is the statement to the respondent.

Results of Research

According to their popularity, learning methods have been analysed in Latvian and Lithuanian respondent population separately. Having analysed learning methods according to their evaluation by Latvian students, such type of distribution has been obtained according to popularity index.

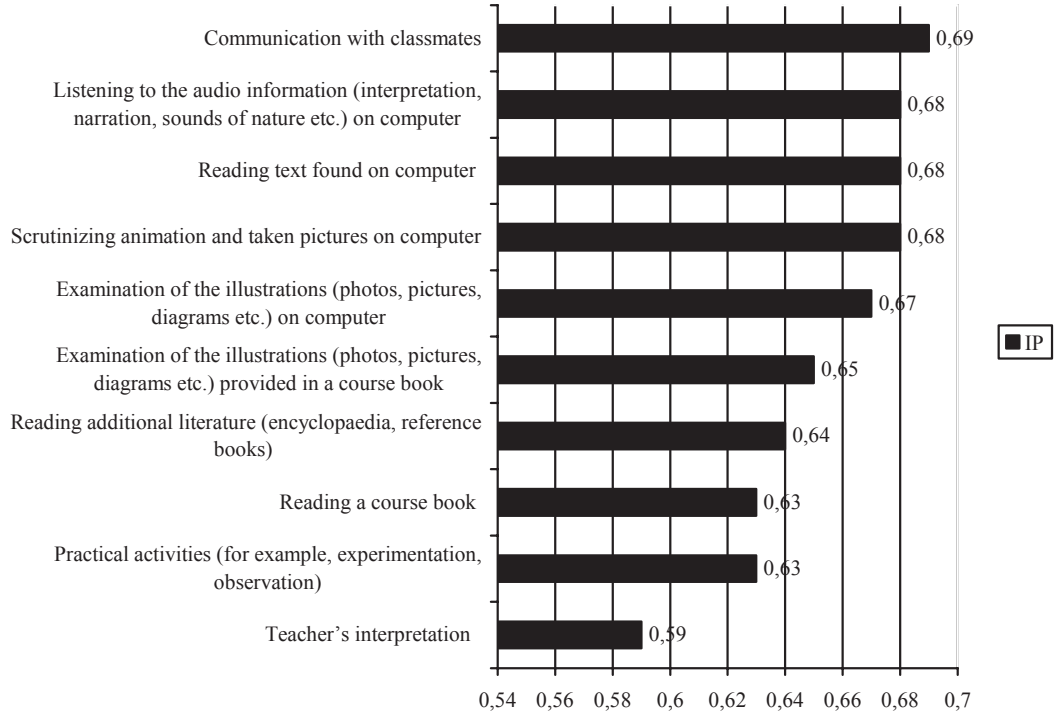

Figure 3. Index of popularity of Latvian students.

We can assert that all presented methods are being evaluated rather positively, popularity indexes are higher than 0.5. The most popular methods are: communication with classmates, listening to the audio information on computer, reading of different texts on computer and so on.

Lithuanian students evaluated learning methods a little bit differently comparing to Latvian students. Certain differences can be noticed. First, it is interesting that teacher's interpretation is the least popular from the point of view of Latvian students; however, Lithuanian students gave the priority, namely, to teacher's interpretation.

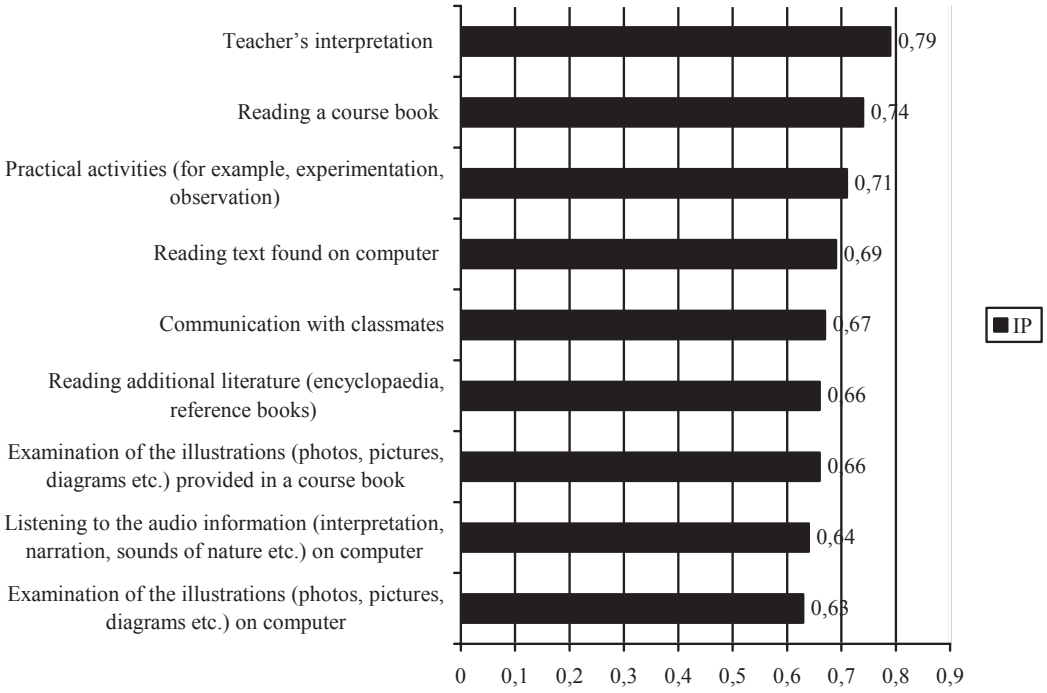

Figure 4. Index of popularity of Lithuanian students.

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Lithuanian students favourably evaluate teacher's interpretation, course book information (reading, examination), practical activities (observation, tests and experiments). In addition, Lithuanian students favourably evaluate communication with classmates, reading of the texts found on computer, work with additional sources of information.

The evaluation of teaching methods depending on the sex of respondents has been analysed (Table 1).

Table 1. Lithuanian and Latvian girls' opinion on learning methods (N/%).

Preposition		Country		Chi square	df	p
		Lithuania	Latvia			
Teacher's interpretation	Helps	477/63.1	125/23.4	23,506	2	**0.000**
	Helps slightly	250/33.1	386/72.1			
	Never helps	29/3.8	24/4.5			
Communication with classmates	Helps	315/41.7	255/47.9	11,089	2	**0.004**
	Helps slightly	389/51.5	260/48.9			
	Never helps	52/6.9	17/3.2			
Reading a course book	Helps	406/54.1	195/36.9	37,793	2	**0.000**
	Helps slightly	311/41.4	308/58.2			
	Never helps	34/4.5	26/4.9			
Examination of the illustrations (photos, pictures, diagrams etc.) provided in a course book	Helps	277/37.2	191/36.4	5,450	2	0.066
	Helps slightly	411/55.2	310/59.0			
	Never helps	57/7.7	24/4.6			
Reading additional literature (encyclopaedia, reference books)	Helps	334/44.8	188/35.5	37,259	2	**0.000**
	Helps slightly	333/44.7	320/60.4			
	Never helps	78/10.5	22/4.2			
Reading text found on computer	Helps	223/43.1	192/45.3	1,750	2	0.417
	Helps slightly	264/51.1	215/50.7			
	Never helps	30/5.8	17/4.0			
Examination of the illustrations (photos, pictures, diagrams etc.) on computer	Helps	165/32.5	188/43.1	30,652	2	**0.000**
	Helps slightly	277/54.5	232/53.2			
	Never helps	66/13.0	16/3.7			
Scrutinizing animation and taken pictures on computer	Helps	271/51.9	177/43.6	17,838	2	**0.000**
	Helps slightly	205/39.3	211/52.0			
	Never helps	46/8.8	18/4.4			
Listening to the audio information (interpretation, narration, sounds of nature etc.) on computer	Helps	191/39.9	162/46.4	8,536	2	**0.014**
	Helps slightly	224/46.8	161/46.1			
	Never helps	64/13.4	26/7.4			
Practical activities (for example, experimentation, observation)	Helps	302/48.7	144/30.2	48,301	2	**0.000**
	Helps slightly	272/43.9	310/65.0			
	Never helps	46/7.4	23/4.8			

After carrying out the analysis, eight statistically significant differences were established between Latvian and Lithuanian students' attitudes. Teacher's interpretation, as a method of better understanding of natural sciences, was evaluated differently in both countries. Lithuanian female students think that teacher's interpretation helps them a lot to master the learning material. Latvian female students evaluate teacher's interpretation worse ($\chi^2 = 23.506$, df = 2, p = 0.000). However, communication with classmates got higher evaluation by Latvian female students than Lithuanian ($\chi^2 = 11.089$, df = 2, p = 0.004). This is a difference of statistical significance.

The evaluation of a course book is rather interesting. Lithuanian female students more favourably than Latvian evaluated reading information in a course book ($\chi^2 = 37.793$, df = 2, p = 0.000). Girls noticed that course book illustrations virtually help them in the learning process (for better perception of information). However, in this case significant differences between two country respondents were not established. A statistically significant difference was found out between two countries according to how respondents evaluate reading of additional literature. Reading of additional literature is more favourably

evaluated as useful by Lithuanian female students ($\chi^2 = 30.652$, df = 2, p = 0.000). A similar difference was established while evaluating computer visualization. Lithuanian female students more favourably evaluate the analysis of information using computer than Latvian peers. This difference is also of statistical significance ($\chi^2 = 30.652$, df = 2, p = 0.000). However, Latvian female students than Lithuanian students more favourably evaluate audio information as useful for learning. The difference is of statistical significance ($\chi^2 = 8.536$, df = 2, p = 0.014).

Practical activities (experimentation, observation and so on) were also more favourably evaluated by Lithuanian female students than Latvian ($\chi^2 = 48.301$, df = 2, p = 0.000).

A similar analysis was carried out seeking to find out possible differences between Lithuanian and Latvian male student evaluations. The results are given in the table.

Table 2. Lithuanian and Latvian boys' opinion on learning methods (N/%).

Preposition		Country		Chi square	df	p
		Lithuania	Latvia			
Teacher's interpretation	Helps	513/61.4	116/24.1	178,716	2	**0.000**
	Helps slightly	276/33.0	337/69.9			
	Never helps	47/5.6	29/6.0			
Communication with classmates	Helps	353/42.7	193/40.0	0,924	2	0.630
	Helps slightly	404/48.9	248/51.5			
	Never helps	70/8.5	41/8.5			
Reading a course book	Helps	445/54.3	144/30.2	70,559	2	**0.000**
	Helps slightly	329/40.1	291/61.0			
	Never helps	46/5.6	42/8.8			
Examination of the illustrations (photos, pictures, diagrams etc.) provided in a course book	Helps	356/43.4	180/37.7	4,074	2	0.130
	Helps slightly	401/48.8	256/53.6			
	Never helps	64/7.8	42/8.8			
Reading additional literature (encyclopaedia, reference books)	Helps	349/42.7	174/36.6	4,749	2	0.093
	Helps slightly	375/45.8	244/51.3			
	Never helps	94/11.5	580/12.2			
Reading text found on computer	Helps	297/47.7	149/38.0	12,568	2	**0.002**
	Helps slightly	285/45.7	224/57.1			
	Never helps	41/6.6	19/4.8			
Examination of the illustrations (photos, pictures, diagrams etc.) on computer	Helps	275/43.4	145/35.3	12,425	2	**0.002**
	Helps slightly	299/47.2	239/58.2			
	Never helps	60/9.5	27/6.6			
Scrutinizing animation and taken pictures on computer	Helps	315/50.6	164/40.6	14,172	2	**0.001**
	Helps slightly	255/41.0	214/53.0			
	Never helps	52/8.4	26/6.4			
Listening to the audio information (interpretation, narration, sounds of nature etc.) on computer	Helps	256/42.5	156/44.4	5,234	2	0.073
	Helps slightly	267/44.4	166/47.3			
	Never helps	79/13.1	29/8.3			
Practical activities (for example, experimentation, observation)	Helps	338/48.6	143/33.3	33,663	2	**0.000**
	Helps slightly	303/43.6	264/61.4			
	Never helps	54/7.8	23/5.3			

Six differences of statistical significance were found out after analysing boys' evaluations. Lithuanian male students than Latvian more favourably evaluated teacher's interpretation ($\chi^2 = 178.716$, df = 2, p = 0.000). A similar difference was established while evaluating reading of a course book. Reading of a course book Lithuanian boys evaluate as a very useful method for learning. ($\chi^2 = 70.559$, df = 2, p = 0.000). In a similar way as girls Lithuanian boys very favourably evaluate examination of the illustrations on computer ($\chi^2 = 12.425$, df = 2, p = 0.020), and also scrutinizing animation and taken pictures on computer ($\chi^2 = 14.175$, df = 2, p = 0.001). The significance of practical activities for learning was more favourably evaluated by Lithuanian boys than Latvian ($\chi^2 = 33.663$, df = 2, p = 0.000). The use of audio information for learning was evaluated similarly by both country respondents.

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Conclusions

- The most popular science learning methods in Latvia are: communication with classmates, listening to audio information on computer, reading of different texts found on computer and so on. Lithuanian students more favourably evaluate teacher's interpretation, course book information and practical activities.
- Female students from Lithuania think that teacher's interpretation helps them a lot to master the learning material. However, communication with classmates helps not so much in the learning process. Reading information in a course book virtually helps them to learn; Reading additional literature is very useful in the learning process of Lithuanian girls. Examination of the illustrations on computer screen helps them to learn science and scrutinizing animation and taken pictures on computer helps them to learn science too. Audio information and practical activities in science lessons are slightly helpful for Lithuanian female students.
- Lithuanian male students think that teacher's interpretation helps them to learn a lot. Reading a course book, examination of the illustrations on computer screen and scrutinizing animation and taken pictures on computer are very useful methods for learning. Practical activities can slightly be helpful in science learning process.
- The differences between results obtained for Latvian and Lithuanian students are mostly statistical significant both geographically and in gender aspect. Probably there are different teaching strategy and tactic used by teachers both in science and informatics, as well as students' personal opinion to use ICT and other learning tools.

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References

Broks, A. (2002). Congratulations. Wishing happy birthday to the Journal of Baltic Science Education. *Journal of Baltic Science Education*, No. 1, p. 5.

Gallup, G. (1978). *The Gallup poll: Public opinion*. Wilmington.

Lamanauskas, V. (2003). *Natural Science Education in Comprehensive School*. Siauliai: Siauliai University Press.

Lamanauskas, V. (2006). Keletas štrichų apie šiuolaikines informacines ir komunikacines technologijas / Some features of modern ICT. In.: *Informacinės komunikacinės technologijos gamtamoksliniame ugdyme – 2006 / Information & Communication Technology in Natural Science Education – 2006* (Tarptautinės mokslinės praktinės konferencijos straipsnių rinkinys, 2006 m. gruodžio 1–2 d.). Šiauliai: Šiaulių universiteto leidykla, p. 6–7.

Lamanauskas, V. (2007). The Augmented Reality Teaching /Learning Platform: New Challenges and New Possibilities to the Users. In.: *Information and Communication Technology in Natural Science Education – 2007* (Proceedings of International Scientific Practical Conference). Šiauliai: Publishing House of Šiauliai University, p. 6–7.

Lamanauskas, V., Vilkonis, R., Klangauskas, A. (2007). Using Information and Communication Technology for Learning Purposes: Students` Position on the Issue. In.: Jack Holbrook and Miia Rannikmae (Eds), *Europe Needs More Scientists – the Role of Eastern and Central European Science Educators* (5th IOSTE Eastern and Central European Symposium). Tartu, p. 151–164.

Lamanauskas, V., Vilkonis, R. (2008). Evaluating the Usefulness of Learning Methods and Means in Science Education: Students` Position in the Baltic Countries. In.: XIII IOSTE Symposium, *The Use of Science and Technology Education for Peace and Sustainable Development* (September 21-26, 2008, Kusadasi, Turkey). Izmir: Palme Publications & Bookshops LTD.CO., p. 756–764.

Schreiner, C., Sjøberg, S. (2004). Sowing the seeds of ROSE. Background, Rationale, questionnaire Development and Data Collection for ROSE (The Relevance of Science Education) - a comparative study of students' views of science and science education. Acta Didactica. – (4/2004) Dept. of Teacher Education and School Development, University of Oslo, Norway, 120 pp.

Schreiner, C., & Sjøberg, S. (2007). Science education and youth's identity construction – two incompatible projects? In D. Corrigan, Dillon, J. & Gunstone, R. (Eds.), *The Re-emergence of Values in the Science Curriculum*. Rotterdam: Sense Publishers.

Sjøberg, S. (2010). Naturvetenskap som allmänbildning - en kritisk ämnesdidaktik., 3:e uppl. – Lund: Studentlitteratur. [Science as general education: a critical subject didactics; *in Swedish*].

Toldsepp, A., Toots, V. (2003). Research and development work from the perspective of compiling balanced curricula for science education. *Journal of Baltic Science Education*, No.1, p. 5–11.

Zoller, U., Tsaparlis, G., Fatsow, M., Lubezky, A. (1997). Students self-assessment of higher-order cognitive skills in college science teaching. *Journal of College Science Teaching*, XXVII(2) (1997), p. 99–101.

Добреньков, В. И., Кравченко, А. И. (2004). *Методы социологического исследования*. Москва.

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