ISSN 1648-3898

OPERATION OF EDUCATIONAL SOFTWARE IN THE PROCESS OF TEACHING SCIENCES IN LITHUANIAN PRIMARY AND BASIC SCHOOL

Palmira Pečiuliauskienė,
Marija Barkauskaitė

Abstract. *On the basis of national research data on the schoolchildren' achievements and on the grounds of a secondary analysis of the gained information the article deals with operation of educational software in the process of teaching world study in primary school and different natural sciences in basic school. It has been established that in comparison with science lessons provided in basic school educational software is often enough followed during the classes on world study in primary school. Primary educational software is regularly used in the city site and regional centre schools while in the rural area it is very rare. On the opposite of the city site schools, basic educational software is widely employed in the rural area.*

Key words: *educational software, primary school, basic school, world study, science education.*

Palmira Pečiuliauskienė,
Marija Barkauskaitė
Vilnius Pedagogical University,
Faculty of Pedagogy and Psychology,
Lithuania

Introduction

Currently, information technology integration into educational practice is very wide and embraces a number of fields the computers in which are applied as the means of teaching, communication etc. (Anderson, Collis, 1993; Holmes, Savage & Tangney, 2000). The concept *Information Technology* involves environment related to the human and organizational aspects where computer is the key element. The other concepts including *educational software, computers and the latest technologies* have a narrower meaning and are used interchangeably in the article: in all cases they have the most general meaning of the concept *information technology*.

When summarizing the variety of information technology applied in educational practice, the following trends can be marked: 1) learning about the computer; 2) learning from the computer; 3) learning with the computer (Jonassen, 1996).

Conceptual verification of the information technology integration process into educational practice passes through four stages: initial, operation, integration and alteration (UNESCO, 1994*)*. The initial stage focuses on computers and software. The next stage involves practical operation of information technology in the majority of educational subjects. A number of countries worldwide are still in this stage – a part of them have just entered, the others – have nearly finished it (UNESCO, 2002). The third stage embraces practical operation of information technology in all educational subjects and integrated teaching and learning. Learning in the last stage becomes a continuous process and public position on learning changes (Dagienė, 2004). The above mentioned stages of information technology integration are characteristic of educational practice in schools and other establishment

institutions of all countries (Lamanauskas, 2005).

Information technology in educational practice in Lithuania started to be operated at the end of the 9th decade of the 20th century. In the initial stage, close attention was devoted to computers and software. Having started the process of computerization, computer equipment at school was supposed to have been the main idea. The results of the first stage of information technology were summarized in the first international research *Information Technology at School* undertaken by the IEA (International Association for the Evaluation of Educational Achievement) in 1997-1999 / SITES M1 (Second Information Technology in Education Study).

The international study SITES M1 tried to clarify the level of school computerization as well as the situation on how information technology operated in different concentres of comprehensive school – primary, basic and secondary school. After Lithuania joined this international investigation, a refusal to examine information technology operated in primary school in terms of insufficient computer supply was taken into consideration (Markauskaite, 2000). Therefore, the study SITES M1 in Lithuania was pursued only in basic and secondary school.

The second stage of the study (SITES M2) took place in 1999-2001. It was quality-based research intended to exhaustively analyze the best examples of information technology, particularly educational software applied in educational practice (Kurilovas, 2003).

International research in Lithuania was supported by the study of operation and implementation of information technology (2003). It was carried out in schools which had obtained educational software applied for teaching sciences including chemistry (*Crocodile chemistry*), physics (*Crocodile technology*), mathematics (*Dynamic Geometry*) and informatics (*Komenskij logo*) (The introduced educational software is being used in various foreign countries and is recommended to be applied in Lithuanian comprehensive schools by the Ministry of Education and Science of the Republic of Lithuania.).The investigation revealed insufficient operation of educational software teaching chemistry, physics, mathematics and informatics. It was established that despite some schools had purchased educational software, they employed them very rarely.

Along the above mentioned research on information technology, a few local investigations the authors of which are the teachers of comprehensive and higher schools have been conducted (Giedraitienė-Lileikienė, 2001). The local studies most frequently discuss the didactic aspects of information technology operation. The conclusions of these studies are coincident with those made by the investigators of other countries. Information technology operation in the educational process can positively influence schoolchildren's results (Ainley at all., 2003; Suanpang, 2004), provisions and their communication with teachers and peers (Fountain, Thomson, 2001, Pelgrum, 2001; Neo, 2003).

The survey of literature indicates that the second stage of information technology in educational practice of teaching sciences in Lithuanian comprehensive school and the process of this stage in comprehensive schools of other Baltic states has quite a few common features. Research shows that recently information technology in Estonian comprehensive school is applied for teaching informatics as well as other subjects (Hakkarainen et all., 2000; Kurm, 2003). However, operation of information technology in educational practice of various subjects is not frequent and is used by a small number of teachers. More often educational software operates in Estonian primary rather than in basic school (Smeets et all, 1999). Research carried out in Latvia disclosed the preconditions of insufficient information technology operation in educational practice of the country including lack of specific programs, need of technological and didactic knowledge of program operation, shortage of financial motion (Kangro, 2004).

The operation of educational software in educational practise depends on technical base i.e. school supply with computers and educational software. The study SITES M1 (1998) pointed out that the majority of comprehensive schools (60–80%) used educational software applied for exact and natural sciences (mathematics, physics and informatics) while the humanities, social sciences and integrated teaching were devoted scant attention. Therefore, this

investigation has been based on the analysis of the frequency of operation of educational software in educational practice of teaching sciences.

Sciences are taught in different types of Lithuanian comprehensive school: primary school (concentre 1, forms 1 to 4), basic school (concentre 2, forms 5 to 10) and secondary school (concentre 3, forms 11 and 12). National research was undertaken in primary and basic school. Primary school (form 4) offers an integrated course in sciences called world study. Basic school (form 8) has different sciences including physics, chemistry and biology.

Research carried out by the Lithuanian Centre of Information Technologies of Education indicates that in 2003, the computer to learners ratio in the primary school concentre was 1 to 32 while in basic school it remained 1 to 19 (Lithuanian education, 2004). According to the data, it is supposed to think that better preconditions on employing educational software prevail in basic rather than in primary school.

A summary of the results obtained from national research (national and international) on information technology operation at institutional level reveals that the studies analysed information technology operation only in two concentres of comprehensive school – basic and secondary school. However, no analysis of information technology operation in primary school was performed. There is lack of research on information technology operation in the process of teaching different subjects including sciences. No studies of information technology operation in differently located comprehensive schools (city site, regional centre, rural area) are undertaken.

The above mentioned preconditions have revealed the problem of our research which is to establish difference in frequencies of operation of educational software in educational practice of teaching sciences in primary and basic school as well as in comprehensive schools located in the city site, regional centre and rural area. This issue has determined ***the aim of research*** *which is to discover the frequency of operation of educational software in educational practice of teaching natural sciences following the below indications: a concentre of comprehensive school (primary school, basic school), location (schools located in the city site, regional centre and rural area), different subject (physics, chemistry, biology).* ***The object of research*** is operation of educational software in the educational practice teaching sciences in primary and basic school.

Methodology of Research

Pedagogical and Psychological Preconditions

Most frequently information technology integration into educational practice can be supported by two trends of pedagogical psychology which are behaviourism and cognitive psychology which is the basis of a constructive pattern of teaching (Markauskaitė, 2000).

When analysing operation of educational software in educational practice of teaching sciences, the article discusses both psychological trends. On the one hand, in terms of behaviourism, operation of educational software is useful in the process of teaching mechanical skills, helps to individualize teaching and ensures cognitive feedback (Gage, Berliner, 1994; Ozmon, Craver, 1996). On the other hand, in terms of constructionism, operation of educational software is efficient if helping to apply gained knowledge in different situations, developing thinking abilities at higher level and encouraging the processes of intensive learning (Ainley, Arthur, Macklin & Rigby, 2003; Mooij & Smeets, 2001).

Instruments of Research

In order to establish the frequency of operation of educational software in educational practice of teaching sciences in primary and basic school, a new survey has not been conducted. The data provided in the account of national research on the 4^{th} and 8^{th} formers' achievements has been used (National research on the 4^{th} and 8^{th} formers' achievements, 2003). Brief reasoning is employed.

The basic aims of national research on schoolchildren's achievements are to ensure feedback on the implementation of the main goals of developing Lithuanian education, on the creation of a successful effective educational system and on maintaining education quality. National research on 4th and 8th formers' achievements carried out in 2003 was undertaken as a multiple part of school program development that had been started in 2002. The account provides analysis of how achievements on the mother tongue, mathematics, science and social education mainly corresponds to the requirements of the General Programs and Educational Standards, explains school life atmosphere, points out to the load of homework, evaluation of learning results and application of teaching aids in educational practice. It can be emphasized that the national research account on schoolchildren's achievements (National research on the 4th and 8th formers' achievements, 2003) does not concentrate on operation of educational software in the process of teaching sciences. However, the collected data allows to evaluate operation of educational software in the process of teaching sciences in primary and basic school in general as well as following the indications given in our research: a concentre of comprehensive school (primary school, basic school), location (schools located in the city site, regional centre and rural area), different subject (physics, chemistry, biology).

A secondary analysis has been based on the database presented in the account of national research, and therefore our sampling of the respondents and a model of the sample are equivalent to sampling of national research and the model of the sample. Thus, brief information on the model of the sample of national research is imparted. A pattern of the sample of national research was chosen and the sample itself was performed under the methods applied in international research IEA (International Association of the Educational Achievement). A random sample of schoolchildren was applied for the purpose of research. A family random sample was chosen as the principle of sampling i.e. all the learners rather than individual students of the same form were randomly sampled to participate in the survey. 2253 fourth-formers from 117 schools and 2717 eighth-formers from 124 schools were involved into national sampling in 2003.

The secondary analysis of the data presented in the account of national research on schoolchildren's achievements is based on the information about operation of educational software in primary and basic school only. When answering the national research question about operation of educational software during the classes in world study, the 4th formers were allowed to choose a single answer: frequently, rarely, almost never, never. When answering the national research question about operation of educational software during science classes (referring to the single subjects including physics, chemistry, biology), the 8th formers were also given a possibility to single out one version: never, rarely, frequently, almost every lesson.

In order to compare the respondents' answers about operation of educational software in different concentres of comprehensive school, the rates of the rank 'never' (never uses educational software) have been used. Information on the rates of the rank 'never' makes available information about the rate of operation of educational software. The intensity (frequently, rarely, almost every lesson, almost never) of operation of educational software is not researched.

Results of Research

Operation of Educational software in Primary School during the Process of Teaching Sciences

Having analysed the data provided in the account of national research, the rates of operation of educational software in primary school have been established (form 4). In addition, the rates of program operation considering school status according to the location (city site, regional centre, rural area) have been confirmed (Table 1).

Table 1. The rates of schoolchildren's evaluation of operation of educational software during the classes in world study (N = 2253)

Operation format	Complete data(%)	Location		
		City site (%)	Regional centre (%)	Rural area (%)
Do not use	45.6	44.0	41.8	52.2
Use	54.4	56.0	58.2	47.8

The data indicates that 54% of the primary school respondents operated educational software during the classes in world study. The comparison of the operation rates of educational software considering school status depending on the location draws that more frequently the schools of the city site (56%) and regional centre (58%) rather than those of the rural area (48%) apply educational software during the classes in world study.

Operation of Educational software in Basic School during the Process of Teaching Sciences

Operation of educational software in basic school during the process of teaching sciences including biology, chemistry and physics has been researched. The data on operation of educational software during the classes in biology, chemistry and physics stored in the account of national research on schoolchildren's achievements have been collected. The obtained information has been processed under two features: 1) do not operate educational software; 2) operate educational software. Moreover, the rates of program operation considering school status agreeably to the location (city site, regional centre, rural area) have been confirmed (Table 2).

Table 2. The rates of schoolchildren's evaluation of operation of educational software during the classes in science education (N = 2717)

Subjects	Operation format	Complete data(%)	Location		
			City site (%)	Regional centre (%)	Rural area (%)
Biology	Do not use	58.7	60.1	61.4	52.3
	Use	41.3	39.9	38.6	47.7
Chemistry	Do not use	67.4	68.4	70.4	61.1
	Use	32.6	31.6	29.6	38.9
Physics	Do not use	69.2	71.4	70.4	63.9
	Use	30.8	28.6	29.6	36.1

The grounds of a secondary analysis show that most frequently (41% of the respondents) educational software is applied during the classes in biology. However, the programs are very rare during the classes in physics (31% of the respondents) in the group of compared sciences.

Research on operation of educational software considering school status according to the location proves that they are more frequently applied during the classes in sciences in schools of the rural area rather than in those of the regional centre. A rate deviation during the classes in physics is 7%, during the classes in chemistry – 9% and during the classes in biology – 9%. The rates

of operation of educational software during the classes in sciences in schools of the city site and regional have a slight deviation (1-2 %).

Comparison of Operation of Educational software in Primary and Basic School

The rates of operation of educational software during the classes in sciences in basic school (Table 2) and during the classes in world study in primary school (Table 1) show that in all cases of comparison, educational software is more frequently applied during the latter classes. There is a single case of evaluation when the operation rates in primary school of the rural area (47.8%) almost agree with the rates of program operation in basic school of the rural area (47.7%).

On the basis of the rates, relative frequency has been calculated. In order to make a comparison of relative frequency of operation of educational software in different concentres of comprehensive school (primary, basic school) and considering school location (city site, regional centre, rural area), mathematical statistics has been applied – a statistical index „t" enabling to check statistical significance of relative frequency deviation has been calculated (Table 3). The table presents statistical significance of relative frequency deviation which is marked as follows: *** - p< 0.001, ** - p< 0.01, * - p< 0.05, coloured – deviation is statistically insignificant.

Table 3. Statistical indexes of relative frequency deviation and its statistical significance of operation of educational software during the classes in world study and science education.

Natural sciences	Complete data	Location		
	(N = 2253; N = 2717)	City site (N = 911; N = 1112)	Regional centre (N = 706; N = 935)	Rural area (N = 636; N = 670)
Biology	9,8***	7,3**	8,0***	0,1
Chemistry	6,7**	11,3***	12,0***	3,3**
Physics	17,2***	12,9***	12,0***	4,3**

Calculated statistical significance of relative frequency deviation indicates that only a single case of comparison which is collating relative frequency of educational software operation in primary and basic school of the rural area finds it statistically insignificant. In other cases of comparison deviation of relative frequency remains statistically insignificant. An initial precondition statistically confirms that educational software is more frequently applied in primary school during the classes in world study.

The results of the latter and other research (Research on Operation and Implementation of Educational software; 2003) were compared. The study examined educational software designed to teach physics (*Crocodile Technology*) and chemistry (*Crocodile Chemistry*). Throughout national research on schoolchildren's achievements, a smaller number of the questioned learners agreed that educational software was not employed when teaching chemistry and physics (67% and 69% respectively). Meanwhile, research on operation and implementation of educational software explained that 76% of the respondents did not operate educational software *Crocodile Technology* during the classes in physics and 72% of those did not use educational software *Crocodile Chemistry* during the classes in chemistry.

A deviation between two different results of the study can be explained by the fact that research on implementation of educational software analysed the opinion about operation of specific educational software. Meanwhile, throughout national research on schoolchildren's achievements, the learners' position on general operation of educational software not identifying specificity of the programs was examined.

The evaluation of the established rates of operation of educational software faces the problem of making a decision on an adequate level. How to compare the achieved results? What is the optimal frequency of operating educational software? We suppose that finding an adequate level of comparison is rather complicated as the frequency of operating the programs is determined by a number of factors such as technical resources, teacher training, teaching purposes etc.

A comparison of the obtained results with the data on computer operation in the U.S. schools presented by the National Centre for Education Statistics discloses that the frequency of computer operation in the process of teaching sciences in Lithuania does not exceed 50% while in the U.S. schools, 99% of teachers use computers in educational practice (U.S. Department of Education, National Center for Education Statistics, 1999). 39% of the respondents claim applying computers very often and 34.0 % of those - frequently. A comparison of the educational software operation rates in the process of teaching sciences in Lithuanian comprehensive school with computer operation in comprehensive schools of other Baltic regions does not show any serious deviations (Information communication technologies development in education in the Baltic Countries (2004-2005), 2006). Considering the relativity of an adequate level, there is no need to evaluate computer operation when teaching individual subjects according to the chosen adequate level. The obtained data of research on operation of educational software quantitatively evaluate this educational aspect in the second stage of employing information technologies.

Discussion

The implementation of information technologies in educational practice is most frequently analysed in terms of school computerization i.e. the first stage of applying information technologies is researched. This period is important and guarantees transition to the next stage of employing information technologies which is operating them in educational practice of a number of subjects.

At the end of decade 9, computers as well as educational software were first applied in educational practice of sciences. Out-of-date training aids used in educational practice teaching sciences were replaced by educational software creating preconditions for clearer understanding, better conveyance and advancement of knowledge, successful operation on the material of a studied subject and an opportunity of applying the previously obtained knowledge in the new situations.

In terms of the situation 'reason-outcome', the evaluation of operation of educational software in educational practice discloses that software employment is determined by the technical preconditions that open up a possibility of operation of educational software. It has been confirmed by the results of our research. A comparison between the rates showing operation of educational software and the rates indicating technical resources in primary schools having a different status of location declares a direct reliance.

Holistically, the evaluation of operation of educational software presents another proportion of computer resources to operation of educational software. Occasionally a direct reliance between the available computer resources and educational software does not exist. Our research proves that more frequently educational software in basic school of the rural area rather than that of the regional centre or city site is used. However, the number of computers devoted to teaching individual subjects is higher in the city cite and regional centre schools rather than that in the rural area. Moreover, it has been statistically approved that educational software in primary rather than in basic school is applied more frequently, although the proportion of the number of the primary school learners to the number of computers is 1:32 while the situation in basic school is 1:19.

From a holistic point of view, examination of operation of educational software shows that resources of computer hardware as well as educational issues of this phenomenon must be thought through. In the future, the problems of educational research should be holistically reasoned considering operation of educational software in practice of teaching sciences and other subjects.

Conclusions

Research reveals that educational software is more frequently applied during the classes in world study in primary school rather than during the classes in natural sciences in basic school. A deviation between operation of educational software in primary and basic school has been statistically confirmed.

In terms of school location, research discloses that the schoolchildren of the city site and regional centre (58%) rather than the learners of the rural area (48%) more frequently operate educational software during the classes in world study. The basic school students of the rural area rather than those of the city site and regional centre more regularly use educational software during the classes in natural sciences (physics, chemistry, biology).

The rates of operation of educational software deviate in different classes of sciences: most commonly the programs are employed in biology (41%), less frequently – in chemistry (33%) and the most rarely - in physics (31%) classes.

References

Ainley, J., Arthur, P., Macklin, P., & Rigby, B. (2003). *Thai learning technology 2001. Capacity Building of Thai Education Reform (CABTER) - Learning technologies (Stage 1)*. Retrieved September 12, 2004, from http://www.onec.go.th/publication/a_tech/sa_tech.htm

Ališauskas, R., Apynis, A.,. Brazdeikis, V., Dagienė, V., Linkevičiūtė, E., Markauskaitė, L. (2004**).** *Informacinių ir komunikacinių technologijų diegimo Lietuvos švietime strategija 2005–2007 metams (in Lithuanian) [Strategy for introduction of information and communication technologies into Lithuanian education for 2005–2007*] Retrieved January 21, 2004 from http://www.ipc.lt/21z/naujienos/2004/IKT-strategija09-11.doc.

Anderson, E.R., & Collis, B. (1993). International Assessment of Functional Computer Abilities. *Studies in Educational Evaluation*, 19, 213-235.

Dagienė, V. (2004) *Informacinių technologijų taikymo švietime konceptualusis pagrindimas*. (in Lithuanian) [*Conceptual reasoning of information technologies application in education*] Retrieved January 20, 2004, from http://www.leidykla.vu.lt/inetleid/inf-mok/25/str12.html.

Fountain, W., & Thomson, S. (2001). Backyard wisdom and student insights in developing effective web-supported learning. *Conference Proceedings (Short papers), ASCILITE'01: Meeting at the Crossroads.* Retrieved September 12, 2004, from http://www.ascilite.org.au/conferences/melbourne01/pdf/papers/fountainw.pdf

Gage, N., L., Berliner, D., C. (1994). *Pedagoginė psichologija*. Vilnius: Alna litera, 1994. (in Lithuanian) [*Pedagogical psychology*]

Giedraitienė–Lileikienė, T. (2001). Informacijos ir komunikacijos technologijų diegimo Kauno m. mokyklose, mokant fizikos, matematikos, informatikos ir ekonomikos, sąsaja su bendrais švietimo ir ugdymo skyriaus darbais. Editor Jurgaitis, D. *Fizika, informatika ir matematika bendrojo ugdymo ir aukštojoje mokykloje.* (p.107-120). Šiauliai: Šiaulių universiteto leidykla. (in Lithuanian) [Connection of implementation of information and communication technologies in Kaunas schools teaching physics, mathematics, computers and economy with general works of education departments. *Physics, informatics and mathematics at schools of general education and institutions of higher education*].

Hakkarainen, K., Ilomäki, L., Lipponen, L., Muukkonen, H., Rahikainen, M., Tuominen, et al. (2000). Students' skills and practices of using ICT: results of a national assessment in Finland. *Computers & Education, 34,* 103 – 117.

Holmes, B., Savage, T., & Tangney, B. (2000). *Innovation in Learning in the Information Society: A Comparative International Study.* Retrieved: September 22, 2004, from http://odtl.dcu.ie/mirror/crite/CRITEfinal.html

Information Communication technologies Development in Education in the Baltic Countries (2004-2005). Microsoft Partners in Learning Research. Retrieved: March 10, 2006, from http://www.emokykla.lt/lt.php/tyrimai/194

Jonassen, D.H. (1996) *Computers in the Classroom: Mindtools for Critical Thinking*. New Jersey: Prentice Hall Inc.

Kangro, A., & Kangro, I. (2004). Integration of ICT in Teacher Education and Different School Subjects in Latvia. *Educational Media International, (1)1*, 31-37.

Kurilovas, E. (2003). *Tarptautinio tyrimo „IT mokykloje" antrajai daliai (SITES M2) pasibaigus*. (in Lithuanian) [*After the 2nd phase of international research (SITES M2) "IT at school"*] Retrieved September 22, 2004, from http://www.ipc.lt/21z/mokymas/mokymopr/elaikr/veidrodis/2003n4.php?id=2&iid=1#1

Kurm, M. (2003). *Tiger Leap Program in Estonian schools of general education* (2003). Retrieved October 5, 2004, from http://www.riigikontroll.ee/upload/failid/ka_7024_tiigrihype_31.03.2003_lopp.pdf.

Lamanauskas, V. (2005). Kai kurios metodologinės gamtamokslinio ugdymo kryptys. *Gamtamokslinis ugdymas*, 1(12), 11-25 (in Lithuanian) [Some Methodological Trends of Scientific Studies of the Natural Science Education, *Natural Science Education*, 1(12), 11-25]

Lietuvos švietimas 2004. (2004). Lietuvos Respublikos švietimo ir mokslo ministerija. Vilnius, Švietimo aprūpinimo centras. (in Lithuanian) [*Lithuanian Education 2004.*]

Markauskaitė, L. (2000). *Informacijos technologijos diegimas Lietuvos mokyklose: lūkesčiai ir rezultatai (SITES.M1 rezultatų apžvalga)*. (in Lithuanian) [*Implementation of information technologies in Lithuanian schools: expectations and results*] Retrieved October 10, 2004, from http://www.ipc.lt/21z/duomenys/tyrimai/sitesm-1/reviu%20(apie%20sites%20m-1%20mokyklai).pdf

Mokomųjų kompiuterinių priemonių naudojimo ir diegimo tyrimas. Ataskaita. (2003). LR švietimo ir mokslo ministerija. Informacinių technologijų centras. Vilniaus pedagoginis universitetas. (in Lithuanian) [*Research on educational software application and introduction. Report*] Retrieved January 8, 2005, from http://www.smm.lt/svietimo_bukle/docs/MK_tyrimas.pdf

Mooij, T., & Smeets, E. (2001). Modeling and supporting ICT implementation in secondary schools. *Computers and Education*, 36, 265 – 281.

Nacionalinis 4 ir 8 klasės moksleivių pasiekimų tyrimas. (2003). Lietuvos švietimo ir mokslo ministerija. Švietimo plėtotės centras. Nacionalinis egzaminų centras. (in Lithuanian) [*National research on 4th and 8th formers' achievement*]

Neo, K. T. (2003). Using multimedia in a constructivist learning environment in the Malaysian classroom. *Australian Journal of Educational Technology,* 19(3). Retrieved October 14, 2004, from http://www.ascilite.org.au/ajet/ajet19/neo.html

Ozmon, H.A., Carver, S., M. (1996). *Filosofiniai ugdymo pagrindai*. Vilnius: leidybos centras. (in Lithuanian) [*Philosophical basics of educations*]

Pelgrum, W. J. (2001) Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers and Education*, *37*, 163 – 178.

Pelgrum, W.J., Anderson, R., E. (Eds) (1999). *ITC and the Emerging Paradigm for Life long learning: a Worldwide Educational Assessment of Infrastructure, Goals. and Practices.* Amsterdam:IEA.

Smeets, E., Mooij, T., Bamps, H., Bartolomé, A., Lowyck, J., Redmond, D., et al. (1999). *The impact of information and communication technology on the teacher*. Retrieved November 25, 2004, from http://webdoc.ubn.kun.nl/anon/i/impaofina.pdf

Suanpang, P., Petocz, P., & Kalceff, W. (2004). Student attitudes toward learning Business Statistics: Comparison of online and traditional methods. *Educational Technology and Society,* 7(3). Retrieved December 10, 2004, from http://ifets.massey.ac.nz/periodical/7_3/3.pdf

UNESCO. (1994). *Informatics for secondary education: A curriculum for schools.* Paper produced by a working party of the International Federation for Information Processing under the auspices of UNESCO, Paris.

UNESCO. (2002). *Basic ICT usage indicators in secondary education in the Baltic and CIS states.* Statistical Report UNESCO, Moscow.

U.S. Department of Education. National Center for Educational Statistics. *Frequency of technology use in schools and classrooms: 1997 to 1998.* Retrieved December 10, 2004, from http://nces.ed.gov/surveys/frss/publications/2000102/5.asp#frequency1

Резюме

ИСПОЛЬЗОВАНИЕ КОМПЬЮТЕРНЫХ ПРОГРАММ В НАЧАЛЪНОЙ И ОСНОВНОЙ ШКОЛЕ ПРИ ПРЕПОДАВАНИИ ЕСТЕСТВЕННОНАУЧНЫХ ДИСЦИПЛИН

Пальмира Печюляускене, Мария Баркаускайте

Проблема исследования: Использование компьютерных программ при преподовании естественнонаучных дисциплин в начальной и основной школе в Литве не исследовалось. Поэтому возникает проблема унстановитъ различия использования компьютерных програм при преподовании естественнонаучных дисциплин в начальной и основной школе разных местностней (города, раионного центра, деревни), на уроках разных естественнонаучных предметов: физики, химии, биологии. Цель

исследования - установить частоту использования компьютерных программ при естественнонаучном овразовании по этым признакам: концентр обшеобразовательной школы (начальнная, основная школа), местность (город, районый центр, деревня), предмет естественнонаучного овразования (физика, химия, биология). Методология исследования. Объект исследования - использование компьютерных программ в начальной и основной школе при преподовании природоведения, естественнонаучных предметов. Методы исследования: вторичний анализ результатов национального исследования достижении учащихся, статистический анализ. Объем исследования - 2253 ученики четвертого класса из 117 школ и 2717 учеников восмого класса из 124 школ. Результаты исследования. В концентре начальной школы при преподовании природоведения, компьютерные программы исползуются чаще чем в концентре основной школы при преподоваии естественнонаучных предмет. Это различие потверждается статистически. В концентре начальной школы при преподовании природоведение, компьютерные программы чаще исползуются в школах городов и районых центров. В концентре основной школы при преподовании естественнонаучных предметов компьютерные программы чаще исползуются в деревенских школах чем в школах городов и районых центров чаще на уроках биологии, чем на уроках химии и физики.

Ключевые слова: концентр начальной школы, концентр основной школы, приодоведение, естественнонаучное овразование.

Received 22 March 2005; accepted 25 February 2006

Palmira Pečiuliauskienė
Doctor of Social Sciences, Associate Professor
Vilnius Pedagogical University/Lithuania/,
Department of Education
Studentų Street 39, LT – 08106 Vilnius, Lithuania;
Phone: +370 5 2790042
E-mail: palmira.p@post.skynet.lt

Marija Barkauskaitė
Professor, Dr.habil., Head of the Department of Education
Vilnius Pedagogical University/Lithuania/,
Department of Education
Studentų Street 39, LT – 08106 Vilnius, Lithuania;
Phone: +370 5 2790042
E-mail: edukologija@vpu.lt