Abstract: The development and economic growth of any country depend on the level of its inhabitants’ education and competences. It should be achieved that the skills and knowledge of the youth are developed from early childhood. Unfortunately, despite the new and improved study programmes the level of knowledge in schools of different levels does not only increase but even gets worse. One of the reasons is the huge amount of information which the youth has to acquire intensively as the result of which the memory is overloaded and is not continuous and stable. There are several possibilities to change the situation and interest applicants to use the information; one of the possibilities is to create additional option for students to use e-environment during studies. In the article there are analysed the test results of the secondary school leavers - new students in the study subject without comprehensive knowledge of which there cannot be imaginable either economists, or engineers, or specialists of many other fields, that is mathematics. There are analysed in Latvia non-published data from project SIBIS that characterize the situation in e-education in two directions: international internet lines as assistant in educational process and the use of electronic learning materials. While evaluating the survey results as well as the situation in Latvia there are sought solutions for this problem.

Key words: mathematics, studies, e-environment, pupils and students, e-materials, internet resources.

Materials and methods

With the purpose to examine the level of mathematics skills background including ICT application there was carried out the test for the 1st-year students of the University of Latvia (LU) and Riga Technical University (RTU). In the test there participated 250 LU students and 125 RTU students. The results were analysed.
Results and discussion

The development and economic growth of any country depend on the level of its inhabitants’ education and competences. In order to achieve that, the skills and knowledge of the youth should be developed from early childhood.

Active inclusion of knowledge in the economic model changes the whole range of economic cardinal postulates as the result of what material product turns into intellectual product (Karnitis, 2004)

Unfortunately, despite the new and improved study programmes the level of knowledge in schools of different levels does not only increase but even gets worse.

In the secondary school during the lessons of mathematics the pupils in most cases are prepared for the final examinations which are compulsory only from 2009. Thus the aim of teaching mathematics in the secondary school is to prepare the pupils for the final examinations but this is very short-sighted act.

More than 80% of secondary school graduates continue studies in the universities. During the first year of studies except some specialities there is taught ‘higher mathematics’, ‘mathematics for economists’, ‘mathematics for engineering sciences’, etc., and during the next semesters there are a lot of subjects in studying of which there is required the knowledge of mathematics on the secondary school level.

Already in the first tests it is obvious that applicants lack necessary basic knowledge (in spite of additional consultations the number of which, however, is limited), while during the initial test of secondary school knowledge examination fail on average 80-90% which is simply disruptive result. When investigating the mistakes, they mostly are based on basic topics which ought to be mastered in secondary school, sometimes even in elementary school.

Hereto it should be recognized that the results are declining from year to year.

![Graph showing the average evaluation of mathematics tests of students of social sciences and engineering sciences in 2006-2011](image)

Fig. 1. The average evaluation of mathematics tests of students of social sciences and engineering sciences in 2006–2011:

(Source: tests of 1st-year students of the two largest universities of Latvia, carried out by the author)

As it is seen in Figure 1, the dynamics of the results is equivalent in the period from 2006 – 2008 then it rapidly changes in 2009 when was renovated the compulsory centralised examination, however, the further results declined again because the number of mathematics lessons both in elementary and in secondary education is not sufficient. Although in each new study program version, which currently are changing often enough (the previous has not expired the experimental period of testing when the next one is applied), the amount of material to cover and the level of complexity rise, in addition besides mathematics the situation is similar in other subjects as well, thus sustainable knowledge is influenced also by overload.

As the youth is prepared mainly for the final examinations, but not so much for the further wider use of knowledge, the defined levels of the final examinations (A level is the highest possible, and D the lowest successful level) and the results of mathematics basic test differ significantly. To demonstrate it there are shown the results of September, 2011 in Figure 2.
Fig. 2. The evaluation of mathematics tests of students of social sciences and engineering sciences in grades and the acquired level at the centralized secondary school examination in 2011. (Source: the results of the tests and centralized examinations of the fresh-1st-year students of the two largest universities of Latvia, carried out by the author.)

To solve these problems that are not only interfering the studying process of the applicants at the university but also are causing extra duties for the lecturers during the lectures partly repeating the topics from secondary school program, giving additional consultations and organizing several tests on repeated topics. As a result the possibilities to discuss more essential topics during the lectures, consultations and seminars are decreasing, namely to evaluate and analyse different processes and relationships connected with the chosen speciality using the mathematics methods.

To ensure that schoolchildren/ students learn to find in internet the necessary information, learn to work with it and use as additional learning aids, there should be found the solution on the government level to cover these expenses for the educational institutions fully, definitely attracting extra means from EU finances for education.

At present one of the possible solutions is: in addition to studies at school pupils using their own initiative improve their knowledge with the help of e-learning, for example, in homepages www.uzdevumi.lv or www.dzm.lv. Also in this field the attitude of the youth and their possibilities are different.

The man as a carrier and preserver of information and knowledge becomes the main factor of economic growth and creation of values (Bikse, 2000)

However, the technologies have potentially big, but not always used, role in the field of learning and teaching. Several international research works show that relatively little research is done to explore the information communication technology (ICT) aspects in the education. In Latvia wider research on ICT application in education are not carried out at all. Thus it could be favourable to carry out a survey about ICT application in education: summary on international topicalities as well as the analysis of the situation in Latvia.

Evaluating the up to date research, summarizing the approaches described in scientific literature and personal experience there can be distinguished two important e-environment application functions in education:

1. the creation of ICT supported learning and teaching environment;
2. the use of ICT in administration and management.

One of the ways of ICT supported learning and teaching environment creation is the development of e-education possibilities. If by the term e-learning we understand specially organized studies/ training where ICT are used (applied) and which could be used in different forms of acquisition of education both in full-time studies, and in distance learning, in formal and in informal education, then e-education involve wide range of activities: from the application of effective digital resources and learning technologies in the auditoriums to improvement of personal learning experience through individual approach to these resources, ensuring individuals with modern and exciting possibility to realize their academic and creative potential at their adequate time and pace and fostering effective lifelong education.

Since 2000 the Central Statistical Bureau carries out surveys about the level of computerization and the use of information technologies of enterprises, institutions and organizations. As the statistical surveys do not include all factors for information society assessment, within the framework of information society technologies program there was established the project SIBIS (Statistical Indicators Benchmarking the Information Society) for the assessment of information society, which is the only project for overall assessment of information society in European Union (EU).

Within the framework of the international project SIBIS+ in Latvia there was carried out the survey including following 5 topics: telecommunications and approach, social incorporation, education, work, employment and knowledge, and e-administration. In the survey there participated in total 1006 inhabitants of Latvia out of which 32.4% from Riga region, 23.1% from Kurzeme, 13.6% from Zemgale, 14.7% from Vidzeme and 16.2% from Latgale. This division was chosen based on both the definite area of the territory and the density of population in it.

In the given research there are analysed unpublished data of the project SIBIS Latvia which characterize e-education in two ways:
• International internet lines as helper in the process of education;
• The use of electronic training materials.
Analysing the survey data there was revealed the following situation: in Latvia in general international internet lines as the help in educational process are used by 16.3% respondents.

![Fig. 3. The density of respondents who use international internet lines in the studying process](Picture created by the author using the unpublished data of the project SIBIS Latvia)

Analysing the survey results according to the regions of Latvia (Fig. 3), the international internet lines are used most in Latgale – 17.4% of respondents and in Vidzeme - 15.4%, and the least in Riga region – only 13.2%. In Zemgale and in Kurzeme there is equal amount of respondents – 14.9% which use the international internet lines. Obviously in the field of education there are not specially actualized, promoted and practiced the possibilities of international internet for the acquisition, processing and exchange of information. It means that there should be aggravated the problem. The limited use of international internet lines in the field of education could be connected with the problems of language acquisition on the level of comprehensive schools. Besides there become actual also problems connected with the use of internet – among the youth the literary and scientific language becomes incomprehensible and strange for the learners.

In the field of further education the use of international internet could ease the mastering of different studying programs, especially those that are not offered by higher educational institutions of Latvia, and thus also to prepare for such programs. This type of education could be implemented in the realization of vocational education, interest education, and lifelong learning.

If e-learning is charged service then how safe it is that it is real training not malicious action with the aim to defraud financial means. How safe it is to send over internet own made assignments (homework, practical works, tests, etc.)

Different situation is in the field of the use of electronic materials, for example, different tests, assignments, etc. In Latvia 37.7% respondents use materials electronically. Radical differences in this field are observed in Riga region and in Zemgale region if compared to the total situation in Latvia and in Kurzeme, Vidzeme, Latgale (most of the respondents are students).

As it is seen in Fig. 4, in Latgale and Zemgale respondents use materials electronically in equal shares - 41.3% and 40.8% respectively. The least materials electronically are used in Vidzeme, only 30.9%. Also in Kurzeme the share is not radically bigger – only 31.1% of respondents. Less than in Zemgale, but more than in Vidzeme and Kurzeme materials electronically are used in Riga region – 40.2%. Such situation can be explained by the fact that most educational institutions: comprehensive, vocational, secondary special educational institutions, higher educational institutions both in the number of establishments and the students are situated in Riga region (it should be taken into account that many students come from different regions) and in Zemgale. So the use of materials electronically and internet possibilities in general in these regions is objective necessity.
The use of electronic materials has its advantages and disadvantages.

It should be mentioned that in order not to mislead pupils, students, their parents, teachers and lecturers the information ought to be updated in the homepages. The question arises how to solve the problem with extra costs for the educational institution.

Researching the analysed data (factors influencing the results) with the help of econometric methods, it is obvious that the factors that have positively influenced the use of electronic learning and communication resources in the studying process could be foreseen earlier (the data obtained using the category regression), and they are: the age, skills to find the needed information in the internet, as well as certainty that the internet is the main type of information acquisition. When using the category regression in the analysis of the survey data it revealed that the main negatively influencing factors for the use of e-learning materials are connected with the working conditions of the person and the attitude towards the person – tense atmosphere at school, the length of the study day, dissatisfaction with existing training and lack of interest in learning. Increase of value by 0.04 units for any of these negatively influencing factors, the other factors remaining constant, the use of electronic materials and communication resources decreases by 0.009 units. The influence of these factors has been estimated with credibility up to 99%.

As the factors have various measurements, the coefficients of the regression equation are not comparable thus it is not possible to determine which of them influence the resulting characteristics more and which less. In order to use the regression coefficients for this purpose, coefficients were modified with the help of ‘CATREG – Regression for Categorical Data’ (variables were standardized).

It is important to use the computer, the internet and different e-materials not only after classes but also at school, when teachers work with both, the whole class, the groups and individually. However, not all teachers are ready for that. Before introducing any new technology into classrooms, teachers must be able to justify its contribution. In order to use ICT constructively, educators may have to use technology when it helps them do their good work better. Moreover, no teacher or classroom exists in isolation. Implementing technology is an issue for the entire educational institution. For example, the advent of network technologies and access to the Internet in educational institutions has brought attention to the need for learning organisation-wide technology planning. Thus, many organizations in recent times have changed their working culture to embrace such ideas as group working and self-management teams. The purchase of classroom computers and presentation equipment does not guarantee the effective integration of technology into teaching and learning. Classroom management strategies, facilities design, and long-range technology planning are equally necessary to realise technology’s potential for education. Classroom design allows the educators to plan classroom layout and technology resources for the effective integration of computer Technologies into a university. Planning considerations offer guidelines for long-range planning that seek to equip and empower teachers for technology-enhanced instruction. (Vintere, Majinovska, 2009.)

At present the demand is growing in the labour market for highly qualified employees who can quickly find the necessary information in the latest scientific achievements, modern technologies and materials that concern their field. Dynamic development processes significantly influence the necessary professional qualification of specialists stressing the need for continuous education, professional growth and social mobility. The qualification of professions and the necessary competence are changing. The fast development of technologies determines the need to over- specialize at different age. The introduction and use of information communication technologies in education can serve as strategic tool for completion of the set objectives. Therefore very important is the development of e-education possibilities. The most significant benefit from the integration of

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**Fig. 4. The density of respondents who use electronic learning and communication resources in the learning process:** (Source: Picture created by the author using the unpublished data of the project SIBIS Latvia)
ICT in education is that for the applicants there are created qualitative new conditions for the study process as well as for their further education and professional performance. Of course, it is clear that the problems of education system cannot be solved only by introducing new technologies in the study process. The main value is not of that how the students use ICT but of that how the use of information communication technologies foster the quality of education. (Vintere, 2006)

However, in addition to the above mentioned the use of electronic materials has the following problems:

- When studying in elementary school, and partly also in secondary school, pupils have not worked out such a degree of responsibility that in spite of the overload at school, they could initiate by themselves additional studying if for that is not expected any evaluation at school;
- Part of the offered materials are on very low level;
- Predominantly these materials, tests or exams are for a fee;
- To master, for example, materials from homepage [www.dzm.lv](http://www.dzm.lv) (natural sciences and mathematics) it is necessary to install additional computer program which is again for a fee, and there are problems to get it, etc.

The solutions for such problems are many and various; unfortunately, taking into account the economic situation in the country most them cannot be implemented at present.

Conclusions

Despite the complications both financial and moral, to approach the favourable result in the field of youth knowledge, at first it is necessary to carry out the following activities that do not demand large funds:

- organize intensive cooperation between the school teachers and university staff in connection to teaching mathematics, physics, and other subjects;
- summarize necessary basic skills for mastering mathematics and other subjects of programs connected with other fields in LU, RTU and LLU;
- improve the mathematics themes of the secondary school course, deepening the training in the fields that are the most necessary when studying at the universities in the fields of humanitarian, social, or exact sciences or specialties connected with medicine; for the more complete preparation the future applicants dividing the pupils in the groups according to their interests;
- organize optional lessons or after-lesson groups where pupils are helped to master better the themes in definite subjects that are necessary when entering the next educational institution;
- improve e-communication possibilities between applicants and teachers;
- find the possibility for the schoolchildren to use fully the home page [www.dzm.lv](http://www.dzm.lv) (without additional investment), as well as offer other sites.

Despite the situation in the country in the fields of e-education and communication is promising due to state’s policy which fosters the provision of computers and Internet connection in all schools as well as provision of the corresponding infrastructure in all territory of Latvia, it should be remarked that failure to use possibilities provided by information communication technologies or lack of skills to use them, can cause the so-called ‘digital exclusion’, which create the risk of failure to join social and economic processes. To foster the principle of provision of equal possibilities for all population there should be created the possibilities of the use of ICT and the possibilities to development skills of the use of ICT.

The main benefit of successful ICT application in education including full e-education development is that there are created qualitatively new conditions for students/schoolchildren in the studying/learning process as well as for their further education and professional performance.

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